Courses

Information for Course Subject Codes by Department can be found here.

Aeronautical and Astronautical Engineering

AAE 20000 - Undergraduate Sophomore Seminar

Credit Hours: 0.00. The courses are intended to provide a forum for guest speakers, organizational and informational meetings with undergraduates, and to provide a venue for discussion of professional development. **Credits:** 0.00

AAE 20300 - Aeromechanics I

Credit Hours: 3.00. Fundamental concepts and principles of bodies in motion, with applications to aeronautical and astronautical problems. Subjects covered include rectilinear motion, curvilinear motion, rotation, and plane motion. The static equilibrium and quasistatic equilibrium situations are treated as a part of motion in which the acceleration is zero. Problems involving impact, separation, work, and energy are considered. **Credits:** 3.00

AAE 20400 - Aeromechanics II

Credit Hours: 3.00. Loads on aircraft. Strain, stress, and equations of equilibrium. Description of aircraft structures and materials. Torsion of shafts. Fuselage and wing structures. Symmetrical bending and stiffness analysis of solid and stringer-panel box beams. Structural failures. **Credits:** 3.00

AAE 20401 - Aeromechanics II Laboratory

Credit Hours: 1.00. Introduction to strain gauges, dial gauges, and photoelasticity. Tensile test. Torsion of solid and hollow propeller shafts. Stress concentration around skin cut-outs. Bending of symmetrical box wing beams. Combined axial and flexural test of aircraft stringers. Buckling of slender stringers. **Credits:** 1.00

AAE 25100 - Introduction To Aerospace Design

Credit Hours: 3.00. The role of design in aerospace engineering. Introduction to aerodynamics, performance, propulsion, structures, stability and control, and weights. Layout and general arrangement of aerospace vehicles. Design concept generation and selection. Computational methods for design. Trade studies and graphical optimization. Conceptual design exercise involving aircraft, spacecraft, or both. Technical presentations and communication for aerospace engineering.**Credits:** 3.00

AAE 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in aeronautics and astronautics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AAE 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in aeronautics and astronautics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AAE 30000 - Undergraduate Junior Seminar

Credit Hours: 0.00. The courses are intended to provide a forum for guest speakers, organizational and informational meetings with undergraduates, and to provide a venue for discussion of professional development. **Credits:** 0.00

AAE 30100 - Signal Analysis For Aerospace Engineering

Credit Hours: 3.00. Signal processing and spectral analysis for aerospace engineering. Fourier and fast Fourier transforms. Vibration analysis; estimation of natural frequencies, wing vibrations. Introduction to linear circuits, operational amplifiers and filtering. Noise suppression. **Credits:** 3.00

AAE 33300 - Fluid Mechanics

Credit Hours: 3.00. Kinematics of fluids and conservation equations for mass, momentum, and energy. Viscous and inviscid incompressible flow. Lift and drag in subsonic flow. Introduction to compressibility and boundary layers. Potential flow. **Credits:** 3.00

AAE 33301 - Fluid Mechanics Laboratory

Credit Hours: 1.00. A laboratory course designed to illustrate various aerodynamic phenomena. Experiments in incompressible viscous flow; flow measurement and visualization; laminar and turbulent boundary layers; wakes. **Credits:** 1.00

AAE 33400 - Aerodynamics

Credit Hours: 3.00. Incompressible airfoil and lifting line theory. Steady and unsteady, one-dimensional, linear and nonlinear flows. Normal shock waves. Steady, supersonic, two-dimensional linear and nonlinear flows. Oblique shock waves. Perturbation theory for wings and bodies. Design applications. **Credits:** 3.00

AAE 33401 - Aerodynamics Laboratory

Credit Hours: 1.00. A laboratory course designed to illustrate various aerodynamic phenomena. Airfoil pressure distribution. Finite wing lift, drag, and moment. Supersonic flow around bodies. Shock waves. **Credits:** 1.00

AAE 33800 - Thermal Sciences

Credit Hours: 3.00. A fundamental course covering a range of topics selected from the disciplines of engineering thermodynamics, fluid mechanics, heat transfer and combustion, with an emphasis on their application to propulsion. This is an entry level course to prepare students for advanced analysis of propulsion and energy systems. Upon completion of this course, students are expected to be able to apply fundamental principles to perform thermodynamic analysis for thermophysical problems involving fluid flow, heat transfer and combustion. **Credits:** 3.00

AAE 33900 - Aerospace Propulsion

Credit Hours: 3.00. Survey of air-breathing and rocket propulsion systems for AAE students not in the propulsion option. Thermodynamic cycles, analysis of air-breathing systems and components. Rocket Equation, rocket cycles, liquid and solid propellants, chemical equilibrium. **Credits:** 3.00

AAE 34000 - Dynamics And Vibrations

Credit Hours: 3.00. Kinematics and kinetics of particles and rigid bodies. Topics include a particle in orbit, systems of particles, vibrations, Euler's equations of motion, Eulerian angles, and aerospace vehicle dynamics. **Credits:** 3.00

AAE 35103 - Aerospace Systems Design

Credit Hours: 3.00. Aerospace system lifecycle and design process. Stakeholder needs elicitation and requirements generation. Quality function deployment and hierarchical objective trees. Concept generation and creativity techniques. Introduction to safety, risk, cost and value analysis. Critical evaluation of the applicability of systems engineering techniques in specific contexts. Application of these techniques to a team semester design project. **Credits:** 3.00

AAE 35200 - Structural Analysis I

Credit Hours: 3.00. Properties of wing and fuselage sections. Beam-column moments. Torsion of thin-walled and skin-stringer multiple-cell sections. Nonsymmetrical bending of skin-stringer wing sections. Flexural shear in open and closed thin-walled and skin-stringer sections. Loads and stresses in the rib system. Cutouts and shear lag. Modified beam theory for wing and fuselage design. Deflection by energy method. Introduction to composite structures. **Credits:** 3.00

AAE 35201 - Structural Analysis I Laboratory

Credit Hours: 1.00. Location of shear center. Torsion of thin-walled open and closed sections. Torsion of multiple-cell, thin-walled section. Nonsymmetrical bending of skin-stringer cross section. Shear lag effect. Bending of composite beam. **Credits:** 1.00

AAE 36100 - Introduction To Random Variables In Engineering

Credit Hours: 3.00. Events, sample space, probability, conditional probability, independence, random variables. Probability mass functions, density functions, and cumulative distribution functions. Derived probability density functions. Bernoulli, Poisson, and normal processes. Applications to engineering problems. Some fundamental limit theorems. **Credits:** 3.00

AAE 36400 - Control System Analysis

Credit Hours: 3.00. Modeling and analysis of dynamical systems with aerospace applications. Laplace transforms, transfer functions, block diagrams. Transient and steady-state response of dynamical systems. Root Locus, Bode, Nyquist methods for control systems analysis. Introduction to controller design. **Credits:** 3.00

AAE 36401 - Control Systems Laboratory

Credit Hours: 1.00. Enhance student awareness of control systems by providing hands-on experience using dynamic systems representative of air and space vehicles. Design of a control system from start to finish by mapping requirements into control solutions through the process of modeling, identification, and controller design (PID and Lead-Lag). **Credits:** 1.00

AAE 38199 - Professional Practice Co-Op I

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Professional Practice students only. Permission of department required. **Credits:** 0.00

AAE 38299 - Professional Practice Co-Op II

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Professional Practice students only. Permission of department required. **Credits:** 0.00

AAE 38399 - Professional Practice Co-Op III

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Professional Practice students only. Permission of department required. **Credits:** 0.00

AAE 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in aeronautics and astronautics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required.**Credits:** 0.00

AAE 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in aeronautics and astronautics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AAE 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in aeronautics and astronautics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AAE 39699 - Professional Practice Internship

Credit Hours: 0.00. Professional experience in aeronautics and astronautics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Permission of department required. **Credits:** 0.00

AAE 40000 - Undergraduate Senior Seminar

Credit Hours: 1.00. A lecture-demonstration series emphasizing evaluation of career options, identification and development of professional skills. Example of career-related topics include choosing a job, and post graduate education in engineering or other disciplines. Examples of professional skills topics covered include interviewing, writing, and ethics. Assessment of student achievement of AAE program learning outcomes. **Credits:** 1.00

AAE 41200 - Introduction To Computational Fluid Dynamics

Credit Hours: 3.00. Introductory course in the formulation and application of finite difference methods for solving fluid flow problems. Classification of partial differential equations and formulation of well-posed problems. Discrete approximation of partial differential equations: stability, consistency, and convergence. Finite-volume formulations. Survey of methods for solving hyperbolic, elliptic, and parabolic problems. Formulation of discrete boundary conditions. Application of methods to one- and two-dimensional flow problems. **Credits:** 3.00

AAE 41600 - Viscous Flows

Credit Hours: 3.00. Navier-Stokes equations, boundary layer theory, frictional drag and heating, separation and transition. Turbulent flows. Computational methods for laminar and turbulent flows. **Credits:** 3.00

AAE 41800 - Zero-Gravity Flight Experiment

Credit Hours: 3.00. Team-based design-build-test engineering experience to maximize the benefits of student participation in the NASA Reduced Gravity Student Flight Opportunity Program (or similar). Gravity, orbits, and weightlessness. Low-gravity capillary fluid physics, scaling laws, and components. Experiment design for multiple short zero gravity test times. Technical proposal writing, design for manufacturability, experiment fabrication, planning, testing, and execution. **Credits:** 3.00

AAE 42100 - Flight Dynamics And Control

Credit Hours: 3.00. Flight vehicle rigid-body equations of motion; linearization via small perturbation techniques. Trim analysis, static and dynamic stability, aerodynamic stability derivatives and control effectiveness. Vehicle transfer functions, stability augmentation, aircraft handling qualities. Introduction to flexible vehicle effects. **Credits:** 3.00

AAE 43800 - Air-Breathing Propulsion

Credit Hours: 3.00. Basic operating principles and analysis of performance characteristics of propulsion systems for air-breathing aerospace vehicles. Ramjet, turbojet, turbofan and turboprop cycle analysis. Propeller analysis and design. Analysis of flow through inlets, combustors, nozzles, compressors, and turbines. Component matching. Not open to students with credit in ME 43800. **Credits:** 3.00

AAE 43900 - Rocket Propulsion

Credit Hours: 3.00. Flight mechanics and the propulsion system requirements for terrestrial and interplanetary flight. Converging-diverging nozzle analysis and design. Thermochemistry of propellants and performance calculations. Solid rocket motor interior ballistics and design. Thrust chamber and turbo machinery analysis and design. Liquid rocket engine cycle analysis and design. Elements of nuclear and electric propulsion systems. **Credits:** 3.00

AAE 44000 - Spacecraft Attitude Dynamics

Credit Hours: 3.00. Description of orientation, angular velocity, and angular acceleration in terms of direction cosines, Euler parameters, and angles. Forces and moments acting on space vehicles. Attitude stability of various types of satellites in circular and elliptic orbits. Spin stabilization and gravity gradient torques. Gyroscopic devices and energy dissipation. Introduction to attitude control. **Credits:** 3.00

AAE 45000 - Spacecraft Design

Credit Hours: 3.00. Senior students perform a team-based spacecraft design, requiring application of the education and skills developed in the aerospace curriculum. Components include analysis methods for preliminary design, development of an initial vehicle concept, and development of a complete numerical model of the mission, culminating in oral and written reports by the teams. **Credits:** 3.00

AAE 45100 - Aircraft Design

Credit Hours: 3.00. Senior students perform a team-based aircraft design, requiring application of the education and skills developed in the aerospace curriculum. Aircraft mission requirements include engine cycle selection and airframe/engine integration, performance, stability and control, structures, human factors, avionics, sensors, and manufacturing processes. The teams present oral and written reports on their designs. **Credits:** 3.00

AAE 45300 - Matrix Methods In Aerospace Structures

Credit Hours: 3.00. Matrix algebra and its programming. Energy principles and finite element formulation method. Coordinate transformation and assemblage. Stiffness, mass, and incremental stiffness matrices for aircraft elements - bar, beam, and shear panel. Analysis and design of wing box and fuselage structures using simple computer programs (static and dynamic). **Credits:** 3.00

AAE 45400 - Design Of Aerospace Structures

Credit Hours: 3.00. Design/failure criteria for aerospace structures, materials selection, introduction to manufacturing methods, structural assemblies, component details, concurrent engineering, and interdisciplinary design teams. **Credits:** 3.00

AAE 49000 - Special Problems In Aeronautical Engineering

Credit Hours: 0.00 to 18.00. Hours and credit to be arranged. Permission of instructor required. **Credits:** 0.00 to 18.00

AAE 49700 - Independent Study In Aerospace Engineering

Credit Hours: 0.00 to 6.00. Projects or special topics of contemporary importance or of special interest outside the scope of the standard undergraduate curriculum. Interested students seek a faculty advisor in their area of special interest and together prepare a brief description of the work to be undertaken. Permission of instructor required. **Credits:** 0.00 to 6.00

AAE 50700 - Principles Of Dynamics

Credit Hours: 3.00. Kinematics, fundamental laws of mechanics, constraints, and generalized coordinates. Lagrange's equations, virtual work. Application to particle dynamics, rigid body motion, and spacecraft dynamics. Knowledge of differential equations required. **Credits:** 3.00

AAE 50800 - Optimization In Aerospace Engineering

Credit Hours: 3.00. Formulation of optimization problems encountered in aerospace engineering. Minima of functions and functionals, necessary conditions, calculus of variations, control formulation, two-point boundary-value problems. Applications to typical problems in aerospace engineering, such as optimal launch, minimum time to climb, maximum range, and optimal space trajectories. **Credits:** 3.00

AAE 51100 - Introduction To Fluid Mechanics

Credit Hours: 3.00. The basic conservation equations are derived for a compressible viscous fluid, and then are specialized for applications in potential flow, viscous flow, and gas dynamics. **Credits:** 3.00

AAE 51200 - Computational Aerodynamics

Credit Hours: 3.00. Finite difference methods for solving fluid flow problems. Review of classification of partial differential equations, well-posed problems, and discrete approximation of partial differential equations. Matrix and von Neumann stability analysis. Consistency and convergence. Grid generation: elliptic, hyperbolic, and transfinite mesh generation methods. Methods for solving the unsteady Euler equations: finite-volume formulations, flux-split and flux-difference formulations, shock-capturing, formulation of boundary conditions, artificial viscosity models, and multi-grid acceleration.**Credits:** 3.00

AAE 51400 - Intermediate Aerodynamics

Credit Hours: 3.00. Thin airfoil theory and panel methods. Three-dimensional elementary solutions, lifting-line and lifting-surface models. Slender wing and slender body theory. Normal/oblique shock waves. One- and multi-dimensional flows and conical flows. Method of characteristics. Introduction to transonic flow, hypersonic flow, and airfoil design. **Credits:** 3.00

AAE 51500 - Rotorcraft Aerodynamics

Credit Hours: 3.00. Introduction to Vertical Take-Off and Landing (VTOL) concepts and configurations. Rotor kinematics. Momentum and blade element theory. Rotor wakes and noise. Airfoil design for rotorcraft. Introduction to Computational Fluid Dynamics (CFD) techniques, rotorcraft performance, and design. **Credits:** 3.00

AAE 51800 - Low-Gravity Fluid Dynamics

Credit Hours: 3.00. Theory and design for control of liquid propellants in weightlessness. Gravity and orbits review. Satellite and space-probe acceleration environments. Capillary-dominated fluid dynamics: contact angle, surface tension, curvatures, and solution methods. Industry practice and current topics. **Credits:** 3.00

AAE 51900 - Hypersonic Aerothermodynamics

Credit Hours: 3.00. Aerodynamics of satellites and planetary re-entry. Continuum hypersonic flow. Inviscid and viscous effects, boundary layers, and heat transfer. Shock and boundary-layer interactions. Equilibrium flow of high-temperature reacting gases. Nonequilibrium effects. Kinetic theory and rarefied flows. Direct simulation Monte Carlo techniques. **Credits:** 3.00

AAE 52000 - Experimental Aerodynamics

Credit Hours: 3.00. Theory and application of experimental techniques and instrumentation for aerodynamics and fluid mechanics. Computer data acquisition, wind tunnels, force balances, flow visualization, pressure probes, hot wire anemometry, laser Doppler velocimetry and turbulence measurements. **Credits:** 3.00

AAE 52100 - Plasma Laboratory

Credit Hours: 3.00. The laboratory course will include lab prep lectures, practical classes and mini-projects. Lab prep lectures will briefly cover topics of the basic plasma physics and diagnostics relevant to the subsequent practical classes. In addition, details of the corresponding lab procedure, instructions and lab report assignment will be discussed. Practical classes will involve students in practical creation and operation of various plasma sources and plasma diagnostics. Specifically, students will operate DC high voltage breakdown facility, electrostatic accelerator (ion thruster), cross-field accelerator (Hall thruster), Atmospheric-Pressure Plasma Jet facility, and will conduct measurements of plasma parameters using Langmuir probes, microwave interferometer and optical spectrometer. **Credits:** 3.00

AAE 52300 - Introduction To Remote Sensing

Credit Hours: 3.00. Fundamentals of satellite and airborne remote sensing. Basic physical principles of electromagnetic wave propagation will be introduced. From this foundation, the phenomenology's enabling properties of the atmosphere; ocean and land surface to be measured at a distance will be developed. These principles will be applied to the design of instruments and satellite missions for Earth observation. Microwave instruments will be emphasized, although there will also be discussion of optical systems. Most of the material would also be applicable to remote sensing of other planets. Intended for students in Engineering or the Sciences. **Credits:** 3.00

AAE 53200 - Orbit Mechanics

Credit Hours: 3.00. Orbit determination of near-earth satellites and various perturbations; libration and attitude control; orbit transfer and interception; lunar theory and interplanetary orbits; ascending mechanics and re-entry. **Credits:** 3.00

AAE 53300 - Space Traffic Engineering Management

Credit Hours: 3.00. The course teaches the basic techniques and concepts relevant to Space Traffic Management (STM) and Space Situational Awareness (SSA) from a rigorous engineering perspective. The class starts with learning how measurements are collected and processed and then moves on to the non-linear orbital motion and astrodynamics in the near-Earth realm. The focus is on orbit determination and orbit improvement of satellites and space debris to detect new objects and maintain custody of them. Lastly, the class focuses on determining the probability of collision of two resident space objects. At the end of the course, the students are equipped with a fundamental Matlab toolset to investigate their own STM or SSA problems.**Credits:** 3.00

AAE 53400 - Spacecraft Electric Propulsion

Credit Hours: 3.00. Spacecraft electric propulsion systems are intended to provide thrust for propelling spacecrafts in interplanetary missions, orbital maneuvers, and attitude control. The course will start with reviewing material on the mechanics and thermodynamics of propulsion, and identifying the niche occupied by the electric propulsion systems. The course will cover elements of plasma physics and electromagnetic theory essential for studying the electric propulsion systems. The core of the course will focus on studying various electric propulsion concepts which utilize electric power produced on-board to generate thrust. Mechanisms of the utilization of the electric power to accelerate gas or plasma and produce thrust will be considered, including electrothermal, electrostatic, electromagnetic, and gasdynamic acceleration mechanisms. **Credits:** 3.00

AAE 53500 - Propulsion Design, Build, Test

Credit Hours: 3.00. Intensive one-semester treatment of the aerospace propulsion component development process. Derivation of design requirements from mission objective to detailed components; the design process. Standard methods for thermostructural, life, performance, and combustion stability design analysis; combustor design. Experimental procedures; fabrication; test. Special topics according to student interest. **Credits:** 3.00

AAE 53700 - Hypersonic Propulsion

Credit Hours: 3.00. Analysis of advanced high speed air breathing propulsion concepts for hypersonic flight. Missions and trajectories. Engine/airframe integration. Aerothermodynamic analysis of ramjets, scramjets, and oblique detonation wave engines. On- and off-design of compression inlets and minimum length nozzles. Cryogenic fuels and skin cooling. Ram accelerator ballistic launch concepts. **Credits:** 3.00

AAE 53800 - Air Breathing Propulsion

Credit Hours: 3.00. (ME 53800) Analysis of operating characteristics of turbojet, turbofan, turboshaft, afterburning, and ramjet propulsion systems. Analysis and design of inlet, diffuser, combustor, compressor, turbine, nozzle. Component matching and off-design performance. Inlet distortion, nozzle-afterbody, and installation losses. Mission analysis. **Credits:** 3.00

AAE 53900 - Advanced Rocket Propulsion

Credit Hours: 3.00. Generalized internal compressible and incompressible flows. Thermochemistry and heat transfer in rocket applications. Advanced topics in solid rocket motor performance and internal ballistics. Liquid rocket engine cycle analysis and turbopump design. Combustion of liquid and solid propellants. Hybrid rockets and thermal-nuclear engines. **Credits:** 3.00

AAE 54500 - Dynamic Behavior of Materials

Credit Hours: 3.00. Materials' responses to high-rate loading are different from their quasi-static behavior. Applications of materials in structures subjected to impact loading from events such as bird strike require the understanding of dynamic material behavior. Such high-rate materials behavior is not available in standard materials handbooks or design manuals. This course introduces stress wave propagation in solids, which is the foundation to characterization and understanding of high-rate response of materials. Then, the theoretical background and working principles of high-rate experimental methods are presented to characterize the material response under high-rate loading conditions. Finally, rate-dependent material models are introduced to describe the dynamic material behavior and deformation mechanisms. **Credits:** 3.00

AAE 54600 - Aerospace Structural Dynamics And Stability

Credit Hours: 3.00. Dynamics of continuous systems: rod, beam, frame, and plate structures. General structural principles: virtual work, Hamilton's principle, Lagrange's equation, and Ritz method for discrete approximations. Modal analysis: eigenanalysis, mode shapes, mode superposition, and complex modes. Nonlinear vibrations: phase plane, Poincare, bifurcation plots, and chaos. Stability of the motion: classification of problems, follower loads, aerodynamic loads, divergence, flutter, pulsating compression, and gyroscopic systems. **Credits:** 3.00

AAE 54800 - Mechanical Behavior Of Aerospace Materials

Credit Hours: 3.00. This course serves as an overview for materials behavior for students without a materials background, including seniors and entry-level graduate students. Materials are at the foundation for all of engineering, as evident by the latest products that we design, to the airplanes that we fly, to the latest smartphones. In fact, breakthroughs with material research are often accompanied by rapid advancements in technology. Thus, it is paramount for all engineers to have an understanding of the structure and behavior of materials. In this class, we focus on the structure of materials, the microstructure connection to mechanical properties, and, ultimately, failure mechanisms. Materials play an important role in both design and manufacturing, which will be addressed in the context of components and extreme environments. Of specific interest will be defects within materials, defect formation/evolution, and their role in strengthening mechanisms. Material anisotropy, micromechanisms, and elasto-plastic properties at the atomic, single-crystal/constituent, and polycrystal-material levels and their use in explaining the deformation and failure characteristics in metals, polymers, and ceramics; failure mechanisms and toughening in composites; structure and behavior of aerospace materials: metal alloys, ceramic-matrix composites, and fiber-reinforced polymer composites. Particular topics will also include: elastic deformation, dislocation mechanics, plastic deformation and strengthening mechanisms, creep, and failure mechanisms; design criteria; special topics. We will attempt to have minimal overlap with AAE 55400, Fatigue of Structures and Materials. Therefore we will not cover fracture, fatigue, or stress concentrators. **Credits:** 3.00

AAE 55000 - Multidisciplinary Design Optimization

Credit Hours: 3.00. Basics of numerical optimization: problem formulation, conditions of optimality, search direction, and step length. Calculus-based techniques for univariate and multivariate optimization. Constrained and unconstrained optimization methods. Global optimization methods. Multi-objective optimization: Pareto optimality and approaches. Recent multidisciplinary design optimization techniques: approximations, response surface methodology, and collaborative optimization. Applications of various methods and techniques to representative engineering problems, culminating in a final project. Ability to solve mathematical problems with MATLAB and IMSL and similar software helpful. **Credits:** 3.00

AAE 55100 - Design Theory And Methods For Aerospace Systems

Credit Hours: 3.00. Introduction to design theory, aerospace design process, design specification and requirements, concept generation and selection, design decomposition, improving designs, process design, and concurrent engineering. Design for assembly/manufacture. Projects allow for application and critical analysis of design methods. **Credits:** 3.00

AAE 55200 - Nondestructive Evaluation Of Structures And Materials

Credit Hours: 3.00. Overview of methods employed for nondestructive evaluation of structures and materials taught in the context of damage tolerant structural analysis. Major inspection topics include: radiography, ultrasonics, eddy current, penetrant, magnetic, and visual/optical techniques. Other new emerging inspection techniques also are discussed. Offered in alternate years. **Credits:** 3.00

AAE 55300 - Elasticity In Aerospace Engineering

Credit Hours: 3.00. A basic course in the theory of elasticity with emphasis on understanding the fundamental principles and solution techniques used in the stress analysis of structures. Cartesian tensors. Governing equations for linear elasticity. Rigorous derivation of beam and plate equations from the three-dimensional elasticity equations. Torsion. Thermoelasticity. The stress functions and complex functions approaches to two-dimensional problems. Energy methods and approximate solutions. Three-dimensional problems. Knowledge of differential equations assumed. **Credits:** 3.00

AAE 55400 - Fatigue Of Structures And Materials

Credit Hours: 3.00. Development and application of methods for predicting the fatigue life of structural components. Characterization and response of materials to cyclic loading. Fatigue resistant design of aerospace structures. Both fatigue crack initiation and crack propagation concepts are discussed. **Credits:** 3.00

AAE 55500 - Mechanics Of Composite Materials

Credit Hours: 3.00. Current and potential applications of composite materials. Review of elasticity of anisotropic solids. Methods for determining mechanical properties of heterogeneous materials. Static and dynamic analyses of laminated composites. Fracture and fatigue of laminates. Reliability, testing, and design of composites. **Credits:** 3.00

AAE 55600 - Aeroelasticity

Credit Hours: 3.00. The study of the effect of aerodynamic forces of flexible aircraft. Static aeroelastic problems; control effectiveness; lift effectiveness; divergence. Dynamic aeroelasticity; classical flutter; an introduction to stability augmentation with controls. A review of standard and modern numerical solution techniques; the k-method, the British or p-k method. **Credits:** 3.00

AAE 55800 - Finite Element Methods In Aerospace Structures

Credit Hours: 3.00. Introduction to the use of advanced finite element methods in the calculation of deformation, strain, and stress in aerospace structures. Topics include: 1-D, 2-D, 3-D, and axisymmetric elements, isoperimetric element formulation, convergence, treatment of boundary conditions and constraints. Special topics include stability, dynamic analysis, and nonlinear material behavior. Emphasis is on the theoretical knowledge of the finite element method. Applied experience is gained by solution of aerospace structural analysis problems through use of professional software. **Credits:** 3.00

AAE 56000 - System-Of-Systems Modeling And Analysis

Credit Hours: 3.00. Introduction to features of system-of-systems problems; problem definition tools; role of complexity; network topology analysis and agent-based simulation models; architecture analysis; metrics for multi-stakeholder problems; semester team projects allow students to exercise and critique such methods for analyzing system-of-systems problems. Some background in probability and statistics (e.g. random variables, probability density and distributions, sampling methods) is expected. **Credits:** 3.00

AAE 56100 - Introduction To Convex Optimization

Credit Hours: 3.00. (IE 56100) Introduction to convex analysis, convex optimization problems, algorithms of convex optimization and measures of their complexity, and application of convex optimization in aerospace engineering. Recognition of convex optimization problems that arise in scientific and engineering applications. Introduction to software tools to solve convex optimization problems. **Credits:** 3.00

AAE 56400 - Systems Analysis And Synthesis

Credit Hours: 3.00. State space methods of analysis and design of continuous and discrete-time linear systems. Coordinate transformations, Jordan canonical forms, digital control, controllability and observability of continuous and discrete systems. Liapunov stability analysis. The linear regulator problem of optimal control via Hamilton Jacobi theory. Pole assignment, stabilizability, detectability. State estimation for deterministic models. Minimal order observers. MA 51100 recommended concurrently. **Credits:** 3.00

AAE 56500 - Guidance And Control Of Aerospace Vehicles

Credit Hours: 3.00. Optimal control theory and application to trajectory optimization; flight control synthesis and guidance law development; handling qualities; stability augmentation; auto-pilots. Launch vehicle and ballistic missile attitude control. AAE 56400 recommended. **Credits:** 3.00

AAE 56700 - Introduction To Applied Stochastic Processes

Credit Hours: 3.00. An introductory course in the concept of a discrete and continuous stochastic process based upon physical phenomena that originally gave rise to the specific stochastic models that are studies. Spectral analysis, response of time invariant systems to noise inputs. Estimation theory, Kalman and Winer filtering. **Credits:** 3.00

AAE 56800 - Applied Optimal Control And Estimation

Credit Hours: 3.00. This course introduces students to analysis and synthesis methods of optimal controllers and estimators for (stochastic) dynamical systems. The topics in this course include a review of probability and stochastic processes, classical estimation techniques, Pontryagin's maximum principle, dynamic programming. Linear Quadratic Regulator problems (LQR), Kalman filter, duality of LQR with Kalman filter, Linear Quadratic Gaussian (LQG), and a range of engineering applications. **Credits:** 3.00

AAE 57100 - Complex System Safety

Credit Hours: 3.00. The objective of this course is to provide students with the ability to assess the safety risk posed by engineering systems, taking into consideration hardware, software, human, and organizational factors, and using risk assessment tools that are used in practice in industry.**Credits:** 3.00

AAE 57500 - Introduction To Satellite Navigation And Positioning

Credit Hours: 3.00. Introduction to radio-navigation techniques, using the Global Navigation Satellite System (GNSS); GNSS signal structures; satellite search and acquisition; satellite tracking; coordinate systems and time; observations; atmospheric effects; and position-velocity-time (PVT) solutions. **Credits:** 3.00

AAE 58500 - Air Transportation Systems

Credit Hours: 3.00. This course provides an overview of civil air transportation system design and operations, ranging from the economics of airlines to air traffic control. The course is divided into two general theme areas: Airline Economics and

Scheduling; and Airline Fight Operations and Air Traffic Control. This course will prepare students for positions in the civil aviation industry and for graduate research in civil aviation topics. Permission of instructor required. **Credits:** 3.00

AAE 59000 - Projects In Aeronautical Engineering

Credit Hours: 1.00 to 6.00. Topics vary - projects in Aeronautical Engineering. Permission of instructor required. **Credits:** 1.00 to 6.00

AAE 59500 - Aerospace Seminar

Credit Hours: 0.00. An interdisciplinary seminar that provides a forum for invited speakers and staff to discuss new developments in practice and current research in aerospace engineering. **Credits:** 0.00

AAE 59700 - Independent Study In Aerospace Engineering

Credit Hours: 0.00 to 6.00. Projects or special topics of contemporary importance or of special interest that are outside the scope of the standard graduate curriculum can be studied under the Special Topics in Aerospace Engineering course. Interested students should seek a faculty advisor by meeting with individual faculty members who work in their area of special interest and prepare a brief description of the work to be undertaken in cooperation with their advisor. Permission of instructor required. **Credits:** 0.00 to 6.00

AAE 60700 - Variational Principles Of Mechanics

Credit Hours: 3.00. Basic concepts of analytical mechanics, calculus of variations, Hamilton's equations, Hamilton-Jacobi theory, canonical transformations. Offered in alternate years. Prerequisite: AAE 50700. **Credits:** 3.00

AAE 61300 - Viscous Flow Theory

Credit Hours: 3.00. Compressible, laminar boundary layer theory; Buseman and Crocco integrals; skin friction and heat transfer. Introduction to turbulent boundary layers and transition phenomena. Advanced boundary layer theory; the method of inner and outer expansions. Boundary layers with chemical reaction; applications to hypersonic flow and combustion. Prerequisite: AAE 51100. **Credits:** 3.00

AAE 61500 - Aeroacoustics

Credit Hours: 3.00. (ME 61500) Quantitative measures of sound (decibel) scales, spectra, energetics of acoustic motions, and measurement techniques. The wave theory of sound (basic equations and properties, sound propagation in homogeneous and inhomogeneous media, one-, two-, and three-dimensional sound fields, and distributed sources). Effects of source movement. Aerodynamic noise generation-acoustic analogy (Lighthill's equation and Ffowcs Williams-Hawkins equation). Introduction to Computational Aeroacoustics (CAA). Noise from turbulent shear flows (jet noise, cavity noise, and noise from flow over objects). Noise from turbomachinery, propellers, and rotors. Prerequisite: AAE 51100 or ME 50900 or ME 51300. **Credits:** 3.00

AAE 62400 - Laminar-Turbulent Transition

Credit Hours: 3.00. Instability mechanisms, such as Kelvin-Helmholtz, Tollmien-Schlichting, Gortler, and crossflow. Secondary instabilities. Nonlinear and nonparallel effects; the Parabolized Stability Equations; receptivity; transition prediction. Effects of compressibility, heating, roughness, turbulence, noise, curvature, etc. Turbulent spots and the extent of transitional flow. Prerequisite: AAE 51100. **Credits:** 3.00

AAE 62600 - Turbulence And Turbulence Modeling

Credit Hours: 3.00. Physical description of turbulence. Reynolds averaged equations. Scaling of basic turbulent flows. Homogeneous turbulence, spectra and two-point correlations. Hierarchy of turbulence models, including zero-, one-, and two-equation models, Reynolds stress models, large eddy simulations, and direct numerical simulations. Additional topics, such as compressibility effects on turbulence and probability density function methods, as time allows. Prerequisite: AAE 51100. **Credits:** 3.00

AAE 63200 - Advanced Orbital Dynamics

Credit Hours: 3.00. Discussion of more advanced concepts in astrodynamics. Includes fundamental theories from celestial mechanics, as well as trajectory determination and perturbation analysis with application to the motion of Earth-orbiting and interplanetary spacecraft. Assumes experience with the two-body problem. Offered in alternate years. Prerequisite: AAE 50700, AAE 53200. **Credits:** 3.00

AAE 64200 - Graduate Professional Practice

Credit Hours: 0.00. Practice in industry and comprehensive written reports of this practice. Approval by the student's adviser or major professor and by the Graduate professional practice administrator. Prerequisite: Approval by the student's adviser or major professor and by the Graduate professional practice administrator. Permission of instructor required. **Credits:** 0.00

AAE 64600 - Elastic Wave Propagation

Credit Hours: 3.00. Elastic wave propagation in rods, beams, and plates. Wave motion in semi-infinite bodies; Rayleigh, Lamb and Love waves. Pochhammer-Chree theory for rods. General properties of dispersive waves and approximation techniques. Impact. Wave front and ray methods. Introduction to wave propagation in anelastic and nonhomogenous media, and to large amplitude and shock waves. Prerequisite: AAE 55300 or ME 56300. **Credits:** 3.00

AAE 64800 - Modeling Damage And Strengthening Mechanisms In Materials

Credit Hours: 3.00. The usage of materials is the backbone of engineering practice. Yet, advances in materials have stagnated due to overly conservative approaches, trial-and-error testing, and long qualification times. Material modeling offers tremendous opportunities to address these issues. This class offers advanced modeling strategies at the intersection of mechanics and materials science for both polycrystalline and composite materials. The course topics are defined as follows: First, advanced micromechanics analysis of modern engineering materials with emphasis on relating elastic microstructural phenomena to the mechanics of material behavior, via the Eshelby inclusion problem and its application to fiber reinforced composites. Second, classical plasticity is summarized via phenomenological and mathematical formulation of the constitutive laws, including yielding, yield surface; von Mises, Tresca yield criteria; Drucker's stability postulate; strain or work hardening, normality rule, perfect plasticity, and stress-strain law. Third, crystal plasticity is discussed, specifically physical and mathematical foundation for plasticity in crystalline materials, with a detailed description of the Bishop and Hill implementation of the Taylor model for deformation of polycrystals. Lastly, concepts of dislocations leading to strengthening mechanisms in metals are discussed: (i) by studying the anisotropy of material and elastoplastic properties at crystal level, microstructural basis for deformation in metals, polymers, and ceramics and (ii) failure mechanisms and toughening in metals, with primary emphasis on work/strain hardening, solid solution hardening, precipitate hardening, and grain boundaries. The course will be comprised of three projects, where the student chooses the topic of the third and final project. Prerequisite: AAE 55300 or equivalent. **Credits:** 3.00

AAE 65400 - Fracture Mechanics

Credit Hours: 3.00. Methods of stress analysis in elastic media containing cracks. Fracture criteria. The strain energy release rate and J-integral. Crack tip plasticity. Interface cracks. Cracks in anisotropic solids. Bending of cracked plates. Dynamic crack propagation. Prerequisite: AAE 55300. **Credits:** 3.00

AAE 66600 - Nonlinear Dynamics, Systems, And Control

Credit Hours: 3.00. Fundamental concepts and tools that are useful in the analysis of nonlinear systems and in the design of controllers and estimators for such systems. Results are illustrated by, and applied to, aerospace/mechanical systems. Prerequisite: AAE 56400. **Credits:** 3.00

AAE 66800 - Hybrid Systems: Theory And Analysis

Credit Hours: 3.00. Hybrid systems are dynamical systems with both continuous and discrete dynamics and they are finding increasing applications in a variety of engineering fields, even in scientific fields such as biological systems. This course will present the recent advances in modeling, analysis, control, and verification of hybrid systems. Topics covered in this course include the following aspects of hybrid systems: continuous-time and discrete-event models; reachability analysis; safety specifications and model checking; optimal control and estimation of hybrid systems; stability analysis and verification tools; stochastic hybrid systems; numerical simulations; and a range of engineering applications. Prerequisites: AAE 56400. **Credits:** 3.00

AAE 67500 - Advanced Signals And Systems For Satellite Navigation

Credit Hours: 3.00. Fundamental theory of ranging signal design. Generation of pseudorandom noise. Methods for detecting, tracking, and estimating delay using ranging signals. Probability of detection, probability of false alarm, and tracking threshold derived from a stochastic signal model. Models for multiple access, quantization, clock and multipath errors. Examples drawn from present-day Global Navigation Satellite Systems (GNSS). Prerequisites: ECE 60000, AAE 56700, or equivalent (Random Variables and Stochastic Processes). **Credits:** 3.00

AAE 69000 - Advanced Aeronautical Engineering Projects

Credit Hours: 1.00 to 6.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 6.00

AAE 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

AAE 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

AT 24802 - Commercial Flight II Under Federal Aviation Regulations Part 141

Credit Hours: 2.00. This course is designed to finish preparation for the FAA Commercial Pilot Certificate practical exam. Permission of department required.**Credits:** 2.00

Aerospace Studies

AFT 11000 - Heritage And Values I

Credit Hours: 1.00. A survey course designed to introduce students to the United States Air and Space Forces and provides an overview of the basic characteristics, missions, and organization of the Air and Space Forces. **Credits:** 1.00

AFT 11100 - Air Force ROTC Leadership Laboratory I

Credit Hours: 1.00. Introduction to military training. Introduction to drill and ceremonies, study and experience in Air Force standards, customs and courtesies. **Credits:** 1.00

AFT 12000 - Heritage And Values II

Credit Hours: 1.00. A survey course designed to introduce students to the United States Air and Space Forces and provides an overview of the basic characteristics, missions, and organization of the Air and Space Forces.**Credits:** 1.00

AFT 12100 - Air Force ROTC Leadership Laboratory II

Credit Hours: 1.00. Reinforces Air Force military training, drill and ceremonies, study and experience in Air Force standards, customs and courtesies. **Credits:** 1.00

AFT 20220 - Air Force ROTC Leadership Laboratory

Credit Hours: 1.00. Leadership Laboratory (LLAB) is a dynamic and integrated grouping of leadership developmental activities designed to meet the needs and expectations of prospective Department of the Air Force second lieutenants and to complement the AFROTC academic program. It is a student planned, organized, and executed practicum conducted under the supervision of the Detachment Commander and Operations Flight Commander.**Credits:** 1.00

AFT 23000 - Team And Leadership Fundamentals I

Credit Hours: 1.00. Provides a fundamental understanding of both leadership and team building. The lessons and course flow are designed to prepare students for field training and leadership positions in the detachment.**Credits:** 1.00

AFT 23100 - Air Force ROTC Leadership Laboratory III

Credit Hours: 1.00. Cadets experiment with and develop leadership/management skills. Study of Air Force customs and courtesies, drill and ceremonies, and giving military commands; instructing, correcting, and evaluating the preceding skills, and study the Air Force officer environment. **Credits:** 1.00

AFT 24000 - Team And Leadership Fundamentals II

Credit Hours: 1.00. Provides a fundamental understanding of both leadership and team building. The lessons and course flow are designed to prepare students for field training and leadership positions in the detachment.**Credits:** 1.00

AFT 24100 - Air Force ROTC Leadership Laboratory IV

Credit Hours: 1.00. Cadets continue with emphasis on field training preparation, developing leadership/management skills. Study of Air Force customs and courtesies, drill and ceremonies, and giving military commands; instructing, correcting, and evaluating the preceding skills, and study the Air Force officer environment. **Credits:** 1.00

AFT 35100 - Leading People And Effective Communication I

Credit Hours: 3.00. Leading People and Effective Communication utilizes student's field training experience to take a more in-depth look at leadership. Special emphasis is placed on enhancing communication skills, and why that is important as a leader. Students have an opportunity to try out these leadership and management techniques in a supervised environment as juniors and seniors.**Credits:** 3.00

AFT 35200 - Air Force ROTC Leadership Laboratory V

Credit Hours: 1.00. Intermediate level leadership experience for military training cadets. Cadets lead the planning, coordinating, and directing of military activities for the cadet corps; provide formal training and guidance to increase the understanding, motivation, and performance of other cadets. **Credits:** 1.00

AFT 36100 - Leading People And Effective Communication II

Credit Hours: 3.00. Leading People and Effective Communication uses the student's field training experience to take a more in-depth look at leadership. Special emphasis is placed on enhancing communication skills, and why that is important as a leader. Students have an opportunity to try out these leadership and management techniques in a supervised environment as juniors and seniors.**Credits:** 3.00

AFT 36200 - Air Force ROTC Leadership Laboratory VI

Credit Hours: 1.00. Advanced leadership experience for field training preparation cadets. Cadets lead the planning, coordinating, and directing of military activities for the cadet corps; provide formal training and guidance to increase the understanding, motivation, and performance of other cadets. **Credits:** 1.00

AFT 40220 - Air Force ROTC Leadership Laboratory

Credit Hours: 1.00. Leadership Laboratory (LLAB) is a dynamic and integrated grouping of leadership developmental activities designed to meet the needs and expectations of prospective Department of the Air Force second lieutenants and to complement the AFROTC academic program. It is a student planned, organized, and executed practicum conducted under the supervision of the Detachment Commander and Operations Flight Commander.**Credits:** 1.00

AFT 47100 - National Security/Commissioning Preparation I

Credit Hours: 3.00. National Security/Commissioning Preparation is designed for college seniors and gives them the foundation to understand their role as military officers and how they are directly tied to our National Security Strategy. It is an overview of the complex social and political issues facing the military profession and requires a measure of sophistication commensurate with the senior college level.**Credits:** 3.00

AFT 47200 - Air Force ROTC Leadership Laboratory VII

Credit Hours: 1.00. Advanced leadership experience for introductory military training cadets. Cadets lead the planning, coordinating, and directing of military activities for the cadet corps; provide formal training and guidance to increase the understanding, motivation, and performance of other cadets. Prepare for active duty. **Credits:** 1.00

AFT 48100 - National Security/Commissioning Preparation II

Credit Hours: 3.00. National Security/Commissioning Preparation is designed for college seniors and gives them the foundation to understand their role as military officers and how they are directly tied to our National Security Strategy. It is an overview of the complex social and political issues facing the military profession and requires a measure of sophistication commensurate with the senior college level.**Credits:** 3.00

AFT 48200 - Air Force ROTC Leadership Laboratory VIII

Credit Hours: 1.00. Advanced leadership experience for field training preparation cadets. Cadets lead the planning, coordinating, and directing of military activities for the cadet corps; provide formal training and guidance to increase the understanding, motivation, and performance of other cadets. Prepare for active duty. **Credits:** 1.00

African American Studies

AAS 27100 - Introduction To African American Studies

Credit Hours: 3.00. Introduction to the philosophical and methodological principles underlying Afro-American studies. Dimensions of the black experience, including history, education, politics, psychology, economics, religion, social organization, and art, will be covered, and the requisite academic tools and sources will be examined. **Credits:** 3.00

AAS 27700 - African American Popular Culture

Credit Hours: 3.00. This course focuses on the production of popular culture through African-based and non African-based traditions among African Americans in the United States. Pop culture forms covered include film, theatre, visual arts, literature, dance, sports, music and religious traditions. **Credits:** 3.00

AAS 35900 - Black Women Writers

Credit Hours: 3.00. (ENGL 35900) This course introduces students to the rich and varied literary texts produced by black women writers. Literary analysis, along with a consideration of historical, cultural, gender, and racial contexts will be emphasized. **Credits:** 3.00

AAS 37000 - Black Women Rising

Credit Hours: 3.00. This course examines the rise of black women and their impact on economic, social, and cultural issues. **Credits:** 3.00

AAS 37100 - The African American Experience

Credit Hours: 3.00. Focus on specific topics of the personal experiences of blacks, in Africa and the diaspora, including black identity, black culture, and the relationships between blacks and society. **Credits:** 3.00

AAS 37300 - Issues In African American Studies

Credit Hours: 3.00. Focuses on a specific topic that relates to selected issues in the life, history, and culture of peoples of African ancestry. **Credits:** 3.00

AAS 37500 - The Black Family

Credit Hours: 3.00. This course considers and examines the black family as a social institution, focusing on both recent research as well as more descriptive accounts of issues concerning the black family. **Credits:** 3.00

AAS 37600 - The Black Male

Credit Hours: 3.00. This course examines critically the factors contributing to the deteriorating status of African American males and the positive ways of coping with that experience. Includes an overview of research perspectives defining current knowledge on the subject. **Credits:** 3.00

AAS 39200 - Caribbean History And Culture

Credit Hours: 3.00. This course introduces students to the rich and varied literary texts produced by black women writers. Literary analysis, along with a consideration of historical, cultural, gender, and racial contexts will be emphasized. **Credits:** 3.00

AAS 47300 - Blacks In Hollywood Film

Credit Hours: 3.00. A history of the representation of blacks in mainstream film throughout the twentieth century. **Credits:** 3.00

AAS 47400 - Research Methods In African American Studies

Credit Hours: 3.00. This course covers research techniques used by researchers to observe and to interpret scholarly investigation on race, class and gender from an African-American perspective. **Credits:** 3.00

AAS 49000 - Directed Readings In African American Studies

Credit Hours: 3.00. This course allows students to create an independent course of study with an instructor on a topic relevant to the African, African American, or African Diasporic experience. **Credits:** 3.00

AAS 49100 - Special Topics In African American Studies

Credit Hours: 1.00 to 4.00. Special Topics in African American Studies addresses special topics or projects under the direction of the instructor in the field of African American or African Diasporic Studies. The course may vary from 1-4 credit hours. It may be taught as a lecture or as a lecture with a lab. **Credits:** 1.00 to 4.00

AAS 57400 - Research Methods In African American Studies

Credit Hours: 3.00. This course covers techniques used by researchers and to interpret scholarly investigation on race, class and gender from an African American perspective. **Credits:** 3.00

AAS 57500 - Theories Of African American Studies

Credit Hours: 3.00. This course addresses the development of an African American intellectual tradition. The course will span disciplines and swathes of time in order to understand how scholars not only created new ideas but developed theories that shaped and changed academic inquiry. **Credits:** 3.00

AAS 59000 - Directed Readings In African American Studies

Credit Hours: 1.00 to 4.00. This directed readings course allows students to work with African American Studies faculty on work that cannot be achieved through one of the regular course offerings. This is a variable topics course that can be satisfied through individual course work with an instructor. A student wishing to earn such credit is required to obtain permission of the instructor in order to enroll for the course. This does not include work for thesis or dissertation projects. Permission of instructor required. **Credits:** 1.00 to 4.00

Agricultural and Biological Engineering

ABE 20100 - Material And Energy Balances In Biological Engineering

Credit Hours: 4.00. Thermodynamic principles associated with biological systems and processing of biological materials. Emphasis on the first law of thermodynamics. Fundamentals of steady-state mass and energy balances for reacting and non-reacting processes including multiple unit operations emphasizing living systems and bioprocessing. Applications of the first law conservation of energy to biological systems, energy conversion systems, and the environmental impacts of energy production. Development of engineering problem solving skills via Mathcad and MATLAB software. Laboratory emphasizes combining technical engineering skills with professional skill development through computer and laboratory exercises including two extensive projects that result in a biological product design.**Credits:** 4.00

ABE 20200 - Thermodynamics In Biological Engineering

Credit Hours: 3.00. Thermodynamic principles and their applications to biochemical and biological systems with emphasis on the second law of thermodynamics and use of molecular interpretations of energies and entropies. Concept of entropy balances and process efficiency. Free energy and chemical equilibrium. Equilibrium between phases, colligative properties, binding of ligands and formation of biological membranes. Molecular motion and transport properties and their application in biochemical analytical methods. Development of physical chemical problem solving skills using Mathcad and MATLAB software.**Credits:** 3.00

ABE 20500 - Computations For Engineering Systems

Credit Hours: 3.00. Development of engineering problem solving and design skills. Use of Excel, MATLAB, and Mathcad for problem solving, data analysis, numerical modeling, and statistics. Introduction to elementary statics, dynamics, materials, thermodynamics, fluid mechanics, and energy topics. **Credits:** 3.00

ABE 21000 - Thermodynamics Principles Of Engineering And Biological Systems

Credit Hours: 3.00. Application of thermodynamic principles to the design and operation of biological and engineering systems. The focus is on mass and energy balances for non-reacting processes and on the second law of thermodynamics. These principles are applied to biological and agricultural engineering systems. Specific topics include refrigeration systems, power cycles, energy conversion systems, and environmental impacts of energy production. **Credits:** 3.00

ABE 22600 - Biotechnology Laboratory I

Credit Hours: 2.00. Focuses on nucleic acid manipulation. Modules include, making a eukaryotic library, identifying clones, sub-cloning into a bacterial expression vector and verification of the clone's identity by restriction analysis and DNA sequencing. Basic laboratory techniques (solution making, buffer preparation, good safety techniques), sterile technique and compliance procedures. **Credits:** 2.00

ABE 28100 - Professional Internship

Credit Hours: 0.00. Supervised professional experience in agricultural and biological engineering. Program conducted under the direction of an engineering faculty member and with the cooperation of an employer. Student submits a summary report. Permission of department required. **Credits:** 0.00

ABE 29000 - Sophomore Seminar

Credit Hours: 1.00. Current agricultural and biological engineering issues will be discussed by students, staff, and guest speakers. Career planning, employment opportunities, professionalism, ethics, and improvement of communication skills will be emphasized. **Credits:** 1.00

ABE 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in agricultural and biological engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ABE 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in agricultural and biological engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ABE 30100 - Modeling And Computational Tools In Biological Engineering

Credit Hours: 3.00. Introduction to principles of analysis, setup, and modeling of biological systems using fundamental principles of engineering. Development of mathematical and numerical models to solve steady state and transient processes involving material and energy balances and utilizing thermodynamic, transport, and kinetic reaction principles, and economics in biological engineering systems.**Credits:** 3.00

ABE 30200 - Biochemical Laboratory Techniques For Biological Engineers

Credit Hours: 1.00. Experiments that introduce methods for analysis and recovery of biological molecules and that utilize the mathematical concepts to manipulate collected data. Introduction to engineering experimental design.**Credits:** 1.00

ABE 30300 - Physical Chemistry In Biological Engineering

Credit Hours: 3.00. Physical chemical principles associated with transport of mass, momentum and energy in bioprocesses. Principles for measuring physical chemical properties, a description of predictive equations for their evaluation and the role of these principles in the design and optimization of bioprocesses.**Credits:** 3.00

ABE 30400 - Biological Engineering Laboratory

Credit Hours: 3.00. Laboratory course focused on bioprocessing topics such as fluid flow, mixing, rheology, hydrolysis, and fermentation of biomaterials. Students will participate in design of experiments, system set up, data collection, statistical data analysis, and presentation of results.**Credits:** 3.00

ABE 30500 - Physical Properties Of Biological Materials

Credit Hours: 3.00. Physical properties of agricultural crops and food products and their relationship to harvesting, storage, and processing. Physical properties covered include: density, shape, moisture content, water potential, water activity, friction and flow or particulate solids, terminal velocity, thermal properties, interaction with electromagnetic radiation, and viscoelastic behavior of solids. **Credits:** 3.00

ABE 30700 - Momentum Transfer In Biological Engineering

Credit Hours: 3.00. Fluid statics, Newton's law of viscosity, shell momentum balances, equations of continuity and motion, one dimensional flow problems, flow through porous media, velocity distributions with more than one independent variable, two dimensional flow through a channel, stream function, velocity potential, dimensional analysis, boundary layer, turbulent flow, Reynolds stress, form and skin friction, application of macroscopic momentum and mechanical energy balances to engineering problems.**Credits:** 3.00

ABE 30800 - Heat And Mass Transfer In Biological Engineering

Credit Hours: 3.00. Principles of transport of energy and mass. Mechanisms of heat transfer, heat conduction, heat convection and heat radiation. Development of applications using macroscopic and microscopic balances of energy. Application of thermal energy balances and Fourier's Law to describe steady state and transient conduction applications including heat generation. Effect of the geometry on these processes. Basic principles of design of heat transfer equipment and its operation. Application of species mass balances and Fick's Law to steady state and transient diffusion problems. Effect of geometry on these processes. Analogies between transport of momentum, heat and mass applications to the solution of practical problems in the Food Process and Biological Engineering fields.**Credits:** 3.00

ABE 31400 - Design Of Electronic Systems

Credit Hours: 3.00. Fundamental aspects of circuits, microprocessors, transducers, sensors, instrumentation, and data acquisition are presented, with particular emphasis on electronic systems used in agricultural, biological, and food applications. Laboratory exercises used to apply the course material to constructing and testing circuits, microprocessor controlled systems, and the data collection and monitoring of systems. **Credits:** 3.00

ABE 32000 - Solid Modeling, Simulation, And Analysis

Credit Hours: 3.00. Introduction to parametric, feature-based solid modeling; dimensioned 2D and 3D engineering drawings; tolerancing; mechanical dynamic simulation; kinematic models, analysis and simulation of simple linkages and complex systems; mechanism design and evaluation; visualization and animation of results; interfacing of computer aided engineering software. Projects involving industrial parts and assemblies will be discussed and assigned. **Credits:** 3.00

ABE 32500 - Soil And Water Resource Engineering

Credit Hours: 4.00. Interrelationships of the plant-water-air-soil system; hydrologic processes; protection of surface and ground water quality; GIS targeting of soil and water protection measures; and design of subsurface and overland drainage systems, irrigation systems, and soil erosion control practices. **Credits:** 4.00

ABE 32700 - Biotechnology Laboratory II

Credit Hours: 2.00. The course is a Course Undergraduate Research Experience (CURE), more specifically, a part of the Howard Hughes Medical Institute's (HHMI) (http://www.hhmi.org/grants/sea/) Science Education Alliance and is an authentic research experience. Students engage in hands-on discovery as scientists with the ultimate objective of contributing new mycobacteriophage genomes to the scientific literature and public databases (www.phagesdb.org and the Purdue institution page can be found here: https://phagesdb.org/institutions/PURD/).**Credits:** 2.00

ABE 33000 - Design Of Machine Components

Credit Hours: 3.00. Introduction to design; stress analysis; deformation and stiffness considerations; static and fatigue strength design; design of components of the food processing, farm and off-highway machines, and mechanical systems. **Credits:** 3.00

ABE 33600 - All Terrain Vehicle Design

Credit Hours: 3.00. A structured approach to the design process, including innovation, analysis, evaluation, documentation, and presentation. Design areas typically focus on machinery and vehicles related to agricultural applications. During the first two weeks, the students will define their design problem, statement of work, approach, and timeline. Their final report will summarize the design process and the steps used to solve the proposed problem. All students will give a brief presentation of their design during the last weekly lab meeting. **Credits:** 3.00

ABE 37000 - Reaction Kinetics In Biological Engineering

Credit Hours: 3.00. This course will introduce students to the tenets of kinetics/rates of chemical/biochemical reactions. Reaction rate models will be developed and used to design basic ideal reactors and non-ideal flow reactors. Models for homogeneous, heterogeneous, and catalytic reactions will be developed and used to develop reactor designs. A variety of computational numerical modeling skills will be used in the solution of these models, including numerical interpolation, and numerical solution of set of differential equations. MatLAB software programming tools will be used by students for computational analysis. **Credits:** 3.00

ABE 38199 - Professional Practice Coop I

Credit Hours: 0.00. Professional practice with qualified employers within industry, government, or small business. Permission of department required. Professional Practice students only. **Credits:** 0.00

ABE 38299 - Professional Practice Co-Op II

Credit Hours: 0.00. Professional practice with qualified employers within industry, government, or small business. Professional Practice students only. Permission of department required. **Credits:** 0.00

ABE 38399 - Professional Practice Co-Op III

Credit Hours: 0.00. Professional practice with qualified employers within industry, government, or small business. Professional Practice students only. Permission of department required. **Credits:** 0.00

ABE 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in agricultural and biological engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ABE 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in agricultural and biological engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ABE 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in agricultural and biological engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ABE 39699 - Professional Practice Internship

Credit Hours: 0.00. Professional practice with qualified employers within industry, government, or small business. Permission of department required. **Credits:** 0.00

ABE 40600 - Ag/Biol Engineering Ambassador Leadership Seminar

Credit Hours: 1.00. Students engage in a weekly seminar/lab that includes topics such as leadership, professional skills, teamwork, engaging audiences and Purdue culture. Students utilize these skills while representing the Department of Agricultural

and Biological Engineering to current and prospective students, alumni, donors, legislators, and other supporters of Purdue' Agricultural and Biological Engineering department. Students must be selected as an ABE Ambassador. Permission of department required.**Credits:** 1.00

ABE 42500 - Water Quality Engineering

Credit Hours: 3.00. This course provides in-depth perspectives on water quality in source and environmental water systems (lakes, rivers, groundwaters, and coastal waters) including sources and causes of water quality impairments and design of workable and cost-effective management solutions. The course integrates hydrology, chemistry, biology, and ecology as foundations of water quality management and incorporates operation mechanisms of management practices in designing solutions for pollution control. Students will have opportunities to engage with lectures, water quality measurements and data analysis, computer modeling, case studies, design, and discussion sessions. **Credits:** 3.00

ABE 42600 - Ecological Restoration Engineering

Credit Hours: 3.00. This course focuses on ecologically-based design principles to restore degraded ecosystems, specifically wetlands, stream/floodplains, and prairies. Students will identify and synthesize design elements, natural and anthropogenic stresses, and management considerations to develop resilient restoration designs. Laboratory experience provides open-ended projects, data collection, and field trips to reinforce the design process. **Credits:** 3.00

ABE 43500 - Hydraulic Control Systems For Mobile Equipment

Credit Hours: 3.00. Design of basic fluid power components and systems. Includes power steering, hydrostatic and hydromechanical transmission, electrohydraulic servo valves, servomechanism, and manually controlled systems. **Credits:** 3.00

ABE 44000 - Cell And Molecular Modeling In Biological Engineering

Credit Hours: 3.00. This course examines the design principles underlying the organizations and dynamics of biological networks with an emphasis on genetic/molecular circuits. Topics include the structure and tuning of network motifs and relationship to performance parameters such as robustness to internal noise, temporal response, noise filtering, bi-stability, pattern generation and temporal programs. Examples are presented from the study of natural systems and the design of new synthetic systems.**Credits:** 3.00

ABE 44400 - Design And Advanced Manufacturing Processes For Internal Combustion Engines

Credit Hours: 3.00. This course introduces the manufacture and assembly of machined piece parts into a functional assembly. The creation of a prototype internal combustion engine will be utilized as the base project for the course, and students will design and create the parts and final assemblies. Students will be given a background on the process flow of modern manufacturing by general metal machining processes, manual machine tool operation, digital machine tool programming, numerical machine tool operation, the measurement of critical machining output variables, and the assembly of piece parts into subassemblies and final products. Course participants will work as a team to develop their production parts, final presentation, and final report.**Credits:** 3.00

ABE 45000 - Computational Modeling And Data Analysis In Agricultural Engineering

Credit Hours: 3.00. The course is divided into three sections. Students will (1) learn about first and second-order dynamic systems, block diagrams, modeling of mechanical and electrical systems, and control theory while using Matlab and Simulink for modeling; (2) Learn about numerical methods for modeling of continuum mechanics and transport phenomena including finite element method and finite difference method. Applications in heat transfer, fluid flow, and solid mechanics will be studied in the

computer lab; (3) Learn about data analysis topics including statistical models, probability theory, regression analysis, classification techniques, and machine learning. **Credits:** 3.00

ABE 45300 - Leadership In Biotechnology

Credit Hours: 1.00 to 3.00. This course provides students who have completed the research experience in ABE biotechnology laboratory courses an opportunity to continue their professional development by serving as peer leaders in the classroom. The ABE biotechnology laboratory courses are part of the Howard Hughes Medical Institute's (HHMI) Science Education Alliance and provide an authentic laboratory research experience with the students engaged in hands-on discovery as a scientist with the ultimate objective of contributing new viral genomes to the scientific literature and public databases. As part of the model for implementing the course-based undergraduate research experience in the biotechnology laboratory courses, senior-level students that successfully completed those courses serve as peer leaders in the classroom. Peer leaders attend the course section along with the currently enrolled students and build competencies in leadership by guiding their team on their research project throughout the semester. Permission of instructor required. **Credits:** 1.00 to 3.00

ABE 45700 - Unit Operations In Biological Engineering

Credit Hours: 3.00. Application of momentum and heat transfer to biological and food process engineering. Viscosity, non-Newtonian fluids, experimental methods of rheological characterization of food and biological systems; viscoelasticity; design equations for pipe flow, pumps, mixing, emulsification, extrusion, sheeting, heat exchanges, aseptic processing, sterilization, freezing, and evaporation.**Credits:** 3.00

ABE 46000 - Sensors And Process Control

Credit Hours: 3.00. Fundamental aspects of transducers, biosensors, instrumentation, and computer control are presented, with particular emphasis on sensors and controls used in agricultural, biological, and food applications. Laboratory and pilot plant scale computer controlled equipment is used to examine response of process variables, sensor calibration, control system modeling, and controller selection and tuning. Prerequisite: differential equations and a course in either heat transfer or fluid mechanics.**Credits:** 3.00

ABE 48400 - Project Planning And Management

Credit Hours: 1.00. Review of topics relevant to project planning and execution in industry, including technical communication, budgeting, team management, intellectual property rights, contracts and timelines. Students will select a Capstone project and assemble a project proposal within a team environment. **Credits:** 1.00

ABE 48500 - Agricultural Engineering Project Management And Design

Credit Hours: 4.00. Team based projects are completed during the semester and documented with a written report and oral presentations. Projects encompass a broad range of topics within agricultural engineering such as the design of environmental systems, machinery, precision agriculture and robotics, and student design competitions. **Credits:** 4.00

ABE 48600 - Agricultural Engineering Design

Credit Hours: 3.00. Students implement, test, refine, present, and deliver the capstone project solution proposed in ABE 48400. Team based projects are completed during the semester and documented with a written report, poster presentation, and oral presentations. Projects encompass a broad range of topics within agricultural engineering such as the design of environmental systems, machinery, precision agriculture and robotics, and student design competitions. **Credits:** 3.00

ABE 49000 - Professional Practice In Agricultural And Biological Engineering

Credit Hours: 1.00. Career areas in agricultural engineering; job opportunities and graduate study; professional attitudes and ethics; contracts and specifications; patents. **Credits:** 1.00

ABE 49500 - Select Topics In Agricultural And Biological Engineering

Credit Hours: 1.00 to 3.00. Credit and hours to be arranged. Special topics and projects of contemporary importance or of special interest that are outside the scope of the standard agricultural and biological engineering curriculum. The specific topic that is offered will be indicated on the student's record. A written report and oral presentation of final results are required. Permission of instructor required. **Credits:** 1.00 to 3.00

ABE 49800 - Undergraduate Research In Agricultural And Biological Engineering

Credit Hours: 1.00 to 3.00. Credit and hours to be arranged. Individual research projects for students with the approval of their advisors. Requires prior approval of, and arrangement with, a faculty research advisor. A written report and public oral presentation of final results are required. Permission of instructor required. **Credits:** 1.00 to 3.00

ABE 49900 - Thesis Research

Credit Hours: 1.00 to 6.00. Credit and hours to be arranged. Individualized research on agricultural and biological engineering problems. Arrange with program coordinator before registering. A written report and public oral presentation of final results are required. Permission of instructor required. **Credits:** 1.00 to 6.00

ABE 50100 - Welding Engineering

Credit Hours: 3.00. Design of weldments and modeling of heat transfer and residual stresses of the welding processes. Finite element theory of nonlinear properties for the many processes including laser, submerged arc, manual, Gas Tungsten Arc Welding (GTAW), plasma, and electron beam. Metallurgy topics include continuous cooling transformation curves in optimizing engineered joint strength, including cutting and welding. Offered in alternate years.**Credits:** 3.00

ABE 50300 - Surface Properties And Powder Performance Of Microparticulate Systems

Credit Hours: 3.00. Material Surface Science is the study of properties that occurs at the interface of two phases. Surface phenomena needs to be addressed to understand and manipulate the behavior of particulate materials. Probing particulate surface properties at the nano- and micro-level helps to relate these to the macroscale powder performance. The main focus of this course is on the application of surface analytical techniques for assessing the physical and chemical factors that dictate particulate interactions in various food, pharmaceutical, biological, mineral, environmental (soil and water) and aerosol systems. This course will provide the student both a broad overview of the state-of-the-art analytical tools available to assess particulate surfaces and a fundamental insight into the characteristic behavior of system of particles. This course is unique because the student will learn and articulate how surface, physical, chemical and bulk properties are relevant in the performance of microparticulate systems of his/her interest.**Credits:** 3.00

ABE 50501 - Particle, Powder, and Compact Characterization

Credit Hours: 2.00. The goal of this course is to familiarize students with the properties and methods used to characterize the physical and mechanical behavior of particles, granules, and compacts with the intention of using these properties for process and performance design.**Credits:** 2.00

ABE 50502 - Particles, Powders, And Compact Characterization Laboratory

Credit Hours: 1.00. The goal of this laboratory course is to train students on state-of-the-art laboratory equipment used to measure the mechanical properties of particles, granules, powders, and compacts.**Credits:** 1.00

ABE 51100 - Drug Development

Credit Hours: 3.00. A review of drug discovery and drug development, with emphasis on the regulatory aspects of these activities. Animal preclinical research and human clinical research are discussed in detail. In addition, the process for the assembly of an IND and NDA is discussed along with the Phases (I,II,III) of human clinical trials. The CMC (chemistry manufacturing and control) aspects of drug development are presented along with ICH documents and manufacturing process analytical technologies. The course concludes with a brief review of international regulatory issues and patents. **Credits:** 3.00

ABE 51200 - Good Regulatory Practices

Credit Hours: 3.00. Includes a review of the FDA and ICH regulations on good manufacturing, good laboratory, good clinical practices. The meaning of these regulations, the globalization of practices and the roles and responsibilities of various professionals implementing these regulations will be addressed. Special emphasis will be detailed coverage of the process for the assembly and submission of an IND or NDA, and the function of the regulatory affairs department in a pharmaceutical company. **Credits:** 3.00

ABE 51300 - Quality Management, Audits, Inspections

Credit Hours: 3.00. This course provides advanced topics in quality management and business improvement methods that apply to the pharmaceutical industry. Emphasis will be placed on specific issues of industry, audits, and inspections, as well as the successful selection and presentation of business and quality improvement projects to produce compliance and competitive advantage. **Credits:** 3.00

ABE 51400 - Documents And Dialogues Of Drug Development And Registration

Credit Hours: 3.00. This capstone advanced course will integrate previous learning relating to laws and regulations, quality principles and practices, and the preparation and submission of documents for preclinical research clinical trials and new drug approvals. Special topic lectures will be given. Considerable time will be devoted to preparing regulatory documents and conducting "mock" dialogues and negotiations with "pretend" agency officials. **Credits:** 3.00

ABE 51500 - Molecular Basis Of Manufacturing

Credit Hours: 3.00. This advanced course addresses important Chemistry Manufacturing and Control (CMC) issues related to manufacturing and quality by design. The course provides important information on strategies for quality by design, manufacturing strategies for early development, the best approaches to analyzing data, and strategies for reporting the information to the FDA. This course will also focus on product design and processing. Using product and process design helps achieve quality by design (QbD), strong development reports, excellent regulatory submissions and allows continuous improvement. The course includes laboratory exercises, laboratory tours, and/or workshops outlining how to interpret the data. **Credits:** 3.00

ABE 52200 - Ecohydrology

Credit Hours: 3.00. Ecohydrology links hydrological and ecological processes at various spatiotemporal scales and is considered to be one of the most exciting frontiers of the future. Hydrological processes in individual ecosystems and the role of water in linking the myriad components of the landscape will be explored in this three-credit course. Interactions between hydrological and biological processes and factors that regulate and shape these interactions will be covered. The ecohydrology principles covered will include integration of water and biota at the catchment scale, nutrient transport and cycling, modeling ecohydrological processes, and quantification of ecosystem services. Recommended: a prior course in hydrology. **Credits:** 3.00

ABE 52700 - Computer Models In Environmental And Natural Resources Engineering

Credit Hours: 3.00. Offers students in environmental and natural resources engineering programs an understanding of the hydrological processes and related design skills. Principles of soil erosion by water; drainage of agricultural lands; surface runoff; flood and reservoir routing; hydrodynamic and water quality in pipe network; nonpoint source pollution; and transport phenomenon are studied. Current computer models utilized in industry for decision support are applied using case studies to further enhance the understanding of the hydrological processes. Limitations and advantages of the models are discussed. Offered in alternate years. **Credits:** 3.00

ABE 52900 - Nonpoint Source Pollution Engineering

Credit Hours: 3.00. Engineering principles involved in assessment and management of nonpoint source (NPS) pollution. Effect of NPS pollution on ecosystem integrity. Use of GIS/mathematical models to quantify extent of pollution. Design/implementation of best management practices to reduce nonpoint source pollution and improve water quality. Discussion of total maximum daily load (TMDL) principles and processes. **Credits:** 3.00

ABE 53000 - Plant Phenotyping Technologies

Credit Hours: 3.00. Introducing concepts, models, algorithms, and tools in plant phenotyping development and application projects. Class topics include high-throughput phenotyping in greenhouse, field phenotyping platforms, Ag remote sensing, plant sensors (hyperspectral, 3D thermal, florescent, X-ray, etc.), plant image processing technologies, statistical modeling, big data, database requirement, artificial intelligence algorithms, and hybridizations of the above techniques applied in plant phenotyping. Permission of instructor required. **Credits:** 3.00

ABE 53100 - Instrumentation And Data Acquisition

Credit Hours: 3.00. This course educates students in the use, selection, and design of instrumentation and data acquisition for agricultural, food, environmental, and biological systems. Emphasis is on measurement of position (GPS), force, pressure, power, torque, flow, and temperature along with environmental sensors. Labs focus on building and using measurement systems and programming PC computers for data acquisition and analysis. Prior knowledge of electrical circuitry is desirable. **Credits:** 3.00

ABE 53500 - Design And Modeling Of Fluid Power Systems

Credit Hours: 3.00. Introduction to fluid power technology. Design of hydraulic systems for mobile and industrial application for functionality, cost and energy efficiency. Modeling strategies for fluid power systems. Demo labs and class projects are given to reinforce the design and modeling learning projects. **Credits:** 3.00

ABE 54000 - Principles Of Systems & Synthetic Biology

Credit Hours: 3.00. Synthetic biology harnesses the power and adaptability of biology to engineer living systems that address grand societal challenges. This course introduces students to fundamental concepts and techniques in this interdisciplinary discipline, and studies state-of-the-art techniques from the primary literature. The course follows the standard Design-Build-Test-Learn (DBTL) cycle of contemporary practice and includes topics such as biological circuit design, advanced DNA assembly techniques, genome editing technologies, next generation sequencing, and directed evolution. **Credits:** 3.00

ABE 54500 - Design Of Off-Highway Vehicles

Credit Hours: 3.00. Problems associated with the design of off-highway vehicles, with special emphasis on farm and industrial tractors and self-propelled machines; engines; power trains; traction; vehicle control systems; human factors; testing and evaluation of performance. **Credits:** 3.00

ABE 54700 - Models And Microbiomes

Credit Hours: 3.00. Determine the use of computational, physical, and biological models for studying and engineering microbiomes. Study peer-reviewed literature and synthesize findings in the form of oral and written deliverables. Background in microbiology either from coursework or research and interest in microbiomes recommended. **Credits:** 3.00

ABE 55700 - Biological Engineering Design I

Credit Hours: 3.00. Course includes analysis and design of operations, such as dehydration, fermentation, and separation processes. Development of experimental designs, integration of pilot plant results into the design, operation and scale-up process systems. Emphasis on how the properties of biological materials influence the quality of the processed product.**Credits:** 3.00

ABE 55800 - Biological Engineering Design II

Credit Hours: 3.00. This course will focus on the design, synthesis, creation, evaluation, and optimization of processes to convert basic biological materials into a finished product. Concepts of materials and energy balances, thermodynamics, kinetics, transport phenomena of biological systems will be used to design processes to minimize energy and environmental impacts, and evaluate economic factors while maintaining product quality. Course will include group projects, oral and written reports.**Credits:** 3.00

ABE 56000 - Biosensors: Fundamentals And Applications

Credit Hours: 3.00. (BME 52100) An introduction to the field of biosensors and an in-depth and quantitative view of device design and performance analysis. An overview of the current state of the art to enable continuation into advanced biosensor work and design. Topics emphasize biomedical, bioprocessing, environmental, food safety, and biosecurity applications. **Credits:** 3.00

ABE 58000 - Advanced Processes In Biological Engineering

Credit Hours: 3.00. Physical and chemical structure of biomass. Reaction kinetics of hydrolysis of hemicellulose and cellulose to fermentable sugars. Fundamentals of ethanol production by fermentation. Separation of fermentation products into pure components.**Credits:** 3.00

ABE 58500 - Soil Microbiology

Credit Hours: 3.00. The soil microbial population and its role in the soil ecosystem; microbial transformations of inorganic and organic compounds; decomposition of residues; and dynamics of soil organic matter. **Credits:** 3.00

ABE 59000 - Special Problems

Credit Hours: 1.00 to 6.00. Assignment by consent of the instructor in the selected field of study. Laboratory, field, and library studies and reports on special problems related to agricultural and biological engineering not covered in regular coursework. Permission of instructor required. **Credits:** 1.00 to 6.00

ABE 59100 - Special Topics

Credit Hours: 0.00 to 4.00. Primarily designed for students (two or more) desiring credit from subject areas for which no specific course, workshop, or individual study plan is offered. Area of study will deal with topics that have enough student interest to justify the formalized teaching of a specialized topic. The course may be repeated by a student as long as the topic being taught is not repeated. Permission of instructor required. **Credits:** 0.00 to 4.00

ABE 62600 - Technology Entrepreneurship And Research Translation

Credit Hours: 3.00. (TLI 62600) The course is designed to introduce graduate students and faculty mentors to the intellectual, financial, and management processes associated with translating research into tangible products through university initiated, early-stage commercialization (start-up) activities. Lectures will present case studies of technologies and pathways to commercialization. Guest speakers will illustrate the start-up process through real-world experience, and will also address approaches for managing entrepreneurial activities, intellectual property and conflicts of interest in a university environment. Permission of Instructor required.**Credits:** 3.00

ABE 62700 - Colloidal Phenomena In Bioprocessing

Credit Hours: 3.00. The structure, stability, and rheology of biological dispersions, emulsions, and foams are explained in terms of the principles of electrostatics, hydrodynamics, thermodynamics, and statistical mechanics. Additional topics include colloidal phenomena in downstream bioprocessing, as well as colloidal aspects of some food systems. Prerequisite: Thermodynamics and physical chemistry. **Credits:** 3.00

ABE 65100 - Environmental Informatics

Credit Hours: 3.00. This course will educate students in the use, manipulation and analysis of environmental data by introducing them to scripting languages (e.g. c-shell, python), data types (e.g. ASCII, binary, NetCDF), databases (e.g. XML, DBF) and data visualization software (e.g. GMT, ArcMap) as well as techniques for checking data quality, working with missing data, and handling large diverse sources of time series and spatial data. Students will manipulate, check and insert data from a variety of sources, use that data as input to distributed hydrologic model, analyze model output and learn methods for properly documenting their data use (creation of metadata) and long-term archival storage of those data. Skills learned should be applicable to most computer operating systems, but the majority of work for this class will be done within the Unix/Linux environment. Students taking this course should have experience with one or more programming languages, including but not limited to C, Fortran, Perl, Python, java, Basic, or two writing scripts or macros within programs such as MATLAB, S-Plus, R, SAS. **Credits:** 3.00

ABE 68000 - Bioseparations And Bioprocess Engineering: Principles, Practice And Economics

Credit Hours: 3.00. Engineering fundamentals of separations and purification of biological molecules. Case studies and examples illustrate principles and practice of centrifugation, precipitation, crystallization, filtration, membrane separations, chromatography, and affinity separation of recombinant proteins and other biomolecules. Process scale-up and economics of biotechnology products and processes are mentioned in the context of their impact on purification development. Prerequisites: ABE 58000. **Credits:** 3.00

ABE 69100 - Special Topics

Credit Hours: 1.00 to 4.00. Primarily designed for advanced specialized topic areas in agricultural and biological engineering for which there is no specific course, workshop, or individual study plan, but having enough student interest to justify the formalized teaching of a course. Permission of instructor required. **Credits:** 1.00 to 4.00

ABE 69400 - Graduate Research Training

Credit Hours: 0.00. Strategies for success in graduate study are taught. Students will learn how to write a graduate research proposal, effectively plan for degree milestones, and learn about benefits of participating in professional societies. Students will also complete required training for graduate student researchers, including responsible conduct of research, laboratory safety, and an equal access/equal opportunity briefing. **Credits:** 0.00

ABE 69600 - Graduate Seminar

Credit Hours: 1.00. Best practices for effectively presenting scientific research are taught and practiced. Students will also present a twenty-minute seminar of original research results, as well as provide and receive constructive criticism on presentation form and content for improved future presentations. **Credits:** 1.00

ABE 69700 - Doctoral Professional Development

Credit Hours: 1.00. Discussion of research problems, methods, procedure, and reports. Discussion and practice to improve written and oral communication. Professional development activities. **Credits:** 1.00

ABE 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

ABE 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Agricultural Economics

AGEC 20201 - Introduction To Data Analytics For Agricultural Business

Credit Hours: 3.00. Overview of data analytics in agricultural business. Students are exposed to an overview of software tools with a primary focus on Excel, introduction to relational databases, and data visualization. Focus is in using financial, accounting, and economic data to make management decisions. Laptop required. **Credits:** 3.00

AGEC 20300 - Introductory Microeconomics For Food And Agribusiness

Credit Hours: 3.00. This course introduces the application of microeconomics as used by farms and agribusiness firms. The behavior of individual firms is evaluated as price and output are determined in various market structures (pure competition, pure monopoly, monopolistic competition, and oligopoly). Other topics include pricing and employment of resources, market failure and the social control of industry (government, economics policy, and regulation), cost and production theory. **Credits:** 3.00

AGEC 20400 - Introduction To Resource Economics And Environmental Policy

Credit Hours: 3.00. The course provides an overview of microeconomic theory and its application to issues related to evaluating resource economic issues and environmental policy. Topics discussed include efficiency, sustainability, valuation, externalities, governmental policies, and benefit cost analysis. **Credits:** 3.00

AGEC 21700 - Economics

Credit Hours: 3.00. National economic problems such as unemployment, recessions, inflation, taxation, bank interest rates, the growth of government, monetary systems, and a rising national debt are discussed along with the principles, policies, and institutions for solving these macroeconomic problems. **Credits:** 3.00

AGEC 22000 - Economics Of Agricultural Markets

Credit Hours: 3.00. This class provides an overview of U.S. and international agricultural markets, and develops a framework for analyzing those markets. Concepts include determination of agricultural prices, spatial dimensions of agricultural markets, and trade; temporal dimensions of agricultural markets, and futures and options markets; and public policy in agricultural markets. **Credits:** 3.00

AGEC 25000 - Economic Geography Of World Food And Resources

Credit Hours: 3.00. A study of the important issues and economic decisions about worldwide resource use for food and fiber production as influenced by geography, climate, history, social institutions, national self-interest, and the environment. **Credits:** 3.00

AGEC 26000 - Mentoring Leadership

Credit Hours: 1.00. This course is designed to teach upperclassmen how to mentor freshman to thrive and survive as entering freshmen in Agricultural Economics. The main focus is on the transition to college life, as well as practical information on time management, taking and rewriting classroom notes, preparing for examinations and quizzes, dealing with stress and interpersonal relationships, and health. Additional topics include opportunities for student involvement in campus life and organizations, career paths for the various programs of study in Agricultural Economics, and how to successfully work in groups. Mentors are restricted to AGBS, AGEC, AGFN, AGMG, FARM, FIMM, QAEC, and SLMK students. Permission of department required. **Credits:** 1.00

AGEC 27500 - Honors Course - Lower Division

Credit Hours: 1.00 to 4.00. Utilized to offer a new honors course for a maximum of three years. Variable title, credit, and instructional type. Course may be repeated for credit if content and titles are different. Offered primarily to first and second-year students. Courses offered must be approved by departmental or program faculty and College of Agriculture Honors Committee. Enrollment in an honors program. Permission of department required. **Credits:** 1.00 to 4.00

AGEC 28900 - Foundational Internship

Credit Hours: 1.00. Foundational internship that is preplanned and conducted under the direction of a faculty or staff member working in cooperation with an employer representative. A learning plan must be developed and approved by the student, faculty or staff coordinator, and employer representative prior to beginning the internship. A comprehensive report describing the management strategies used by the company or organization when he/she spent their internship is required. Permission of department required. **Credits:** 1.00

AGEC 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in agricultural economics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AGEC 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in agricultural economics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AGEC 29600 - Selected Topics In Agricultural Economics

Credit Hours: 1.00 to 3.00. Special topics in agricultural economics aimed at sophomore-level students. May be repeated for credit under a different topic title. **Credits:** 1.00 to 3.00

AGEC 29800 - Careers In Agribusiness

Credit Hours: 1.00. This course is designed to give an overview of the career possibilities available to students with a degree from the Department of Agricultural Economics at Purdue University. The goal of the course is to help students think about their future, engender excitement about the diversity of career prospects that will be available to them, and help provide real-world context for the material that will be learned in other Agribusiness and Agricultural Economics courses. Students will learn from individuals working all along the farm and food value chain from agricultural input supply to farming to transportation and storage to food processing to food retailing, in firms ranging from start-ups to multinational corporations. Additionally, students will learn from individuals working in affiliated careers from government, law, education and non-governmental organizations, etc. as well as from some who are no longer working in food and agriculture. **Credits:** 1.00

AGEC 30300 - Intermediate Applied Microeconomics

Credit Hours: 3.00. This course develops advanced microeconomic models of consumer and producer choice. All theory will be derived from mathematical first principles and will rely heavily on applications of calculus, with motivating examples and case studies drawn from topics in agricultural and resource economics. The course will also cover basic numerical simulation methods in tandem with the theory; the aim is for students to be able to simulate and quantify economic phenomena using real-world examples related to the theory.**Credits:** 3.00

AGEC 30500 - Agricultural Prices

Credit Hours: 3.00. Analysis of prices and the movement of farm product prices; relations of farm product prices to farm input and other prices; conceptual and statistical analysis of agricultural supply and demand relationships; application of price analysis, price forecasting, agricultural outlook, agricultural policy; adjustment of farming to new price conditions. **Credits:** 3.00

AGEC 31000 - Farm Organization

Credit Hours: 3.00. Economic factors controlling success in farming; types of farming; business records and analysis; adjustment in organization to meet changing economic conditions; organization and management of successful farms. **Credits:** 3.00

AGEC 32100 - Principles Of Commodity Marketing

Credit Hours: 3.00. An in-depth background on the origin, operation, and application of futures and options in risk management for agriculture. Covers grain, livestock, and yield futures and options. Applications of futures and options to price and yield risk management is provided. Comparison of expected results from various risk management alternatives and decision-making processes to use in selecting a risk management strategy. **Credits:** 3.00

AGEC 32700 - Principles Of Food And Agribusiness Marketing

Credit Hours: 3.00. This course is a study of the major components of marketing decisions made by food and agribusiness firms. The course examines the marketing process, market research, marketing opportunities, and marketing strategies. Students will work on developing skills for evaluating and making marketing decisions.**Credits:** 3.00

AGEC 33000 - Management Methods For Agricultural Business

Credit Hours: 3.00. Management of nonfarm, agriculturally related businesses. Topics include tools for management decision making, legal forms of business organization, basics of accounting, and important financial management techniques. Case studies and computer simulation game. **Credits:** 3.00

AGEC 33100 - Principles Of Industrial Selling

Credit Hours: 3.00. The principles of selling and their application to the industrial businesses. Topics include attitudes and value systems, basic behavioral patterns, the purchase decision process, relationship of sales to marketing, selling strategies, preparing for sales calls, making sales presentations, handling objections, and closing sales. Emphasis is placed on application of principles to real-world situations and on building selling skills through class projects. Requires class trips. Students will pay individual lodging or meal expenses when necessary. **Credits:** 3.00

AGEC 33300 - Food Distribution - A Retailing Perspective

Credit Hours: 3.00. Distribution factors that affect the food industry. Particular attention to the food wholesaling and retailing sectors. Presentation of economic tools to evaluate performance in the food industry. Discussion of the relative importance of each of the major departments in the modern supermarket. Discussion of current and future industry prototypes.**Credits:** 3.00

AGEC 34000 - International Economic Development

Credit Hours: 3.00. This course is designed to introduce students to issues and problems related to international economic development. Topics covered include a description of the current situation in developing countries and the history of growth and development. The course is grounded in the body of theory associated with economic development, but concentrates on the many practical problems such as poverty, population growth, urbanization, education and the environment. The three areas with the greatest attention are agricultural development, international trade, and policy analysis for developing countries.**Credits:** 3.00

AGEC 35200 - Quantitative Techniques For Firm Decision Making

Credit Hours: 3.00. Introduction to mathematical programming and computing as an aid to agricultural decision making by firms, linear programming, game theory and strategy, simulation, the waiting-line problem, the equipment replacement decision, and multiproduct scheduling methods.**Credits:** 3.00

AGEC 37500 - The Process Of Economic Research

Credit Hours: 1.00. This course is a study of the process of conducting economic research. The course examines the research problem and objectives, literature review, conceptual framework, methods and procedures, and reporting research. Students will identify a research topic and project advisor. For Honors program students only in Agricultural Economics. Permission of instructor required. **Credits:** 1.00

AGEC 39001 - Professional Internship Programs In Agricultural Economics

Credit Hours: 0.00. Supervised professional experiences in agricultural economics. Programs must be preplanned and conducted under the direction of the departmental coordinator with the cooperation of an employer. Students must submit a summary report. Permission of instructor required. **Credits:** 0.00

AGEC 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in agricultural economics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AGEC 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in agricultural economics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AGEC 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in agricultural economics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AGEC 40000 - Agricultural Economics Study Abroad

Credit Hours: 0.00 to 8.00. Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities. **Credits:** 0.00 to 8.00

AGEC 40600 - Natural Resource And Environmental Economics

Credit Hours: 3.00. (FNR 40600) Introduction to economic models of renewable and nonrenewable natural resources and the use of these models in the analysis of current resource use and environmental issues. **Credits:** 3.00

AGEC 41000 - Agricultural Policy

Credit Hours: 3.00. Economic analysis of U.S. food and agricultural policy; current and past farm legislation; international trade; agricultural policies in selected countries; domestic and foreign food assistance; structural change; agricultural research policy; macroeconomic linkages with the agricultural sector; and emerging environmental policy issues, land and water use.**Credits:** 3.00

AGEC 41100 - Farm Management

Credit Hours: 4.00. Principles of farm organization and management, farmer interviews, and the application of computerized farm decision-making methods. **Credits:** 4.00

AGEC 41200 - Farm Business Management Workshop

Credit Hours: 1.00 to 3.00. Making decisions regarding the organization and operation of farm businesses with which students will be associated after graduation. Areas of decision-making include enterprise selection, farm growth, organizing large-scale farms, communication, labor management, machinery management, operating agreements, legal organization, and tax strategies. **Credits:** 1.00 to 3.00

AGEC 42100 - Advanced Commodity Marketing

Credit Hours: 3.00. Application of commodity marketing principles to grain, livestock, and other commodity sectors. Applications include hedging, speculation, risk management, and fundamental and technical price analysis. Examination and testing of pricing strategies and the development of commodity marketing plans. **Credits:** 3.00

AGEC 42400 - Financial Management Of Agricultural Business

Credit Hours: 3.00. A study of the major types of financial decisions made by agriculturally related firms, including investment in inventory, receivables and cash, property, plant, and equipment; sources and types of short-term, intermediate, and long-term capital; legal patterns of the business organization, emphasis on implementation involving agribusiness case problems. **Credits:** 3.00

AGEC 42500 - Estate Planning And Property Transfer

Credit Hours: 3.00. The ownership and transfer of farm business property. Includes tax and other implications of life estates, trust arrangements, sale of property, and charitable contributions. **Credits:** 3.00

AGEC 42700 - Advanced Agribusiness Marketing

Credit Hours: 3.00. Application of marketing principles to market planning, research, and analysis. Development of strategic marketing plans for agribusiness.**Credits:** 3.00

AGEC 42900 - Agri-Marketing Analytics

Credit Hours: 3.00. This course focuses on the use of modern, data-drive analytics marketing techniques. Focuses on the analysis of marketing data and metrics to help make business decisions. A hands-on course that requires extensive use of the computer. Laptops required.**Credits:** 3.00

AGEC 43000 - Agricultural And Food Business Strategy

Credit Hours: 3.00. An advanced course in business planning and strategy for potential agribusiness and food firm managers. Focuses on development of viable business strategy in the context of the firm's market and its internal condition. Makes extensive use of case studies that document management dilemmas of agribusiness firms, ranging from those providing inputs to agricultural producers to firms involved in the retail distribution of food.**Credits:** 3.00

AGEC 43100 - Advanced Industrial Sales And Marketing

Credit Hours: 4.00. Advanced presentation techniques, sales management and analysis, improving communication skills, study of industrial marketing strategies, interaction with industry executives, and strategies for career development. Requires class trips. Students will pay individual lodging or meal expenses when necessary. Permission of instructor required. **Credits:** 4.00

AGEC 45000 - International Agricultural Trade

Credit Hours: 3.00. Study of U.S. agricultural trade with emphasis on international trade theory, exchange rates and their determination, relationships between domestic agricultural policies and trade policies, and analysis of institutional arrangements for world trade in agricultural products.**Credits:** 3.00

AGEC 45100 - Applied Econometrics

Credit Hours: 3.00. Application of strategies to economic problems. Simple and multiple regression, dummy variables, logit analysis, time series, and forecasting.**Credits:** 3.00

AGEC 45500 - Agricultural Law

Credit Hours: 3.00. Selected general legal topics (courts, contracts, torts, property and commercial law) with emphasis on farming problems (e.g., landowner-tenant, grain contracts, fences, and animal liability) and cases. **Credits:** 3.00

AGEC 45600 - Federal Income Tax Law

Credit Hours: 3.00. Introduction to the federal income tax laws applicable to individuals and small business with emphasis on the farming business. The course includes management implications and the policy basis for the tax law system. Techniques and practice for the preparation of selected forms will be included. There will be limited exposure to taxation of partnerships, corporations, estates, and to federal gift and estate tax law. **Credits:** 3.00

AGEC 47500 - Honors Course - Upper Division

Credit Hours: 1.00 to 4.00. Utilized to offer a new honors course for a maximum of three years. Variable title, credit, and instructional type. Course may be repeated for credit if content and titles are different. Offered primarily to third and fourth-year students. Courses offered must be approved by departmental or program faculty and College of Agriculture Honors Committee. Enrollment in an honors program. Permission of department required. **Credits:** 1.00 to 4.00

AGEC 48900 - Professional Internship

Credit Hours: 2.00. Professional internship that is preplanned and conducted under the direction of a faculty or staff member working in cooperation with an employer representative. A learning plan must be developed and approved by the student, faculty or staff coordinator, and employer representative prior to beginning the internship. A summary report describing their economic or business analysis for the company or organization where he/she spent their internship is required. Permission of department required. **Credits:** 2.00

AGEC 49600 - Selected Topics In Agribusiness Management

Credit Hours: 1.00. Intended for individuals in the food industry marketing and management, sales and marketing, agribusiness management, agricultural finance, and farm management options. Also open to students in other agricultural economics options as well as to students outside the department. Focuses on current topics in the management of food and agribusiness firms. Provides advanced treatment of these topics for upper-division students. This is a set of one-hour seminars that will address current topics in food and agribusiness management. The topics of focus will be those that either are not treated in other courses, or are not treated in depth needed by a student pursuing a management career in the food and agribusiness industries. Topics will be reviewed annually as to relevance and will be changed as needed. Five week session. **Credits:** 1.00

AGEC 49800 - Special Problems

Credit Hours: 1.00 to 3.00. Open primarily to qualified seniors who want to study special problems in agricultural economics not covered in regular work. Permission of instructor required. **Credits:** 1.00 to 3.00

AGEC 49900 - Thesis

Credit Hours: 1.00 to 6.00. Thesis. Permission of instructor required. **Credits:** 1.00 to 6.00

AGEC 50600 - Agricultural Marketing And Price Analysis

Credit Hours: 3.00. Marketing margins and derived demand; elasticity. Modeling supply and demand relationships; single and multiple equation systems; forecasting. Industrial organization economics applied to the food processing, wholesaling, and retailing industries; subsector analysis, vertical coordination; marketing and competition policies. **Credits:** 3.00

AGEC 51600 - Mathematical Tools For Agricultural And Applied Economics

Credit Hours: 3.00. This course provides first year graduate students and advanced undergraduate students with the specific set of applied mathematical tools needed to support graduate coursework in microeconomics, macroeconomics, economic programming, and econometrics. The course reviews skills and concepts from a number of fields of mathematics including matrix algebra, calculus, optimization theory, and mathematical statistics. The course emphasizes specific applications to economic theory and applied problems in agricultural economics and related areas. Students should be comfortable with introductory-level calculus before entering the course. Permission of instructor required. **Credits:** 3.00

AGEC 52400 - Agricultural Finance

Credit Hours: 3.00. Designed to provide students the concepts and tools to apply financial management principles to farm businesses. Topics include financing alternatives, preparation and interpretation of financial statements, and capital investment analysis using discounted cash flows. **Credits:** 3.00

AGEC 52500 - Environmental Policy Analysis

Credit Hours: 3.00. Designed to assist in understanding how environmental information and knowledge are produced, disseminated, and utilized in a variety of institutional contexts. Readings are selected to promote discussion and interaction concerning alternative mechanisms for protecting environmental resources. Prerequisite: introductory microeconomics course suggested. **Credits:** 3.00

AGEC 52600 - International Food And Agribusiness Marketing Strategy

Credit Hours: 3.00. Students will develop their analytical, decision-making, and communication skills related to marketing management of food systems in the world economy. They will analyze a foreign market's potential and market entry strategies; compare consumer differences and similarities across markets; define issues related to marketing mix standardization or adaptation; and evaluate effects of economic, social, and legal environments on marketing strategy. **Credits:** 3.00

AGEC 52800 - Global Change And The Challenge Of Sustainably Feeding A Growing Planet

Credit Hours: 3.00. This course investigates the major drivers of global agricultural and environmental change associated with the global farm and food system. This includes demography, income growth, biofuels, climate change, environmental and ecosystem services, livestock consumption, food waste and land use change. Weekly modules include a guest lecture, student led discussion of readings and discussion of lab assignments undertaken using the SIMPLE model of global agriculture, environment and food security. The class culminates with a course project which is presented to the class and written up in a term paper. **Credits:** 3.00

AGEC 53000 - Strategic Agribusiness Management

Credit Hours: 3.00. Addresses issues in the strategic management of agricultural and food businesses. Emphasis is on developing a framework for formulating strategy, making strategic choices in a variety of business environments, and implementing strategy. Extensive use of management case studies and a major term project with an agribusiness firm focus on developing managerial problem-solving skills. **Credits:** 3.00

AGEC 53200 - World Food Problems

Credit Hours: 3.00. This course focuses on the multi-disciplinary challenges that exist in meeting the food and nutrition needs of a growing world population. The course aims to instill an appreciation of the importance of economics, food production and technology, trade, culture, communication, political processes and institutions, demography and related factors in determining adequate food availability and health globally. Permission of instructor required. **Credits:** 3.00

AGEC 55200 - Introduction To Mathematical Programming

Credit Hours: 3.00. Introduction to constrained and optimization problems and their solution using mathematical programming techniques. Theory and implementation of linear, quadratic, and integer programming methods are examined. Applications to farm management, diet and feed rations, spatial market equilibrium, agricultural sector analysis, and other problems from agricultural economics. Use of computer software packages for practical problems. **Credits:** 3.00

AGEC 57100 - Global Issues In International Agribusiness

Credit Hours: 1.00. This is the first course in a required three-course sequence designed for students in the "Professional Masters in International Agribusiness" concentration in the Department of Agricultural Economics. The course objective is to expose students to a wide range of global issues directly and indirectly related to the production, processing, and marketing of agricultural products (food, fuel, fiber). Topics vary and may include food security, malnutrition, food safety, biofuels, the environment, trade and agricultural policy, emerging agricultural technologies, and climate change. Prerequisites: Enrollment in Professional Masters in International Agribusiness or permission of instructor required. **Credits:** 1.00

AGEC 57200 - International Agribusiness Market Opportunities

Credit Hours: 2.00. This is the second course in a required three-course sequence designed for students in the "Professional Masters in International Agribusiness" concentration in the Department of Agricultural Economics. The course objective is to assist students in identifying and exploring market opportunities in international agribusiness, including those related to the production, processing, and marketing of agricultural products including food, fuel, and fiber. The course combines lectures with discussion and project-based learning and group activities. **Credits:** 2.00

AGEC 57300 - International Business Analysis

Credit Hours: 3.00. This is the third course in a required three-course sequence designed for students in the Professional Masters in International Agribusiness concentration in the Department of Agricultural Economics. The course objective is to assist students in conducting a professional business analysis focusing on either a market opportunity, financial management, or other management issue in international agribusiness. The course is project-based and includes group activities and written and oral presentations. **Credits:** 3.00

AGEC 59500 - Internship

Credit Hours: 0.00 to 3.00. This course allows students to work in firms, government agencies or non-profit organizations undertaking projects with the supervision of faculty mentors and onsite supervisors. Permission of department required. **Credits:** 0.00 to 3.00

AGEC 59600 - Seminars In Current Issues In Agricultural Economics

Credit Hours: 1.00 to 3.00. Study of selected current developments in agricultural economics. Topics will be announced in advance. Permission of instructor required. **Credits:** 1.00 to 3.00

AGEC 60000 - Agricultural Finance

Credit Hours: 3.00. Advanced capital budgeting topics including: tax policy, inflation, optimal replacement, bid models, and inclusion of financing flows; application of expected utility theory and mathematical programming to optimal capital structure decisions of proprietors; farmland investment, pricing, and dynamics; pricing contingent claims. Prerequisite: AGEC 52400; AGEC 55200 suggested. **Credits:** 3.00

AGEC 60200 - Preparation And Procedures For Policy Analysis

Credit Hours: 3.00. Research methods, scientific methodology, problem identification, and the nature of policy problems including economic policy readings, case studies, and practice project proposals. **Credits:** 3.00

AGEC 60400 - Fundamentals Of Applied Welfare Economics

Credit Hours: 1.00. Basic concepts and principles of applied welfare economics including Pareto conditions for welfare maximization; public goods, externalities, and property rights; consumer and producer surplus; theory of the second best; and neoclassical and contemporary theories of income distribution. Concurrent Prerequisite: ECON 51100. **Credits:** 1.00

AGEC 60500 - Agricultural Markets And Price Analysis

Credit Hours: 3.00. Agricultural markets are multi-faceted, having been studied using a wide range of analytical tools. This graduate-level course emphasizes charactering demand and supply of agricultural markets and understanding forces that determine commodity and food prices. It also aims to cover a set of economic studies of prices and assist students in applying theoretical frameworks and time-series econometrics to empirical analysis of agricultural prices. In addition to studying prices in perfectly competitive markets, the first half of the course highlights several classic models of consumer demand and agricultural supply, prices under imperfect competition, price spreads (marketing margins), and the economics of information. The second half of the course focuses on empirical price analysis. Popular time-series econometric tools are introduced to study price relationships over space and time, price discovery mechanisms, and functions of futures markets. **Credits:** 3.00

AGEC 60800 - Benefit-Cost Analysis

Credit Hours: 2.00. Principles and practice for analysis of the benefits and costs of public investments. Topics include measures of project worth, choice of the discount rate, analysis of projects with multiple objectives and purposes, identifying and quantifying benefits and costs, applications of consumer and producer surplus in project analysis, treatment of risk and uncertainty, and shadow pricing techniques for project evaluation in developing counties. Concurrent Prerequisite: AGEC 60400; a graduate course in microeconomic theory. **Credits:** 2.00

AGEC 60900 - Applied Welfare Analysis

Credit Hours: 3.00. This course develops the theory and methods used to assess the benefits and costs of economic policies and projects. Topics include benefit-cost analysis, economic impact analysis, nonmarket valuation, and analysis of risk and uncertainty. Prerequisites: A graduate course in microeconomic theory; a graduate course in regression analysis. **Credits:** 3.00

AGEC 61200 - Agricultural Production Economics I

Credit Hours: 3.00. Economic theory and empirical research methods for management of natural resource based production systems. Topics include: analysis of response in crops and livestock production, resource allocation, economics of site specific management, commodity supply and input demand. Concurrent Prerequisite: ECON 51100. **Credits:** 3.00

AGEC 61300 - Introduction To Economics Of Risk

Credit Hours: 3.00. A background in expected utility theory and applications. EUH axioms, risk aversion, utility elicitation, expected utility and moments, stochastic dominance, mean-variance, risk free asset, diversification, single index model, increasing risk, production under risk, programming models and applications. Prerequisite: AGEC 55200, ECON 51100, STAT 51100. **Credits:** 3.00

AGEC 61400 - Advanced Agricultural Production Economics

Credit Hours: 3.00. Course covers advanced techniques for economic analysis of agricultural production economics. Students are required to produce a course project demonstrating competency at the applied research frontier of the field and participate in presentation, discussion, and peer review of course members' work. Prerequisites: AGEC 61200 and ECON 60700 or Consent of Instructor. **Credits:** 3.00

AGEC 61600 - Resource Economics And Policy

Credit Hours: 3.00. Natural resource development and allocation in both static and dynamic contexts. Analysis of scarcity and growth issues, equity considerations, derivation of optimal pricing and depletion rules. Application of advanced production concepts to national resource problems. Prerequisite: AGEC 60400, ECON 51100. **Credits:** 3.00

AGEC 61700 - Applied Welfare And Environmental Economics

Credit Hours: 3.00. Theory of welfare economics relevant to understanding foundations of benefit-cost analysis and concepts for policy design in areas such as environment, resources, and trade. Applied projects to be selected and analyzed by students. Prerequisite: AGEC 60400 and ECON 60700 , or Consent of Instructor. **Credits:** 3.00

AGEC 61800 - Applied General Equilibrium Analysis

Credit Hours: 3.00. Theory and empirical techniques behind numerical general equilibrium analysis. The course is divided into two parts: 1) development of the basic analytical framework and model properties, and 2) in-depth study of selected applications in international trade, price analysis, and resource and environmental economics. Homework assignments involve a mix of qualitative analysis and microcomputer-based computational exercises. Prerequisite: AGEC 60400; Prerequisite: ECON 51100 or ECON 60700. **Credits:** 3.00

AGEC 61900 - Applied Microeconomic Theory

Credit Hours: 3.00. Provides students with the capability to apply microeconomic theory and econometrics to analyses of economic issues and problems. Students will work through applied producer/consumer problems to gain experience in the uses of econometric estimation. Topics include: primal-dual approaches, direct and indirect functions, flexible functional forms, static optimization, separability and aggregation, risk and expectations, dynamics and demographics. Examples are drawn from both consumer and producer applications. Prerequisite: AGEC 65100, ECON 60700. **Credits:** 3.00

AGEC 62000 - Computational Analysis Of Markets And Policy

Credit Hours: 3.00. Exposes students to a variety of topics in applied economics relating to markets and policy. Students build, calibrate, and revise simple economic models, with the basic structure of more complex models being provided. Through a series of problem sets focusing on analytical skills and computation, students bridge theory and application in economics. **Credits:** 3.00

AGEC 62200 - Food System Organization And Policy

Credit Hours: 3.00. Development of framework to study food system organization and policy; survey of measurement and empirical testing problems in industrial-organization research on food-system market structure and performance; review of competition policies and evaluation of policy alternatives. Prerequisite: Graduate courses in microeconomic theory and marketing. **Credits:** 3.00

AGEC 62500 - Macroeconomic Issues In Agriculture

Credit Hours: 3.00. Studies the nature and importance of linkages between agriculture and the macro economy, and examines theories and methods used to establish or quantify these linkages in agricultural models. Extensions of macroeconomic

accounting and theory into an open economy are explored by examining attempts by agricultural economists to estimate macroeconomic linkages and build them into commodity models, and considering consequences of implicit and explicit macroeconomic assumptions in much of our work. The changing role of agriculture in an economy under structural transformation will be key to understanding these linkages and how they evolve, as shown in several new developments seeking to explain both recent events and policy history in macro-theoretical frameworks consistent with observed empirical regularities. **Credits:** 3.00

AGEC 63000 - Urban And Regional Economics

Credit Hours: 3.00. The literature discussed in this urban and regional economics course covers theoretical texts, conceptual as well as statistical, and empirical applications in order to introduce the student to the economist's view on spatial variation in economic outcomes. This ranges from coverage of the theory of industrial location choice, through theoretical and empirical analysis of the spatial distribution of economic activities (agglomeration theory, industrial clusters, central place theory), to theoretical and empirical explanations for the spatial structure of cities, the working of regional labor markets and migration. The course covers various empirical tools utilized in spatial data analysis (spatial econometrics) and modeling of regional economies and their interrelations (interregional input-output analysis). Prerequisites: AGEC 20300 or ECON 34000 or ECON 51100. **Credits:** 3.00

AGEC 63100 - The Theory And Practice Of Spatial Econometrics

Credit Hours: 3.00. This course deals with the analysis of spatial data and centers on both exploratory tools developed in spatial statistics and GIScience, as well as on econometric models that have been the main focus in spatial econometrics. During the course, the theoretical basis for the analysis of spatial data and spatial models will be covered. This theoretical angle will be combined with ample opportunities to acquire hands-on experience in the analysis of spatial data. To the effect, up-to-date software, such as GeoDa, R, Stata, and MATLAB will be used. A good working knowledge of basic statistics and regression techniques is needed. Prior experience with GIS is helpful but not required. Prerequisites: AGEC 45100 or AGEC 65000 or ECON 67100 or STAT 41700 or STAT 51200 or STAT 51700. **Credits:** 3.00

AGEC 63300 - Advanced Topics In Space, Health, And Population Economics

Credit Hours: 1.00. This course is designed to introduce students to advanced research in space, health, and population economics. It is designed to introduce both topical content and state-of-the-art research tools to students through a combination of guest speakers, faculty presentations, and discussions. The seminar also serves as a forum for students to present their own work and receive critical commentary from faculty and peers. The course is organized as a graduate seminar and gives students a chance to actively explore their own research ideas. **Credits:** 1.00

AGEC 64000 - Agricultural Policy

Credit Hours: 3.00. Policy analysis for agriculture in the world economy. Emphasis on application of economic theory to analyze commodity programs, international trade, environmental concerns, and investment in human capital and agricultural research. Prerequisite: AGEC 41000, AGEC 60400. **Credits:** 3.00

AGEC 64300 - Theory Of Economic Development

Credit Hours: 3.00. The economic theories behind the predominant approaches to economic development are reviewed. Both the sources of growth and problems in the development process are stressed. Emphasis is on the analysis and evolution of the models supporting the different approaches and the empirical analysis leading to changes in the paradigms. The role of agriculture in the economic development process is one of the topics. Other important issues are technological change, income distribution, structural adjustment, and the debt problem. Prerequisite: ECON 51100, ECON 51200. **Credits:** 3.00

AGEC 64400 - International Agricultural Trade

Credit Hours: 3.00. International trade theory relevant to understanding world agricultural trade and the problems of agriculture in an open economy. Models for analyzing the effects of trade policy and market conditions on the agricultural sector. Welfare analysis of restrictions on trade. Prerequisite: ECON 51100, ECON 51200 **Credits:** 3.00

AGEC 65000 - Application Of Quantitative Analysis: Econometrics I

Credit Hours: 3.00. Brief presentation of probability concepts, mathematical expectation, probability density and distribution functions as background for studying principles of economic model construction. Emphasis is on econometric single equation models, principles of estimation, the general linear model, tests of hypothesis, confidence interval estimation, and special topics such as errors in the variables, multicollinearity, dummy variables, hetero-scedasticity, autocorrelation and prediction problems. Prerequisite: STAT 51100; ECON 51100 or ECON 60700, matrix algebra. **Credits:** 3.00

AGEC 65100 - Application Of Quantitative Analysis: Econometrics II

Credit Hours: 3.00. Emphasis is on using advanced econometric techniques. The course covers use of computer software and interpretation and reporting of econometric results. The first part of the course includes general econometric concepts, such as least squares and maximum likelihood estimation, desirable statistical properties, assumptions of the classical linear regression model, Monte Carlo methods, nested and non-nested hypothesis tests. Later, more specialized topics are covered, including multiple equation models, simultaneous equation models, limited dependent variable models, and other topics that are deemed relevant. Prerequisite: AGEC 65000. **Credits:** 3.00

AGEC 65200 - Application Of Quantitative Analysis: Mathematical Programming

Credit Hours: 3.00. Recent literature on the theory and application of mathematical programming and agricultural modeling. Model building and analysis techniques with focus on matching solution methods to problems. Prerequisite: AGEC 55200, ECON 61200; a course in matrix algebra. **Credits:** 3.00

AGEC 65400 - Economic Dynamics

Credit Hours: 2.00. Focuses on the application of the tools of dynamic optimization to problems in economics. Covers continuous-time and discrete-time dynamic optimization techniques, including the calculus of variations, optimal control theory, and dynamic programming. Applications are drawn from a range of problems in microeconomics and macroeconomics, including current topics in agricultural economics, natural resource economics, and investment theory. Course meets weeks 1 - 10. Prerequisite: AGEC 65200, ECON 60700. **Credits:** 2.00

AGEC 65500 - Applied Economic Time Series Analysis

Credit Hours: 3.00. This course is designed to improve students' abilities to estimate and interpret time series models. The course begins with univariate models and progresses to multivariate analysis. Alternative methods for identifying, estimating, and forecasting with time series models will be discussed. In addition, analysis of non-stationary time series and co-integration modeling will be covered in this course. Prerequisite: AGEC 65100 or consent of instructor. Mastery of applied statistics, calculus, and microeconomic theory at the Masters level or higher is desirable. **Credits:** 3.00

AGEC 68100 - Economics For Food And Agribusiness Managers

Credit Hours: 3.00. Addresses the institutional setting, business climate, and structure of the food and agricultural markets. Encompasses both the domestic and international dimensions of the food chain, including consumer demand, global sourcing, and worldwide production potential. Focuses on managerial economics, as applied to such topics as food system market structure, the nature and dimensions of domestic and global competition, the components of cost and revenue, and the food system value chain. Permission of department required.**Credits:** 3.00

AGEC 68200 - The Macroeconomics And Trade Environment Of The Food System

Credit Hours: 3.00. Exposes students to the nature of linkages among agriculture, international markets, and the macro-economy, which are key to the fortunes of U.S. farmers and agribusiness. Exam theories and methods that allow students to establish or quantify these linkages and evaluate the consequences of alternative policies, demonstrating the usefulness of economic analysis as a tool. Also explores current policy issues facing the food and agribusiness industries, which might include farm legislation; environmental regulations; and food safety and nutrition labeling rules, among other policy topics. Permission of department required.**Credits:** 3.00

AGEC 68400 - Applied Quantitative Methods For Decision Making

Credit Hours: 3.00. Explores the application of contemporary concepts and quantitative techniques for decision making in the face of uncertainty. Focus is on application of statistical tools to decisions facing the food and agricultural business manager. Permission of department required.**Credits:** 3.00

AGEC 68500 - Advanced Quantitative Methods For Decision Making Under Uncertainty

Credit Hours: 3.00. Explores key areas of risk management of the food and agricultural firm, including price, production, strategic, regulatory, technology, market/competitor, political, financial, and exchange rate risk. Contemporary tools, such as score carding, decision trees, and real options are introduced for quantifying and managing uncertain decisions. Permission of department required.**Credits:** 3.00

AGEC 68600 - Strategic Food And Agribusiness Management

Credit Hours: 3.00. This course explores integration of the functional areas of business at the corporate level. Heavy emphasis is on analysis of the business environment, setting strategic direction, assessing core competencies, choosing a market position and developing competitive advantage, and organizational implementation and control in the context of the food and agricultural markets. The course makes heavy use of case studies of firms in the food and agricultural marketplace. Permission of department required.**Credits:** 3.00

AGEC 68700 - Problem Solving And Project Management For Decision Makers

Credit Hours: 3.00. Develops a structured approach to problem solving, including problem definition, development of alternatives, identifying consequences, assessing trade-offs, and making informed choices. Research methods and project management concepts will be addressed. A major business analysis project will be framed during the course, to be completed as part of the capstone course in business analysis. Permission of department required.**Credits:** 3.00

AGEC 68800 - Business Analysis Capstone Course

Credit Hours: 3.00. Capstone experience where students will work on individual projects focused on a comprehensive detailed analysis of an issue facing their employer or an issue of general interest to the student. It is expected that this project will draw on tools and concepts developed throughout the MS program and be delivered to an appropriate audience of decision-makers upon completion. Permission of department required.**Credits:** 3.00

AGEC 69000 - Seminars In Agricultural Economics

Credit Hours: 0.00 to 18.00. Intensive study of selected current developments in agricultural economics. Topics will be announced in advance. Permission of instructor required. **Credits:** 0.00 to 18.00

AGEC 69100 - Topical Research In Agricultural Economics

Credit Hours: 1.00 to 6.00. Topics of interest to the student. Designed to give training in research. Credit dependent upon amount of work done. Permission of instructor required. **Credits:** 1.00 to 6.00

AGEC 69200 - Workshop In Applied Economics

Credit Hours: 1.00. A workshop on how to communicate research results in a seminar setting. Students present at least once during the course and will be present for other students' presentations. Students may present their own research, or a paper from a recent journal also is acceptable. The course is open to master's students, and one credit of this course is required of doctoral students. **Credits:** 1.00

AGEC 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

AGEC 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Agricultural Sciences Education & Communication

ASEC 10100 - Agriculture, Science And Social Issues

Credit Hours: 1.00. This course introduces Purdue Agriculture students to social issues that influence the future of science innovation and the agriculture industry. It will particularly focus on areas of apparent disconnect with regard to agriculture, scientific evidence and the general public. In order to learn how to communicate with others on controversial issues, concepts of engagement will be discussed as ways to better understand audiences and find areas of common interest. Featuring guest speakers on current social issues, students will learn how issues impact the agriculture industry and science innovation and consider how to engage stakeholders regarding these concerns. **Credits:** 1.00

ASEC 15200 - Agricultural Communication Seminar

Credit Hours: 3.00. This course provides an introduction to agricultural communication as a professional field, including its current status and role within the larger U.S. mass media system. The course will also provide an overview of career options and professional skills and competencies required of agricultural communicators. **Credits:** 3.00

ASEC 21200 - Greenhouse And Landscape Fundamentals For Educators

Credit Hours: 3.00. (HORT 21200) This course will prepare future educators in using a greenhouse and landscape as teaching tools. The key focus will be preparing students to apply greenhouse and landscape management fundamentals in order to teach these concepts in the classroom. Laboratories will explore how to identify and produce both woody and herbaceous plants while safely maintaining and operating greenhouse technologies. Students will also explore how to implement landscape design technologies and identify tools, equipment, and landscape plants. Permission of instructor required.**Credits:** 3.00

ASEC 24000 - Seminar In Agricultural Education

Credit Hours: 1.00. Development of an understanding of the origin, scope, and objectives of agricultural education; role of the agricultural science and business teacher as a professional educator; basic responsibilities of a teacher of agricultural science and business; and significance of legislation affecting agricultural education. **Credits:** 1.00

ASEC 28000 - Digital Storytelling

Credit Hours: 3.00. Students will plan, shoot, and edit videos; collaborate in teams; plan and generate social media; and write feature pieces for digital platforms. Students will gain meaningful digital storytelling experiences that will enhance their understanding of various platforms and build their professional portfolios. **Credits:** 3.00

ASEC 28500 - Introduction To Publication Design

Credit Hours: 3.00. Introduction to pre-press production of professional-quality publications. Emphasis on computer applications for publication layout, design and production. Topics include composition, readability, typography, graphic resolution, and color management systems.**Credits:** 3.00

ASEC 29000 - Special Problems In Agricultural Science And Education Communication

Credit Hours: 1.00 to 6.00. Open primarily to freshmen and sophomores who desire to study special problems in agricultural communication, agricultural education, life science education, extension education, leadership education or youth development not covered in regular coursework. To be arranged with instructor or departmental representative prior to registering. Permission of instructor required. **Credits:** 1.00 to 6.00

ASEC 30100 - Building Intercultural Partnerships

Credit Hours: 3.00. This course uses a combination of readings, videos, experiential activities, presentations, and face-to-face & virtual excursions/engagement with "other/different" international cultural groups to deepen students' ownership of their own learning and to identify and understand both similarities and differences in values and social norms across countries and cultures. Students will enhance their intercultural communication skills, their emotional resilience, and their ability to engage effectively and equitably in conversations and partnerships with people from other countries and cultures.**Credits:** 3.00

ASEC 31800 - Coordination Of Supervised Agricultural Experience Programs

Credit Hours: 2.00. Record keeping and supervisory skills needed to advise and coordinate supervised agricultural experience programs for secondary agricultural science and business students. Integration of supervised agricultural experiences with programming in youth organizations and classroom instruction for secondary agricultural science and business classrooms. **Credits:** 2.00

ASEC 31900 - Planning Agricultural Science And Business Programs

Credit Hours: 2.00. Development of course content plans that coordinate and utilize agricultural science and business, community resources, FFA, and supervised agricultural experience programs. **Credits:** 2.00

ASEC 33100 - The Role Of Horses In Human History, Culture And Society

Credit Hours: 3.00. A multi-disciplinary course that introduces students to the history of the human-horse relationship in a global context. Because the history of horse and human interaction is so broad and so important to the development of civilization, the course will include a broad view of horses in the context of agriculture, transportation, sport, culture and art. Permission of instructor required. **Credits:** 3.00

ASEC 34000 - Laboratory Practices In Agricultural Education

Credit Hours: 2.00. This course is designed to introduce pre-service agricultural education teachers to laboratory integration into the agricultural education curriculum at the middle school and secondary school level. Emphasis is placed on laboratory safety,

skill acquisition, developing knowledge of laboratory components in Agriscience, laboratory utilization, facilitating student learning in the laboratory setting, appropriate teaching methods and techniques, curriculum applications, and classroom resources. Travel to on and off-campus sites will be required. **Credits:** 2.00

ASEC 34100 - Curriculum Development In Agricultural Education

Credit Hours: 2.00. This course is designed to expose students to appropriate teaching techniques, curricula and resources within agricultural education. Procedures for designing, implementing, and evaluating curriculum will be examined. Emphasis will be placed on new and emerging areas in agriculture, food, and natural resources. **Credits:** 2.00

ASEC 35500 - Controversial Science And Media In The Public Sphere

Credit Hours: 3.00. This course will utilize case studies of controversial science news to explore the multiple factors that converge to influence how science and technology become controversial issues across a variety of social/ political domains. In addition to foundational understanding of communication theory, students will develop two primary skills: 1) a structure for the critical analysis of science news, 2) the skills to meaningfully communicate across stakeholders. The science content (GMOs, climate change, pesticide use, etc.) will provide the background information for analysis of the main focus of the course, which is in learning the communication process for effectively communicating science to non-science audiences. Case studies and applied critical media theory will be utilized to explore such controversies as climate change, genetically modified foods, and other emergent science controversies. **Credits:** 3.00

ASEC 38000 - Feature Writing And Production

Credit Hours: 3.00. Students gain hands-on studio experiences in all phases of features writing, storytelling, and production. Students will analyze audiences, generate story ideas, research, interview, write, edit, shoot photos, plan social media, design pages, and can shoot short-form video. **Credits:** 3.00

ASEC 38500 - Communication Strategies For Controversial Issues In ANR

Credit Hours: 3.00. This course trains students to communicate about controversial science and emerging technology in contested environments. Additionally, the course covers public engagement principles for science topics and how to communicate risks in the context of agriculture, and natural resources science and technology.**Credits:** 3.00

ASEC 40000 - Agricultural Education Study Abroad

Credit Hours: 0.00 to 8.00. Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities. **Credits:** 0.00 to 8.00

ASEC 43100 - Planning For International Engagement Methods

Credit Hours: 1.00. A team-based laboratory course for students who seek experience working with international partners to plan and conduct quality service-learning projects. Using established partner relationships, students will work with international partners to address hands-on, real-world, identified challenges to learn the principles of extension methodology and sustainable community development by integrating their discipline knowledge and technical skills from previous courses. Students will also learn the intercultural communication, market analysis, project design and planning, entrepreneurial business planning for micro-credit loans and business ventures, and cultural factors affecting community food security while they work in bi-national teams to determine how best to apply their classroom knowledge and experience to respond to partners' needs and local resource constraints.**Credits:** 1.00

ASEC 43110 - International Engagement Methods

Credit Hours: 1.00 to 3.00. Using established partner relationships, students will travel to and live in Cap Haitien for 8-10 days and work with Haitian partners and students to learn the principles of extension methodology, sustainable community development, and how to most effectively work with local leaders. Students will also learn the intercultural communication, entrepreneurial business planning, and cultural factors affecting community food security status while they work bi-national teams to determine how best to apply their classroom knowledge and experience.**Credits:** 1.00 to 3.00

ASEC 43120 - Evaluating International Engagement Methods

Credit Hours: 1.00. Designed for students who have just returned from the Engagement Methods for Int'l Food Security course or have previous experience working with our partners. In order to 1) fully comprehend the impact of the experience and 2) foster true long-term relationships with and service to our partners, it is required to work on our projects when we return. Matt McGregor, Former Exec. Dir. of Timmy Global Health, told us that "it's not really about the trip". It is essential that we accomplish: 1) Closure of trip experiences with partners and contacts - thank you's and complete follow-up; 2) Reflection of Purdue student experiences and personal goals/follow-up actions; 3) Promotion of food insecurity realities and opportunities for support; and 4) Planning, recommendations, and promotion of future service learning courses.**Credits:** 1.00

ASEC 44000 - Methods Of Teaching Agricultural Education

Credit Hours: 3.00. Principles and procedures for teaching agricultural science and business in public schools. Must be admitted to teacher education program. **Credits:** 3.00

ASEC 44100 - Field Experience In Agricultural Education Programs

Credit Hours: 1.00 to 3.00. Field experience in agricultural science and business programs to include observation and participation in the teaching process and program development activities. **Credits:** 1.00 to 3.00

ASEC 44200 - Curriculum Implementation In Agricultural Education

Credit Hours: 2.00. Students develop skills necessary to implement standards-based curriculum in Agricultural Education through hands-on application. Course is designed for students who have an understanding of curriculum development and teaching methodology. **Credits:** 2.00

ASEC 48000 - Agricultural Communication Capstone Seminar

Credit Hours: 3.00. Prepares graduating students for entry to the workplace, assesses and enhances their communication knowledge and skills, and provides project experiences that will demonstrate their ability to communicate scientific and technical information through a variety of media. Projects will include student presentations and magazine style articles on issues of concern to agricultural and general audiences; and a final project that requires students to conceive and create a web site that uses converging media to communicate effectively a topical issue. **Credits:** 3.00

ASEC 48500 - Environmental Communication

Credit Hours: 3.00. This is an interactive learning course in science and environmental communication with a strong emphasis on development of practical writing and communication skills for students who will become professionals in environment or natural resources. The public primarily obtains environmental information through the media, as such, scientists need to develop the understanding and skills necessary to engage with a range of audiences through the design of effective communication products. This course provides a unique balance of communication theory and skills training in which students develop the confidence to meaningfully communicate environmental issues. **Credits:** 3.00

ASEC 49000 - Special Problems

Credit Hours: 1.00 to 6.00. Open to undergraduates who desire to study special problems in agricultural communications, agricultural education, or youth development not covered in regular coursework. To be arranged with the instructor or departmental representative prior to registering. Permission of instructor required. **Credits:** 1.00 to 6.00

ASEC 49100 - Special Topics In Agricultural Science And Education Communication

Credit Hours: 1.00 to 3.00. Designed for specialized topic areas for which there is no specific course, but have enough student interest to justify formalized teaching of an undergraduate-level course. The course may be repeated by a student as long as the topic being taught is not repeated. The specific topic that is offered will be indicated on the student's record. To be arranged with the instructor or departmental representative prior to registering. Permission of instructor required. **Credits:** 1.00 to 3.00

ASEC 49700 - Thesis Research

Credit Hours: 1.00 to 6.00. For Honors students only doing specialized youth development and agricultural education research. Arrange with academic advisor and honors research coordinator before registering. **Credits:** 1.00 to 6.00

ASEC 49900 - Special Problems In Agricultural Communication

Credit Hours: 1.00 to 3.00. Application of principles of mass communication in the production of agriculturally related news, feature, and magazine articles, radio and television reports, photographs, and publications in the Department of Agricultural Communication Service. Permission of instructor required. **Credits:** 1.00 to 3.00

ASEC 52000 - Foundations Of Agricultural Education, Extension, And Communication

Credit Hours: 3.00. Critical analysis of the historical and philosophical assumptions, current strategic intents and relevant policies underpinning the discipline of agricultural education - inclusive of Extension education and agricultural communication - and project the impact existing economic, social and political issues may have in this field in the next 15 to 25 years. Instructor permission required. **Credits:** 3.00

ASEC 53100 - Global Learning For Agriculture, Food And Natural Resources

Credit Hours: 3.00. This is a graduate-level course in which students research, design, and evaluate communication and education methods and theoretical frameworks to apply appropriate cultural, community engagement, targeted outcomes of a population defined by the student. The central experience is an international/intercultural professional development experience immersed in rural and urban communities and cultures. Students will learn and develop global perspectives and effective engagement strategies to address agronomic, cultural, and community engagement realities affecting agriculture, life sciences and natural resources. **Credits:** 3.00

ASEC 54000 - Program Development In Agricultural And Extension Education

Credit Hours: 3.00. Application of principles of agricultural and extension education. Emphasis on program development, supervised experience programs, and effective organization of an agricultural and extension education program. **Credits:** 3.00

ASEC 54100 - Program Development In School-Based Agricultural Education

Credit Hours: 3.00. This graduate course in agricultural education concentrates on program planning and delivery of secondary programs in agriculture. Special emphasis is placed on utilizing school and community resources to develop programmatic offerings, recruit and retain students, organize FFA activities, direct supervised agricultural experience programs, and manage the agricultural education program. Various topics to be discussed will be determined based upon current trends in the field of

agricultural education as well as the needs and interests of the students enrolled. Foundational procedures involved in conducting a secondary agricultural education program will be addressed. Permission of instructor required. **Credits:** 3.00

ASEC 54500 - Teaching STEM Through Agriculture, Food And Natural Resources

Credit Hours: 3.00. The course focuses on the background and history of STEM movement and agricultural education, contemporary models, strategies, and justification for incorporation of science, technology, engineering and mathematics (STEM) concepts and practices into K-12 formal and non-formal agricultural education programs. Consider and develop the best practices for STEM teaching and learning and enhancement of STEM content in agriculture, food and natural resources (AFNR) context. The goal of the course is to help students develop knowledge about STEM integration and equip them with teaching knowledge and skills for designing K-12 lesson plans by using integrated STEM through AFNR. Students will learn strategies that promote engagement in integrated STEM through AFNR activities. At the end of the course, students should be able to design and implement research-based integrated STEM through AFNR lesson plans and assessment plans. **Credits:** 3.00

ASEC 54600 - Communication And Issues Engagement For Agricultural Professionals

Credit Hours: 3.00. In this eight-week online course, students will be exposed to science communication and issues engagement principles. The course is designed primarily for those with little or no formal communication training. Topics include evidence-based best practices for communicating science; news media and social media influences on controversial science; how to monitor controversial issues; and major theoretical perspectives and strategies for engaging the public on food and agricultural science. **Credits:** 3.00

ASEC 54800 - Communicating Science To The Public

Credit Hours: 1.00. This course will help graduate students in science disciplines learn to communicate science to non-expert audiences. Through readings, assignments and guided discussions, students will learn relevant communication theories and recommended strategies for engaging with the public on science and technology topics. **Credits:** 1.00

ASEC 55000 - Program Evaluation In Formal And Non-formal Settings

Credit Hours: 3.00. The purpose of this course it to provide a basic understanding of program evaluation processes, concepts, and theories and to develop expertise needed to design and conduct systematic evaluation of formal and non-formal programs. **Credits:** 3.00

ASEC 55100 - International Engagement And Development Strategies

Credit Hours: 3.00. Sem. S and SS, cr. 3; an overview of cross-disciplinary, cultural, theoretical frameworks, communication tools, and assessment methods applied to international agricultural development and engagement. Lectures, panel discussions, and case studies on appropriate methods of development and engagement, international project planning, intercultural effectiveness, principles of sustainable agricultural, food, community development, and program/project monitoring and evaluation will be the basis of assignments and team work. This eight-week course will provide the theoretical and social frameworks and principles needed to successfully work in multi-agency partnerships on international development projects. **Credits:** 3.00

ASEC 56500 - Principles Of Adult Education

Credit Hours: 3.00. (EDCI 56500) Principles of adult education applied to helping adults learn, evaluating their performance, and determining their needs. Examines history, philosophy, and research of adult education. Explores techniques required in design and delivery of instruction for adults. **Credits:** 3.00

ASEC 58200 - Introduction To The Application Of Inferential Statistics

Credit Hours: 3.00. The goal of this course is to introduce students to the use and application of statistics with a particular focus on descriptive and inferential analysis procedures. This course will also introduce students to the use of statistical software, namely the Statistical Package for the Social Science (SPSS). Permission of instructor required. **Credits:** 3.00

ASEC 58500 - Science Communication

Credit Hours: 3.00. This course utilizes foundational research and commentary from scholars to track the evolution of media and our ability as scientists to understand and effectively communicate these issues to a non-science audience. Science and technology are evolving faster than societies ability to understand, assimilate, and make policies to address these increasingly complex issues. As a result, controversies arise over issues such as climate change, forest management, genetically modified foods, energy choices, genetic engineering, nanotechnology, water management, and agricultural practices, etc. This course covers the range of issues in the field of science communication including: the nature of science, how to translate evidence for a lay audience, media practices, reporting and qualifying uncertainty, human psychology and belief systems, information processing, and the most current research for messaging science. We will work together to examine the foundational scholarly literature in this area and how it is/ or is not reflected in construction of popular media. You will use this knowledge to construct both compelling oral science narratives, and a science story for popular consumption. **Credits:** 3.00

ASEC 59000 - Special Problems

Credit Hours: 1.00 to 6.00. A study of special problems in agricultural communications, agricultural education, or youth development not covered in regular coursework. To be arranged with the instructor or departmental representative prior to registering. Permission of instructor required. **Credits:** 1.00 to 6.00

ASEC 59100 - Special Topics

Credit Hours: 1.00 to 4.00. Specialized topics not covered in other courses. Topics, requirements, and credits to be determined yearly. To be arranged with the instructor or departmental representative prior to registering. Permission of instructor required. **Credits:** 1.00 to 4.00

ASEC 59500 - Internship In Agricultural Sciences Education And Communication

Credit Hours: 1.00 to 10.00. A special course designed to provide practical field experience under professional supervision in selected situation related to the student's area of specialization. Amount of credit to be determined by the nature and extent of the assignment. To be arranged with the instructor of departmental representative prior to registering. Permission of instructor required.**Credits:** 1.00 to 10.00

ASEC 62000 - Adolescent And Youth Development In Context

Credit Hours: 3.00. This graduate-level course examines the major developmental issues of adolescents and youth with attention to their familial, cultural, and socio-economic backgrounds. Topics include health and well-being; biological, socio-emotional, and cognitive development; sexual and racial/ethnic identity; risks and resilience; peer and family relationships; civic engagement and activism; positive youth development; and the transition to adulthood. Course readings focus primarily on adolescents and youth in the United States, although international contexts are also incorporated across the class. **Credits:** 3.00

ASEC 63000 - Theories Of Learning And Development

Credit Hours: 3.00. The goal of this course is to introduce students to a variety of theoretical perspectives of learning and development and how they may be used in both formal, informal and non-formal educational settings. This goal will be achieved

through students' analysis of key concepts, assumptions, propositions and principles of four theoretical areas: (1) Foundational Learning Theory, (2) Student Development Theory, (3) Career & Workforce Development Theory and (4) Youth Development & Experiential Learning Theory. This course will also build on students' prior exposure to behaviorist, cognitive, and constructivist approaches of learning and development. In sum, many of the theories discussed in this course will provide students with a greater understanding of human thought and behavior that will help them become more effective educators, researchers and practitioners. Permission of instructor required.**Credits:** 3.00

ASEC 64000 - Courses Of Study In Agricultural Education Programs

Credit Hours: 2.00 to 4.00. Principles and procedures of curriculum construction applied to development and organization for courses of study in agricultural science and business. **Credits:** 2.00 to 4.00

ASEC 64200 - Seminar In Agricultural And Extension Education

Credit Hours: 1.00 to 4.00. Identification and analysis of contemporary programs used in agricultural and extension education. Prerequisite: 12 credit hours in Education. **Credits:** 1.00 to 4.00

ASEC 64400 - ASEC Graduate Seminar

Credit Hours: 1.00. Students are familiarized with planning and presenting ASEC research through written and oral presentations based on the student's proposed thesis topic. Weekly attendance and participation at seminars help graduate students use appropriate and effective presentation skills, understand expectations regarding responsible conduct of research, and learn about current topics in ASEC related research areas. **Credits:** 1.00

ASEC 68100 - Research Design For Social Scientists

Credit Hours: 3.00. The goal of the course is to examine social science theories and research designs in the contexts of agricultural and natural resources education, communication and engagement. Students will develop understanding of the chain of reasoning and create a research design to study a problem of interest. Students will apply the concepts they learned in a research methods course by critiquing research manuscripts and creating a rationale for a research proposal. After taking the course, students should have gained understanding of how research designs are thoughtfully and argumentatively justified to study a researchable problem in informal, non-formal, and formal educational contexts and other social science contexts. Pre-or-Corequisite: FNR 58000 or EDPS 53300 (or instructor's permission for graduate-level social science research methods course). **Credits:** 3.00

ASEC 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

ASEC 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Agricultural Systems Management

ASM 10400 - Introduction To Agricultural Systems

Credit Hours: 3.00. Basic principles of selection and operation of agricultural production equipment, including farm tractors and machines and crop-processing equipment. Planning considerations for crop storage and animal production systems and devices for water conservation and erosion control. **Credits:** 3.00

ASM 10500 - Computing Technology With Applications

Credit Hours: 3.00. Computers will be used to solve problems (logistics, economic, agri-science) related to agricultural technology and businesses. Spreadsheets for problem solving and data analysis is the focus, with advanced features employed to improve functionality and capability of decision aids. Use of office software for written communication and visual aids will also be covered. Some applications of cloud platforms and specialty applications for communication and computations in team/group environments will be used. Interoperability and compatibility of files and platforms will be part of the experience. **Credits:** 3.00

ASM 20100 - Construction And Maintenance

Credit Hours: 3.00. Fundamental principles in the selection and use of tools for the construction and maintenance of agricultural and related facilities, equipment, and machines. Areas covered include small engines, concrete and masonry, wood, plumbing, electricity, and metal. **Credits:** 3.00

ASM 21100 - Technical Graphic Communications

Credit Hours: 3.00. Introduction to graphic communication methods using traditional techniques and emphasizing modern computer-based techniques. Topics covered include: free-hand sketching, lettering, and dimensioning; selection of data presentation methods; and plan interpretation and cost calculations. A majority of assignments will include use of commercially available computer-aided drawing packages. **Credits:** 3.00

ASM 21600 - Introduction To Surveying

Credit Hours: 1.00. Introduction to plane surveying, including instruction and practice in the use of surveying instruments. Basic overview of distance/angle measurement, leveling, direction, traversing, and mapping. Each weekly topic includes practical application and field exercises as applied to landscape architecture and forestry. **Credits:** 1.00

ASM 22100 - Career Opportunities Seminar

Credit Hours: 1.00. An introductory course to acquaint students with career and employment opportunities in the field of agricultural systems management. Guest speakers are invited to share their experiences and philosophies with the students. Special emphasis is given to improving communication skills. **Credits:** 1.00

ASM 22200 - Crop Production Equipment

Credit Hours: 3.00. Principles of machine performance, capacity, machinery components, and operation. Study of tractors, trucks, utility vehicles, and combines. Equipment topics include chemical application, tillage tools, planters and seeders, hay and forage harvesters, electronic monitors and controllers. Computer-based analysis of equipment sizing and systems selection. **Credits:** 3.00

ASM 23600 - Environmental Systems Management

Credit Hours: 3.00. Analysis of environmental systems with special emphasis on non-urban and agribusiness needs. Technological and sociological solutions to environmental problems. Computer-based tools are used to analyze global environmental issues, chemical use and management, waste disposal and management, water and air quality, soil and water conservation, sustainable agriculture, regulatory and policy issues. **Credits:** 3.00

ASM 24500 - Materials Handling And Processing

Credit Hours: 3.00. Principles of materials handling and processing. Physical properties and characteristics of food, fiber, and feed materials as related to harvesting, handling, processing, and storage. Processing of agricultural materials including drying, preservation, size reduction (e.g. grinding, crushing, shredding), mixing and blending, refrigeration, extrusion, and pelleting. Conveying and transport systems with consideration of their effects on damage and quality. The course elements are tied together by a treatment of scheduling and coordination of biologically based systems, which involve production, handling, quality control, and processing. **Credits:** 3.00

ASM 29100 - Special Topics

Credit Hours: 1.00 to 4.00. Designed for specialized topic areas for which there is no specific course, but have enough student interest to justify formalized teaching of an undergraduate-level course. The course may be repeated by a student as long as the topic being taught is not repeated. The special topic that is offered will be indicated on the student's record. Permission of instructor is required. **Credits:** 1.00 to 4.00

ASM 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in agricultural systems management. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ASM 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in agricultural systems management. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ASM 33300 - Facilities Planning And Management

Credit Hours: 3.00. Principles of facility (system) planning and management involving buildings, equipment, and materials handling and flow. Student teams select a case firm (problem) with instructor approval. Principles learned week by week are applied to the development of an overall plan for the complex, over the course of the semester. Case examples can include firms handling supplies, seeds, grains, feeds, chemicals, wastes, and farm produce, as well as farming operations producing grain, forage, and/or livestock products. Students will learn to use AutoCAD to develop drawings, without prior computer drafting experience. **Credits:** 3.00

ASM 34500 - Power Units And Power Trains

Credit Hours: 3.00. An introduction to power generation and transfer in mechanical and fluid power systems. Internal combustion engines, fuels, and cycles are introduced. Clutches, mechanical transmissions, automatic transmissions, hydrostatic transmissions, and final drives are discussed. Principles of hydraulics, fluids, cylinders, pumps, motors, valves, hoses, filters, reservoirs, and accumulators are studied. **Credits:** 3.00

ASM 35000 - Safety In Agriculture

Credit Hours: 1.00. An overview of the agricultural safety movement in the United States with consideration given to the specific human environmental and technological factors influencing farm-related accidents. Special emphasis is given to reduction of unnecessary risks in agricultural production. Course meets during weeks 1-8. **Credits:** 1.00

ASM 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in agricultural systems management. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ASM 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in agricultural systems management. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ASM 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in agricultural systems management. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ASM 40000 - Agricultural Systems Management Study Abroad

Credit Hours: 0.00 to 8.00. Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities. **Credits:** 0.00 to 8.00

ASM 42000 - Electric Power And Controls

Credit Hours: 3.00. Fundamentals and application of electric power for agricultural facilities; safe wiring principles; operation and performance characteristics of electric motors; applications of control systems that include monitors, sensors, relays, and programmable logic controllers. **Credits:** 3.00

ASM 42100 - Senior Seminar

Credit Hours: 1.00. Professional attitudes and ethics, resume preparation and interview procedures, business correspondence, meetings, and career planning. **Credits:** 1.00

ASM 42200 - Advanced Machine Technology For Agricultural Crop Production

Credit Hours: 3.00. The course examines technologies and techniques associated with modern farming practices often referred to in general as precision agriculture. It is structured to center around expert presentations from industry, academia, and farming practice, with a focus on technologies and appropriate application of such technologies in crop production systems in the Eastern Corn Belt. Consent of instructor required. **Credits:** 3.00

ASM 44100 - Methods Of Teaching Agricultural Mechanics

Credit Hours: 1.00. Emphasis on facilities, shop layout, organization, course planning, and demonstrations. Course meets during weeks 1-6. For students seeking certification as teachers of agriculture. **Credits:** 1.00

ASM 44400 - Design And Advanced Manufacturing Processes For Internal Combustion Engines

Credit Hours: 3.00. This course introduces the manufacture and assembly of machined piece parts into a functional assembly. The creation of a prototype internal combustion engine will be utilized as the base project for the course, and students will create and test the parts and final assembly. Students will be given a background on the process flow of modern manufacturing by general metal machining processes, manual machine tool operation, digital machine tool programming, numerical machine tool operation, the measurement of critical machining output variables, and the assembly of piece parts into subassemblies and final products. Course participants will work as a team to develop their production parts, final presentation, and final report.**Credits:** 3.00

ASM 49000 - Special Problems

Credit Hours: 1.00 to 6.00. Assignment by consent of instructor in the field of selected study. Laboratory, field, and library studies and reports on special problems related to agricultural systems management not covered in regular coursework. A written report and oral presentation of final results is required. Permission of instructor required. **Credits:** 1.00 to 6.00

ASM 49100 - Special Topics

Credit Hours: 1.00 to 4.00. Designed for specialized topic areas for which there is no specific course, but have enough student interest to justify formalized teaching of an undergraduate-level course. The course may be repeated by a student as long as the topic being taught is not repeated. The specific topic that is offered will be indicated on the student's record. Permission of instructor required. **Credits:** 1.00 to 4.00

ASM 49400 - Project Planning And Management

Credit Hours: 1.00. Review of topics relevant to project planning and execution in industry, including technical communication, budgeting, team management, intellectual property rights, contracts and timelines. Students will select a Capstone project and assemble a project proposal within a team environment. **Credits:** 1.00

ASM 49500 - Agricultural Systems Management Capstone Project

Credit Hours: 3.00. Students implement, test, refine, present, and deliver the capstone project solution proposed in ASM 49400. Team based projects are completed during the semester and documented with a written report, poster presentation, and oral presentations. Projects encompass a broad range of topics within agricultural systems management. **Credits:** 3.00

ASM 49600 - Project Planning And Capstone Project

Credit Hours: 1.00 to 4.00. Topics relevant to project planning and execution in industry, including technical communication, budgeting, team management, intellectual property, and timelines. Students will develop a project proposal to address contemporary issues in agricultural systems management and complete that plan related to contemporary issues in agricultural systems management. Permission of instructor required. **Credits:** 1.00 to 4.00

ASM 49800 - Directed Experience In Teaching Mechanized Agriculture

Credit Hours: 1.00 to 3.00. This course is designed primarily for students majoring in agricultural education, extension education, agricultural systems management, and agricultural engineering. Permission of instructor required. **Credits:** 1.00 to 3.00

ASM 49900 - Thesis Research

Credit Hours: 1.00 to 6.00. Thesis Research. Admission to honors program. Permission of instructor required. **Credits:** 1.00 to 6.00

ASM 51000 - Agrosecurity-Emergency Management For Agricultural Production Operations

Credit Hours: 3.00. Prepares individuals for management and loss control positions in agricultural production, agribusiness operations, and emergency management agencies. Addresses prevention, preparation, mitigation, response, and recovery from disasters such as fires, explosions, entrapments, tornadoes, floods, winter storms, earthquakes, vandalism, chemical releases, and bio-terrorism. Students complete a community service learning activity, in which they assist a farm or agribusiness manager in developing formal emergency preparedness plans. **Credits:** 3.00

ASM 51100 - Foundations In Homeland Security Studies

Credit Hours: 3.00. An interdisciplinary course addressing prevention, mitigation, preparation, response, and recovery from catastrophic events that threaten private and public sector resources and infrastructures. Course contents will include: characteristics of security; personal/corporate perspectives; identification of assets; assessing cost/benefits of protecting assets; risk assessment and risk management; crisis decision making; emergency management resources and response infrastructures; best practices in emergency management and risk and crisis communication; business continuity; and the importance of a collaborative response. Case studies include the 9-11 attacks and Hurricane Katrina. External experts will present and career opportunities will be discussed.**Credits:** 3.00

ASM 51200 - Managing Resources and Applications for Homeland Security

Credit Hours: 3.00. An interdisciplinary course providing examples and practice in applying and managing the resources, including technologies, used in the private and public sectors for homeland security programs. Course contents will include: terrorism; corporate security; biosecurity; health care preparedness; personal/community preparedness; risk transfer; and information security and privacy. Additional content includes discussion of local, state, and federal preparedness programs issues in the public/private sectors that are designed to ensure survival during a continuum of emergency events, and continued practice in using collaborative application of team building skills. Permission of instructor required.**Credits:** 3.00

ASM 53000 - Power And Machinery Management

Credit Hours: 3.00. Management and selection of farm machines and power units with emphasis on cost analysis and evaluation of new machines and practices. **Credits:** 3.00

ASM 53200 - Introduction To Agricultural Informatics

Credit Hours: 3.00. This course will overview current and emerging digital technologies with applications in agriculture, environment, and food systems. Students are expected to have a minimal computing and/or programming background, and those with no programming background should contact the instructor for guidance. Through a modular hands-on course design, students will incrementally learn user-centered technology design skills, computational thinking skills to evaluate, design, conceptualize, and implement informatics solutions to data-driven challenges. Students will gain programming skills in current data science and web development technology stacks (Python, HTML, CSS, SQL, Django), and design an informatics solution to problem in their own area of interest. This course supports professional development for students in pursuit of careers in digital product design or data-driven research.**Credits:** 3.00

ASM 54000 - Geographic Information System Application

Credit Hours: 3.00. Fundamentals of GIS analysis applied to environmental, agricultural, and engineering-related problems. Topics include data sources, spatial analysis; projections; creating data and metadata, and conceptualizing and solving spatial problems using GIS. **Credits:** 3.00

ASM 55000 - Grain Drying And Storage

Credit Hours: 3.00. Crop drying and storage principles including equilibrium moisture, psychrometrics, and drying rates. Modern drying and conditioning techniques including dryeration, in-bin counterflow drying, and combination drying. Estimating fixed and variable drying costs, aeration of stored grain, and maintenance of grain quality. Offered in even-numbered years. **Credits:** 3.00

ASM 59000 - Special Problems

Credit Hours: 1.00 to 6.00. Assignment by consent of the instructor in the field of selected study. Laboratory, field, and library studies and reports on special problems related to agricultural systems management not covered in regular coursework. Permission of instructor required. **Credits:** 1.00 to 6.00

ASM 59100 - Special Topics

Credit Hours: 1.00 to 4.00. Primarily designed for specialized topic areas in agricultural systems management for which there is no specific course, workshop, or individual study plan, but having enough student interest to justify the formalized teaching of a course. Permission of instructor required. **Credits:** 1.00 to 4.00

ASM 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

ASM 69900 - ASM Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of Instructor required. **Credits:** 1.00 to 18.00

Agriculture

AGR 10100 - Introduction To The College Of Agriculture And Purdue University

Credit Hours: 0.50. Students are introduced to the College of Agriculture and Purdue University. Specific areas discussed include the diversity of career opportunities within agriculture, the relationships between different areas of agriculture, ethics, the impact of undergraduate coursework, including the core curriculum, on scholarship and career preparation, and the challenges facing the food, agricultural, and natural resource system. The use of guest lecturers provides a networking opportunity for students. Enrollment in this course is restricted to beginning freshmen students. Course meets weeks 1-8. **Credits:** 0.50

AGR 10700 - Pathway To Purdue

Credit Hours: 1.00. This course is a required one credit introductory course for students participating in the Pathway to Purdue program. Students will learn about the Pathway to Purdue programs, study skills and techniques, transfer policies and requirements, as well as hear from a variety of guest speakers who will discuss relevant topics. Permission of department required. **Credits:** 1.00

AGR 10800 - Agriculture Technology And Innovation

Credit Hours: 1.00. The course will cover a broad range of innovations and technologies involved in the agricultural industry. The broad topics covered in this class will discuss development of latest technologies assisting in increase in yield, production

and efficiency of agricultural systems. This may include, but is not limited to topics regarding environmental protection, plant production, livestock systems, and agricultural machinery. **Credits:** 1.00

AGR 11100 - Introduction To Agricultural And Biological Engineering Academic Programs

Credit Hours: 0.50. An introduction to the academic programs offered in the Department of Agricultural and Biological Engineering which include Agricultural Systems Management, Agricultural and Natural Resources Engineering, and Biological and Food Process Engineering. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services. Course meets during weeks 1-8. **Credits:** 0.50

AGR 11200 - Introduction To Agricultural Economics Academic Programs

Credit Hours: 0.50. An introduction to the academic programs offered in the Department of Agricultural Economics. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services. Course meets during weeks 1-8. **Credits:** 0.50

AGR 11300 - Introduction To Agronomy Academic Programs

Credit Hours: 0.50. An introduction to the academic programs offered in the Department of Agronomy, which includes Applied Meteorology, Agronomic Business and Marketing, Environmental Soil Science, International Agronomy, Plant Genetics and Plant Breeding, Soil and Crop Management, Soil and Crop Science, Turf Science, and associate degrees. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services. Course meets during weeks 1-8. **Credits:** 0.50

AGR 11400 - Introduction To Animal Sciences Academic Programs

Credit Hours: 0.50. An introduction to the academic programs offered in the Department of Animal Sciences. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services. Course meets during weeks 1-8. **Credits:** 0.50

AGR 11500 - Introduction To Biochemistry Academic Programs

Credit Hours: 0.50. An introduction to the academic programs offered in the Department of Biochemistry. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services. Course meets during weeks 1-8. **Credits:** 0.50

AGR 11700 - Introduction To Entomology Academic Programs

Credit Hours: 0.50. An introduction to the academic programs offered in the Department of Entomology. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services. Course meets during weeks 1-8. **Credits:** 0.50

AGR 11800 - Introduction To Food Science Academic Programs

Credit Hours: 0.50. An introduction to the academic programs offered in the Department of Food Science. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services. Course meets during weeks 1-8.**Credits:** 0.50

AGR 11900 - Introduction To Forestry And Natural Resources Academic Programs

Credit Hours: 0.50. An introduction to the academic programs offered in the Department of Forestry and Natural Resources. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services. Course meets during weeks 1-8. **Credits:** 0.50

AGR 12000 - Introduction To Horticulture And Landscape Architecture Academic Programs

Credit Hours: 0.50. An introduction to the academic programs offered in the Department of Horticulture and Landscape Architecture. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services. Course meets during weeks 1-8. **Credits:** 0.50

AGR 12100 - Introduction To Agricultural Sciences Education And Communication Academic Programs

Credit Hours: 0.50. An introduction to the academic programs offered in the Department of Agricultural Sciences Education and Communication which includes Agricultural Communication and Agricultural Education. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services. Course meets during weeks 1-8. **Credits:** 0.50

AGR 12200 - Introduction To Natural Resources And Environmental Science Academic Programs

Credit Hours: 0.50. An introduction to the academic programs offered in Pre-Environmental Studies and Natural Resources and Environmental Science. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services. Course meets during weeks 1-8. **Credits:** 0.50

AGR 12400 - Introduction To College Of Agriculture Pre-Veterinary Medicine Academic Programs

Credit Hours: 0.50. An introduction to the academic programs offered in Pre-Veterinary Medicine. Topics include, but are not limited to undergraduate plans of study, courses, experiential programs, internships, student organizations, career opportunities, academic policies, scholarships, and student services. Course meets during weeks 1-8. **Credits:** 0.50

AGR 12500 - Introduction To Plant Science

Credit Hours: 1.00. An introduction to the academic programs offered in plant science. Topics include, but are not limited to, undergraduate plans of study, courses, and experiential programs including undergraduate research opportunities, internships, student organizations, career opportunities, academic policies, scholarships, and student services. **Credits:** 1.00

AGR 15000 - Woman In Agriculture I

Credit Hours: 1.00. Intended to expose first-year students to resources and the development of a network of students across campus. The course will support their transition to Purdue through a sense of community and increased engagement, and provide students access to faculty across the College of Agriculture in a small group setting. Activities include seminars to expose

students to college and university resources, hands-on learning activity for team building, study halls, and group meals.**Credits:** 1.00

AGR 15100 - Women In Agriculture II

Credit Hours: 1.00. Intended to expose first-year students to academic, industry, government and professionals across the field of agriculture. The course will support networking and internship preparation through increased engagement with professionals across the field of agriculture, site visits and seminars. Activities include student seminars and presentation, field trips, case-studies and mock scenarios for problem solving and team building. Section one will focus on career exposure, development and communication skills.**Credits:** 1.00

AGR 20100 - Communicating Across Culture

Credit Hours: 3.00. This course will provide students with an opportunity to understand their place in a multicultural, multiethnic, multinational country, the United States. It is designed to provide an academic overview of the field of multicultural education as it evolved to this day. The course will offer an introductory overview of the many differences that exist within all human beings. Because the diversity among individuals is endless, we cannot study all differences, but will study a sampling such as race, ethnicity, gender identity, age, social class, disability, learning styles, and religion/spiritual orientation. Issues of poverty, language, and social justice may also be examined in relationship to the above major areas of emphasis. **Credits:** 3.00

AGR 20500 - Dean's Scholars Seminar

Credit Hours: 1.00. Students are introduced to the breadth and mission of the College of Agriculture. Specific areas discussed include the diversity of career opportunities within agriculture, the relationships between different areas of agriculture, ethics, the opportunities within undergraduate research, and the challenges facing the food, agricultural, and natural resource system. Students will be exposed to a series of guest lecturers to gain an overview of the various fields within the college and undergraduate research or scholarly work opportunities.**Credits:** 1.00

AGR 29000 - Special Topics In Agriculture

Credit Hours: 0.00 to 3.00. Presentation of subject matter not available in other courses offered by the college. The specific topic that is offered will be indicated on the student's academic record. **Credits:** 0.00 to 3.00

AGR 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in agriculture, food, or natural resources. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AGR 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in agriculture, food, or natural resources. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AGR 29400 - Directed Readings In Agriculture, Environment, And Society

Credit Hours: 0.00 to 3.00. Presentation of subject matter not available in other courses offered by the college. Directed reading and discussion of books and other documents of significant importance and current interest in agriculture, food systems,

renewable natural resources, and the environment. The specific topic that is covered will be indicated on the student's academic record. Permission of instructor required. **Credits:** 0.00 to 3.00

AGR 33300 - Data Science For Agriculture

Credit Hours: 3.00. Students will apply data processes including identifying data needs, acquiring data, assessing data quality, data wrangling, filtering, and visualization. In each of several topic areas (forestry, animal science, agronomy, food science, entomology, engineering, economics), data-driven insights and improved decision making will be the culmination of applied data skills. Students will understand data ethics and practice data management skills including the merging of disparate but related data sets. **Credits:** 3.00

AGR 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in agriculture, food, or natural resources. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AGR 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in agriculture, food, or natural resources. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AGR 39500 - International Internship

Credit Hours: 3.00. Supervised international internship in agricultural, food, or natural resource disciplines. The international internship must be approved as part of a Purdue University study abroad program and conducted under the supervision of a College of Agriculture faculty member. Students must submit a summary report and fulfill all requirements established by faculty supervisor. Consent of the College of Agriculture International Programs in Agriculture and Office of Academic Programs staff required. **Credits:** 3.00

AGR 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in agriculture, food, or natural resources. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AGR 40000 - Agriculture Study Abroad

Credit Hours: 0.00 to 8.00. Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities. **Credits:** 0.00 to 8.00

AGR 49000 - Special Problems

Credit Hours: 0.00 to 3.00. Topics and credit hours to be arranged. **Credits:** 0.00 to 3.00

AGR 49300 - Special Topics In International Agriculture

Credit Hours: 0.00 to 3.00. A course that provides students interested in international agriculture opportunity for in-depth study and analysis of major issues associated with the relationship of U.S. agriculture to world agriculture and agricultural development abroad. Current and significant topics will be selected. Permission of instructor required. **Credits:** 0.00 to 3.00

AGR 49400 - Advanced Readings In Agriculture, Environment, And Society

Credit Hours: 0.00 to 3.00. Presentation of subject matter not available in other courses offered by the college. Directed reading and discussion of books and other documents of significant importance and current interest in agriculture, food systems, renewable resources and the environment. The specific topic that is offered will be indicated on the student's academic record. Permission of instructor required. **Credits:** 0.00 to 3.00

AGR 49500 - International Professional Experience In Agriculture, Food, Or Natural Resources

Credit Hours: 0.00. Supervised international professional experiences in agricultural, food, or natural resource disciplines. The professional experience period must be preplanned and conducted under the supervision of a College of Agriculture faculty member. Students must submit a summary report. Consent of the College of Agriculture international professional experience program coordinator required. Permission of instructor required. **Credits:** 0.00

AGR 49600 - Multicultural Professional Experience

Credit Hours: 0.00. The multicultural professional experience must be pre-planned and conducted under the supervision of a College of Agriculture faculty member. The experience must be a minimum of four weeks in length. Students must submit a summary report. **Credits:** 0.00

AGR 59500 - Current Topics In Agriculture, Natural Resources, And Related Sciences

Credit Hours: 1.00 to 3.00. Critical examination of developments in specialized and emerging areas of agriculture not taught in other courses. Some topics include lecture, lab, directed reading or independent study. Students must have graduate standing or obtain permission of instructor. **Credits:** 1.00 to 3.00

Agronomy

AGRY 10500 - Crop Production

Credit Hours: 3.00. Fundamental principles of crop production and distribution. Emphasis is placed on applying technological advances in agronomy to active crop-production situations, including basic soils, agricultural meteorology, and crop physiology and breeding. **Credits:** 3.00

AGRY 12000 - Water And Food Security

Credit Hours: 3.00. General science introduction to global and regional water resources issues, especially with respect to food security. It will address the role of water in agriculture throughout the world and agriculture's impact on water resources. Students will focus first on developing the scientific underpinnings of water supply and crop water use. With this background, they will explore key issues relating to water scarcity and balancing agricultural and urban demands for water, water quality and soil salinization, water footprints of food and the use of virtual water embedded in food to offset national water deficits, regulation and roles science and policy in solving water problems. **Credits:** 3.00

AGRY 12300 - Genetics And Society

Credit Hours: 3.00. Introduction to the broad impacts that genetics and genomics have on society, from medicine, genetic testing and DNA evidence to agriculture, genetically modified crops and synthetic life. Background information is provided on a weekly topic followed by extensive in-class discussion. **Credits:** 3.00

AGRY 12500 - Environmental Science And Conservation

Credit Hours: 3.00. (EAPS 12500, FNR 12500, NRES 12500) Introduction to environmental science and conservation includes topics in ecological principles, conservation and natural resource management, human impacts on the environment, toxic waste disposal, climate change, energy, air and water pollution, environmental geology and geologic hazards. **Credits:** 3.00

AGRY 15500 - Introduction To Soil Morphology

Credit Hours: 2.00. This course features an introductory field experience in evaluating soil morphology. Students will develop skills determining horizon nomenclature, texture, soil color, structure, consistence and drainage. Basic concepts regarding the impact of soil morphology on use of soils for various purposes will be presented. Collegiate soil judging is a portion of the subject matter discussed. **Credits:** 2.00

AGRY 21000 - Fundamentals Of Turfgrass Culture

Credit Hours: 3.00. (HORT 21000) An introductory course in turfgrass management emphasizing turfgrass growth and development, species characteristics, their adaptation and basic cultural requirements for ornamental and functional turfgrass areas. The requirements and cultural inputs needed for proper establishment and maintenance of a high quality, low maintenance lawn will be discussed. **Credits:** 3.00

AGRY 21100 - Fundamentals Of Turfgrass Culture Laboratory

Credit Hours: 1.00. (HORT 21100) Companion lab to AGRY 21000. Laboratory exercises will focus on turfgrass and seed anatomy, morphology, identification as well as the hands-on basic principles of turfgrass culture. Designed for the student who intends to pursue a career in turfgrass management and plans to enroll in AGRY 510. Enrollment preference will be given to Turfgrass Science Majors. **Credits:** 1.00

AGRY 25100 - Introduction To Soils

Credit Hours: 1.00. Characteristics of soils and associated landscapes; soil genesis and classification; relation of soils to land use; soil management relative to erosion, tillage, drainage, moisture supply, and aeration. Credit cannot be given in both AGRY 25100 and AGRY 25500/NRES 25500 or AGRY 27000. Course meets during weeks 1-6. **Credits:** 1.00

AGRY 25500 - Soil Science

Credit Hours: 3.00. (NRES 25500) Differences in soils; soils genesis; physical, chemical, and biological properties of soils; relation of soils to problems of land use and pollution; soil management relative to tillage, erosion, drainage, moisture supply, temperature, aeration, fertility, and plant nutrition. Introduction to fertilizer chemistry and use. Not available to students who have taken AGRY 27000. **Credits:** 3.00

AGRY 27000 - Forest Soils

Credit Hours: 3.00. Development, distribution, and classification of soil profile; soil characteristics related to forest practices; nature and cause of soil differences; fertility and plant nutrition. Not available to students who have taken AGRY 25500 or NRES 25500. **Credits:** 3.00

AGRY 27500 - Honors Course - Lower Division

Credit Hours: 1.00 to 4.00. Utilized to offer a new honors course for a maximum of three years. Variable title, credit, and instructional type. Course may be repeated for credit if content and titles are different. Offered primarily to first- and second-year students. Courses offered must be approved by departmental or program faculty and College of Agriculture Honors Committee. Permission of instructor required. **Credits:** 1.00 to 4.00

AGRY 28500 - World Crop Adaptation And Distribution

Credit Hours: 3.00. Examination of how environmental factors, including climate and soils, impact the global distribution of major food crops. Identification of the types of naturally occurring plant communities and comparison of these communities with those of environmentally and economically sound field cropping systems. Exploration of how man's intervention has maintained or modified the productivity of food crops in agricultural communities and how his intervention has affected the environment. **Credits:** 3.00

AGRY 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in agronomy. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AGRY 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in agronomy. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AGRY 32000 - Genetics

Credit Hours: 3.00. The transmission of heritable traits; probability; genotypic-environmental interactions; chromosomal aberrations; polyploidy; gene mutations; genes in populations; the structure and function of nucleic acids; biochemical genetics; molecular genetics; coding.**Credits:** 3.00

AGRY 32100 - Genetics Laboratory

Credit Hours: 1.00. This course is a hands-on laboratory course that uses plants and microorganisms to demonstrate basic concepts of classical, molecular, and modern genetics. This course is designed to provide students with fundamental knowledge and skills for conducting genetics and molecular biology laboratory experiments. Students will gain experience with methods including but not limited to gel electrophoresis, DNA extraction, PCR, cloning, restriction digest analysis, phenotypic analysis, DNA sequencing, bioinformatics, SNP genotyping, qualitative gene expression analysis, and quantitative gene expression analysis. Students will learn how to plan and validate their laboratory experiments. The goal of this course is to prepare students to confidently perform and interpret experimental results in future laboratory courses or careers. **Credits:** 1.00

AGRY 33500 - Weather And Climate

Credit Hours: 3.00. An introductory course in meteorology and climatology with applications to daily life. The study of the fundamental physical principles behind weather and climate and how they apply to the homeowner and the world citizen. Emphasis is on how to interpret weather conditions and forecasts, what controls the wide range of climates in the world, and what the future may hold. **Credits:** 3.00

AGRY 33700 - Environmental Hydrology

Credit Hours: 3.00. This course is designed to provide undergraduate students with both the basics of how water moves through the environment and current theories as to how hydrologic response is modified by environmental change at a variety of temporal and spatial scales. **Credits:** 3.00

AGRY 33800 - Environmental Field Skills

Credit Hours: 1.00. This practical, field-based laboratory course is designed to provide hands-on experience with environmental monitoring field techniques, including stream discharge measurements, slug tests, aquatic sampling, surveying and wetland delineations utilizing local sites and watersheds as the classroom. **Credits:** 1.00

AGRY 34900 - Soil Ecology

Credit Hours: 3.00. An introductory course that will cover the basic concepts of soil ecology. Biological diversity and the interactions between and within biotic and abiotic components of the soil ecosystem, nutrient cycling, and genetic engineering are introduced. **Credits:** 3.00

AGRY 35000 - Global Awareness

Credit Hours: 1.00 to 3.00. A seminar-type course about world geography, cultures, and agriculture. Speakers are selected from the many Purdue graduate students and visiting scholars from around the world. Extra credit may be earned through independent study of a global issue. **Credits:** 1.00 to 3.00

AGRY 35500 - Soil Morphology And Geography

Credit Hours: 2.00. This course features field experience in advanced techniques in soil morphology including the study of the relationship of soils to landscaped, common parent materials of Midwest and classification of soils in the Soil Taxonomy. Course material emphasizes the development of detailed descriptions of soil properties and how these properties directly impact the interpretations and recommendations for land use options. Use and management of soils based on landscape position and morphology will be covered including on-site waste disposal, homes with basements as well as road and street construction. Collegiate soil judging is a portion of the subject matter discussed. Requires class trips. Students will pay individual lodging or meal expenses when necessary. **Credits:** 2.00

AGRY 36500 - Soil Fertility

Credit Hours: 3.00. Principles of soil chemistry and physics influencing plant nutrition; emphasis on diagnosis and solution of problems on soil reaction and nutrient status; fertilizer chemistry and use; reaction of pesticides and growth regulators with soils. **Credits:** 3.00

AGRY 37500 - Crop Production Systems

Credit Hours: 3.00. Factors affecting management decisions in crop production systems. Development of small grain and row cropping systems. Interaction of factors affecting efficient production systems, including seed selection, tillage, planting management, pest management, and harvesting and storage considerations. **Credits:** 3.00

AGRY 38500 - Environmental Soil Chemistry

Credit Hours: 4.00. (NRES 38500) Designed as an upper level introductory course covering environmental soil chemistry concepts in framework most applicable to inorganic and organic chemical contamination of soil and water resources and intended for students in environmental science fields that may not have a strong chemistry and/or math background. (el.5). **Credits:** 4.00

AGRY 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in agronomy. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AGRY 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in agronomy. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AGRY 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in agronomy. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AGRY 39800 - Agronomy Seminar

Credit Hours: 1.00. Weekly discussions of agronomic topics and other subjects relative to agronomic interest. Students are expected to participate in the discussions.**Credits:** 1.00

AGRY 39900 - Individual Study

Credit Hours: 1.00 to 3.00. Supervised individual study or research over topics not covered in other courses. Arrange with agronomy faculty before registering. Permission of instructor required. **Credits:** 1.00 to 3.00

AGRY 40000 - Agronomy Study Abroad

Credit Hours: 0.00 to 8.00. Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities. **Credits:** 0.00 to 8.00

AGRY 42000 - Computing For The Natural Sciences

Credit Hours: 3.00. Basic programming, problem solving, data visualization and communication in the context of agriculture and natural science research using R. Topics include iteration, functions, vectors, strings, algorithms, graphics and reproducible reports in R. This course is appropriate for undergraduates with a curiosity in computing fundamentals and interest in working with research data, especially those potentially applying to graduate school. Also appropriate for graduate students, researchers or other professionals who desire an introduction to programming with R. NO programming experience is necessary. This is not a statistics course; having had introductory statistics and some background coursework in agricultural or other natural sciences is expected.**Credits:** 3.00

AGRY 43100 - Atmospheric Thermodynamics

Credit Hours: 3.00. (EAPS 42100) Structure and composition of the atmosphere. Thermodynamics of dry and moist air, including adiabatic and pseudoadiabatic processes, hydrostatic stability, and air mass determination. **Credits:** 3.00

AGRY 43200 - Atmospheric Dynamics I

Credit Hours: 3.00. (EAPS 42200) A study of the general system of equations governing mass and momentum changes in the atmosphere; special horizontal wind representations; thermal wind relationships; circulation, vorticity, divergence, and vertical motion. **Credits:** 3.00

AGRY 43300 - Atmospheric Dynamics II

Credit Hours: 3.00. (EAPS 42300) An extension of AGRY 43200 with the emphasis on perturbation theory and hydrodynamic stability, air mass and frontal theory, barotropic and baroclinic models, wave cyclone theory, and numerical weather prediction. **Credits:** 3.00

AGRY 44100 - Synoptic Laboratory I

Credit Hours: 1.00. (EAPS 43100) Analysis of vertical distributions of temperature and moisture with applications to adiabatic and pseudoadiabatic processes, hydrostatic stability, and air mass determination. **Credits:** 1.00

AGRY 44200 - Synoptic Laboratory II

Credit Hours: 1.00. (EAPS 43200) Analysis of horizontal distributions of pressure, temperature, wind, vorticity, and vertical motions. Applications to synoptic scale wave propagation. **Credits:** 1.00

AGRY 44300 - Synoptic Laboratory III

Credit Hours: 1.00. (EAPS 43300) Diagnosis of midtropospheric wave propagation and growth. Analysis of surface pressure fields and fronts and their relationships to upper air features. Extensive use is made of teletype and facsimile weather information. **Credits:** 1.00

AGRY 44400 - Weather Analysis And Forecasting

Credit Hours: 3.00. (EAPS 43400) In-depth study of contemporary weather analysis and forecasting techniques and problems. Extensive use is made of teletype and facsimile data and numerical weather prediction guidance provided by the National Meteorological Center. **Credits:** 3.00

AGRY 45000 - Soil Conservation and Water Management

Credit Hours: 3.00. (NRES 45000) Principles of soil conservation with emphasis on control of soil erosion by wind and water; impact of soil management decisions on environment; soil-water-plant relations, includes agronomic aspects of water management for both irrigation and drainage. **Credits:** 3.00

AGRY 46500 - Soil Physical Properties

Credit Hours: 3.00. Physical properties and processes in soils; water flow, soil structure, chemical movement; principles and methods of physical analysis of soils; the influence of soil physical processes on environmental quality and plant growth. **Credits:** 3.00

AGRY 47500 - Honors Course - Upper Division

Credit Hours: 1.00 to 4.00. Utilized to offer a new honors course for a maximum of three years. Variable title, credit, and instructional type. Course may be repeated for credit if content and titles are different. Offered primarily to third- and fourth-year students. Courses offered must be approved by departmental or program faculty and College of Agriculture Honors Committee. Permission of instructor required. **Credits:** 1.00 to 4.00

AGRY 48000 - Plant Genetics

Credit Hours: 3.00. Principles and recent advances in plant genetics including: genetic segregation, linkage, DNA markers and applications, chromosomes and genomes, variation in chromosome number and structure, mutation, recombination and DNA repair, quantitatively inherited traits, introduction to principles of population genetics, gene expression, gene organization, regulation of gene activity, gene function, identifying important genes, cloning genes, reverse genetics, plant transformation, applications of genetic engineering, genome sequencing, using sequence data. **Credits:** 3.00

AGRY 48500 - Precision Crop Management

Credit Hours: 3.00. An experiential lecture, discussion and field laboratory course for graduating seniors majoring in Agronomy. Analysis of multi-layer digital georeferenced crop data is used to inform the development and evaluation of zone-specific agronomic input prescriptions. Variables include factors affecting soil productivity, soil fertility and N management (including emerging sensor and crop modeling technologies). Prescriptions for variable crop genetics and seeding rates are also discussed. Sound agronomic use of emerging technologies such as real time soil moisture, organic matter, temperature and moisture sensing to affect variable seeding depth, rate and precision are included. May be used in combination with AGRY 49800 to meet the Agronomy undergraduate capstone requirement; will also meet the GIS/GPS requirement in Agronomy plans of study. **Credits:** 3.00

AGRY 49700 - Agronomy Internship Or Research Reporting

Credit Hours: 1.00. Reflection and reporting on participation in government, industrial, or other internship program or research assistantship. This course is intended to provide an opportunity for students to reflect on their internship experience, interact with students with similar experience, and report on the experience, as part of preparation for a career in the environmental sciences. Permission of department required.**Credits:** 1.00

AGRY 49800 - Agronomy Senior Seminar

Credit Hours: 1.00. Weekly discussions and presentations on assigned topics in Agronomy, interpersonal interactions, professional ethics, and leadership skills. Student teams will evaluate case studies and present their analysis orally and in writing. **Credits:** 1.00

AGRY 49900 - Thesis Research

Credit Hours: 1.00 to 6.00. For students doing individualized research on agronomic problems; report required. Arrange with academic advisor and honors research advisor before registering. Admission to honors program. Permission of instructor required. **Credits:** 1.00 to 6.00

AGRY 50500 - Forage Management

Credit Hours: 3.00. The study of the role of economically important crop species in the soil-plant-animal complex. Physiology, utilization, and management of forage species will be emphasized. **Credits:** 3.00

AGRY 51000 - Turfgrass Science

Credit Hours: 3.00. An advanced course in turfgrass management which focuses on the management requirements of intensively cultured turfgrass areas, with a specific emphasis on golf course and athletic fields. Interrelationships among soil, plant and atmospheric environments, management practices and turfgrass quality will be stressed. **Credits:** 3.00

AGRY 51100 - Population Genetics

Credit Hours: 3.00. (ANSC 51100) Basic concepts of population genetics. Characterization of populations using gene frequencies, gametic and zygotic disequilibrium; forces changing gene frequencies (mutation, migration, selection, and random genetic drift) and genotypic frequencies (mating systems: inbreeding, crossbreeding, and phenotypic assortative) and related hypothesis testing; gene trees and the coalescent process; and molecular phylogenies. **Credits:** 3.00

AGRY 51200 - Integrated Turfgrass Systems

Credit Hours: 3.00. Integration of agronomic principles for professionally managing golf courses, athletic complexes, lawn care companies, and sod production facilities in an efficient and environmentally friendly manner. Emphasizes independent thinking and team cooperation for understanding the social, ethical, and economical aspects underlying the daily agronomic management decisions, including construction, establishment, cultural practices, fertilization, and pest management. Course meets for weeks 1-10. **Credits:** 3.00

AGRY 51400 - Environmental Stress Management For Turfgrass

Credit Hours: 1.00. Designed for students who desire an understanding of how environmental stresses influence turfgrass growth and how they can be managed with cultural practices. The course covers current research findings in stress management and integrates turfgrass environmental physiology with turfgrass management. **Credits:** 1.00

AGRY 51500 - Plant Mineral Nutrition

Credit Hours: 3.00. Fundamental principles and concepts of the mineral nutrition of higher plants; processes and mechanisms controlling nutrient bioavailability and acquisition; physiological, genetic, and ecological aspects of plant nutrition including rhizosphere dynamics and interaction with disease. **Credits:** 3.00

AGRY 51800 - Plant Physiology And Biotechnology Research Techniques

Credit Hours: 3.00. This course has two components. The physiology section covers some of the popular experiments, such as the measurement of water potential, photosynthesis, stomata density, carbohydrate content, enzyme activity, mineral deficiency, drought stress physiology, plant pigment analysis, etc. The biotechnology section guides students through the entire procedure of genetic engineering, culminating in a project that will serve as an example on how to use molecular tools to answer fundamental physiological questions. **Credits:** 3.00

AGRY 52000 - Principles And Methods Of Plant Breeding

Credit Hours: 3.00. Introduction to methods and techniques of breeding field crops, with emphasis on the application of genetic principles; analysis of and present approach to the solution of specific breeding problems in selected field crops. **Credits:** 3.00

AGRY 52500 - Crop Physiology And Ecology

Credit Hours: 3.00. Study of the physiological basis for growth, yield, and adaptation of crop plants. Topics emphasized include: carbohydrate assimilation and partitioning, nitrogen metabolism, crop growth and development, water relations, stress tolerance,

and crop improvement using physiological genetics. Basic background in college level plant biology is recommended. **Credits:** 3.00

AGRY 53000 - Advanced Plant Genetics

Credit Hours: 3.00. Advanced treatment of principles and recent advances in plant genetics including: mutagenesis; cell, molecular and direct approaches to genetic analysis and genetic interactions; haploidy; chromosomal organization and aberrations; transposable elements; mutations, para mutation and epigenetics in higher plants; extra nuclear inheritance; cytogenetic and molecular affinities between crop plants and their wild relatives; genetic manipulations; gene discovery; genetic approaches to understanding agriculturally useful plant traits. ESTs and global gene expression analysis, proteomics, metabolic profiling, comparative genomics and genome evolution. Offered in odd-numbered years. **Credits:** 3.00

AGRY 53500 - Boundary Layer Meteorology

Credit Hours: 3.00. (EAPS 52500) This course has required class trips. Students will pay individual lodging or meal expenses where necessary. A study of the physical nature of the lowest layers of the atmosphere. The energy balance concept and the turbulent transfer of heat, momentum, and water vapor are discussed in detail. Some specific microclimates are studied in this context. **Credits:** 3.00

AGRY 53600 - Environmental Biophysics

Credit Hours: 3.00. An analysis of the energy fluxes to and from terrestrial plants, insects, mammals, and humans as they exist in their macro and microclimates. Agricultural meteorology methods (both research and operational) will be presented. Labs will be both in-laboratory and in-field with reports required. A special project will be required of all students and will be presented in class and written as if for publication. **Credits:** 3.00

AGRY 54000 - Soil Chemistry

Credit Hours: 3.00. Emphasis on processes controlling the gaseous, solution, and solid phases in soils including precipitation, acid-base, oxidation-reduction, complexation, absorption, and ion exchange. **Credits:** 3.00

AGRY 54400 - Environmental Organic Chemistry

Credit Hours: 3.00. The fundamental properties and processes responsible for the fate of organic chemicals in the environment, with emphasis on soil and water chemistry. Areas to be addressed will include both conceptual and theoretical aspects of processes relevant to environmental fate of contaminants; measurement, estimation, correlation, and application of the parameters most commonly used to assess various chemodynamic properties in soil-water systems. **Credits:** 3.00

AGRY 54500 - Remote Sensing Of Land Resources

Credit Hours: 3.00. Application of remote sensing and spatial databases for observing and managing land resources within the Earth System; analysis and interpretation of remotely sensed data in combination with field observations and other data sources; conceptualization and design of a global earth resources information system. **Credits:** 3.00

AGRY 55000 - Field Crops Breeding Techniques

Credit Hours: 2.00. Field nursery experience, including crossing procedures, plant evaluation, selection for pest resistance and for agronomic characters, and field data evaluation. **Credits:** 2.00

AGRY 55500 - Soil And Plant Analysis

Credit Hours: 3.00. Principles and methods of chemical analysis of plants and soils. Topics include soil carbon analysis, exchangeable cations, soil acidity, salinity, pesticide analysis, and elemental analysis of plant tissue and forage analysis. Quantitative gravimetric and volumetric techniques are reviewed followed by use of instrumental methods of analysis including atomic absorption, UV/Visible spectrometry, HPLC, and gas chromatography. Laboratory safety, quality assurance/quality control, and data reporting are emphasized. Students having at least one year of chemistry including a quantitative analysis laboratory will be suitably prepared. **Credits:** 3.00

AGRY 56000 - Soil Physics

Credit Hours: 3.00. Fundamentals of soil physics; transport of chemicals, heat, and gases; field spatial variability; principles and methods of physical analysis of soils; the influence of soil physical processes on environmental quality and agricultural production. Students having an understanding of introductory soil science will be suitably prepared. **Credits:** 3.00

AGRY 56500 - Soils And Landscapes

Credit Hours: 3.00. Soils as natural components of landscapes, geomorphology and soil characteristics; processes of soil formation; principal soils of Indiana, their adaptations, limitations, productivity and use; global soil distributions; application of GPS and mobile GIS in the field. This course requires two all-day field trips. Students will pay individual meal expenses when necessary. **Credits:** 3.00

AGRY 58000 - Soil And Rhizosphere Microbiology

Credit Hours: 3.00. Soils are complex ecosystems that host a diverse array of organisms, which interact with and respond to their environment. This course explores the ecology, evolution, and functions of soil microbes, with a particular focus on their interactions with plants. Through this course, students will gain an understanding of the metabolic processes and life-history strategies of archaea, bacteria, fungi, and viruses in soil, root, and rhizosphere compartments. Students will also survey the microbiomes of diverse soil ecosystems, such as forests, agroecosystems, and grasslands, and learn principles of soil microbiology and biogeochemistry. In addition, students will acquire practical knowledge about the methods used for characterizing microbes in soil and plant systems. **Credits:** 3.00

AGRY 58200 - Environmental Fate Of Pesticides

Credit Hours: 3.00. Emphasis is given to developing a fundamental understanding of the processes controlling the fate of organic chemicals, such as pesticides, in the environment. Processes considered include: volatilization, degradation, leaching, and sorption. **Credits:** 3.00

AGRY 58500 - Soils And Land Use

Credit Hours: 3.00. Soils as a resource in development planning; soil properties affecting land use; use of soil survey, aerial photos, topographic maps, and other resource data in land-use allocation; nonengineering aspects of site selection for various land uses, water conservation, waste disposal, and erosion control. **Credits:** 3.00

AGRY 59600 - Professional Presentations

Credit Hours: 1.00. Develop confidence and skills in preparing and delivering professional presentations to both peer scientific and student audiences. (el. 7) **Credits:** 1.00

AGRY 59700 - Communicating With The Public

Credit Hours: 1.00. This course will prepare students being trained as agronomy professionals to enhance their communication skills so they can successfully interact with the public. (el. 7) Offered in alternate years. **Credits:** 1.00

AGRY 59800 - Special Problems

Credit Hours: 1.00 to 6.00. Research on agronomic problems conducted in laboratory, field, or library; report required; arrange with an agronomy staff member before registering. Permission of instructor required. **Credits:** 1.00 to 6.00

AGRY 60000 - Genomics

Credit Hours: 3.00. An introduction to the technologies and analytical methods used in studying genomes, their functions and systems biology. This course prepares graduate students for further study of these techniques in additional courses and in their research. Students with an understanding of introductory genetics and statistics will be suitably prepared for this course. Offered in even-numbered years. **Credits:** 3.00

AGRY 60100 - Introduction To Graduate Research

Credit Hours: 1.00. This course provides framework for graduate studies. It helps the new graduate student understand the roles and responsibilities in graduate education, providing guidance for scientific reading, writing, and research activities. Topics include understanding ethical issues in science, enhancing their ability to communicate with a broad range of people, and establishing initial perspectives on professional development. Permission of department required.**Credits:** 1.00

AGRY 60500 - Advanced Plant Breeding

Credit Hours: 3.00. Advanced study of genetic principles and their application to plant breeding systems, techniques, and objectives. Offered in alternate years. Prerequisite: AGRY 52000; a course in statistics covering simple analysis of variance. **Credits:** 3.00

AGRY 61100 - Quantitative Genetics

Credit Hours: 3.00. Continuation of AGRY 51100, ANSC 51100. Quantitative genetics in animals and plants. Genotypic and environmental variances; covariances between relatives; single- and multiple-trait selection and correlated responses; genotype-environment interaction. Inbreeding and crossbreeding: means, variances, heterosis, intra- and inter-population improvement. Prerequisite: STAT 51200; Prerequisite: AGRY 51100 OR ANSC 51100. **Credits:** 3.00

AGRY 62400 - Plant Ecophysiology

Credit Hours: 3.00. This course will explore the influence of the environment on growth and development, reproduction, adaptation, survival and evolution of plants. The fundamental study of physiological mechanisms underlying adaptive strategies and their ecological consequences will be included. Prerequisites: Undergraduate or graduate level of Plant Physiology (HORT 30100 or AGRY 52500 or HORT 55100 or FNR 43400 or equivalent). **Credits:** 3.00

AGRY 63500 - Micrometeorology

Credit Hours: 3.00. A rigorous study of the atmospheric boundary layer with special attention to turbulent diffusion processes in the lower atmosphere. Offered in alternate years. Prerequisite: AGRY 53500. **Credits:** 3.00

AGRY 64100 - Statistical Hydrology

Credit Hours: 3.00. This course is designed to serve as an advanced graduate course in the statistical analysis of hydrologic data, including time series analysis and modeling, frequency analysis and uncertainty. Prerequisites: AGRY 33700 or CE 54200 or ABE 32500 and STAT 51100 or STAT 50300. **Credits:** 3.00

AGRY 64900 - Molecular Microbial Ecology

Credit Hours: 3.00. Focuses on the application of various molecular genetic techniques for studying micro-organisms from and in the environment. The method, theoretical basis of each method, and interpretation of results are covered. The major areas discussed are the application of molecular genetic techniques to study: (1) total microbial communities; (2) diversity of micro-organisms in a community; and (3) biotechnological uses of micro-organisms. Prerequisite: AGRY 32000 or AGRY 58000 or BCHM 56200 or BIOL 24100 or BIOL 43800 or BIOL 54900. **Credits:** 3.00

AGRY 65000 - Clay Mineralogy

Credit Hours: 4.00. Principles of crystal chemistry, survey of clay mineral structures, and identification of clay minerals by X-ray diffraction, chemical methods, differential thermal analysis, infrared spectroscopy, and specific surface area measurements. Role of clay minerals in the natural environment. Offered in alternate years. **Credits:** 4.00

AGRY 69500 - Graduate Professional Practice

Credit Hours: 1.00 to 3.00. An internship experience with a for-profit, non-profit, or governmental entity to complement the student's academic coursework. Practical experience with an employer is required to successfully complete the course. The student must present a letter from the proposed employer describing to a reasonable extent the work to be undertaken, document the expectations, and find an Agronomy faculty advisor/instructor to oversee the experience. Course may be taken in successive semesters. Permission of instructor required.**Credits:** 1.00 to 3.00

AGRY 69600 - Agronomy Graduate Seminar

Credit Hours: 1.00. Weekly discussion of assigned topics in soil and crop science. **Credits:** 1.00

AGRY 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

AGRY 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

American Sign Language

ASL 10100 - American Sign Language I

Credit Hours: 3.00. A basic introduction to American Sign Language. This course introduces students to the tools for mastering the grammar at a basic expressive and receptive level. Introduction to cultural and historical aspects of ASL and the deaf community. **Credits:** 3.00

ASL 10200 - American Sign Language II

Credit Hours: 3.00. A continuation of ASL 10100. Further study of the language with more emphasis on receptive and expressive conversational skills. Includes readings of research studies relevant to lectures. **Credits:** 3.00

ASL 20100 - American Sign Language III

Credit Hours: 3.00. A more advanced study of American Sign Language. Further development of receptive and expressive skills using more advanced material. Continued emphasis on cultural and historical aspects in relation to the evolution of the language and language usage. **Credits:** 3.00

ASL 20200 - American Sign Language IV

Credit Hours: 3.00. A continuation of ASL 20100. Includes some introduction to linguistic structure, especially classifiers, temporal sequencing and aspect, and conversational regulators. **Credits:** 3.00

ASL 28000 - American Deaf Community: Language, Culture, And Society

Credit Hours: 3.00. The linguistic, cultural, and societal context of the deaf community in America. Both historical and contemporary aspects of deaf identity will be included, with an emphasis on the central role that ASL plays in the lives of deaf individuals. **Credits:** 3.00

ASL 30100 - American Sign Language V

Credit Hours: 3.00. This course is a continuation of ASL 20200 (5th in sequence of courses in ASL). Features of Level 5 are expanded student discourse, advanced ASL structure and vocabulary, roleshift variations, formal storytelling, text analysis and formal/informal presentations. **Credits:** 3.00

ASL 30200 - American Sign Language Advanced-Level VI

Credit Hours: 3.00. This course is a sequential course in the advanced study of American Sign Language (ASL) with emphasis on basic concepts of language based ASL. This is an application of language usage in ASL in which students will gain an advanced understanding and mastery of ASL grammar. Includes instruction in semantic and grammatical accuracy and appropriate discourse strategies in a variety of communication contexts. Students utilize advanced receptive and expressive skills. **Credits:** 3.00

ASL 36100 - The Structure Of American Sign Language I: Phonology And Morphology

Credit Hours: 3.00. Linguistic study of ASL, including the following: phonological features of individual signs (hand shape, orientation, location, movement) and how those features shift when placed in a stream of signs; morphological features of signs, including compounding and lexicalization of fingerspelled words; grammar, focusing on typical word orders found in ASL sentences; meaning of signs and how those meanings have shifted over time (as well as how those meanings shift for particular dialects); and typical pragmatic features of conversation in ASL. Knowledge of ASL is required. **Credits:** 3.00

ASL 36200 - The Structure Of American Sign Language II: Syntax, Semantics And Language Use

Credit Hours: 3.00. This course introduces students who already have prior knowledge of linguistics (e.g., phonetics, phonology, and morphology) to three areas of study in linguistics: Syntax, Semantics, and language use. Linguistic study of ASL, including the following: Syntax includes units on basic sentence types, lexical categories, word order, time and aspect, verbs, and the function of the spaces. Semantics includes the meanings of individual signs and sentences. Language in Use includes Black ASL, Variation and Historical Change. Bilingualism and language acquisition will be also covered. ASL Discourse has the ways that

signed conversations among deaf people differ from speaking conversation of hearing people, why these differences exist, and why they are culturally important. Knowledge of ASL is required.**Credits:** 3.00

ASL 36400 - Introduction To Structure Of American Sign Language

Credit Hours: 3.00. This course provides an introductory overview of the major linguistic structures of American Sign Language. Major topics are: phonology, morphology, syntax, language use, and linguistic applications. Some comparisons with English and other spoken and signed languages will be examined. Course will be conducted in ASL. **Credits:** 3.00

ASL 39000 - Undergraduate Research In American Sign Language

Credit Hours: 3.00. This course is designed to allow for the investigation of topics related to the linguistic structure of ASL, populations of ASL language learners, sub-populations of the Deaf Community at the undergraduate level. Permission of instructor required. **Credits:** 3.00

American Studies

AMST 10100 - America And The World

Credit Hours: 3.00. This course examines the evolution of American culture as the United States transitioned from a relatively isolated country at the end of the 19th century to an active shaper of a global community by the 21st century. We will examine ways in which American Culture shaped and was shaped by international relationships that transcend nation states. We will explore reactions to, and the results of, the spread of American culture both inside and outside the United States. By studying traditional cultural forms like art, music, design, literature, film, and technology the course will build a foundation from which to understand the configuration of American culture. Yet the course will also emphasize American culture expression, that in the forms of television, advertising, sport, cartoons, social media, video games, fashion, food, drugs, and automobiles, have transcended the geographical boundaries of the United States to engage in global interplays of material cultural exchange. **Credits:** 3.00

AMST 20100 - Interpreting America

Credit Hours: 3.00. Introduction to the interdisciplinary study of American culture, history, and society in its national and global contexts. **Credits:** 3.00

AMST 21000 - Sport In American Culture

Credit Hours: 3.00. This course engages critical questions regarding sport and its role in American culture. It examines the ways sport serves as a key site for the study of larger social issues and social problems, including how race, gender, social class and other social locations are simultaneously reproduced and challenged in and through sport. The course also explores the relationships between sport and other major social institutions, such as the economy, education, politics, and media. **Credits:** 3.00

AMST 22000 - Technology And Play

Credit Hours: 3.00. This course introduces students to games, as well as investigating innovations and controversies in the gaming industry. It will explore theories of play, how technological innovations and business practices in both digital and analog gaming (through board games, video games, tabletop games, and esports) mediate or structure the experience of play. It will also survey the rise of myriad gaming subcultures, including celebrity streamers and esports.**Credits:** 3.00

AMST 25000 - An Introduction To American Protest Movements: What Are They? What Can They Do? How Can We Make One?

Credit Hours: 3.00. In this course, we will study the reasons people in the United States have historically decided to create social movements, tactics and strategies they use to make and sustain those movements, obstacles to their success, and ways of judging their victories. The course will draw on scholarship on social movements from various fields, especially the field of American Studies. Because social movements are created by ordinary people, we will use a variety of sources they leave behind: speeches, testimonials, pamphlets, historical accounts, autobiographies, manifestos. We will also explore scholarship on social movements to try to understand how best to record and analyze the work social movements do. The course seeks to provide students an understanding of the role of protest movements in American history. Permission of instructor required. **Credits:** 3.00

AMST 30100 - Perspectives On America

Credit Hours: 3.00. Advanced interdisciplinary study of American culture, history, and society in their national and global contexts. **Credits:** 3.00

AMST 31000 - Invention, Innovation, And Design

Credit Hours: 3.00. This course focuses on the various ways that invention, innovation, and design shape the modern world. We will investigate the forms, uses, and meanings of a diverse set of objects, networks, and systems that influence the ways we live. We will explore these ideas through the concepts of consumption, waste, and "smart" to gain a deeper understanding of how material infrastructures influence human existence. This project-based course will use readings, discussions, and critical reflections to inform a series of hands-on projects to understand our roles as designers, creators, and users of science, technology, and material culture. Permission of instructor required. **Credits:** 3.00

AMST 32000 - Understanding The National Football League

Credit Hours: 3.00. This course counters the cultural myth that sports are "simply a form of entertainment" or "an escape from reality" and takes seriously the notion that sports matter as a social, cultural, and political force. Students will use academically informed inquiry and investigation to examine broader cultural dynamics through a critical examination of the National Football League. Course topics include how the NFL shapes social identities including race, gender, sexuality, and American identity, the connection between football and militarism, the relationship between the NFL and commercialism, the role the NFL plays in the triad of men's violence, among other topics. **Credits:** 3.00

AMST 32500 - Sports, Technology, And Innovation

Credit Hours: 3.00. This course examines how science, technology, engineering, and data analysis reshape sports. Traditionally, sports have been understood as competitions between humans. However, recent technoscientific developments have altered this arrangement and have changed the ways sports are played. We have reached a place where heated competitions not only take place on the fields of play, but also within scientific and engineering laboratories. The fundamental question this project-based course will address is: how will new and emerging scientific knowledge and technological innovations transform sports? We will explore topics ranging from football, baseball, basketball, and soccer, to e-sports, fantasy sports, and sports analytics. **Credits:** 3.00

AMST 33000 - American Car Culture

Credit Hours: 3.00. The automobile has become one of the most influential technologies of the 20th century, and continues to impact American life in the 21st. This course will examine the immense social, political, technological, and environmental impacts of the car on American culture; and take an interdisciplinary approach to the understanding the automobile industry, its production systems, its marketing strategies, and the way automobiles reflect the changing landscapes of consumer tastes and values over time. **Credits:** 3.00

AMST 49000 - Senior Capstone In American Studies

Credit Hours: 6.00. Interdisciplinary senior capstone project in American Studies. Permission of department required. **Credits:** 6.00

AMST 59000 - Directed Readings In American Studies

Credit Hours: 1.00 to 3.00. A reading course in aspects of American Studies directed by the instructor in whose particular field of specialization the content on the reading falls. Permission of Instructor required. **Credits:** 1.00 to 3.00

AMST 60100 - Introduction To American Studies

Credit Hours: 3.00. An exploration of the cultural and institutional history of American Studies designed to acquaint students with the interdisciplinary concepts of American Studies by focusing on major canonical texts associated with that history. Prerequisite: Master's student standing and American Studies majors only. **Credits:** 3.00

AMST 60200 - Contemporary Issues In American Studies

Credit Hours: 3.00. An investigation of analytical categories, particularly race, class and gender, the multiple methodologies, and theoretical premises that shape developments in the field of American Studies. Prerequisite: AMST 60100. **Credits:** 3.00

AMST 60300 - American Studies Interdisciplinary Project

Credit Hours: 3.00. Students will conduct independent research under faculty supervision towards completion of the Special Field examination for the Ph.D. degree. The project should be an extended, original research essay, based upon interdisciplinary research. The project should aim to produce original findings on a clearly defined topic or problem. In addition to the research and essay, students must produce a statement of methodology in which they explain their choice of sources and how their project contributes to the field of American Studies. To be taken in the final semester of coursework. Prerequisite: AMST 60100. **Credits:** 3.00

AMST 60400 - Transnational American Studies

Credit Hours: 3.00. What does the term transnational mean? How is the term defined, practiced, and studied in different fields? How does one take a transnational perspective, or examine the transnational variable? This course will draw from various fields (sociology, history, anthropology, ethnic studies, etc.) to explore contemporary scholarship on transnationalism in theory and in practice. Specifically, we will examine scholarship that either, 1) utilizes the transnational perspective in understanding history, the globe, and human behavior/interactions, or 2) utilizes transnational behaviors/ties as a variable to measurement adaptation. Materials in this course will examine - through the lens of race, ethnicity, class, gender, and sexuality - individual and comparative transnational case studies related to the Americas, Africa, Asia, and Europe. This is a graduate seminar, and your active participation in discussions is mandatory. You will be asked to lead four seminar discussions on selected topics from the required readings, write three memos, and submit an extended book review. Permission of instructor required. **Credits:** 3.00

AMST 60500 - Theory And American Culture

Credit Hours: 3.00. This course provides an overview of key foundational texts in social and cultural theory, with a focus on theories of import to scholars in American Studies and related fields. We will explore the various types of theory, examining its internal logic, implications, and critiques. Consider this a brief introduction, meant to give you a general feel for the range and sophistication of available theories in American Studies. Moreover, as the "Cultural Politics" website observes, "Recent theory has reminded us that origin stories are powerful determining forces, and thus these tales of the growth and development of the discipline should be read both for what they say and for what they may leave out, read both for their truths and their partialities."

Similarly, the course syllabus itself creates a particular narrative regarding the development of the discipline. As such, students are encouraged to consider the syllabus through this perspective. **Credits:** 3.00

AMST 60600 - American Studies Methods

Credit Hours: 3.00. This class is specifically designed to be a survey course on the various methods employed by American Studies scholars from different disciplines. The objective of this course is to approach methods from both an epistemological and empirical perspective. In particular, we will investigate the what, why, and how of conducting research in an interdisciplinary field. As such, the following questions will drive this course: What are American Studies methods? Why are certain methodologies utilized (i.e., for what purpose)? How does one conduct research in American Studies? What method(s) should you use in your own research inquiry? And finally, what are some potential drawbacks in using a certain methodology for your project? This is a graduate seminar, and your active participation in discussions is mandatory. You will be asked to submit weekly discussion questions, lead five seminar discussions on selected topics from the required readings, and complete six assignments. The final assignment will include the background and methodological components of a research proposal.**Credits:** 3.00

AMST 62000 - EPXIRED - Archival Theory And Practice

Credit Hours: 3.00. This class explores recent theories of the Archive, as well as theories of archiving, examines scholarly approaches to archival research, and introduces students to the practical aspects of accessioning, arranging, describing, and preserving archival collections. Archival work for the class will be conducted under the supervision of a faculty member and a partnering library. Prerequisite: AMST 60100, AMST 60200. **Credits:** 3.00

AMST 63000 - M A Research Seminar

Credit Hours: 6.00. A research seminar required of all M.A. students in their final semester. Students write substantial essays based upon original research in which they seek to crystallize, in practice, methods and concepts of American Studies. Prerequisite: AMST 60100. **Credits:** 6.00

AMST 65000 - Reading Seminar In American Studies

Credit Hours: 3.00. A reading seminar on a selected topic in American Studies, taught by two faculty members from different disciplines, usually one from the humanities and one from the social sciences. Prerequisite: AMST 60100. **Credits:** 3.00

AMST 69500 - American Studies Service Learning/Internship

Credit Hours: 3.00. This course is to be used by students to complete a service learning or internship project that provides professional development towards completion of the degree. The project must be conducted under the supervision of a faculty member and community partner. The faculty supervisor will be responsible for determining the academic content of the course and requirements of service. In addition to academic requirements for the course, a final written report on the project must be filed with the American Studies program. The final report must describe the relationship between work completed for the course and the student's plan of study. Prerequisite: AMST 60100, AMST60200. **Credits:** 3.00

AMST 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Animal Sciences

ANSC 10200 - Introduction To Animal Agriculture

Credit Hours: 3.00. A study of animal agriculture emphasizing the efficient production of animal food products from poultry, dairy and meat animals. Credit cannot be obtained for both ANSC 10100 and 10200. Course may also be offered for dual credit with cooperating Indiana high schools upon documented approval by Department of Animal Sciences. This course is required for ANSC majors classified as Freshman and Sophomores. **Credits:** 3.00

ANSC 10600 - Biology Companion Animal

Credit Hours: 3.00. Introduction to the various aspects of companion animal biology. Topics include anatomy, physiology, health, immunity, nutrition, growth, digestion, metabolism, behavior, genetics, reproduction and lactation. **Credits:** 3.00

ANSC 12100 - Ethics Of Animal Use

Credit Hours: 2.00. The Ethics of Animal Use explores ethical issues relating to animal use in contemporary society. It integrates philosophical theories with scientific evidence relating to the use of animals in agriculture, biomedical research, companion animals, and issues relating to wildlife and the environment. **Credits:** 2.00

ANSC 18100 - Orientation To Animal Sciences

Credit Hours: 1.00. Introduction to the faculty, programs, opportunities, career preparation, and personal development requirements needed to succeed in a career in the animal industries. Course meets during weeks 1-8. Requires class trips. Students will pay individual lodging or meal expenses when necessary. **Credits:** 1.00

ANSC 22100 - Principles Of Animal Nutrition

Credit Hours: 3.00. Classification and function of nutrients, deficiency symptoms, digestive processes, characterization of feedstuffs, and formulation of diets for domestic animals.**Credits:** 3.00

ANSC 23000 - Physiology Of Domestic Animals

Credit Hours: 4.00. A lecture and laboratory course designed to present physiology of domestic farm animals. Function of tissues and organs, maintenance of internal steady-state conditions, and body responses to external environmental conditions will be presented. Physiological mechanisms involved in lactation, growth, and reproduction will be included. **Credits:** 4.00

ANSC 24000 - Principles Of Animal Production

Credit Hours: 3.00. A comprehensive overview of production systems including life cycles and animal requirements for non-ruminant and ruminant farm animals species. How animal production is affected by the environment, availability of resources, and market access will emphasized. Data requirements and interpretation for decision making will be highlighted. **Credits:** 3.00

ANSC 24500 - Applied Animal Management

Credit Hours: 2.00. Skills and practices related to handling and care of beef and dairy cattle, horses, poultry, sheep, and swine. **Credits:** 2.00

ANSC 25500 - Principles Of Animal Products

Credit Hours: 3.00. Survey of the animal product industries; meat, dairy, eggs, and wool. Meat as a food, conversion of muscle to meat, conversion of dairy to dairy products, food safety, food quality, inspection, and basic processing, in addition to basic wool production. **Credits:** 3.00

ANSC 28100 - Career Planning In Animal Sciences

Credit Hours: 1.00. A seminar course designed to inform students of the career opportunities in animal industries, develop their interviewing and other interpersonal skills, and begin to plan the course of study, work experiences, and marketing methods needed to obtain a successful internship and employment. **Credits:** 1.00

ANSC 29200 - Special Assignments

Credit Hours: 0.00. To be arranged with individual staff members prior to registration. Reading, discussions, written reports, seminar presentations, teaching, field or laboratory experiences provided for enrichment in special areas of animal science. Permission of department required. **Credits:** 0.00

ANSC 29300 - Special Assignments

Credit Hours: 1.00 to 3.00. Reading, discussions, written reports, seminar presentations, teaching, field or laboratory experiences provided for enrichment in special areas of animal science. Combination of ANSC 29300 and AGR 49300 cannot exceed six credits. Permission of instructor required. **Credits:** 1.00 to 3.00

ANSC 29400 - Exploring International Animal Agriculture

Credit Hours: 3.00. An experiential learning class. Interrelationship of animal agriculture with agronomic production, feed industries, culture, national infrastructure, political systems and international trade will be investigated through international travel. Critical thinking and communication skills will be enhanced by topic leadership, comparative analysis and seminar presentation. May be repeated for credit with variable title. **Credits:** 3.00

ANSC 29500 - Special Topics In Animal Sciences

Credit Hours: 0.00 to 3.00. Lecture presentation of specialized material not available in formal courses of the department. The specific topic that is offered will be indicated on the student's record. May be repeated for credit with variable title. Permission of instructor required. **Credits:** 0.00 to 3.00

ANSC 30100 - Animal Growth, Development, And Evaluation

Credit Hours: 2.00. Provides an overview of how nutrition, genetics, and environment affect beef cattle, swine, and sheep growth, development, and end-product quality and value. Students receive hands-on experience evaluating and determining the economic value of live animals and carcasses in various market grids.**Credits:** 2.00

ANSC 30300 - Animal Behavior

Credit Hours: 3.00. Discussion of animal behavior with emphasis on developing an understanding of the reasons domesticated animals react the way they do toward their kind and to humans. The laboratory will be used for observation of behavior patterns in animals. Solutions for unusual behavior include behavior modification techniques. **Credits:** 3.00

ANSC 31100 - Animal Breeding And Genetics

Credit Hours: 4.00. Genetic principles and their applications in improvement of production efficiency in livestock.**Credits:** 4.00

ANSC 32400 - Applied Animal Nutrition

Credit Hours: 3.00. Application of the principles of animal nutrition to the formulation and feeding of supplements and complete rations for animals; ration ingredients and substitution values; computer applications; legal aspects of feed formulation; and industry practices. Requires class trips. Students will pay individual lodging or meal expenses when necessary. **Credits:** 3.00

ANSC 32500 - Applied Ruminant Nutrition

Credit Hours: 2.00. Application of the principles of ruminant nutrition to the formulation and feeding of supplements and complete rations for animals; ration ingredients and substitution values; computer applications; legal aspects of feed formulation; and industry practices. **Credits:** 2.00

ANSC 32600 - Applied Non-ruminant Nutrition

Credit Hours: 2.00. Application of the principles of non-ruminant nutrition to the formulation and feeding of supplements and complete rations for animals; ration ingredients and substitution values; computer applications; legal aspects of feed formulation; and industry practices. **Credits:** 2.00

ANSC 33100 - The Role Of Horses In Human History, Culture, And Society

Credit Hours: 3.00. A multi-disciplinary course that introduces students to the history of the human-horse relationship in a global context. Because the history of horse and human interaction is so broad and so important to the development of civilization, the course will include a broad view of horses in the context of agriculture, transportation, sport, culture and art. **Credits:** 3.00

ANSC 33200 - Environmental Physiology Of Domestic Animals

Credit Hours: 2.00. Interactions of environmental factors with physiological processes in domestic animals. **Credits:** 2.00

ANSC 33300 - Physiology Of Reproduction

Credit Hours: 3.00. This course is designed to introduce students to the essential principles of mammalian reproduction and apply this knowledge in a hands-on laboratory setting. Upon completion of this course, students are expected to understand the processes of sexual determination, sexual differentiation, steroid hormone signaling, spermatogenesis, oogenesis, fertilization, gestation, parturition and lactation. **Credits:** 3.00

ANSC 34500 - Animal Health Management

Credit Hours: 3.00. The objectives of this course are to familiarize the student with disease processes and mechanisms. Management techniques in food, companion, and research animal species that minimize or prevent disease will be emphasized, as well as the consequences on animal production, reproduction, and human health. **Credits:** 3.00

ANSC 35100 - Meat Science

Credit Hours: 3.00. Study of muscle and meat, principles involved in the conversion of living animals to meat and by-products; efficient utilization of all types of meat as food. **Credits:** 3.00

ANSC 35101 - Meat Science Laboratory

Credit Hours: 1.00. Application of scientific principles to the meat industry, with emphasis on all aspects of processing including: harvest; carcass grading and evaluation; fabrication; cured, smoked, and comminuted meat products; quality control; product development; and retail and food service merchandising. **Credits:** 1.00

ANSC 36000 - Muscle Food Production And Safety

Credit Hours: 3.00. Study the science, art, and economics of processed meats. Investigate methods to add value to meat and meat products, including hands-on processing, new product development, and industry tours. Study of meat-borne pathogens and methods of control. Science and practical aspects of food safety in meat production. Seven principles of HACCP will be investigated and each student will receive HACCP Certification from the International HACCP Alliance.**Credits:** 3.00

ANSC 37000 - Livestock Evaluation

Credit Hours: 2.00. This course is designed to develop logical thinking and speaking skills, while developing the ability to critically evaluate livestock in their production environments. Prior experience in public speaking or judging is not required. The combination of ANSC 37000, ANSC 37100, ANSC 37200, ANSC 47000, ANSC 47100, and ANSC 47200 cannot exceed three credits toward ANSC electives. Requires class trips. Students will pay individual lodging or meal expenses when necessary. **Credits:** 2.00

ANSC 37100 - Dairy Evaluation

Credit Hours: 2.00. This course will enable the student to become familiar with breeds of dairy, parts of dairy cattle and their relationship to function. Opportunities will exist to associate with people from various breed organizations within the dairy industry. The combination of ANSC 37000, 37100, 37200, 47000, 47100, and 47200 cannot exceed three credits toward ANSC electives. Requires class trips. Students will pay individual lodging or meal expenses when necessary. **Credits:** 2.00

ANSC 38100 - Leadership For A Diverse Workplace

Credit Hours: 3.00. An interactive, small group discussion class covering effective interpersonal and group skills needed to enhance career satisfaction in a diverse workplace including building networks within industry, cross-cultural communication and gaining experiences in group problem-solving and decision-making. This course may be used as an additional written communication elective as required in all plans of study in Animal Sciences.**Credits:** 3.00

ANSC 39000 - Animal Sciences Internship

Credit Hours: 0.00. Internships with producers, businesses, or agencies arranged in cooperation with faculty coordinator. Permission of department required. **Credits:** 0.00

ANSC 39300 - Animal Industry Travel Course

Credit Hours: 1.00 or 2.00. A classroom and travel course designed to expose students to animal production operations, agribusinesses, industry leaders, and their philosophies as well as critical contemporary issues throughout various geographical areas of the United States. Travel is conducted during spring break or summer sessions and includes visits to animal production farms, universities, and agribusinesses. Additional fee required. Limited to two credits toward Animal Sciences electives. Offered in odd numbered years. Permission of instructor required. **Credits:** 1.00 or 2.00

ANSC 40000 - Animal Sciences Study Abroad

Credit Hours: 0.00 to 8.00. Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities. **Credits:** 0.00 to 8.00

ANSC 40400 - Animal Welfare

Credit Hours: 3.00. A multi-disciplinary course that introduces students to the fields of animal welfare and the ethics of animal use. The course will emphasize farm animal welfare and production issues. Requires class trips. Students will pay individual lodging or meal expenses when necessary. **Credits:** 3.00

ANSC 41500 - Advanced Animal Physiology

Credit Hours: 3.00. This course is an advanced physiology course building on concepts and knowledge introduced in ANSC 23000 about whole body physiology. Additionally, this course will introduce interpretation of scientific literature to understand physiological processes. **Credits:** 3.00

ANSC 42500 - Ruminant Reproductive Farm Management

Credit Hours: 2.00. This course will teach how to apply the animal science disciplines such as nutrition, genetics, physiology, and animal behavior in a systems approach that will result in the desired level of reproductive performance. Animal handling skills associated with the reproductive management of beef cattle, dairy cattle, goats, and sheep will be discussed. Laboratories require use of both live animals and animal specimens.**Credits:** 2.00

ANSC 42600 - Non-ruminant Reproductive Farm Management

Credit Hours: 2.00. This course will teach how to apply the animal science disciplines such as nutrition, genetics, physiology, and animal behavior in a systems approach that will result in the desired level of reproductive performance. Animal handling skills associated with reproductive management of swine and horses will be discussed. Laboratories require use of both live animals and animal specimens. **Credits:** 2.00

ANSC 43500 - Reproductive Management Of Farm Animals

Credit Hours: 3.00. Management practices associated with improved reproductive efficiency. Procedures for diagnosis of reproductive failure and practical methods of controlling reproduction will be identified. **Credits:** 3.00

ANSC 44000 - Horse Management

Credit Hours: 3.00. Current breeding, feeding, housing, selection, disease control, and other management practices essential for sound economic planning of horse operations in today's horse industry. Laboratory farm visits provide students with real application examples and industry contacts. **Credits:** 3.00

ANSC 44100 - Beef Management

Credit Hours: 3.00. Breeding, feeding, and management practices essential for economical beef production, including performance testing. **Credits:** 3.00

ANSC 44200 - Sheep Management

Credit Hours: 3.00. Breeding, feeding, and management practices essential for economical sheep production and commercial lamb feeding, including performance testing. **Credits:** 3.00

ANSC 44300 - Swine Management

Credit Hours: 3.00. Breeding, feeding, and management practices essential for commercial swine production, including performance testing. **Credits:** 3.00

ANSC 44400 - Dairy Management

Credit Hours: 3.00. Current breeding, feeding, physiology, disease prevention, and management practices essential for economical milk production. Requires class trips. Students will pay individual lodging or meal expenses when necessary. **Credits:** 3.00

ANSC 44500 - Commercial Poultry Management

Credit Hours: 3.00. Current developments and practices in the commercial production of eggs, broilers, and turkeys; principles of breeding, physiology, nutrition, management, and disease prevention. Requires class trips. Students will pay individual lodging or meal expenses when necessary. **Credits:** 3.00

ANSC 44600 - Companion Animal Management

Credit Hours: 3.00. This course details understanding of the economic scope of the pet industry as well as the role of pets in American society. The students will acquire the information to be responsible pet owners by experiencing their knowledge of housing practices, nutritional care, health care, behavior and breeding of companion animals. **Credits:** 3.00

ANSC 47000 - Livestock Judging

Credit Hours: 1.00. This course is designed to teach livestock evaluation, relationship of production data to live animal evaluation characteristics, expand logical thinking and reasoning skills, and enhance oral communication skills. Requires class trips. Students will pay individual lodging or meal expenses when necessary. **Credits:** 1.00

ANSC 47100 - Dairy Judging

Credit Hours: 1.00. Opportunities will exist to allow the student to practice analysis and enhance decision-making processes in placing animals in collegiate dairy contests. Communication skills will be developed to properly present and defend those decisions with confidence. Requires class trips. Students will pay individual lodging or meal expenses when necessary. **Credits:** 1.00

ANSC 48100 - Contemporary Issues In Animal Sciences

Credit Hours: 1.00. Industry-led and student-led discussions and debate of current issues facing animal industries. Experiences from internships, research problems, study abroad, or job shadowing will be shared among the students. **Credits:** 1.00

ANSC 48500 - Dairy Farm Evaluation

Credit Hours: 2.00. This course will provide students with an opportunity to integrate and apply knowledge of dairy cattle management systems, nutrition, reproduction, genetics, milk quality, animal handling, physical farm facilities, manure handling and management, personnel and their financial implications. Students will develop critical analysis skills and apply troubleshooting principles in the identification and resolution of dairy farm management issues in a learning environment that is structured around farm evaluation field trips and case studies. **Credits:** 2.00

ANSC 49100 - Special Problems

Credit Hours: 1.00 to 3.00. Supervised individual laboratory or library assignments. Written reports required. Permission of instructor required. **Credits:** 1.00 to 3.00

ANSC 49200 - Special Assignments

Credit Hours: 0.00. To be arranged with individual staff members prior to registration. Reading, discussions, written reports, seminar presentations, teaching, field or laboratory experiences provided for enrichment in special areas of animal science. Permission of department required. **Credits:** 0.00

ANSC 49300 - Special Assignments

Credit Hours: 1.00 to 3.00. Reading, discussions, written reports, seminar presentations, teaching, field or laboratory experiences provided for enrichment in special areas of animal science. Combination of ANSC 29300 and 49300 cannot exceed six credits. Permission of instructor required. **Credits:** 1.00 to 3.00

ANSC 49400 - Animals And Food Security: International Services Learning

Credit Hours: 1.00 to 4.00. This course prepares students for a service learning international experience and includes the planning of the trip, the actual trip and a reflective learning post-trip class. The course is a partnership between Purdue Animal Sciences, a host university and their students, a local community organization, and an international community development, NGO. The core of the experience is the faculty-led international service learning course where students live and work in villages in a developing country. Students will learn extension methodologies and how to contribute to sustainable projects. Students will be expected to work in bi-national teams across agricultural and community disciplines to not only contribute to the communities served but to apply their classroom knowledge and experience to make a difference in the community. AGEC 43000 is a highly recommended prerequisite. Prerequisites: Multicultural Awareness course (COA list). Permission of instructor required. **Credits:** 1.00 to 4.00

ANSC 49500 - Special Topics In Animal Sciences

Credit Hours: 0.00 to 3.00. Lecture presentation of specialized material not available in the formal courses of the department. The specific topic that is offered will be indicated on the student's record. Permission of instructor required. **Credits:** 0.00 to 3.00

ANSC 49900 - Thesis Research

Credit Hours: 1.00 to 6.00. For students doing specialized animal sciences research; report required. Arrange with academic advisor and honors research coordinator before registering. Permission of instructor required. **Credits:** 1.00 to 6.00

ANSC 51100 - Population Genetics

Credit Hours: 3.00. (AGRY 51100) Basic concepts of population genetics. Characterization of populations using gene frequencies, gametic and zygotic disequilibrium; forces changing gene frequencies (mutation, migration, selection, and random genetic drift) and genotypic frequencies (mating systems: inbreeding, crossbreeding, and phenotypic assortative) and related hypothesis testing; gene trees and the coalescent process; and molecular phylogenies. **Credits:** 3.00

ANSC 51300 - Design Of Animal Breeding Programs

Credit Hours: 3.00. Integration of principles of animal breeding and genetics into animal improvement programs. Emphasis is placed on the interaction among genetics, nutrition, and physiology. **Credits:** 3.00

ANSC 51400 - Animal Biotechnology

Credit Hours: 3.00. Presentation and discussion of the history, developments, and applications of molecular genetic analysis of human and animal genomes, and use of gene transfer in research, animal agriculture, and human medicine. Ethical and

economical ramifications of biotechnology in society will be introduced through reading assignments and discussion. **Credits:** 3.00

ANSC 51600 - Molecular Microbiome Analysis

Credit Hours: 3.00. The overall goal of the course is to provide students with an advanced understanding of microbial ecology in the animal microbiome and how to analyze next-generation sequencing data of amplicon libraries. In order to complete this goal, students will participate in activities including classroom lecture, group discussion, critical reading of literature, written assignments and exams, and student projects. Permission of instructor required.**Credits:** 3.00

ANSC 52200 - Monogastric Nutrition

Credit Hours: 3.00. Digestion and absorption, nutrient utilization and interrelationships in poultry, swine, and other monogastric animals. **Credits:** 3.00

ANSC 52400 - Ruminant Nutrition And Physiology

Credit Hours: 3.00. Physiological, microbiological, and biochemical effects and their interrelationships on digestion and metabolism in the ruminant animal. **Credits:** 3.00

ANSC 53400 - Advanced Reproductive Physiology

Credit Hours: 3.00. A study of mechanisms that interact to control reproduction in farm animals. Current scientific literature and hypotheses are presented, and potential methods to enhance reproductive efficiency are examined. **Credits:** 3.00

ANSC 53500 - Avian Physiology

Credit Hours: 2.00. (BMS 82800) A study of the basic principles of physiology and functional anatomy of birds. Topics include the following systems: muscular, nervous, cardiovascular, respiratory, digestive, lymphoid, endocrine, and reproductive. **Credits:** 2.00

ANSC 53700 - Adipocyte Biology

Credit Hours: 3.00. This course will provide the student with a conceptual background in the development of adipose tissue and its biological function with emphasis on the endocrine and immunologic aspects of the adipocyte. Differences between species will be emphasized where possible. **Credits:** 3.00

ANSC 55200 - Advanced Meat Science

Credit Hours: 3.00. The overall goal of the course is to provide students with an advanced understanding of meat science and technology. In order to complete this goal, students will participate in activities including classroom lecture, group discussion, critical reading of literature, written assignments and exams, and/or student projects. **Credits:** 3.00

ANSC 55500 - Animal Growth And Development

Credit Hours: 3.00. A study of the molecular and cellular processes controlling embryonic development and growth of domesticated animals. Includes discussions of current research concerning molecular mechanisms of fertilization, egg activation, early development, and endocrine factors controlling cell growth, differentiation, and tissue formation. Experimental approaches utilized for developmental and growth biology research are discussed. **Credits:** 3.00

ANSC 59500 - Special Topics In Animal Sciences

Credit Hours: 0.00 to 3.00. Lecture presentation of specialized material not available in the formal courses of the department. The specific topic offered is indicated on the student's record. Permission of instructor required. **Credits:** 0.00 to 3.00

ANSC 62000 - Proteins And Amino Acids In Nutrition

Credit Hours: 3.00. Presentation of concepts concerning requirements for dietary amino acids, nutritional regulation of amino acid metabolism, and regulation of protein metabolism. Integrates biochemical and physiological functions of amino acids and features topics in nutritional regulation of whole-body protein turnover in mammalian and avian species. Offered in odd numbered years. Prerequisite: BCHM 56200. **Credits:** 3.00

ANSC 62500 - Nutritional Biochemistry And Physiology I

Credit Hours: 4.00. (FN 605) Integration of biochemical and physiological functions of nutrients in humans and animals emphasizing interactions in bone and gut. Prerequisite: ANSC 22100, 23000, BCHM 30700. **Credits:** 4.00

ANSC 62600 - Nutritional Biochemistry And Physiology II

Credit Hours: 2.00. (NUTR 60600) Integration of biochemical and physiological functions of nutrients in humans and animals emphasizing post-absorptive use of nutrients as sources of energy and for the synthesis of macromolecules. Offered weeks 1 - 8. Prerequisite: ANSC 62500. **Credits:** 2.00

ANSC 62700 - Nutritional Biochemistry And Physiology III

Credit Hours: 2.00. (NUTR 60700) Integration of biochemical and physiological functions of nutrients in humans and animals, emphasizing lipid metabolism and transport in the context of cardiovascular function. Offered weeks 9-16. Prerequisite: ANSC 62600. **Credits:** 2.00

ANSC 66000 - Intestinal Microbiology And Immunology

Credit Hours: 1.00. (FS 66000) Discussion and critique of recent journal articles related to intestinal microbiology/immunology. The specific areas covered under this forum are: (1) intestinal microbiology, (2) food microbiology as it relates to gastrointestinal diseases, (3) probiotics and prebiotics-related to intestinal health or pathogen control, and (4) mucosal immunity with major emphasis on intestinal immunology. **Credits:** 1.00

ANSC 68100 - Animal Sciences Graduate Seminar

Credit Hours: 1.00. Instruction and application of concepts for effective oral professional presentations in the field of Animal Sciences. The course will provide students with knowledge for effective oral communication of scientific information and an opportunity to put guidelines into practice. Permission of department required. **Credits:** 1.00

ANSC 69100 - Topical Research Problems

Credit Hours: 1.00 to 4.00. To be arranged with individual staff members prior to registration. Requires approval of the department head. Supervised individual research projects. Written reports required. Permission of instructor required. **Credits:** 1.00 to 4.00

ANSC 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

ANSC 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Anthropology

ANTH 2050N - Introduction to Cultural Anthropology

Credit Hours: 3.00. A survey of cultural and social processes that influence human behavior, with comparative examples from different ethnic groups around the world, with the goal of better understanding the broad range of human behavioral potentials and those influences that shape the different expressions of these potentials. (Not open to students who have had A304.).**Credits:** 3.00

ANTH 10000 - Being Human: Introduction To Anthropology

Credit Hours: 3.00. Introduces anthropology's holistic approach to human nature and behavior. This course uses the tools of cultural, biological, archaeological, and linguistic anthropology to follow the human journey of uniformity and diversity through time and across space. **Credits:** 3.00

ANTH 20100 - Introduction To Archaeology And World Prehistory

Credit Hours: 3.00. Introduction to the ideas and practices of archaeology that are used in the contemporary study of human prehistory. Emphasis is placed on the social and technological changes that accompanied major turning points in the human past, including the earliest stone tools, the development of farming, through the advent of writing and monumental architecture among ancient states. **Credits:** 3.00

ANTH 20300 - Biological Bases Of Human Social Behavior

Credit Hours: 3.00. This course is an introduction to human social behavior from the perspective of biological anthropology, with special emphasis on human evolution and non-human primates. Topics include aggression, communication, learning, maturation, sexuality, and the evolution of social systems. **Credits:** 3.00

ANTH 20400 - Human Origins

Credit Hours: 3.00. Surveys our evolutionary journey, from fossil primates to modern humans, through a review of evolutionary theory and genetics, the fossil evidence for current theories in human evolution with insight from modern non-human primates, and the influence of environmental stressors on modern human biological variation. **Credits:** 3.00

ANTH 20500 - Human Cultural Diversity

Credit Hours: 3.00. Offers an engaging introduction to concepts, themes, methods, and ethical concerns that guide research and analysis in cultural anthropology. Students will learn how to identify and interpret the complexities of human culture - what makes cultures different, and in what ways are they more alike than we might assume? Topics include: race and racism; ethnicity and nationalism; gender; sexuality; kinship, family, and marriage; class and inequality; the global economy; politics and power; religion; and health and illness. **Credits:** 3.00

ANTH 21000 - Technology And Culture

Credit Hours: 3.00. This course explores the social dimensions of technology from the perspective of ancient, modern, and post-modern society. Topics include the origins of particular technologies; processes of technical development and dissemination; the politics of everyday artifacts; virtual identities; and technologies of the body. Suggested courses (not prerequisites): ANTH 10000, ANTH 20100 and/or ANTH 20500. **Credits:** 3.00

ANTH 21200 - Culture, Food And Health

Credit Hours: 3.00. This course is designed to provide an introduction to the field of Nutritional Anthropology in which we will examine issues related to diet, health and illness from holistic anthropological perspectives.**Credits:** 3.00

ANTH 21500 - Introduction To Forensic Anthropology

Credit Hours: 3.00. Introduction to forensic anthropology, the science that utilizes methods from skeletal biology and archaeology as tools in human identification in a medico-legal context. This course introduces students to methods used to recover and positively identify human remains, and to evaluate trauma and taphonomy in medico-legal situations. Topics include an overview of historical and current developments in the field. Students will develop a comprehensive understanding of the sequential order of applied work from the search for forensic scenes through the recovery of remains, and skeletal analysis in the laboratory. **Credits:** 3.00

ANTH 23000 - Gender Across Cultures

Credit Hours: 3.00. Explores gender and sexuality from a cross-cultural perspective. Draws on case studies to explore the complexities of women's and men's lives. Examines gender hierarchies, gender in a globalized world, and the cultural construction of sexuality and gender. **Credits:** 3.00

ANTH 23500 - The Great Apes

Credit Hours: 3.00. Students will learn the behavior and conservation of our closest relatives and how early ape studies changed our understanding of what it meant to be human. Topics include gender in science, ethics of research and cross-cultural understandings. **Credits:** 3.00

ANTH 24000 - Medicine, Science, And Culture

Credit Hours: 3.00. This course explores the intersections of medicine, science, and culture as powerful shapers of our lives and the world today. Anthropology broadly studies the human experience to help explain how our bodies, biology, and beliefs inform what "medicine," "health," "illness," and "healing" come to mean in diverse and cross-cultural contexts. The course will cover foundations in medical anthropology by exploring a range of topics and applications.**Credits:** 3.00

ANTH 25400 - Archaeological Hoaxes, Myths And Frauds

Credit Hours: 3.00. This course examines why the ancient past inspires so many theories about aliens, dark conspiracies, lost civilizations, and apocalyptic predictions. Topics include the popularity of pseudoscientific theories in American culture and the historical contexts in which common pseudoscientific ideas have emerged; why they persist in the face of archaeological evidence; and the role of pseudo-archaeology in the growing antagonism toward scientific expertise. Through an understanding of datasets and methods archaeologists use to evaluate claims about the past, the course goes beyond debunking ancient aliens and Atlantis to develop important critical thinking skills to evaluate evidence and recognize pseudo-scientific arguments in the media. **Credits:** 3.00

ANTH 25600 - Archaeology Of Beer

Credit Hours: 3.00. Alcoholic beverages are an important aspect of foodways, the cultural practices and values surrounding food and drink. This course provides an overview of the ancient origins of beer and other alcoholic beverages globally, and examines the cultural context and social role of these innovations through a combination of archaeology, material culture studies, historical texts, and ethnography. In addition to examining archaeological case studies of the production and consumption of beer and other alcoholic beverages, topics to be covered include: evolution of brewing and fermenting technology, biology and chemistry of brewing and fermentation, residue and materials analysis, origins of agriculture, emergence of social complexity, sexual division of labor, social identity (gender, class, ethnicity), and recent trends in production and consumption. **Credits:** 3.00

ANTH 28200 - Introduction To LGBTQ Studies

Credit Hours: 3.00. (WGSS 28200) This course offers students an introduction to the interdisciplinary study of lesbian, gay, bisexual, transgender and queer lives. It provides a basic grounding in theories of sexuality and LGBT histories, identities and movements in the U.S. and globally. **Credits:** 3.00

ANTH 30600 - Quantitative Methods For Anthropological Research

Credit Hours: 3.00. This course provides an introduction to the broad statistical methods used throughout the 4-fields of Anthropology. It covers elementary probability theory, basic concepts of statistical inference and study design. The course will motivate statistical methods through data analysis and visualization. It is designed for students who intend to focus in an anthropological discipline. It would also benefit a variety of students interested in 1) quantitative science literacy and planning for graduate work, 2) joining the workforce and becoming part of the educated citizenry. There are no prerequisites from the Statistics or Mathematics Departments. **Credits:** 3.00

ANTH 30700 - The Development Of Contemporary Anthropological Theory

Credit Hours: 3.00. Explores the history of anthropological theories pertaining to the understanding of commonality and variation in human biology, behavior, society, and cultures as they have developed over the approximately two centuries since anthropology was founded as a separate discipline. Considers those social, cultural, and historical factors that have influenced the history of anthropological ideas. Permission of instructor required. **Credits:** 3.00

ANTH 30800 - Critical Data Studies

Credit Hours: 3.00. Critical Data Studies (CDS), is an interdisciplinary field that addresses the ethical, legal, socio-cultural, epistemological and political aspects of data science, big data and digital infrastructure. This course focuses on current topics in critical data studies scholarship. Particular emphasis will be given to democratic and participatory approaches to algorithm design and responsible data management, curation and dissemination. Students will develop tools and methods to help scholars think critically and identify issues of concern to Local Communities. This is a research and writing intensive course.**Credits:** 3.00

ANTH 31000 - Mortuary Practices Across Cultures

Credit Hours: 3.00. Explores how death is treated or has been treated in diverse world cultures and time periods. Death is viewed as an expression of social behavior and as an expression of symbolic meaning. **Credits:** 3.00

ANTH 31100 - The Archaeology Of The Ancient Andes

Credit Hours: 3.00. Development of Andean culture from its earliest roots through the Spanish conquest of the Inca empire in the 16th century. Topics will include first settlement, the development of the first complex societies, and the emergence and collapse of the Inca Empire. **Credits:** 3.00

ANTH 31200 - The Archaeology Of Ancient Egypt And The Near East

Credit Hours: 3.00. Selected topics on the archaeology of ancient Near Eastern cultures in Mesopotamia, the circum-Mediterranean area, Egypt, and the Nile Valley, emphasizing an anthropological interpretation of the political, social, religious, and economic systems that contributed to their development. **Credits:** 3.00

ANTH 31300 - Archaeology Of North America

Credit Hours: 3.00. Archaeological overview of North America emphasizing Indigenous cultures prior to the arrival of Europeans, but including Contact and Post-Contact communities of the Historic Period. Topics will include the peopling of the Americas, culture and environment, social complexity, and Cultural Resource Management. **Credits:** 3.00

ANTH 32000 - Ancient States And Empires

Credit Hours: 3.00. Why did some small-scale societies develop into complex chiefdoms, states, and empires while others did not? How did ancient societies adapt in the face of social conflict and environmental challenges? What lessons can we learn from resilience or collapse of states in the ancient past? This course compares the political, social, ecological, contexts of the rise and fall of early complex societies, from densely populated hunter-gatherers in North America to the world's major ancient civilizations in Mesoamerica, the Andes, Nile Valley, Mesopotamia, Indus Valley, and China. We will also explore how societies responded to 'grand challenges' in antiquity such as climate variability, food insecurity, global-intercultural interaction, and what modern lessons we might derive from their successes and failures. **Credits:** 3.00

ANTH 32700 - Environment And Culture

Credit Hours: 3.00. This course provides a general overview to the field of environmental anthropology, and surveys key methods, and theories that anthropologists use to interpret human-environment interactions. Topics include culture ecology, agroecology, ethnobiology, political ecology, and environmental justice. **Credits:** 3.00

ANTH 33500 - Primate Behavior

Credit Hours: 3.00. This course is an introduction to the primate order and primate studies. The emphasis is on field studies. Ecological influences on social organization and behavior, learning, play, and communication will be considered as adaptations within an evolutionary framework.**Credits:** 3.00

ANTH 33600 - Human Variation

Credit Hours: 3.00. Biological differences between human individuals and groups, causes of variations, the role of genetics, concepts of race, and the interrelationship between the social and biological meanings of race will be considered. **Credits:** 3.00

ANTH 33700 - Human Diet: Origins And Evolution

Credit Hours: 3.00. This course will survey humans evolving relationship with food over the last few million years; from our Pilo-pleistocene origins (foraging) through the origins of agriculture to modern industrial food production. **Credits:** 3.00

ANTH 34000 - Global Perspectives On Health

Credit Hours: 3.00. This course examines health issues and risks faced by individuals around the world, but especially in resource poor geographical areas. We will explore in-depth the gendered, ethnic, cultural, and class dimensions that underlie the patterning of disease and illness worldwide. **Credits:** 3.00

ANTH 34100 - Culture And Personality

Credit Hours: 3.00. A cross-cultural survey stressing different basic personality types and the processes by which adult personality is acquired. Case studies of selected non-Western cultures will be used to provide comparative perspective. **Credits:** 3.00

ANTH 34600 - Pregnancy, Birth, And Babies

Credit Hours: 3.00. This course examines human universal patterns and cross-cultural variation in pregnancy, birth, and infant care practices, using evolutionary and biocultural perspectives. Students will connect course themes to current events and controversies, such as medical models of birth, public breastfeeding, and parent-infant co-sleeping.**Credits:** 3.00

ANTH 35800 - African Cultures

Credit Hours: 3.00. An introduction to the diversity of African cultures emphasizing detailed studies of selected cultural groups. Ethnographic writings about African cultures are assessed in relation to general information about the continent, its people and the colonial experience. **Credits:** 3.00

ANTH 36800 - Sociolinguistic Study Of African American English

Credit Hours: 3.00. A study of the history, structure, uses, and educational concerns of African American speech communities and the culture at large. **Credits:** 3.00

ANTH 37000 - Ethnicity And Culture

Credit Hours: 3.00. Course examines ethnicity and nation as constructs that vary across cultures, history and space, and surveys theories of cultures, ethnicity and nationalism. Issues examined include cultural identities, power, domination and resistance, and the role of identity politics in contemporary conflicts. **Credits:** 3.00

ANTH 37300 - Anthropology Of Religion

Credit Hours: 3.00. Anthropological theories of the origin, development, and functions of religion, ritual, and myth. Data drawn from western and non-western societies, with special emphasis on the relationship of religion to social structure, cultural patterns, and social change. **Credits:** 3.00

ANTH 37600 - Archaeology Of Death

Credit Hours: 3.00. Examination of mortuary behavior using archaeological, ethnographic, ethnohistorical, and biological data. Review of methods of studying variation in mortuary practices. **Credits:** 3.00

ANTH 37700 - Anthropology Of Hunter-Gatherer Societies

Credit Hours: 3.00. Selective global survey of societies whose mode of subsistence is/was based on the collection of wild food resources. Topics to be covered include: the development and current state of theory, ecology, social organization, land use, demography, subsistence rights, and worldview. **Credits:** 3.00

ANTH 37800 - Archaeology And Cultural Anthropology Of Mesoamerica (Mexico, Belize And Guatemala)

Credit Hours: 3.00. Overview of Mesoamerican peoples, cultures, and languages from the earliest periods to the rise of civilizations including Aztec, Maya, and Zapotec, and from the Spanish Conquest to the modern Indian communities of Mexico, Guatemala, and Belize. **Credits:** 3.00

ANTH 37900 - Native American Cultures

Credit Hours: 3.00. General survey of Native cultures of the Americas. Topics to be covered include prehistory, language, religion, aesthetics, culture contact and change, contemporary issues, and social, economic and political organization. **Credits:** 3.00

ANTH 38000 - Using Anthropology In The World

Credit Hours: 3.00. The use of anthropology in practical contexts. What anthropological practice is, how it originated, how it can be applied in non-academic and interdisciplinary contexts and careers. The main contemporary issues surrounding anthropological practice, including training, ethics, relevance, and rigor. For majors and non-majors. **Credits:** 3.00

ANTH 38400 - Designing For People: Anthropological Approaches

Credit Hours: 3.00. This course is about designing for people. You will use anthropological knowledge and skills to better understand human and technology interactions. With students from other fields, you will learn how to apply an anthropological perspective to human centered design and design with the needs of a specific user group in mind. **Credits:** 3.00

ANTH 38500 - Community Engagement In Anthropology

Credit Hours: 3.00. This course offers hands-on service learning experience with local community organizations involved with minority and immigrant populations. Part of the semester will include class meetings to explore issues and experiences of immigrant and ethnic groups in the U.S. **Credits:** 3.00

ANTH 38501 - Topics In Anthropology

Credit Hours: 3.00. An examination of selected topics in the field of anthropology. P: Sophomore or higher class standing required. **Credits:** 3.00

ANTH 39000 - Individual Research In Anthropology

Credit Hours: 1.00 to 3.00. Individual research or reading in an area of anthropology under the guidance of an anthropology faculty member. Permission of instructor required. **Credits:** 1.00 to 3.00

ANTH 39200 - Selected Topics In Anthropology

Credit Hours: 1.00 to 3.00. Various topics in anthropology that may change from semester to semester are presented by anthropology faculty members. **Credits:** 1.00 to 3.00

ANTH 39300 - Interdisciplinary Approaches To Environmental And Sustainability Studies

Credit Hours: 3.00. (ENGL 39300) This course is the lynchpin of the undergraduate Certificate in Environmental and Sustainability Studies. It will present a series of case studies, core concepts, and problem questions that integrate the following three academic approaches: 1) Human Dimensions and Environment/Sustainability, 2) Engineering and Environment/Sustainability, and 3) Environmental/Sustainability Sciences. **Credits:** 3.00

ANTH 40002 - Archaeological Methods And Techniques

Credit Hours: 3.00. Introduction to archaeological methods and techniques both in the field and laboratory. Fundamentals of field and laboratory equipment and technology, artifact recovery and processing, and report preparation. Introduction to preservation laws and regulations, and archaeological ethics and their application to archaeological practice. **Credits:** 3.00

ANTH 40400 - Comparative Social Organization

Credit Hours: 3.00. The course uses a broad cross-cultural comparative perspective to identify and analyze the major forms of human social organization. Emphasis is on kinship terminology, descent, marriage, residence units, economic exchange, political structure, and social inequality. **Credits:** 3.00

ANTH 40500 - Ethnographic Methods

Credit Hours: 3.00. This course introduces students to the basic methods of ethnographic research: the collection, analysis, and presentation of data derived from the systematic, direct observation of human behavior and interviewing of key informants. Students are required to complete a field project. **Credits:** 3.00

ANTH 41001 - Senior Capstone In Anthropology

Credit Hours: 3.00. Culminating experience required for all anthropology majors. Course synthesizes four-field anthropology coursework and training, and discusses academic/career options that benefit from anthropological training. Major element of the course will include synthesis paper and presentation, senior portfolio, and professional development. **Credits:** 3.00

ANTH 41400 - Introduction To Language And Culture

Credit Hours: 3.00. An exploration into the nature of human communication, particularly the structures, functions, and substance of human language. Focus is on the interpenetration of language, culture and cognition, on the evolution of language and speech, and on their uses in everyday life. **Credits:** 3.00

ANTH 41800 - Field Methods In Cultural Anthropology

Credit Hours: 1.00 to 9.00. Introduces basic field methods in Cultural Anthropology. Topics may include ethnographic or other interviewing techniques and methods of inquiry into any of the broad topics covered by Cultural Anthropology. Permission of department required. **Credits:** 1.00 to 9.00

ANTH 42500 - Archaeological Method And Theory

Credit Hours: 3.00. Introduction to the theory and methods of contemporary American archaeology. Basic field and laboratory methods are placed in the context of theoretical viewpoints and problems. Major theoretical issues in the field are explored, showing the integration of American archaeology with anthropology. **Credits:** 3.00

ANTH 42800 - Field Methods In Archaeology

Credit Hours: 1.00 to 9.00. Introduces basic field and laboratory methods in contemporary archaeology: methods of site survey, mapping, and excavation through the excavation of archaeological sites; the basics of archaeological data analysis and classification, and the computer-based analysis of archaeological data. Permission of instructor required.**Credits:** 1.00 to 9.00

ANTH 43600 - Human Evolution

Credit Hours: 3.00. This class examines the fossil evidence for human evolution and theories proposed to explain the development that led from the origin of primates to modern humans. This course will include lectures, exercises with fossil casts, presentation, and discussions. **Credits:** 3.00

ANTH 43800 - Field Methods In Biological Anthropology

Credit Hours: 1.00 to 9.00. Introduces basic laboratory methods in Biological Anthropology. Topics may include analysis of human or primate nutritional and biological markers or laboratory methods in the analysis of human skeletal populations. Permission of department required. **Credits:** 1.00 to 9.00

ANTH 46000 - Contemporary Issues In Agriculture

Credit Hours: 3.00. (AGRY 46000) Evaluates environmental, social, and humanistic implications of technological change in modern agriculture, using a problem-solving perspective. **Credits:** 3.00

ANTH 47000 - Psychological Anthropology

Credit Hours: 3.00. This course is an introduction to psychological anthropology, a field of study focusing on the complex relationship between individual experience, human psychology, and social and cultural variation. Using case studies drawn from a variety of cultures, we will discuss a range of topics, including cognition; motivation; emotion; learning and enculturation; self, identity, and personhood; and mental illness. **Credits:** 3.00

ANTH 48200 - Sexual Diversity In Global Perspectives

Credit Hours: 3.00. This course focuses on anthropological and interdisciplinary research in the study of sexuality with particular attention to lesbian, gay, bisexual and transgender identities. It explores historical, theoretical and ethnographic work on sexualities and genders in the US and globally. **Credits:** 3.00

ANTH 49700 - Senior Honors Seminar

Credit Hours: 3.00. A critical examination of some major works in anthropology and sociology, both classical and modern, and of some current theoretical and substantive issues in these disciplines. Open only to students in the departmental honors program. **Credits:** 3.00

ANTH 49800 - Senior Honors Paper

Credit Hours: 3.00. Requires a substantial paper on a topic approved by the instructor. The student is expected to work closely with the instructor on the paper's content and style. A presentation of the results of the work is made at the end of the semester. Open only to students in the departmental honors program. **Credits:** 3.00

ANTH 50400 - Archaeological Theory

Credit Hours: 3.00. Focuses on the development of archaeological theory, discussing several theoretical positions and genres of archaeological research. Students gain experience in working with theory in their own research and achieve literacy in archaeological theories. **Credits:** 3.00

ANTH 50500 - Culture And Society

Credit Hours: 3.00. Introduces contemporary sociocultural anthropology theory and practices, relating material to anthropology's history and its place in the social sciences. Covers problem formulation, study of cultural change, representation of human cultural diversity, and key case studies. **Credits:** 3.00

ANTH 50600 - The Development Of Modern Anthropology

Credit Hours: 3.00. The ways and kinds of thinking about the human species in pre-nineteenth-century Europe: nineteenth- and twentieth-century developments in Europe and North America; the central scientific paradigms; professional societies and journals; and national/international anthropologies will all be covered. **Credits:** 3.00

ANTH 50700 - History Of Theory In Anthropology

Credit Hours: 3.00. Connects the theoretical foundations of anthropology throughout the development of the discipline and related disciplines. Unpacks the when, how, and why of various theoretical positions, their shaping of research, and their concomitant logics of evidence.**Credits:** 3.00

ANTH 51400 - Anthropological Linguistics

Credit Hours: 3.00. Investigates the varieties of communication in human behavior, while exploring linguistics as a tool in social science research. Also considers origins of human language and speech, and relations of language with other aspects of culture, with societal phenomena and with individual cognition. **Credits:** 3.00

ANTH 51900 - Introduction To Semiotics

Credit Hours: 3.00. (COM 50700, ENGL 57000, LC 57000) The study of languages, literatures, and other systems of human communication. Includes a wide range of phenomena which can be brought together by means of a general theory of signs. The course deals with three fundamental areas: 1) verbal communication, 2) nonverbal communication (iconic systems, gestures, body language, etc.), and 3) communication through art forms. **Credits:** 3.00

ANTH 52300 - GIS For Humanities And Social Science Research

Credit Hours: 3.00. This course will introduce students the skills of spatial thinking, basic functions of Geography Information Systems (GIS), and spatial research methods that are most relevant to humanities and social science. The course will start with an introduction to basic GIS concepts and technology, then move onto GIS applications during the research process, including spatial research design, data acquisition, management, visualization, and spatial analytical techniques. Practical work will be introduced and completed using ESRI ArcGIS Pro software. **Credits:** 3.00

ANTH 53400 - Human Osteology

Credit Hours: 3.00. Anatomy of the human skeleton and dentition. Detailed study of skeletal elements and teeth, morphology, function, disease, and pathology. Identification of human remains with regard to age at death, gender, growth, and development in biocultural context. **Credits:** 3.00

ANTH 53500 - Foundations Of Biological Anthropology

Credit Hours: 3.00. Covers topics in biological anthropology, applying to both living and extinct humans and to non-human primates. Topics include: evolutionary theory; genetics; human variation and the race concept; intersections of biology and culture; fossils and paleoanthropology; ecology and speciation, primate behavior, and theories on the social behavior of early and contemporary humans. **Credits:** 3.00

ANTH 53600 - Primate Ecology

Credit Hours: 3.00. An examination of the complex interrelationships between populations of nonhuman primates and their habitats. Course topics focus on behavioral ecology and conservation including, predator-prey relationships, diet, and interspecific relations. **Credits:** 3.00

ANTH 56300 - Historical Linguistics

Credit Hours: 3.00. (ENGL 56300, LC 56300) A survey of mechanisms and motivations of linguistic change. Topics include: phonological, morphological, semantic and syntactic change, comparative and internal reconstruction, linguistic variation, language contact, and linguistic typology. **Credits:** 3.00

ANTH 56500 - Sociolinguistics

Credit Hours: 3.00. (SLHS 56500, COM 56500, ENGL 56500, LC 56500, LING 56500) An introduction to language in its social context, focusing on uses and users of language. Topics include social class, ethnic group, gender, language attitudes, and bilingualism. **Credits:** 3.00

ANTH 57500 - Economic Anthropology

Credit Hours: 3.00. Investigates economic aspects of nonindustrial societies, including forager, tribal, and peasant social formations. Emphasis on the economics of the domestic sphere and how households are linked to larger structures such as market systems and "world systems." **Credits:** 3.00

ANTH 58900 - Archaeology And Materials Science

Credit Hours: 3.00. This course provides instruction in the methods and theories used by archaeologists and materials scientists to study ancient and historic technology. The course focuses on the analysis and interpretation of archaeological artifacts and provides opportunities for hands-on learning. **Credits:** 3.00

ANTH 59000 - Individual Research Problems

Credit Hours: 1.00 to 3.00. Individual research or reading in an area of anthropology under an anthropology staff member. Does not include thesis work. Permission of instructor required.**Credits:** 1.00 to 3.00

ANTH 59200 - Selected Topics In Anthropology

Credit Hours: 1.00 to 3.00. Topics vary.**Credits:** 1.00 to 3.00

ANTH 60500 - Seminar In Ethnographic Analysis

Credit Hours: 3.00. Focuses on ethnographic research design, methodology, and ethics, discussing the appropriate selection of any method. Students gain experience with the varieties of ethnographic practice across anthropology and sibling sciences, the generation and analysis of data, and the writing up of ethnographic and of other qualitative research. **Credits:** 3.00

ANTH 60600 - Quantitative Research Design

Credit Hours: 3.00. Focuses on quantitative research design, methodology, and ethics, discussing the appropriate selection of any method. Students gain experience in generating and analyzing of quantitative and mixed-method data, and in the writing up and communication of quantitative research, altogether aiming for statistical literacy. **Credits:** 3.00

ANTH 60800 - Proseminar In Graduate Studies In Anthropology

Credit Hours: 2.00. This is an introduction to graduate study in Anthropology at Purdue. Students will be introduced to the research of Purdue Anthropology faculty and how their work fits into the contemporary landscapes of their fields. Students will gain familiarity with tools needed for graduate work in Anthropology at Purdue and be exposed to navigating the world of academic conferences and publishing. Students will have opportunities to engage in discussions on research ethics in our field. Students will engage with visiting speakers and their work as well as participate in learning how to organize academic events. During the semester, students will also be introduced to the resources available at Purdue to support their graduate studies and professional development including funding opportunities, procedures for preparing for research, career planning, supports for teaching, information about the structure of the Anthropology graduate program and supports for work-life balance. Students will receive credit for the course based on participation. Permission of instructor required.**Credits:** 2.00

ANTH 60900 - Seminar In Anthropology

Credit Hours: 2.00 or 3.00. Topics vary. Permission of instructor required. **Credits:** 2.00 or 3.00

ANTH 61100 - Special Topics In Archaeology

Credit Hours: 3.00. Critical examination of a selected aspect of contemporary archaeological research and theory. Topics will vary from year to year. **Credits:** 3.00

ANTH 62000 - Special Topics In Cultural Anthropology

Credit Hours: 3.00. Critical examination of a selected aspect of contemporary cultural anthropology research and theory. Topics will vary from year to year. **Credits:** 3.00

ANTH 62700 - Political Ecology

Credit Hours: 3.00. Political ecology centers on questions described as a research framework that pairs the strengths of political economic analysis with sociocultural and ecological approaches to environmental change. Students will explore the diverse ways of doing political ecology by drawing upon the fields of anthropology, political science, geography, and history as well as interdisciplinary environmental sciences. Students will critically examine the field through a historical exploration of its intellectual genealogy, an investigation of current research trends, and imagining possible future directions. Emphasis will be placed on both theory and methods while analyzing a variety of case studies. Permission of instructor required. **Credits:** 3.00

ANTH 63000 - Academic Professional Development

Credit Hours: 3.00. This seminar focuses on research design, grant writing, publishing, giving presentations, and the academic job market. As there are other seminars offered in the department that focus on the applied aspects of anthropology, this seminar focuses primarily on academic topics. The substance of the course will come from your own work in the form of proposals, teaching, and job market materials as well as your review of fellow classmates' work. **Credits:** 3.00

ANTH 64000 - Foundations And Frameworks: Applying Anthropology

Credit Hours: 3.00. This course focuses on using anthropology to address social issues. The course examines topics including: the history of anthropologists working in applied settings, the relationship between theory and practice, professional ethics, job

opportunities, and skills needed as anthropological practitioners. Students should have some background in anthropology if coming from another discipline e.g. prior coursework or relevant experience as determined by instructor. **Credits:** 3.00

ANTH 64100 - Discovery And Design: Making Projects Work

Credit Hours: 3.00. This course is about using anthropology to make projects work. Students will learn anthropological approaches and methods to discover salient aspects of a design problem and use this understanding to devise responses. Anthropological discovery, design and delivery processes are demonstrated. Students should have some background in anthropology if coming from another discipline e.g. prior coursework or relevant experience as determined by instructor. **Credits:** 3.00

ANTH 64200 - Public Engagement: Using Anthropological Knowledge

Credit Hours: 3.00. This course is about using and communicating anthropological knowledge. We will discuss what it means to work as an anthropologist and public intellectual. Effectively working with stakeholders, presenting information, offering solutions for addressing problems and implementing change are addressed. Students should have some background in anthropology if coming from another discipline e.g. prior coursework or relevant experience as determined by instructor. **Credits:** 3.00

ANTH 67300 - Seminar In The Anthropology Of Religion

Credit Hours: 3.00. Explores anthropological approaches to studying the place of religion in human experience. Considers different theories that anthropologists have developed for understanding religion - symbolic, materialist, evolutionary, psychological, and others - and how they fit with ethnographic data on religion in different cultures. **Credits:** 3.00

ANTH 69600 - Research MS

Credit Hours: 1.00 to 18.00. Research activities related to the MS degree. Possible activities might include, but are not limited to, data collection, individualized reading or project work, participation in group research meetings, proposal and project writing. Activities must be approved by the faculty supervisor. Permission of instructor required. **Credits:** 1.00 to 18.00

ANTH 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

ANTH 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Arabic

ARAB 10100 - Standard Arabic Level I

Credit Hours: 3.00. Introduction to Modern Standard Arabic: the writing and sound systems, and systematic presentation of basic grammatical structures. Reading, writing, and vocabulary building are emphasized throughout. The course also includes an introduction to Arab culture. No previous knowledge of Arabic required. Permission of department required.**Credits:** 3.00

ARAB 10200 - Standard Arabic Level II

Credit Hours: 3.00. Further study of Modern Standard Arabic. Continued presentation of the basic structures of Arabic grammar and expansion of vocabulary. Reading and writing will be emphasized.**Credits:** 3.00

ARAB 11100 - Elementary Standard Arabic Conversation I

Credit Hours: 1.00. Development of oral skills for self-expression. Guided practice in conversation to enhance communicative competence. Group discussions in Standard Arabic on practical topics. **Credits:** 1.00

ARAB 11200 - Elementary Standard Arabic Conversation II

Credit Hours: 1.00. Development of oral skills for self-expression. Guided practice in conversation to enhance communicative competence. Small group discussions in Standard Arabic on practical topics. May be taken concurrently with ARAB 10200. **Credits:** 1.00

ARAB 12100 - Qur'anic Arabic Level I

Credit Hours: 3.00. Introduces students with knowledge of the Arabic alphabet and elementary Arabic word structure to the basic elements of Qur'anic Arabic and provides them with foundational knowledge of classical Arabic lexicon and grammar. Students will gain insights into the organizational structure of different words and short phrases as they explore the nature of Qur'anic Arabic, its diction, morphology and vocabulary that are crucial for understanding the text. In this course, students will also expand their vocabulary as they work through exercises focusing on identifying the importance of rendering sounds for correct reading, recitation and morphology of different words through sample excerpts from short chapters of the Qur'an. Students can take this course for language credit to meet course requirements in all fields that require a language. Permission of instructor required.
Credits: 3.00

ARAB 12200 - Qur'anic Arabic Level II

Credit Hours: 3.00. Continues students' development and mastery of Qur'anic Arabic and expands the foundational knowledge of classical Arabic lexicon and grammar gained in ARAB 121. Students will gain insights into the morphology and syntax of the Arabic of the Qur'an and explore Qur'anic Arabic, its diction, morphology and vocabulary that are crucial for understanding the meaning of the text. In this course, students will also expand their vocabulary as they work through exercises focusing on identifying the importance of rendering sounds for correct reading, recitation and morphology of different words through sample excerpts from short chapters of the Qur'an. Students can take this course for language credit to meet course requirements in all fields that require a language.
Credits: 3.00

ARAB 20100 - Standard Arabic Level III

Credit Hours: 3.00. This course is designed to allow students to use the grammar and vocabulary acquired in the first two semesters in dealing with specific social situations. Continued improvement of conversational, reading, and writing abilities and expansion of vocabulary. **Credits:** 3.00

ARAB 20200 - Standard Arabic Level IV

Credit Hours: 3.00. Increased mastery of the four language skills, with emphasis on reading and translation using materials from literary classical and modern Arabic. The course includes a study of some parts of the Koran. **Credits:** 3.00

ARAB 21100 - Elementary Standard Arabic Conversation II

Credit Hours: 1.00. Continuation of ARAB 11200. May be taken concurrently with ARAB 20100. **Credits:** 1.00

ARAB 21200 - Elementary Standard Arabic Conversation IV

Credit Hours: 1.00. Continuation of ARAB 21100. May be taken concurrently with ARAB 20200. **Credits:** 1.00

ARAB 22400 - Arabic Level IV: Business Arabic

Credit Hours: 3.00. Practical reading, writing, speaking, and listening comprehension skills directed toward use of Arabic for business purposes, including language needed for business negotiations, financial situations, travel, and memo writing. Aspects of cultural and social appropriateness needed in business situations in the Arab world. **Credits:** 3.00

ARAB 23000 - Arabic Literature In Translation

Credit Hours: 3.00. Survey of Arabic literature, from the classical to the postmodern period. Emphasis on connections between literary works and contemporary life. Conducted in English; no knowledge of Arabic required. **Credits:** 3.00

ARAB 23900 - Arab Women Writers

Credit Hours: 3.00. Survey of Arab women writers from North Africa, the Middle East, and Arab communities in the Western world. Emphasis on issues of sexuality, marriage, work, travel and immigration. Conducted in English; no knowledge of Arabic required. **Credits:** 3.00

ARAB 28000 - Arabic Culture

Credit Hours: 3.00. A historical and literary survey of defining characteristics of Arabic culture from pre-Islamic times to the modern period. **Credits:** 3.00

ARAB 28100 - Introduction To Islamic Civilization And Culture

Credit Hours: 3.00. This course is a survey of broad currents in the cultures, thought and civilization of the Muslim world. It emphasizes religious, intellectual and cultural trends, social and political structures and contemporary issues of Muslim societies within the current global cultural world. Taught in English. **Credits:** 3.00

ARAB 30100 - Standard Arabic Level V

Credit Hours: 3.00. Continued development of Arabic speaking, listening, reading, and writing abilities, using materials dealing primarily with the everyday life and civilization of Arabic-speaking countries, from various sources (newspapers, poetry, chapters from the Qu'ran). Conducted primarily in Arabic. **Credits:** 3.00

ARAB 30200 - Standard Arabic Level VI

Credit Hours: 3.00. Further work to develop speaking, listening, reading and composition skills in Standard Arabic, using materials dealing with ideas and events that have shaped the Arabic-speaking culture. Conducted primarily in Arabic. **Credits:** 3.00

ARAB 33000 - The Middle East On Film

Credit Hours: 3.00. This course offers an introduction to films produced in the Middle East and on Middle Eastern Cultures. In this class, we will view films from the Arab world, including North Africa, and the large Middle Eastern region. Parallel to film screening, students will read critical and analytical material that provide background as well as commentary and analysis of cultural and historical contexts on content of films and their making. The course will examine a series of topics such as identity politics, religious affiliation, gender, immigration, belonging, homeland and exile. We will also situate the films within the aesthetic traditions of production and reception and analyze how they provide critical perspectives and insights in central issues in the cultures of Middle Eastern cultures. The overarching goal of the class is to provide students with a solid understanding of the function of cinema and films in representation of the evolution and transformation of the cultures and societies of the region and the issues central to how communal and individual identities in the Middle Eastern region are shaped. The class will also equip the students with skills to analyze meaning making and the role of technical aspects such as cinematography, body language, script, setting and acting in the creation of characters. All films will be screened with English subtitles. **Credits:** 3.00

ARAB 33400 - North African Literature And Culture

Credit Hours: 3.00. A view of the culture and society of the Maghreb (Morocco, Algeria, Tunisia, and Libya). Emphasis on issues of race, politics, religion, and gender through literature and other forms of artistic expression, including film and music. Conducted in English; no knowledge of Arabic required. **Credits:** 3.00

ARAB 49000 - Special Topics In Arabic

Credit Hours: 1.00 to 4.00. Study of a selected topic in Arabic literature or culture. The topic will be announced in advance. Conducted in English; readings in English. Permission of instructor required. **Credits:** 1.00 to 4.00

ARAB 58700 - Modern Arab Thought

Credit Hours: 3.00. Prominent and critical issues in modern Arab thought. Identity, historical meaning, the Arab-Islamic cultural legacy, and tradition vs. modernity are engaged through Arab encounters with the West. Conducted in English; no knowledge of Arabic required. **Credits:** 3.00

Architectural Technology

ARCH 11700 - Construction Drafting And CAD

Credit Hours: 3.00. Introduction to drafting and CAD fundamentals, with emphasis on architectural and civil engineering topics. Development of basic drafting skills, using orthographic projections, auxiliary views, pictorial drawings, and drafting conventions. Students may not receive credit for both ART 116 and ART 117.**Credits:** 3.00

ARCH 12000 - Introduction To Construction Drafting With Building Information Modeling (BIM)

Credit Hours: 3.00. Introduction to drafting fundamentals using Building Information Modeling (BIM), an intelligent 3D model-based process that equips architecture, engineering, and construction professionals with the insight and tools to more efficiently plan, design, construct, and manage buildings and infrastructure. Autodesk Revit will be the software presented.

Credits: 3.00

ARCH 15500 - Residential Construction

Credit Hours: 3.00. Wood frame construction through a semester project requiring planning, preliminary, and working drawings. Outside lab assignments are required.**Credits:** 3.00

ARCH 21000 - History Of Architecture I

Credit Hours: 3.00. Survey of styles and influence of cultures which led to the development of architecture and engineering from the earliest times to the early 20th century.**Credits:** 3.00

ARCH 22200 - Commercial Construction

Credit Hours: 3.00. Preparation of preliminary and working drawings for an intermediate-size commercial or institutional building.**Credits:** 3.00

ARCH 22300 - 3D Architectural Modeling I

Credit Hours: 3.00. This course will study graphic solutions to visualizing interior spaces and environments by utilizing 3D modeling software. Students will learn the fundamentals and advanced toolset in the 3D modeling software Trimble SketchUp while working on a semester long visualization project.**Credits:** 3.00

ARCH 32300 - 3D Architectural Modeling II

Credit Hours: 3.00. This course has been designed to expand the students' knowledge, creativity, and technique when creating 3D digital models and renderings. This class should not be the students' introduction into Autodesk Revit Software, but a course developed to refine modeling and rendering skills. Topics include but are not limited to: understanding the use of architecture, materials, lighting, etc.**Credits:** 3.00

ARCH 32500 - Building Science & Energy

Credit Hours: 3.00. The study and practice of interior lighting with an emphasis on environmentally efficient lighting systems and energy economy. Through the design process and execution of luminaire layouts, students will examine the visual process, lamp and luminaire selection, calculation methods, lighting controls and evaluation of effective solutions.**Credits:** 3.00

INT 30200 - Three-Dimensional Design

Credit Hours: 3.00. This studio class examines the fundamentals of three-dimensional design, detailing and documentation, along with 3D thinking and visualization of design solutions sensitive to functional, ergonomic and aesthetic objectives.**Credits:** 3.00

Art and Design

AD 105EN - Beginning Painting I

Credit Hours: 2.00 or 3.00. Introduction to the techniques of painting. Aspects of pictorial composition; wide range of media. Painting from still life and live model. Will not count toward a Herron B.F.A. degree.**Credits:** 2.00 or 3.00

AD 109EN - Color & Interior Design

Credit Hours: 3.00. Aimed primarily at the person wishing to use color with an understanding of its effects in daily life. Survey of traditional meanings in various cultures. Concept of color as energy. Group and individual experiments included in an investigation of color, with regard to motivation and physical and emotional response factors.**Credits:** 3.00

AD 201EN - Photography I For Non, Art Majors

Credit Hours: 1.00 to 3.00. Introduction to the basics of black, and, white fine art photography for non, art majors only. Students provide their own fully manual 35mm camera. Will not count toward a Herron B.F.A. degree.**Credits:** 1.00 to 3.00

AD 1130N - Beginning Drawing I

Credit Hours: 2.00 or 3.00. Introduction to drawing, exploring a wide range of techniques. Study from nature and still, life objects and sketching from the model.**Credits:** 2.00 or 3.00

AD 10500 - Design I

Credit Hours: 3.00. Two-dimensional design fundamentals: concepts and processes. Studio problems are used to introduce concepts, vocabulary, and skills applicable to continued study in a variety of visual disciplines. Includes introduction to a variety of two-dimensional media and computer applications. **Credits:** 3.00

AD 10600 - Design II

Credit Hours: 3.00. Three-dimensional fundamentals: concepts and processes. Studio problems introduce design concepts, vocabulary, and construction skills applicable to continued study in a variety of visual disciplines. Includes introduction to a variety of 3-D media and 3-D computer graphics concepts. **Credits:** 3.00

AD 11300 - Basic Drawing

Credit Hours: 3.00. An introduction to drawing and sketching as a means of communication of ideas. CTL:IFA 1320 Drawing **Credits:** 3.00

AD 11400 - Drawing II

Credit Hours: 3.00. Continuation of AD 11300; emphasis is given to the exploration of a variety of media, the structuring of pictorial space, and figure drawing. **Credits:** 3.00

AD 11700 - Black And White Photography

Credit Hours: 3.00. An introductory course in silver-based photographic processes and creative image making. Emphasis is on the development of camera and darkroom techniques, and fostering critical thinking skills related to the traditions and aesthetics of black and white photographic practice. **Credits:** 3.00

AD 11900 - Color Photography

Credit Hours: 3.00. Introductory course in creative use of color photographic processes and studio practices. Emphasis is on the acquisition of digital cameras, studio, and digital printing skills which enable students to successfully perceive and structure images reflecting color's formal, symbolic, and emotional impact.**Credits:** 3.00

AD 12500 - Introduction To Interior Design

Credit Hours: 3.00. Introductory survey of interior spaces and their impact upon the physical, social, psychological, and aesthetic needs of people. Critical evaluation of concepts in the interior design profession and related fields will be emphasized. **Credits:** 3.00

AD 13000 - Interior Design Communication

Credit Hours: 3.00. Spatial studies, conceptual ideation, and methods of communicating in various two- and three-dimensional media. **Credits:** 3.00

AD 14600 - Design Drawing I

Credit Hours: 3.00. Problems in the skills and methods of professional design drawing. Emphasis on development of drawing as a conceptual tool and as part of the design process. Concentration on the media and techniques used in contemporary design drawing. **Credits:** 3.00

AD 19000 - Special Topics In Art And Design

Credit Hours: 1.00 to 3.00. Topics will vary. Permission of department required. **Credits:** 1.00 to 3.00

AD 20000 - Beginning Painting

Credit Hours: 3.00. This course is an introduction to painting, emphasizing fundamental painting techniques and materials in conjunction with varied subject matter. Traditional and nontraditional approaches and their art historical meanings will be examined and applied. **Credits:** 3.00

AD 20100 - Art For Elementary School Teachers

Credit Hours: 3.00. Art theory and experiences, curriculum theory, and materials preparatory for instruction of elementary school children. No undergraduate students may be enrolled in this course until they have been admitted to teacher education and a copy of this acceptance is on file. **Credits:** 3.00

AD 20200 - Introduction To Art Education

Credit Hours: 2.00. Lectures, readings, and discussions covering the history, theory, and professional literature of art education. **Credits:** 2.00

AD 20500 - Design III

Credit Hours: 3.00. Problems in two- and three-dimensional design, utilizing a variety of tools, materials, and processes. Study is made of the interaction between designer and society, involving concepts in art, psychology, technology, anthropology, and history. **Credits:** 3.00

AD 20600 - Studio In Visual Communication Design

Credit Hours: 3.00. Investigation of visual communication design theory, history, skills, and methodology, as well as preparation of art and mechanicals for graphic arts reproduction. **Credits:** 3.00

AD 21300 - Life Drawing I

Credit Hours: 3.00. Introduction to drawing the human figure with emphasis upon structure and gesture. **Credits:** 3.00

AD 21500 - Materials And Processes

Credit Hours: 3.00. An introductory course in the selection of materials and processes as relevant to design, with laboratory experiences in the safe and proper use of tools and equipment. Required of students wishing extensive access to A&D tools and equipment. **Credits:** 3.00

AD 22000 - Computers In Art

Credit Hours: 3.00. Introduction to computer graphics concepts and the electronic image as a fine art form. Emphasis is placed on personal expression, using the computer as a two-dimensional art tool. **Credits:** 3.00

AD 22600 - History Of Art To 1400

Credit Hours: 3.00. Review of painting, sculpture, and architecture from their beginnings to the end of the Middle Ages. CTL:IFA 1311 Art History I **Credits:** 3.00

AD 22700 - History Of Art Since 1400

Credit Hours: 3.00. Review of painting, sculpture, and architecture from 1400 to present. CTL:IFA 1312 Art History II **Credits:** 3.00

AD 22800 - Visual Communication Design Computing I

Credit Hours: 3.00. An introductory course in visual design computing programs used in the study and production of visual communication design.**Credits:** 3.00

AD 22900 - Visual Communication Design Computing II

Credit Hours: 3.00. An intermediate course in visual design computing programs used in the study and production of visual communication design.**Credits:** 3.00

AD 22901 - Visual Communication Design Sophomore Review

Credit Hours: 0.00. Sophomore Review is a qualifying assessment supervised by faculty members to monitor student learning and progress. Students who do not pass the review will be ineligible for Visual Communication Design upper-level studio courses. Permission from department required. **Credits:** 0.00

AD 23000 - Interior Design I

Credit Hours: 3.00. Study of behavior patterns, perceptions, needs, and usage of three-dimensional space through conceptual solutions to human environments. Interior design theory and application of design process through analysis, research, and synthesis will be explored. **Credits:** 3.00

AD 23300 - Electronic Media Studio

Credit Hours: 3.00. Introductory class to artistic practices on the computer. Students will work with digital still images, sounds, stop-frame animation and HTML-based websites and learn how to connect simple sensors to the computer to control digital images and sounds interactively. **Credits:** 3.00

AD 23400 - Art And Design Internship Preparation

Credit Hours: 1.00. Introduction and preparation for Art & Design Internship experience. Students will develop a resume, cover letter, and other resources in their search for a suitable internship placement. **Credits:** 1.00

AD 23500 - Materials And Processes II

Credit Hours: 3.00. Problems in three-dimensional design, incorporating materials, production processes, and applications of current technology, emphasizing aspects of society and technology. An introduction to complete industrial design problems, including problem definition, concepts, resource information, design development, final proposals, and presentation techniques. **Credits:** 3.00

AD 23600 - Lighting Fundamentals For Photography

Credit Hours: 3.00. Introductory course in understanding electronic strobe lighting. Begins with a review of basic lighting principles and a series of problem-solving assignments, which introduce control, and applications of electronic strobe lighting. Still life photography and portraiture are emphasized and covers on-location lighting. **Credits:** 3.00

AD 24000 - Interior Drafting And Drawing

Credit Hours: 3.00. Basic drafting and drawing techniques used in residential and small commercial buildings. Emphasis on interior projects, on multi-view drawing, isometrics, perspective, and architectural construction drawings, and rendering techniques. **Credits:** 3.00

AD 24200 - Ceramics I

Credit Hours: 3.00. An introduction to ceramic materials and processes used in creating wheelthrown and hand-formed pottery and sculpture. Emphasis on contemporary interpretations of traditional forms. Freshman and Sophomore students have priority. **Credits:** 3.00

AD 24600 - Design Drawing II

Credit Hours: 3.00. Continuation of the work done in A&D 245. Emphasis on development of skills and presentation quality design drawing. **Credits:** 3.00

AD 25000 - Interior Design II

Credit Hours: 3.00. Introduction to space planning methodology applied to small-scale residential and nonresidential environments. Human factors and user requirements, physical and psychological, will be emphasized. Interior materials, components, and special environmental concerns will be explored. **Credits:** 3.00

AD 25001 - Interior Design Sophomore Review

Credit Hours: 0.00. Sophomore Review is a qualifying assessment supervised by faculty members to monitor student learning and progress. Students who do not pass the review will be ineligible for Interior Design upper-level studio courses. Permission from department required. **Credits:** 0.00

AD 25100 - History Of Photography I

Credit Hours: 3.00. An introduction of the history of photography from the medium's inception until 1950. Emphasis is placed on understanding photographs from a variety of aesthetic, social, and cultural perspectives, including those of race, class, and gender. **Credits:** 3.00

AD 25500 - Art Appreciation

Credit Hours: 3.00. Understanding and appreciation of the problems overcome by mankind in the origins and growth of art. **Credits:** 3.00

AD 25600 - Presentation Techniques

Credit Hours: 3.00. Studio preparing students for project presentations. Classes will cover graphic techniques, including page layout, typography, portfolio formats, perspective drawings, photography, and verbal communication. **Credits:** 3.00

AD 25601 - Industrial Design Sophomore Review

Credit Hours: 0.00. This course is a qualifying assessment supervised by faculty members to monitor student learning and progress. Students who do not pass the review will be ineligible for Industrial Design upper-level studio courses. Permission from department required. **Credits:** 0.00

AD 26200 - Jewelry And Metalwork I

Credit Hours: 3.00. An introduction to the design and execution of hand-wrought jewelry and metalwork. **Credits:** 3.00

AD 26500 - Relief Printmaking

Credit Hours: 3.00. An introduction to the techniques of woodcut, linocut, collagraph, and related media. Emphasis on fine art conceptual issues, creativity, matting and framing art, and professional practices. **Credits:** 3.00

AD 26600 - Silkscreen Printmaking

Credit Hours: 3.00. An introduction to the techniques of silkscreen printmaking on paper, including the uses of handmade and light-sensitive stencils. Emphasis on fine art conceptual issues, creativity, matting, and framing art, and professional practices. **Credits:** 3.00

AD 26700 - Digital Imaging

Credit Hours: 3.00. An introductory course in the creative generation and digital enhancement of photo-related imagery. Emphasis is on the development of technical and critical thinking skills, as well as fostering an awareness of pertinent theoretical issues in digital age.**Credits:** 3.00

AD 27000 - Constructed Textiles

Credit Hours: 3.00. A beginning class in non-loom constructed textile techniques such as macram and card-weaving. Emphasis on three-dimensional design in fiber using historical textile structures as the basis for contemporary interpretations. **Credits:** 3.00

AD 27100 - Dyed Textiles

Credit Hours: 3.00. Beginning course in non-screen fabric dyeing techniques such as tie-dye and batik. Survey of historical surface design for contemporary interpretations in both two and three dimensions. **Credits:** 3.00

AD 27500 - Beginning Sculpture

Credit Hours: 3.00. An introductory course in sculpture, exploring basic concepts, techniques, and materials. Problems in class will emphasize individual student's aesthetic understanding of techniques and inventive use of materials. **Credits:** 3.00

AD 28000 - Human Behavior And Designed Environment

Credit Hours: 3.00. This foundation course examines issues pertaining to the environment's effects on human behavior and how humans' physiological, informational, and social needs impact the design of interior spaces. Specific topics explored include: personal and social use of space, proxemics, ergonomics, anthropometrics, cultural factors and universal design. **Credits:** 3.00

AD 28500 - Interior Components And Materials

Credit Hours: 3.00. Study of surface materials and subsystems and their application to architectural interior spaces. Emphasis on specification guidelines, including product performance, building codes, fire, safety, and health regulations. **Credits:** 3.00

AD 29000 - Special Topics In Art And Design

Credit Hours: 1.00 to 3.00. Topics will vary. Permission of department required. **Credits:** 1.00 to 3.00

AD 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in art and design. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AD 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in art and design. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AD 30000 - Life Drawing II

Credit Hours: 3.00. Emphasis is given to organizing the figure in pictorial space. **Credits:** 3.00

AD 30200 - Theory And Practice Of Elementary School Art

Credit Hours: 3.00. Theory and practice of art education for elementary school from early childhood through middle childhood. Restricted to art education majors. **Credits:** 3.00

AD 30300 - Art in Middle/Junior High Schools

Credit Hours: 3.00. Theory and practice of art education for early adolescent students in the middle/junior high school. **Credits:** 3.00

AD 30400 - Video Art

Credit Hours: 3.00. Introduction to digital video as a creative medium for artistic expression. Students will record, digitize, edit and distribute digital video content and author a digital portfolio of their work in the form of an interactive DVD. Permission of department required. **Credits:** 3.00

AD 30500 - Industrial Design I

Credit Hours: 3.00. Introduction to design principles in processes employing basic problem-solving techniques. Emphasis will be placed on man's interaction with form, thought processes, procedures, craftsmanship, and use of materials. Acceptance into professional industrial design concentration by successful performance in the mandatory portfolio review. Prerequisites: Passing mandatory portfolio review.**Credits:** 3.00

AD 30600 - Industrial Design II

Credit Hours: 3.00. An analysis of design through organic and aesthetic principles, natural solutions, and man-made systems. Skills and techniques for communication of creative design solutions. Rapid visualization, rendering, model making, and working models will be stressed. **Credits:** 3.00

AD 30701 - History Of Contemporary Photography

Credit Hours: 3.00. This course examines evolution of major themes in contemporary photography (Digital era to Present) from a variety of aesthetic, social, and cultural perspectives, fostering an awareness of pertinent theoretical issues. **Credits:** 3.00

AD 31100 - Ancient Greek Art

Credit Hours: 3.00. The great variety of Greek art, which helped lay the foundation of Western artistic tradition, is presented in several different media and over a period of several centuries. The social context and cultural context of Greek art, especially its humanistic values, is emphasized. Offered every two years. **Credits:** 3.00

AD 31200 - Ancient Roman Art

Credit Hours: 3.00. The history of Roman art in several different media is studied, from its origins to the end of the Empire, stressing the social and historical content of this art and its legacy to the modern world. Architecture, sculpture, painting and mosaics are emphasized along with small-scale arts such as jewelry, ceramics, and glass. Offered every two years. **Credits:** 3.00

AD 31400 - Experimental Drawing

Credit Hours: 3.00. Individual development of students' drawing abilities and skills at intermediate and advanced levels, emphasizing drawing as primary means of expression, experimentation with materials, and exposure to many different modes of creating in the area of drawing. **Credits:** 3.00

AD 31500 - Design Methodology

Credit Hours: 3.00. This course will cover the fundamental concepts of design methodology. Studies in various problem-solving and research methods as they apply to the designer and society.**Credits:** 3.00

AD 31600 - Seminar On Ideas In Industrial Design I: Design And Society

Credit Hours: 3.00. A study of design and the designer and the factors in society that affect his or her work. **Credits:** 3.00

AD 31800 - Fundamentals Of Interactive Multimedia Design

Credit Hours: 3.00. Fundamental issues of interactive multimedia design: Animation, interface design, and experience design from a visual communications perspective.**Credits:** 3.00

AD 31900 - Web Design For Visual Communication

Credit Hours: 3.00. Introduction to web-based design from a visual communication design application. **Credits:** 3.00

AD 32600 - Physical Computing

Credit Hours: 3.00. Introduction to electronics and computer vision for artists. Students learn to create expressive audiovisual systems that can respond to events in the physical world (movement, light/temperature change, sound, touch, etc.) through custom interfaces. **Credits:** 3.00

AD 33000 - Interior Design III

Credit Hours: 3.00. Study of advanced space-planning criteria and selection of furnishings, equipment, materials, and finishes. Design considerations for special populations (e.g., disabled, aged, low-income) will be explored. Must pass mandatory portfolio review. Prerequisites: Passing mandatory portfolio review.**Credits:** 3.00

AD 33100 - Digital Video Production And Aesthetics

Credit Hours: 3.00. This course is a basic studio introduction to video production and how video can be used as an artistic medium in conjunction with the students' photography. Topics include video/film formats, lighting, audio, editing, distribution, experimental, commercial and music video, production paperwork and extensive time spent on mastering the camera. Classes will consist of hands-on demonstrations, and critiques. **Credits:** 3.00

AD 33200 - Visual Communication Design I

Credit Hours: 3.00. A course designed to introduce the student to projects that will develop an understanding of basic problem-solving techniques in the areas of publication and promotional graphics. Acceptance into professional VCD sequence via mandatory portfolio review.**Credits:** 3.00

AD 33300 - Photo Silk Screen

Credit Hours: 3.00. Advanced study of the techniques of photo silkscreen and light-sensitive stencils. Emphasis on fine art conceptual issues, creativity, matting and framing art, and professional practices. **Credits:** 3.00

AD 33400 - New Media Culture

Credit Hours: 3.00. This lecture course provides a historical overview of the development of new media art. In their research, project papers, and practical assignments, students explore issues of media criticism, technology's impact on culture and society and visions of media utopias. **Credits:** 3.00

AD 33700 - Commercial And Professional Practice In Photography

Credit Hours: 3.00. This course introduces students the skills necessary to attain entry-level employment in the photographic field and familiarizes students with the vocabulary, procedures, and working realities specific to occupations in the field of photography in the areas of photo-journalism, magazine illustration, advertising/web design, and fine arts. Permission of department required. **Credits:** 3.00

AD 33800 - Advanced Interior Design Communication

Credit Hours: 3.00. Study of graphic design fundamentals and application of interior design visual presentation. To provide a foundation for developing proficiency in the use visual communication design in interior design presentation. Offered 3rd year in the Interior Design BFA program of study.**Credits:** 3.00

AD 33900 - Women Artists In The 20th Century

Credit Hours: 3.00. A critical overview of the lives, works, and experiences of women artists from the late 19th century to the present, examining the social and cultural challenges they faced, and reflecting on the changing roles women have played in art and society. **Credits:** 3.00

AD 34000 - Furniture Development

Credit Hours: 3.00. This course is an introduction to furniture design. The focus of this course is information relevant to furniture design including: basic ergonomics, structural techniques and materials and processes. Additional pertinent information regarding new and ongoing design trends will be explored. A mid-semester field trip to a major furniture manufacturer and/or design studio is offered. Students will design and build two of the following objects: a small freestanding shelving unit, small table, bench, table top object or stool. Students must pass mandatory portfolio review for this course. **Credits:** 3.00

AD 34200 - Ceramics II

Credit Hours: 3.00. A continuation of AD 24200; according to student needs in creating ceramic forms, a variety of in-depth experiences: experimental kiln building and firing techniques, methods of ceramic construction, surface treatment, and clay and glaze formulation. **Credits:** 3.00

AD 34300 - Northern Renaissance Art

Credit Hours: 3.00. The development of a mature North European art originating in the International Gothic tradition and culminating in the works of Albrecht Durer, Jerome Bosch, and Pieter Bruegel, the Elder. **Credits:** 3.00

AD 34400 - Latin American Art In The 20th Century

Credit Hours: 3.00. This course offers a critical yet comprehensive overview of modern and contemporary art from Latin America. It focuses on major artists, whose works and contributions are considered in both their specific socio-cultural context and in a larger art historical perspective. **Credits:** 3.00

AD 34600 - Italian Renaissance Art

Credit Hours: 3.00. A study of the painting, sculpture and architecture of Italy between 1300 and 1545 AD, including artists such as Leonardo da Vinci, Raphael and Michelangelo. The course will also relate these works of art to the culture, religion, politics, economics and social life of the period. **Credits:** 3.00

AD 34700 - Lighting For Interior Environments

Credit Hours: 3.00. The study of illuminating principles, design criteria, specifications and environmental systems applied to architectural interiors in public and private spaces. Permission of department required.**Credits:** 3.00

AD 34800 - History Of Islamic Art

Credit Hours: 3.00. Islamic art, one of the world's richest artistic traditions, is surveyed from its origins in the 7th century AD to the modern day. All types of artistic media, from large to small-scale, are included and seen against the background of the Islamic religion and history. Offered on a two-year rotation. **Credits:** 3.00

AD 35000 - Interior Design IV

Credit Hours: 3.00. Study of large-scale public and social spaces, emphasizing interior systems and components. Application of design for historic preservation, renovation, or adaptive reuse will be considered. **Credits:** 3.00

AD 35900 - Medieval European Art

Credit Hours: 3.00. A comprehensive study of the varied art forms in Western Europe from the decline of the Roman Empire until the beginnings of the Italian Renaissance: 500 A.D. to 1500 A.D. **Credits:** 3.00

AD 36101 - The Constructed Image

Credit Hours: 3.00. An intermediate level course focusing on the production of creative images constructed in the studio and in the field. Projects will address the planning and design of photographic images through the use of set design, styling, and post-production. Students will investigate both historical and contemporary trends in the art of the photographically-constructed image.**Credits:** 3.00

AD 36200 - Jewelry And Metalwork

Credit Hours: 3.00. Lost wax casting and mold making, mechanisms and stone setting for jewelry and metalwork. **Credits:** 3.00

AD 36300 - Documentary Photography

Credit Hours: 3.00. This course is an introduction to the great tradition of documentary photography. Students learn to see the world around them in a new way and produce a documentary project. The course requires reading and writing about photography, as well as making photography on a regular basis. The class emphasis is on thinking about why people photograph, what photographs do and do not mean to us, and on doing documentary work, on telling stories with photographs. **Credits:** 3.00

AD 36500 - Intermediate Painting

Credit Hours: 3.00. A studio course concentrating on the development of conceptual and technical skills of painting. This course is designed to help individual students gain a greater awareness of their personal creative goals and to foster means of expression. **Credits:** 3.00

AD 36600 - Visual Communication Design II

Credit Hours: 3.00. Field trips may be required. The study of corporate graphics and visual identity programs. **Credits:** 3.00

AD 36800 - Etching And Intaglio Printmaking

Credit Hours: 3.00. An introduction to the techniques of etching, engraving, aquatint, drypoint, collagraph, monoprint, and related processes. Emphasis on fine art conceptual issues, creativity, matting and framing art, and professional practices. **Credits:** 3.00

AD 36900 - Lithographic Printmaking

Credit Hours: 3.00. An introduction to the techniques of stone and plate lithography. Emphasis on fine art conceptual issues, creativity, matting and framing art, and professional practices. **Credits:** 3.00

AD 37000 - Woven Textiles

Credit Hours: 3.00. A beginning course in loom-woven textiles and pattern drafting. Emphasis on two- and three-dimensional design in fiber, using historical textile structures as the basis for contemporary interpretations.**Credits:** 3.00

AD 38000 - Baroque Art

Credit Hours: 3.00. A survey of European art and architecture during the 17th century, focused on Italy and the Netherlands, and emphasizing some of their leading painters. Works of art are seen in a broad social and cultural context, including the Counter-Reformation and the rise of capitalism. **Credits:** 3.00

AD 38100 - Alternative Photographic Processes

Credit Hours: 3.00. This course is designed to explore methods and concepts for creating photographs using alternative and historic processes. Through technical workshops and assigned projects students will become well-versed in medium and large format film cameras, as well as various 19th century processes.**Credits:** 3.00

AD 38200 - A Global History Of Modern Art

Credit Hours: 3.00. A study of artistic circulations and cultural exchanges between Europe, Asia, Africa, and the Middle East since the 18th century, designed to examine the history of modern art in a global and critical way. **Credits:** 3.00

AD 38300 - Modern Art

Credit Hours: 3.00. A comprehensive overview of Modern art from Impressionism to Surrealism, designed to help students understand the radical transformations art and society underwent in that period, and reflect upon the influence of new technologies, scientific discoveries, and world events on artistic creation. **Credits:** 3.00

AD 38400 - Contemporary Art

Credit Hours: 3.00. A comprehensive overview of the visual arts from the 1940's to the present, designed to help students understand the cultural, social, and historical dynamics that influence artistic creation, and reflect upon the artists' role in contemporary societies. **Credits:** 3.00

AD 38500 - History Of Interior Design

Credit Hours: 3.00. A survey of the historical changes in interior design and architecture from the 18th century to the present in their social, cultural, and political contexts. The course situates the history of interior design within broader debates about the social uses of space and the cultural significance of architecture and interiors. **Credits:** 3.00

AD 39100 - History Of Chinese Art

Credit Hours: 3.00. A historical survey of the visual arts and architecture of China from antiquity to the present. Emphasis will be placed on the relation of a broad range of art forms to their social and cultural contexts. **Credits:** 3.00

AD 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in art and design. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AD 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in art and design. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AD 39500 - History Of Design

Credit Hours: 3.00. A survey of the historical development of design from the industrial revolution to the present that examines the influence of new technologies, materials, and style on design practice as well as the role of design in shaping the technologies and things of everyday life. Throughout the course, students will analyze design within the broader social, cultural, and political context of production, consumption, and use. **Credits:** 3.00

AD 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in art and design. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

AD 39600 - Art Museum Practices

Credit Hours: 3.00. This course examines art museums as cultural institutions with varied collections, serving an important social role. Museum administration and operation are discussed, as are exhibition preparation and museum architecture; a few field trips are required. Museum careers also are explored. **Credits:** 3.00

AD 39700 - Sustainability In The Built Environment

Credit Hours: 3.00. The study of philosophical concepts, principles, and theories of sustainability as they pertain to building methods, materials, systems, and occupants. To provide a foundation for evaluation of materials, processes, and applications of design components for environmentally responsible. Field trips will be required. **Credits:** 3.00

AD 40000 - Advanced Painting

Credit Hours: 3.00. A studio course concentrating on the development of an advanced body of work built upon the conceptual and technical skills of painting. This course is designed to help individual students gain a greater awareness of their personal creative goals and to foster means of expression. **Credits:** 3.00

AD 40200 - Art In Secondary School

Credit Hours: 3.00. Theory and practice of art education for adolescent and young adult students in the secondary school. Required prior to professional semester. **Credits:** 3.00

AD 40400 - Moldmaking And/Or Wheel-Throwing Production Techniques In Ceramics

Credit Hours: 3.00 to 6.00. This course will teach mold-making or wheel-throwing (depending on the individual student's interest) with a view to creating ceramic objects suitable for commercial mass-production. Both tableware and/or sculptural objects will be explored. For the wheel-throwing option the students must have at least one year of high school throwing or AD 24200 with a grade of at least "B" or permission of instructor. For the mold making and casting option only, students must be an Art and Design student or have permission of instructor. **Credits:** 3.00 to 6.00

AD 40500 - Industrial Design III

Credit Hours: 3.00. Design projects emphasizing sophisticated problem-solving methods. Design projects will stress diversity of industrial design and will trace the development of products from initial concept, research, and development through production. **Credits:** 3.00

AD 40600 - Industrial Design IV

Credit Hours: 3.00. Design of products in their relation to economic, physiological, psychological, and behavioral patterns of the consumer. Emphasis upon total thought processes to allow environmental considerations as well as technological realities. **Credits:** 3.00

AD 41500 - Professional Techniques

Credit Hours: 3.00. Research development for product design, with emphasis on socioeconomic concerns and documentation techniques. Portfolio refinement, including verbal, written, and other visual documentation and presentation skills in various media, such as drawing. Photography and computer-generated graphics will be stressed. **Credits:** 3.00

AD 41600 - Seminar On Ideas In Industrial Design II: Design And Creative Problem Solving Methods

Credit Hours: 3.00. A study of creative problem solving methods as used by the designer in his or her work. **Credits:** 3.00

AD 41700 - Variable Topics In Electronic And Time-Based Art

Credit Hours: 3.00. Examination of thematic or specialized topics reflecting the most recent developments and contemporary artistic practices in Electronic and Time-Based Art. Permission of department required. **Credits:** 3.00

AD 42100 - Advanced Studies In Photography And Related Media I

Credit Hours: 3.00. The first of two advanced level courses in photography/related media focusing on production of a formally and conceptually coherent body of work. Course emphasizes development of studio and critical thinking skills, and initiates investigation of the creative process. **Credits:** 3.00

AD 43000 - Interior Design V

Credit Hours: 3.00. Design of multi-use complex environments, emphasizing program and problem solving, facility planning, building systems, and materials technology. Application of alternative presentation technologies will be explored. **Credits:** 3.00

AD 43100 - Visual Communication Design III

Credit Hours: 3.00. The advanced study of communication concepts of poster and poster application in current media. **Credits:** 3.00

AD 43200 - Visual Communication Design IV

Credit Hours: 3.00. The study of product identity, packaging, and branding. **Credits:** 3.00

AD 43400 - Professional Practice For Visual Communication Designers

Credit Hours: 2.00. Specific professional practice topics for the visual communication designer. Topics include contracts, professional associations, ethics, portfolio and resume preparation, self-promotion and exhibition of creative work, the job market and the future of the profession. Field trips may be required. **Credits:** 2.00

AD 44000 - Interior Detailing And Construction

Credit Hours: 3.00. The process of designing, detailing, specifying, and constructing interior environments. Emphasis on teams, building systems, architectural drawing, and building codes. **Credits:** 3.00

AD 44200 - Ceramics III

Credit Hours: 3.00. A continuation of AD 34200; according to student needs in creating ceramic forms, a variety of in-depth experiences: experimental kiln building and firing techniques, methods of ceramic construction, surface treatment, and clay and glaze formulation. **Credits:** 3.00

AD 45400 - Modern Architecture

Credit Hours: 3.00. A study of nineteenth- and twentieth-century architecture. **Credits:** 3.00

AD 46200 - Metalsmithing

Credit Hours: 3.00. Metal forming and metalsmithing processes for small metal objects and jewelry. **Credits:** 3.00

AD 46500 - Professional Practice

Credit Hours: 3.00. The study of professional office and business procedures for the practice of interior design. Includes project administration, contracts, forms, and documents as used in the marketplace. **Credits:** 3.00

AD 46800 - Printmaking III

Credit Hours: 3.00. Study of the techniques of photo plate lithography and photo etching, with continued advanced studies in lithography and etching/intaglio. Emphasis on color printmaking, fine art conceptual issues, creativity, matting and framing art, and professional practices. **Credits:** 3.00

AD 47000 - Advanced Studies In Textiles

Credit Hours: 3.00. A textile seminar and studio course in advanced textile design, with the purpose of developing a personal direction and competence in textiles as fiber art. **Credits:** 3.00

AD 47800 - Internship In Art And Design

Credit Hours: 1.00 to 8.00. Intensive exposure to professional experience through supervised internship in art-and-design-related firms, departments, or studios. Consent to enroll, amount of credit, placement, and evaluation to be approved and coordinated by department. Permission of instructor required. **Credits:** 1.00 to 8.00

AD 49000 - Special Problems In Art And Design

Credit Hours: 1.00 to 6.00. Individual problems in art and design. Permission of instructor required. **Credits:** 1.00 to 6.00

AD 49100 - Special Topics In Art

Credit Hours: 1.00 to 4.00. Topics will vary. **Credits:** 1.00 to 4.00

AD 49900 - Studio Arts Professional Practice/Senior Exhibition

Credit Hours: 3.00. Study of professional practice in the contemporary art world: ethics, gallery, exhibition, studio practice, writing, visual documentation, and business of art. Seniors meet throughout spring semester to organize, install, and de-install Fine Arts Senior Exhibition. **Credits:** 3.00

AD 50200 - Curriculum Studies In Art Education

Credit Hours: 3.00. (EDCI 52000) Study of selected theories of curriculum conception as they apply to constructing arts education curricula in the schools. Permission of instructor required. **Credits:** 3.00

AD 50400 - Philosophical Studies In Art Education

Credit Hours: 3.00. (EDCI 52100) To introduce students to philosophy as a mode of disciplined inquiry in art education. Students will critically examine the literature of art education and identify problems requiring philosophical resolution. Permission of instructor required. **Credits:** 3.00

AD 51200 - Interaction Design Studies

Credit Hours: 3.00. This course examines concepts and methods for interaction design (IXD). It emphasizes a human-centered perspective and explores fundamental components involved in IXD research. Students will explore a wide range of literature and implement IXD theories in multi-disciplinary collaborative projects. **Credits:** 3.00

AD 52000 - Student Visual Design Service

Credit Hours: 3.00. The course will simulate the operation of a professional design studio affording the opportunity for hands-on experience in the development of a total graphic product from concept to finish and will include contact with clients, typesetters, and printers. Permission of instructor required. **Credits:** 3.00

AD 52200 - Interaction Design Evaluation

Credit Hours: 3.00. This course builds a foundation for interaction designers to conduct evaluation research. Students start from analyzing evaluation cases on interactive designs and systems to employing evaluation in design projects using quantitative, qualitative, or mixed methods of inquiry. **Credits:** 3.00

AD 53200 - Cognition In Design

Credit Hours: 3.00. This course focuses on understanding cognitive issues and theories in design. Students are exposed to different cognitive models and phases while they are designing interactive systems. They will develop the cognitive perspective, analyze user experience, and develop an interaction design. **Credits:** 3.00

AD 53500 - Furniture Design

Credit Hours: 3.00. Examination of furniture design trends and designers. Explore materials and manufacturing processes. Design and build a full-size seating unit. Shop skills required. Permission of instructor required. **Credits:** 3.00

AD 54200 - Information Visualization Design

Credit Hours: 3.00. This course starts from exploring visual perception and attention theories, studying modern visualization technologies and toolkits, and reviewing evolving visualization research. Students work on small exercises, and then accomplish complicated virtual and physical visualization projects for information representation and communication. **Credits:** 3.00

AD 55000 - Research Methods In Art And Design

Credit Hours: 3.00. An intensive course in research methods to assist students in developing a topic for directed study. Introduction to various research tools; exercises exploring issues of style, content, and organization; research methods and how they pertain to art and design. Permission of department required. **Credits:** 3.00

AD 55800 - Directed Project Research In Studio Arts

Credit Hours: 1.00 to 3.00. Initial M.F.A. project research and production in studio arts. Permission of instructor required. **Credits:** 1.00 to 3.00

AD 56800 - Directed Project Research In Design

Credit Hours: 1.00 to 3.00. Initial M.F.A. project research and production in design. Permission of instructor required. **Credits:** 1.00 to 3.00

AD 59000 - Special Art Problems

Credit Hours: 1.00 to 6.00. Individual problems in art history, appreciation, design, crafts, drawing, and painting. Credit dependent upon amount of work done. Permission of instructor required. **Credits:** 1.00 to 6.00

AD 59100 - Practicum For Art And Design Teaching Assistants

Credit Hours: 0.00. Seminar to train new Art and Design teaching assistants in the content, policies, and format of the courses they support in various roles, such as: primary instructor, primary studio technician, primary grader for the course, or primary student teacher supervisor. Topics include problem/project presentation, critique techniques, grading, and knowledge of materials and processes of the discipline. Subsequent semesters focus on improving and refining teaching and operational skills. Open only to Art and Design teaching assistants each semester they teach. Permission of instructor required. **Credits:** 0.00

AD 59200 - Graduate Seminar In Art Or Design History

Credit Hours: 3.00. This is a graduate seminar that focuses on a particular theme, period, or movement in the history of art or design. Permission from department required.**Credits:** 3.00

AD 60000 - Painting

Credit Hours: 3.00 to 6.00. Painting. Permission of department required. **Credits:** 3.00 to 6.00

AD 60300 - Theory In Art Seminar

Credit Hours: 3.00. Study of critical issues in modern and postmodern art and relevant methodologies: formalism, iconography, biography and autobiography. Marxism (cultural studies), semiotics, and psychoanalyses. Elements of contemporary professional art practice discussed, including writing of artists' and designers' statements, biographies, and resumes. Prerequisite: Admission to the M.F.A. program in Art and Design. Permission of department required. **Credits:** 3.00

AD 60500 - Problems In Industrial Design

Credit Hours: 3.00. Problems in product innovation, product design, product development, and environmental design. Emphasis is placed on the development of working prototypes. **Credits:** 3.00

AD 60600 - Problems In Visual Design

Credit Hours: 3.00. Problems relating to printing and digital technology, motion design, computer graphics, perception, and the development of visual communication prototypes. **Credits:** 3.00

AD 60700 - Graduate Seminar In Photography And Related Media

Credit Hours: 3.00 to 6.00. Study and discussion of the aesthetics, theory, and criticism of photography and related media. Applications include historical and contemporary research and/or the development and critical analysis of a body of work. Prerequisite: Admission to the M.F.A. program in Art and Design. Permission of department required. **Credits:** 3.00 to 6.00

AD 60800 - Advanced Typography

Credit Hours: 3.00. Explores the communicative and structural aspects of traditional and non-traditional typography, its current and past practitioners, and its evolving role in society. Independent research and group projects will supplement lectures, assigned readings, and field trips. Permission of department required. **Credits:** 3.00

AD 60900 - Information Design

Credit Hours: 3.00. This course aims to teach specific principles and methods pertaining to information design, an emerging discipline within visual communications design (graphic design) involving the selection, organization and presentation of information to a given audience, covering a wide and varied group of delivery mediums. Prerequisite: Admission to the M.F.A. program in Art and Design. Permission of department required. **Credits:** 3.00

AD 61000 - Advanced Poster Design

Credit Hours: 3.00. Specific principles and methods pertaining to poster design. Explores the historical and social implications of poster design. Practical and theoretical exercise will aid students in creative thinking and concept generation. Prerequisite: Admission to the M.F.A. program in Art and Design. Permission of department required. **Credits:** 3.00

AD 61100 - Advanced Web Design For Visual Communication Design

Credit Hours: 3.00. Explores experimental interface design issues and surveys emerging and advanced theories of interface design for the Web. Application of motion graphics design principles and design experimentation is part of the curriculum. Prerequisite: Admission to the M.F.A. program in Art and Design. Permission of department required. **Credits:** 3.00

AD 61200 - Color Aesthetic And Research

Credit Hours: 3.00. Explores color aesthetic based on the works of color masters (e.g., Albers, Itten, Chevreul, Birren, Munsell, and Ostwald) and contemporary color research issues applied to art and design. Color research methodology will be addressed. **Credits:** 3.00

AD 61300 - Drawing

Credit Hours: 3.00 to 6.00. Drawing. Permission of department required. **Credits:** 3.00 to 6.00

AD 61400 - Graduate Installation And Critique

Credit Hours: 3.00. A seminar for all graduate students in the studio arts incorporating the process of installation art to facilitate the exchange of ideas and professional criticism. **Credits:** 3.00

AD 61500 - Social Issues In Industrial Design

Credit Hours: 3.00. A study of mass-production materials and processes used by designers. Students will focus on the limitations and benefits of various manufacturing methods. Special attention will be given to injection molding, casting, and stamping. Prerequisite: Admission to the M.F.A. program in Art and Design. **Credits:** 3.00

AD 61600 - Electronic And Time-Based Art

Credit Hours: 3.00 to 6.00. This seminar explores contemporary artistic practices in Electronic and Time-Based Art, including emerging fields such as: generative and interactive art, audio-visual installation, and new media performance. The format of the course is a mixture of critique, workshops, research, presentations, and discussion. Permission of department required. **Credits:** 3.00 to 6.00

AD 61700 - Advanced Motion Design

Credit Hours: 3.00. This course explores Motion Design's multidisciplinary aspects, combining graphic design, animation, film, photography, videography, illustration, broadcast graphics, sound design, and visual effects. It prepares students to tackle common screen media challenges, emphasizing the development of sophisticated Motion Design projects. Offering an in-depth examination of Motion Design, this program highlights the range of techniques, processes, methods, and aesthetic options open to creators. It requires intensive effort, sharp observation, critical analysis, and commitment from graduate students, calling for a significant time commitment to achieve meaningful outcomes. The course highlights the essential role of a well-executed design process in creating work that is both innovative and engaging to the target audience while adhering to high professional standards.**Credits:** 3.00

AD 62500 - Applied Ornamental Design

Credit Hours: 3.00. Examination of past and present ornamental design applications and of the cultures that created them. Students will generate their own individual visual iconography to be transformed into designs for consumer products, architectural elements, or furniture. Prerequisite: Admission to the M.F.A. program in Art and Design. **Credits:** 3.00

AD 63500 - Advanced Materials And Processes

Credit Hours: 3.00. A study of mass-production materials and processes used by designers. Students will focus on the limitations and benefits of various manufacturing methods. Special attention will be given to injection molding, casting, and stamping. Prerequisite: Admission to the M.F.A. program in Art and Design. **Credits:** 3.00

AD 64000 - Special Topics In Interior Design

Credit Hours: 1.00 to 6.00. Special topics and theoretical approaches to individual projects within the built environment will be investigated, such as urban environments, existing and new structures, and interior environments. Topics could include either residential or non-residential projects. Prerequisite: Admission to the M.F.A. program in Art and Design. Permission of instructor required. **Credits:** 1.00 to 6.00

AD 65800 - MFA Project Research In Studio Arts

Credit Hours: 1.00 to 6.00. Intensive M.F.A. project production and thesis research in studio arts. Prerequisite: Three credit hours of AD 55800 with a minimum B- grade. Permission of instructor required. **Credits:** 1.00 to 6.00

AD 66100 - Jewelry And Metalsmithing

Credit Hours: 3.00 to 6.00. Jewelry and Metalsmithing. Permission of department required. **Credits:** 3.00 to 6.00

AD 66500 - Printmaking

Credit Hours: 3.00 to 6.00. Printmaking. Permission of department required. **Credits:** 3.00 to 6.00

AD 66800 - MFA Project Research In Design

Credit Hours: 1.00 to 6.00. Intensive M.F.A. project production and thesis research in design. Prerequisite: Three credit hours of AD 56800 with a minimum B- grade. Permission of instructor required. **Credits:** 1.00 to 12.00

AD 66900 - Materials And Processes For The Studio Artist

Credit Hours: 3.00 to 6.00. This course introduces graduate studio artists to various materials, methods and processes to supplement their current practical media of choice. Such methods include, but are not limited to, welding for the artist (MIG and arc), casting, cement, plaster, mold making, structural construction, using fabric for sculptural processes, sewing (machine and hand) printing on fabric. This is a survey course and exposes the student to the above allowing them to select one or multiple processes and materials to enhance and expand their practice. Permission of department required. **Credits:** 3.00 to 6.00

AD 67000 - Textile Art

Credit Hours: 3.00 to 6.00. Textile Art. Permission of department required. **Credits:** 3.00 to 6.00

AD 67500 - Sculpture

Credit Hours: 3.00 to 6.00. Sculpture. Permission of department required. **Credits:** 3.00 to 6.00

AD 67800 - Graduate Internship

Credit Hours: 1.00 to 6.00. Intensive exposure to professional experience through supervised internship in art or design firms, departments, or studios. The internship will consist of work to enhance the development of future professionals. The internship experience will help students integrate theory and practice and confirm career choices. Prerequisite: Admission to the M.F.A. program in Art and Design. Permission of instructor required. **Credits:** 1.00 to 6.00

AD 69000 - Advanced Problems In Art And Design

Credit Hours: 0.00 to 18.00. Credit and hours to be arranged. Permission of instructor required. **Credits:** 0.00 to 18.00

AD 69100 - Directed Readings In Art History

Credit Hours: 3.00. A survey of specialized publications for in-depth study in an area of special interest. Permission of instructor required. **Credits:** 3.00

AD 69300 - Historical Problems In Art Education

Credit Hours: 3.00. (EDCI 63000) Examination of methods used to investigate art education's history, past theory, and practices. Class work will include readings and discussion and will culminate in guided research and a short historical study. Permission of instructor required. Prerequisite: BA in art education. **Credits:** 3.00

AD 69600 - Aesthetic Development In Children

Credit Hours: 3.00. (EDCI 63100) Examination of historical and contemporary theory and research in children's aesthetic development (response and production) and analysis of the influences of such development on art education curricula and methodology. Permission of Instructor required. Prerequisite: BA in Art Education or an equivalent area. **Credits:** 3.00

AD 69700 - MFA Graduate Exhibition

Credit Hours: 3.00. Completion of M.F.A. thesis, oral defense, gallery installation of M.F.A. exhibition, public presentation, and documentation of exhibition. Prerequisite: Admission to the M.F.A. program in Art and Design. Concurrent Prerequisite: Must complete 12 credit hours of AD 65800 or AD 66800 during the same or prior session. Only open to M.F.A. graduate students in Art and Design. Permission of instructor required. **Credits:** 3.00

AD 69800 - Research MA Or MFA Thesis

Credit Hours: 1.00 to 18.00. Research MA Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Asian American Studies

ASAM 24000 - Introduction To Asian American Studies

Credit Hours: 3.00. A general introduction to Asian American history and culture, with a focus on the diverse and multifaceted experiences of peoples of Asian descent in America and their contributions to U.S. culture and society. **Credits:** 3.00

ASAM 34000 - Contemporary Issues In Asian American Studies

Credit Hours: 3.00. Overviews various issues in contemporary Asian American Studies through theoretical and literary readings combined with examinations of popular media. Topics examine the multiple intersections of race, ethnicity, class, gender, and sexuality. **Credits:** 3.00

ASAM 34200 - Special Topics In Asian American Studies

Credit Hours: 3.00. This course will focus on specific issues and themes in Asian American Studies. **Credits:** 3.00

ASAM 49000 - Special Topics In Asian American Studies

Credit Hours: 3.00. Various topics in Asian American studies, changing from semester to semester as presented by different instructors.**Credits:** 3.00

Astronomy

AST A1000 - The Solar System

Credit Hours: 3.00 or 4.00. Celestial sphere, measurement of time, earth as a planet, moon, eclipses, planets and their satellites, comets, meteors, theories on origin of solar system.**Credits:** 3.00 or 4.00

ASTR 100AN - The Solar System

Credit Hours: 3.00 or 4.00. Celestial sphere, measurement of time, earth as a planet, moon, eclipses, planets and their satellites, comets, meteors, theories on origin of solar system.**Credits:** 3.00 or 4.00

ASTR 2640N - Stars And Galaxies

Credit Hours: 3.00 or 4.00. Principles of physics as applied to astronomy, sun as a star, physical properties of stars, stellar motions and distributions, double stars, variable stars, star clusters, nebulae, Milky Way System, other galaxies, expanding universe.**Credits:** 3.00 or 4.00

ASTR 12300 - Our Place In The Universe: From The Solar System To Distant Cosmos

Credit Hours: 3.00. This course is intended for students interested in learning about everything in the cosmos, from the Solar System, stars, our Galaxy, and other external galaxies now and in the distant past. Key physical principles in understanding these topics will be covered at the non-calculus level. The key space missions that enabled space explorations as well as their challenges and societal impact will be also discussed. **Credits:** 3.00

ASTR 26300 - Descriptive Astronomy: The Solar System

Credit Hours: 3.00. A descriptive course in astronomy intended for non-physics majors. Topics include properties of stars, stellar birth and death; the Hertzsprung-Russel diagram; binary systems; red giants and white dwarfs; supernova; neutron stars and black holes; galaxies; cosmology and the big bang; and dark matter. Includes required night-sky observing sessions. **Credits:** 3.00

ASTR 26400 - Descriptive Astronomy: Stars And Galaxies

Credit Hours: 3.00. A descriptive, nonmathematical course in astronomy intended for non-physics majors. Topics include: properties of stars; stellar birth and death; the Hertzsprung-Russel diagram; main sequence stars; binary systems; stellar clusters; red giants and white dwarfs, nova and supernova; neutron stars and black holes; galaxies and the cosmological red shift. Includes required observing sessions. Not available to students with credit in ASTR 36400. **Credits:** 3.00

ASTR 36300 - The Solar System

Credit Hours: 3.00. This course is intended for students in science or engineering. The components of the course consist of an overview of solar system objects and an overview of the physical processes that control the evolution of solar system objects since formation. The overview of solar system includes observations of the Sun, planets, asteroids and Kuiper-belt objects, comets, and interplanetary dust. Specific processes that are discussed include hydrostatic equilibrium, orbital dynamics, radioactive decay, and heat flow. The role of these processes in shaping planetary surfaces and atmosphere is explored. **Credits:** 3.00

ASTR 36400 - Stars And Galaxies

Credit Hours: 3.00. This course is intended for students in Science or Engineering. This is the second of a two-semester introductory sequence on astronomy and astrophysics, although it is designed to be a standalone course. It is intended mainly for Science and Engineering majors who are comfortable with calculus-based contents. The course provides an overview on the formation and evolution of stars, galaxies, and clusters of galaxies. Selected topics that are covered in more detail include stellar structure and atmosphere, properties of black holes, neutron stars, and white dwarfs, galactic dynamics, and dark matter in galaxies and clusters of galaxies. **Credits:** 3.00

ASTR 37000 - Cosmology

Credit Hours: 3.00. Intended for science and engineering majors. Basic physics and math knowledge will be assumed. The picture of how the Universe came to be and how it has evolved has recently come into sharp focus. This progress is the result of improved observational techniques that have resulted in high resolution images of very distant galaxies, a more accurate mapping of the Large Scale Structure of the Universe or the high resolution picture of the young universe provided by Cosmic Microwave Background observations. We will present a historical perspective of how ideas and data have shaped Cosmology through the centuries. In addition, we will review the theoretical models that are in agreement with the current observations. Our goal will be to provide the students with a broad overview of the current research in Cosmology with an eye toward stimulating the students curiosity about the many questions still awaiting answers in this field. **Credits:** 3.00

ASTR 56000 - Stellar Evolution

Credit Hours: 3.00. (PHYS 56000) Observational basis of astrophysics; formation of galaxies and stars; evolution of stars; white dwarfs, supernovae and neutron stars, pulsars, quasars, black holes; cosmic rays, their origin and acceleration; radio astronomy, radio galaxies; the H-21 cm line and the 3mK blackbody radiation; gravitational radiation; X-ray and g-ray astronomy; cosmology; space physics, magnetosphere, and solar wind. **Credits:** 3.00

ASTR 56100 - Galaxies And Large Scale Structure

Credit Hours: 3.00. (PHYS 56100) Covers basic observed properties and models of galactic structure, dynamics of stars, physics of interstellar medium, formation of galaxies, properties of clusters of galaxies, and dark matter. **Credits:** 3.00

ASTR 56200 - Introduction To High Energy Astrophysics

Credit Hours: 3.00. (PHYS 56200) An overview of important physical processes in a variety of astronomical settings and of the experimental techniques employed in the field of high energy astrophysics. Covered in more detail are individual systems that include black holes, neutron stars, white dwarfs, supernova remnants, active galactic nuclei, clusters of galaxies, gamma-ray bursts, and cosmic rays, with special emphasis on several research frontiers. **Credits:** 3.00

ASTR 56300 - Astroparticle Physics

Credit Hours: 3.00. (PHYS 56300) An overview of an emerging research frontier in modern physics that lies at the interface of particle physics and astrophysics. Emphasis is on topics that are particularly relevant to both fields, including cosmology, cosmic ray physics, very-high-energy gamma ray astrophysics, neutrino astrophysics, and gravitational wave physics. **Credits:** 3.00

ASTR 56700 - Observational Techniques In Astronomy

Credit Hours: 3.00. (PHYS 56700) Fundamental concepts in observational astronomy, including coordinate and time systems, telescopes and detectors, radiation and optics, and methods of statistical data analysis. **Credits:** 3.00

Aviation Technology

AT 10000 - Introduction To Aviation Technology

Credit Hours: 1.00. An introduction to the Department of Aviation Technology and its curricula as well as an overview of the aviation industry and associated careers. Aviation safety practices and human factors issues are discussed. An overview of aviation regulations and the regulatory process is included.**Credits:** 1.00

AT 10200 - Aviation Business

Credit Hours: 3.00. A discussion of the financial structure and operation of the aviation industry including aircraft and aerospace design parameters, as well as aviation financial and industrial processes. The course will cover material relevant to the overall structure of the aviation industry including history, current status of aerospace manufacturers, commercial airlines, and general aviation as well as governmental aviation agencies and international aviation. Commercialization of space and current issues in aviation will also be covered. **Credits:** 3.00

AT 10300 - Aerospace Vehicle Propulsion And Tracking Systems

Credit Hours: 3.00. This course is an introduction to propulsion systems used in aerospace vehicles. The student will learn terminology, component parts, and operational theory of propulsion systems. Course topics covered are reciprocating and turbine engine operation theory as well as rocket propulsion systems. including electrical, fuel, fire, ignition and lubrication. Operational and regulatory fuel requirements are discussed. Emerging technologies and environmental practices will be explored. **Credits:** 3.00

AT 10600 - Basic Aircraft Science

Credit Hours: 3.00. An introduction to federal regulatory systems and associated publications. Includes aircraft nomenclature, theory of flight, and fundamentals of the aviation industry. Introduces weight and balance procedures. Permission of department required. **Credits:** 3.00

AT 10901 - Introduction To Uncrewed Aircraft System Operations

Credit Hours: 3.00. This course will provide students the aeronautical knowledge required to operate a small UAS in the National Airspace. Students are introduced to various aspects of uncrewed aviation operations, which includes UAS system types and components, regulations and operational approvals, and indoctrination to the civil and commercial applications of UAS. Through the use of UAS simulation technology, students will develop basic small UAS flight skills and successfully complete various UAS operational scenarios. Upon successful completion of the course students will be prepared to obtain a Federal Aviation Administration (FAA) Remote Pilot Certificate with a Small UAS Rating. Permission of department is required. **Credits:** 3.00

AT 11200 - Introduction To Operational Aviation Safety

Credit Hours: 1.00. This course teaches students about industry safety standards and the School of Aviation and Transportation Technology's Safety Program. This course will emphasize applying various safety models to accident case studies and reported incidents.**Credits:** 1.00

AT 11501 - Experiential Honors Project IA

Credit Hours: 0.00 to 3.00. This is an interdisciplinary course open to all majors with a GPA of 3.0 or higher. The Center for Research and Education in Advanced Transportation Ecosystems-CREATE (approval is required to register). Each course provides students hands-on experience in addressing a specific real-world problem with a broad societal impact, some of these projects may be supported by an industry partner. CREATE will seek industry partners, help define the scope and deliverables associated with each project and invite students to participate. Permission of instructor required.**Credits:** 0.00 to 3.00

AT 11600 - Aircraft Science For Engineering Technology

Credit Hours: 3.00. Required for AET. This course is an introduction to theory of flight, aircraft nomenclature, aircraft configurations, high speed flight, and helicopter configurations and rotor dynamics. Covers lift/drag and concepts for flight at an engineering technology level beyond that of flight ground school. Federal regulatory systems for aircraft design and persons other than flight personnel and associated technical documents are covered. Introduces center of gravity theory, defines how to locate centers of gravity, and introduces weight and balance procedures for engineering technology, not covered by flight ground school. This course teaches topics in the curriculum required by 14 CFR Part 147 as outlined in the School of Aviation and Transportation Technology's Part 147 Operations Manual approved by the FAA, and provides specific knowledge and skills needed for FAA certification examinations.**Credits:** 3.00

AT 11601 - Experiential Honors Project IB

Credit Hours: 0.00 to 3.00. This is an interdisciplinary course open to all majors with a GPA of 3.0 or higher. Completion of AT 11501 with a grade of B or higher is required. The Center for Research and Education in Advanced Transportation Ecosystems-CREATE (approval is required to register). Each course provides students hands-on experience in addressing a specific real-world problem with a broad societal impact, some of these projects may be supported by an industry partner. CREATE will seek industry partners, help define the scope and deliverables associated with each project and invite students to participate. Permission of instructor required.**Credits:** 0.00 to 3.00

AT 11901 - Uncrewed Aerial Systems: Safety And Risk Management

Credit Hours: 3.00. This course discusses the fundamental concepts of Safety and Risk Management and their application to UAS operations. The course will provide insight into strategies for developing and implementing a formal safety management system (SMS) that effectively supports an organization's UAS operations. In addition, students will gain an understanding of ethical decision-making and its relationship to safety. Laboratory exercises provide students practical application of this knowledge to various UAS operational scenarios, which includes utilizing SMS principles in assessing risks and developing appropriate mitigations. Must possess a valid FAA Part 107 Remote Pilot Certificate. **Credits:** 3.00

AT 12700 - Publications Records And Regulations

Credit Hours: 3.00. Required for AET. This course provides students with the concepts, and information to understand the regulations and publications specific to aviation and aerospace vehicle repair and maintenance. The privileges and limitations of the 14 CFR Part 65 airmen certificates are covered, as well as the regulations governing repair facilities and repair stations. The specific forms and records, and the proper disposition of those records are covered. In addition, aircraft technical drawings and prints are examined and the student is to develop the ability to read and comprehend aircraft drawings, as well as make drawings/sketches for vehicle repair and/or alteration. Precision measuring equipment is covered as is the hardware specific to aviation and aerospace. Inspection procedures and conformity checks are covered. Engine run up operations for inspection purpose are covered. This course teaches topics in the curriculum required by 14 CFR Part 147 as outlined in the School of

Aviation and Transportation Technology's Part 147 Operations Manual approved by the FAA, and provides specific knowledge and skills needed for FAA certification examinations.**Credits:** 3.00

AT 14400 - Private Pilot Lectures

Credit Hours: 4.00. A study of the subject areas and information needed to operate as a private pilot in the aviation environment. The FAA private pilot written exam will be offered to those who qualify after taking the Lecture Course offering. **Credits:** 4.00

AT 14500 - Private Pilot Flight

Credit Hours: 2.00. In this course, the student will receive the necessary dual flight instruction and solo flight time to qualify for the FAA Private Pilot Certificate under Part 61 of the Federal Aviation Regulations.**Credits:** 2.00

AT 20200 - Aerospace Vehicle Systems Design, Analysis And Operations

Credit Hours: 3.00. Introduction to the design and engineering analysis of various systems found on modern aircraft and aerospace vehicles. Operational theory will also be presented for specific aircraft. Systems include electric power distribution, digital data, instrumentation, hydraulic, pneumatic, environmental, flight management, and autoflight. **Credits:** 3.00

AT 20300 - Aviation Operations Management

Credit Hours: 3.00. This course provides a forum for investigating contemporary issues facing the aviation and aerospace industries. Major topics include aviation operation, human resources, fiscal, and technology management. **Credits:** 3.00

AT 20501 - Statics For Aerostructures

Credit Hours: 3.00. This course provides an introduction to the static analysis of aerostructures. Force systems, resultants and equilibrium, moments, distributed loads, and centroids as they relate to aeronautical structures are studied. CAD software is introduced.**Credits:** 3.00

AT 20700 - Introduction To Aircraft Systems

Credit Hours: 3.00. Principles and design concepts of aircraft operating systems are covered. Emphasis is given to flight control, electrical, environmental, hydraulic, pneumatic, pressurization, oxygen, heating, cooling, fire protection, and ice and rain protection systems. Also included are theory of operation and design of aircraft instruments and associate systems.**Credits:** 3.00

AT 20802 - Aircraft Materials

Credit Hours: 3.00. In this course students study aluminum and composite materials used in aircraft. The course covers elements of design, fabrication, final assembly, and testing. Students also study the practical application of statics for airframe loads. **Credits:** 3.00

AT 20900 - Autonomous Aircraft Technology And Maintenance I

Credit Hours: 3.00. This course introduces fundamental concepts of autonomous aircraft technology and maintenance. Topics include history, airframe and powerplant selection, regulations governing uncrewed systems, airspace descriptions, safety, autonomous system programming and calibration, data package options, weather, system maintenance and repair, manual flight training, and aerodynamics and flight controls for autonomous aircraft. **Credits:** 3.00

AT 21000 - Ground Trainer I

Credit Hours: 1.00. Included in this course are maneuvers to develop basic attitude instrument flying skills, including tracking, holding, and approach procedures. Permission of department required.**Credits:** 1.00

AT 21100 - Ground Trainer II

Credit Hours: 1.00. This course is designed to develop a higher degree of coordination and judgement through additional experience in the flight training device. This course will continue to prepare the student for the FAA Commercial Pilot Certificate. Permission of department required.**Credits:** 1.00

AT 21200 - Operational Risk Assessment

Credit Hours: 1.00. This course gives students a comprehensive understanding of industry incident risk assessment and analyses. Students will learn about Safety Management Systems (SMS) feedback loop processes and techniques utilized to find root causes. Additionally, residual risks of real-world mishaps during flight operations will be examined.**Credits:** 1.00

AT 21500 - Experiential Honors Project IIA

Credit Hours: 0.00 to 3.00. This is an interdisciplinary course open to all majors with a GPA of 3.0 or higher. Students must have completed the AT 11601 course. The Center for Research and Education in Advanced Transportation Ecosystems-CREATE (approval is required to register). Each course provides students hands-on experience in addressing a specific real-world problem with a broad societal impact, some of these projects may be supported by an industry partner. CREATE will seek industry partners, help define the scope and deliverables associated with each project and invite students to participate. Permission of instructor required.**Credits:** 0.00 to 3.00

AT 21600 - Experiential Honors Project IIB

Credit Hours: 0.00 to 3.00. This is an interdisciplinary course open to all majors with a GPA of 3.0 or higher. Students must have completed AT 21500 with a grade of B or higher. The Center for Research and Education in Advanced Transportation Ecosystems (CREATE) approval is required to register. Each course provides students hands-on experience in addressing a specific real-world problem with a broad societal impact, some of these projects may be supported by an industry partner. CREATE will seek industry partners, help define the scope and deliverables associated with each project and invite students to participate. Permission of instructor required.**Credits:** 0.00 to 3.00

AT 21900 - Autonomous Aircraft Technology And Maintenance II

Credit Hours: 3.00. This course will further develop skills and understanding of autonomous aircraft technology and maintenance. Emphasis will be on design, selection, construction, flight test, evaluation, and repair, of stabilized uncrewed aircraft. Students will work hands-on with open-source flight controllers to perform autonomous missions. Additionally, students will design and deploy scenario-specific sensors using student-constructed rotorcraft. Students will be expected to demonstrate their sensor payload through lab and field demonstration and professional documentation. **Credits:** 3.00

AT 22300 - Human Factors For Flight Crews

Credit Hours: 3.00. This course explores the fundamental concepts of single pilot and multi-crew human factors issues. The first part of the course focuses on the physiological factors that affect single pilot aeronautical decision-making. The second part examines human error, threat and error management, and domains of crew resources management. The third segment utilizes team-building exercises, case study presentations, and a formal assignment to emphasis course learning outcomes.**Credits:** 3.00

AT 23300 - Ethics And Aviation

Credit Hours: 3.00. This discussion-oriented class is an introduction to the principles of ethical theory and the application of that theory to practical problems associated with the aviation industry. Actual aviation case studies are used to illustrate major concepts. **Credits:** 3.00

AT 24302 - Commercial Flight I Under Federal Aviation Regulations Part 141

Credit Hours: 2.00. This course is designed to develop a higher degree of coordination and judgment through additional experience in more advanced flight maneuvers and cross-country flying under Part 141 of the Federal Aviation Regulations. It will start to prepare the student for the FAA Commercial Pilot Certificate. Permission of department required.**Credits:** 2.00

AT 24800 - Commercial Flight II

Credit Hours: 2.00. The course is a continuation of the flight training received in AT 24300. Basic instrument flying techniques will be introduced to further enhance and refine the development of precision flying skills. Permission of department required. **Credits:** 2.00

AT 24900 - Instrument Flight Lectures

Credit Hours: 3.00. A study of the operation of flight instruments and radio navigation aids, federal aviation regulations pertinent to instrument flight, meteorology, instrument charts, instrument flight planning, and air traffic control procedures. Preparation for the FAA Instrument Rating written examination. **Credits:** 3.00

AT 25200 - Aviation Projects

Credit Hours: 3.00. This course will introduce the students to group projects in collaboration with industrial partners in aviation. A new project will be conducted each semester. Students will participate in the development of project goals, conducting field research, and developing a final course document and presentation. Travel outside of the normal assigned classroom time might be required. Permission of Department required. **Credits:** 3.00

AT 25300 - Instrument Flight

Credit Hours: 2.00. The course is designed to prepare the student for the FAA Commercial Pilot Certificate and Instrument Rating. Flight, ground pilot trainer, and ground instruction are included. Permission of department required. **Credits:** 2.00

AT 25302 - Instrument Flight Under Federal Aviation Regulations Part 141

Credit Hours: 2.00. This course is designed to prepare the student for the FAA Instrument Rating under Part 141 of the Federal Aviation Regulations. Permission of department required.**Credits:** 2.00

AT 25400 - Commercial Flight Lectures

Credit Hours: 3.00. The course is designed to review the principles of flight, aircraft systems, pertinent federal aviation regulations, and airman publications and service in order to prepare the student for the FAA Commercial Pilot written examination.**Credits:** 3.00

AT 26200 - Basic Aircraft Powerplant Technology

Credit Hours: 4.00. A study of the design, construction, and operating practices of aircraft reciprocating and small gas turbine engines. Laboratory exercises emphasize airworthiness evaluation, fault-isolation techniques, and standard service/maintenance practices. **Credits:** 4.00

AT 26502 - Aircraft Electrical Systems

Credit Hours: 3.00. An in-depth study of aircraft electrical components, both individually and as systems in the aircraft. DC electrical circuits, series and parallel circuits, magnetism, and electromagnetism are covered, as are DC power systems, schematics, and aircraft wiring practices. Aircraft charging systems, main power distribution, solid state electronics, batteries, and motors are also discussed. **Credits:** 3.00

AT 26700 - Fixed And Rotary Wing Assemblies

Credit Hours: 3.00. An overview of various fixed and rotary wing components and systems. Flight control systems, landing gear, fuel systems, wheels, brakes, and rotor systems are among the subjects studied.**Credits:** 3.00

AT 26900 - Air Traffic Control I

Credit Hours: 4.00. An introduction to the principles of air traffic control, including tower, approach control and enroute separation. Navigation theory as it relates to the ATC system will be explained, as well as the theory of operation of ATC radar and computer systems. **Credits:** 4.00

AT 27200 - Introduction To Composite Technology

Credit Hours: 3.00. An introduction to basic composite materials, processes, construction, testing, and repair. Students will work with a variety of wet and pre-impregnated fiber and matrix systems including glass, aramid fiber, and carbon-graphite.**Credits:** 3.00

AT 27800 - Nondestructive Testing For Aircraft

Credit Hours: 3.00. A study of nondestructive testing methods used to evaluate the structural integrity of airframes, engines, and components. Magnetic particle, liquid penetrant, electromagnetic, ultrasonic, and radiographic inspection are covered. **Credits:** 3.00

AT 28100 - Traffic Control II

Credit Hours: 4.00. An intensive review of air traffic control procedures and aviation regulations for students interested in seeking employment as air traffic controllers. **Credits:** 4.00

AT 28500 - ATC Procedures And Weather

Credit Hours: 3.00. An introduction to the technical procedures involved in the development and operation of the air traffic control system. Instrument procedures and design will be covered. Weather theory as pertaining to ATC will be discussed, along with observation and dissemination systems used by the FAA and NWS. **Credits:** 3.00

AT 28600 - National Airspace Systems Operations

Credit Hours: 3.00. An introduction to the technical procedures involved in operating unmanned Aerial Systems in the air traffic control system. Flight operations and procedures will be covered. Weather theory and flight regulations as they apply to UAS operations will also be discussed. **Credits:** 3.00

AT 29000 - Aviation Project

Credit Hours: 1.00 to 4.00. Independent study primarily for sophomore students who wish to pursue study and development work in special areas. Subject material must be arranged with the instructor before enrolling in the course. Permission of instructor required. **Credits:** 1.00 to 4.00

AT 29300 - Industrial Practice I

Credit Hours: 1.00. Industrial practice and experience in participating industry. Requires written report of the experience. Permission of department required. **Credits:** 1.00

AT 29400 - Industrial Practice II

Credit Hours: 1.00. Industrial practice and experience in participating industry. Requires written report of the experience. Permission of department required. **Credits:** 1.00

AT 30702 - Advanced Aircraft Systems

Credit Hours: 3.00. An in-depth study of aircraft components and operation with an emphasis on transport-category aircraft. Systems covered include fuel, environmental, fluid-power, flight control, fire protection, ice-control, warning, and auxiliary power. Practical projects utilize small ad transport-category aircraft. **Credits:** 3.00

AT 30802 - Aircraft Materials Processes

Credit Hours: 3.00. A study of the processes by which aircraft materials are converted into usable components. Laboratory activities include machining, welding, and analysis of material properties. **Credits:** 3.00

AT 30900 - Unmanned Autonomous Aerial Systems

Credit Hours: 3.00. This course includes the construction and flight test demonstration of fully autonomous aircraft. System performance will be monitored in real time. Post flight analysis, with system performance evaluation and optimization will be covered. **Credits:** 3.00

AT 30901 - Introduction To UAS Sensor Technology

Credit Hours: 3.00. This course introduces students to multiple forms of UAS sensors and core fundamentals of Remote Sensing and Geospatial Technology. Students will be introduced to basic data capture and processing techniques and to effectively apply different forms of UAS sensors to real-world applications.**Credits:** 3.00

AT 31100 - Aerospace Internship

Credit Hours: 3.00. This course consists of placing the student in an existing business or research unit within the department. Students will function as interns as they develop and manage business and/or operational processes within these units. This experience prepares students for the externship experience in the follow-on course. **Credits:** 3.00

AT 31400 - Operational Safety Mitigation

Credit Hours: 1.00. This course provides students with a hands-on learning experience within the Professional Flight Safety program. Students will use data and evidence from real-world safety reports to assess risks, develop control measures, and generate proposals that may be implemented into flight operations. Students will gain a clearer understanding of how flight operations and safety operations collaborate to mitigate hazards.**Credits:** 1.00

AT 31500 - Experiential Honors Project IIIA

Credit Hours: 0.00 to 3.00. This is an interdisciplinary course open to all majors with a GPA of 3.0 or higher. Students must have completed the AT 21600 course. The Center for Research and Education in Advanced Transportation Ecosystems-CREATE (approval is required to register). Each course provides students hands-on experience in addressing a specific real-world problem with a broad societal impact, some of these projects may be supported by an industry partner. CREATE will seek industry partners, help define the scope and deliverables associated with each project and invite students to participate. Permission of instructor required.**Credits:** 0.00 to 3.00

AT 31600 - Experiential Honors Project IIIB

Credit Hours: 0.00 to 3.00. This is an interdisciplinary course open to all majors with a GPA of 3.0 or higher. Students must have completed AT 31500 with a grade of B or higher. The Center for Research and Education in Advanced Transportation Ecosystems-CREATE (approval is required to register). Each course provides students hands-on experience in addressing a specific real-world problem with a broad societal impact, some of these projects may be supported by an industry partner. CREATE will seek industry partners, help define the scope and deliverables associated with each project and invite students to participate. Permission of instructor required.**Credits:** 0.00 to 3.00

AT 31900 - Uncrewed Aircraft Systems: Applications, Data, And Documentation

Credit Hours: 3.00. Focused on applying uncrewed aircraft technology to specific data gathering missions. Sensor types, mounting selection, and control will be demonstrated. Emphasis will be placed on sensor payloads, mission planning, and data acquisition. Post-flight data processing and analysis will be conducted using GIS and Remote Sensing software applications. All specifications and procedures will be documented in an industry-accepted format. **Credits:** 3.00

AT 32001 - Advanced Aviation Operations

Credit Hours: 3.00. This course covers modern principles for managing complex global aviation maintenance, ground and aerospace manufacturing operations. Particular emphasis is placed on "system-of-systems" and organizational resilience concepts in air vehicle lifecycle maintenance, aerospace manufacturing and airport surface/gate operations. Principles of Data Science, systems-thinking, process visualization, emerging technologies and modern workforce challenges and their impact on global sustainable airworthiness, safety, quality and performance reliability are covered in-depth. **Credits:** 3.00

AT 32501 - Advanced Aviation Meteorology

Credit Hours: 3.00. This course is designed for students who are preparing for careers as professional pilots or dispatchers and require an advanced knowledge of the impact of weather on aviation operations. **Credits:** 3.00

AT 32700 - Advanced Transport Flight Operations

Credit Hours: 3.00. This course addresses advanced aviation topics to include high speed aerodynamics, automated cockpit instrumentation, domestic/international flight operations, and global navigation.**Credits:** 3.00

AT 33502 - Avionics Systems

Credit Hours: 3.00. This course covers the theory of operation and applications of common electrical components used in various aircraft circuits. The theory and mathematical relationships of alternating current, reactance, impedance, and phase shift are examined. Operational theory, installation practices, and troubleshooting concepts of common aircraft communication and navigation systems are investigated. **Credits:** 3.00

AT 33800 - Airline Management

Credit Hours: 3.00. This course is a detailed study of airline management principles and processes. Topics include airline, economics, organization, forecasting, marketing, alliances, pricing, scheduling, finance, fleet planning, labor relations and air freight. Business ethics pertaining to airlines are introduced. **Credits:** 3.00

AT 34001 - Aerospace Business Statistics

Credit Hours: 3.00. This course provides an introduction to business statistics with a specific focus on managerial decision making in the aerospace industry. The course will focus on aircraft leasing and value determination. Topics include descriptive statistics, probability models, estimation, hypothesis testing, and regression analysis. Students use software to perform their own analyses. **Credits:** 3.00

AT 35100 - Flight Instructor Flight

Credit Hours: 2.00. Flight training in preparation for flight instructor certification. Instructional techniques are demonstrated and practiced by the student. Heavy emphasis is placed on student practice teaching of all maneuvers. FAA Commercial Pilot Certificate with Instrument Airplane Rating required. Permission of department required. **Credits:** 2.00

AT 35200 - Flight Instructor Lectures

Credit Hours: 4.00. The course teaches techniques of flight and ground instruction, analysis of maneuvers, aircraft performance, and federal aviation regulations applicable to flight instructors. Some practice teaching will be required. Preparation for the FAA written exam is included. **Credits:** 4.00

AT 35300 - Multi-Engine Flight

Credit Hours: 1.00. This course prepares the student for the FAA multi-engine rating. Dual flight instruction is conducted in a multi-engine aircraft. Individual ground instruction will be arranged.**Credits:** 1.00

AT 35400 - Turbine Flight Operations Lecture

Credit Hours: 2.00. A study of corporate aircraft systems and operations and an orientation to operational procedures.**Credits:** 2.00

AT 35900 - Airport Management

Credit Hours: 3.00. This course is a study of the history and development of contemporary airport facilities. Areas of study will include FAA airport design requirements, master plans, and airport operations. Field trips may be required. **Credits:** 3.00

AT 36201 - Aviation Operations

Credit Hours: 3.00. This course introduces students to the principles of managing a complex aviation operation. Students will be assigned active roles in monitoring and reporting on aircraft flight and maintenance practices. Every student will be assigned a role as part of a small group whose responsibility is to gather appropriate information, develop reports, and conduct practical research tasks as assigned. Weekly and monthly group meetings will be conducted similar to those found in the airline industry with students playing an active role in these meetings.**Credits:** 3.00

AT 36302 - Fundamentals Of Powerplant Systems

Credit Hours: 4.00. This course covers powerplant systems, including fuel metering devices, ignition systems, and propeller and propeller-related systems. Students learn to use the special tools required for these systems, and the processes for inspection, repair, and overhaul. Airworthiness evaluation and determination is stressed, as are testing and fault diagnosis procedures. The properties and operating characteristics of aircraft fuels are also covered. **Credits:** 4.00

AT 36500 - Instrument Flight Instructor Flight

Credit Hours: 1.00. Flight and ground training in preparation for the Instrument Flight Instructor Flight Test is given. Instructional techniques are demonstrated and practiced by the student. Analysis of maneuvers and common student errors also included. FAA Flight Instructor Airplane Pilot Certificate and Flight Instructor Instrument written exam passed. Permission of department required. **Credits:** 1.00

AT 36600 - Multi-Engine Flight Instructor Flight

Credit Hours: 1.00. Flight and ground training in preparation for the Flight Instructor Multi-engine Flight Test is given. Instructional techniques are demonstrated and practiced by the student. Analysis of maneuvers and common student errors also included. FAA Flight Instructor Airplane, Instrument Airplane, Commercial Pilot Certificate with Airplane Multi-engine Land Rating, 15 hours pilot in-command in multi-engine airplanes. Permission of department required. **Credits:** 1.00

AT 36900 - Air Traffic Control

Credit Hours: 3.00. An introduction to the principles of air traffic control, including tower and en route separation. Navigation theory as it relates to the ATC system will be explained, as will the theory of operation of ATC radar and computer systems. **Credits:** 3.00

AT 37002 - Advanced Aircraft Powerplants

Credit Hours: 3.00. This course covers the design, construction, operation, and overhaul practices of aircraft reciprocating and small gas-turbine engines. Airworthiness evaluation, fault-isolation techniques, and standard service and maintenance practices are emphasized. Dimensional and visual inspection and testing of engines following overhaul are stressed, as well. **Credits:** 3.00

AT 37200 - Aircraft Maintenance Practices

Credit Hours: 3.00. An in-depth study of practices and procedures used to ensure that an aircraft is maintained in an airworthy state. Aircraft publications and maintenance methodology are emphasized.**Credits:** 3.00

AT 37600 - Aircraft Gas Turbine Engine Technology I

Credit Hours: 4.00. Basic aircraft gas turbine engine theory, nomenclature, component design, turbine engine systems, operation, and fault isolation techniques are emphasized. Turbine engine maintenance, overhaul, operation, and inspection procedures are studied in detail.**Credits:** 4.00

AT 38100 - Aviation Security

Credit Hours: 3.00. This course introduces the challenges and complexity of aviation security faced by aviation professionals across the industry. It traces the evolution of current security approaches and explores technologies and processes targeting threat mitigation and improved operational efficiency. **Credits:** 3.00

AT 38201 - Advanced Flight Instructor Lecture

Credit Hours: 3.00. A discussion of instructional techniques for flight and ground instruction with a focus on instrument and multi-engine flight. This course includes analysis of maneuvers, aircraft performance, and federal aviation regulations applicable to flight instructors. Some practice teaching will be required. Preparation for the FAA practical tests for instrument instructor and multi-engine instructor are included.**Credits:** 3.00

AT 38300 - Instrument And Multiengine Instructor Flight

Credit Hours: 1.00. This course prepares the student for the FAA Flight Instructor Instrument and Multiengine Instructor ratings. All flight instruction is conducted in a multi-engine aircraft. **Credits:** 1.00

AT 38500 - Design Support Analysis

Credit Hours: 2.00. This course is designed to teach students interested in engineering design, design support, customer support, or aerospace manufacturing, the elements of product support and the analysis of design as related to the manufacturability, maintainability, and supportability of aerospace products. The students will be expected to complete a life cycle cost analysis and logistics plan for a design.**Credits:** 2.00

AT 38700 - Turbine Aircraft Simulation Lab

Credit Hours: 2.00. This course is a laboratory flight experience in a turbine aircraft flight simulator emphasizing normal and abnormal aircraft operations. Emphasis is on FAA-required flight procedures for pilot certification and safe operation of turbine powered aircraft. Permission of department required.**Credits:** 2.00

AT 38800 - Large Aircraft Systems

Credit Hours: 3.00. This course introduces transport aircraft limitations, systems, and systems operation. Topics include turbojet aircraft powerplants, flight instruments, electrical power, air-conditioning, pressurization, hydraulic, and flight control systems. Emphasis is aircraft and systems manufacturer's design and operational philosophies. **Credits:** 3.00

AT 39300 - Industrial Practice III

Credit Hours: 1.00. Industrial practice and experience in participating industry. Requires written report of the experience. **Credits:** 1.00

AT 39400 - Industrial Practice IV

Credit Hours: 1.00. Industrial practice and experience in participating industry. Requires written report of the experience. **Credits:** 1.00

AT 39500 - Turbine Aircraft Simulation Laboratory

Credit Hours: 1.00. This course is a laboratory flight experience in a turbine aircraft flight simulator, emphasizing normal and abnormal aircraft operations. Emphasis is on FAA-required flight procedures for pilot certification and safe operation of turbine-powered aircraft. Students seeking an FAA type rating must receive a grade of at least a B- in AT 35300. Permission of department required. **Credits:** 1.00

AT 39600 - Turbine Aircraft Flight Laboratory

Credit Hours: 1.00. This course is a laboratory flight experience in a turbine-powered aircraft, emphasizing normal and abnormal aircraft operations. Emphasis is on FAA-required flight procedures for certification and safe operation of turbine-powered aircraft. Permission of department required. **Credits:** 1.00

AT 40300 - Airman Certification Procedures

Credit Hours: 1.00. A survey of the procedures for obtaining federal certification as an Aircraft Maintenance Technician. **Credits:** 1.00

AT 40400 - Turbojet Copilot Operations

Credit Hours: 1.00. Provides students who are selected to participate in the turbojet copilot program with classroom, simulator, and flight instruction in turbojet systems and operation. Permission of instructor required. **Credits:** 1.00

AT 40500 - Turbojet Copilot Practicum I

Credit Hours: 1.00. This course provides students with copilot flight experience in a corporate-type turbojet aircraft. Student copilots gain experience in turbojet systems and operation, high-speed/high altitude ATC procedures, advanced navigation, and high-altitude meteorology. Permission of instructor required. **Credits:** 1.00

AT 40900 - Advanced Air Mobility: Management And Operations

Credit Hours: 3.00. UAS capstone course. Application of AAM technologies across multiple commercial-type operations, including certification, application, and management. A demonstration of the cumulative knowledge and skills learned in previous UAS courses. Requires current FAA Part 107 Remote Pilot Certificate. **Credits:** 3.00

AT 41101 - Aerospace Internship II

Credit Hours: 3.00. Students will be placed in an external industry-sponsored position that exists either within the department or at a location specified by the sponsor. Students will function as interns as they develop and manage business and/or operational processes within these units. **Credits:** 3.00

AT 41200 - Aviation Finance

Credit Hours: 3.00. The course will focus on the financial knowledge needed to operate and evaluate aviation businesses. Content will cover the impact of financial decisions on operational outcomes that add/decrease value to an aviation company's bottom line. Case studies will be utilized to demonstrate practical aspects of financial decisions as they relate to organizational performance and profitability. **Credits:** 3.00

AT 41501 - Experiential Honors Project IVA

Credit Hours: 0.00 to 3.00. This is an interdisciplinary course open to all majors with a GPA of 3.0 or higher. Students must have completed the AT 31600 course. The Center for Research and Education in Advanced Transportation Ecosystems-CREATE (approval is required to register). Each course provides students hands-on experience in addressing a specific real-world problem with a broad societal impact, some of these projects may be supported by an industry partner. CREATE will seek industry partners, help define the scope and deliverables associated with each project and invite students to participate. Permission of instructor required.**Credits:** 0.00 to 3.00

AT 41600 - Airline Indoctrination

Credit Hours: 2.00. This course provides the background knowledge required to serve as a crewmember operating a transport-category airplane. Topics include aircraft systems, airline operations, and FAR Part 121 regulations.**Credits:** 2.00

AT 41601 - Experiential Honors Project IVB

Credit Hours: 0.00 to 3.00. This is an interdisciplinary course open to all majors with a GPA of 3.0 or higher. Students must have completed AT 41501 with a grade of B or higher. The Center for Research and Education in Advanced Transportation Ecosystems-CREATE (approval is required to register). Each course provides students hands-on experience in addressing a specific real-world problem with a broad societal impact, some of these projects may be supported by an industry partner. CREATE will seek industry partners, help define the scope and deliverables associated with each project and invite students to participate. Permission of instructor required.**Credits:** 0.00 to 3.00

AT 41901 - Advanced Air Mobility Capstone

Credit Hours: 3.00. The conclusion and demonstration of the cumulative knowledge and skills learned within the UAS curriculum. Students will engage in a series of assignments that will guide them toward proposing and researching a capstone project that demonstrates knowledge gained in UAS and AAM topics. Students are expected to focus on the development of deliverable products that demonstrate their skills as effective UAS operators. **Credits:** 3.00

AT 42101 - Managerial Economics In Aviation

Credit Hours: 3.00. This course explores the process of making managerial decisions based on modern economic principles and concepts, and provides the student with a set of tools that can be used to make those decisions. Marginal analysis, forecasting, and cost analysis concepts are introduced, as are game-theoretic and probabilistic decision-making models. Bargaining strategies and linear programming tools are covered, as well.**Credits:** 3.00

AT 42201 - Aerospace Risk Management

Credit Hours: 3.00. This course focuses on students' understanding of the financial expertise needed to analyze trading and hedging programs for application in reducing aerospace risk exposure. The studies include research into the development and use of operational indices and their possible relation to hedging with commodity and security instruments. Emphasis will be placed on trading methods, use of futures, options, derivatives, and swaps as hedging financial instruments in providing improved risk management. **Credits:** 3.00

AT 43300 - Supervised Aviation Experience

Credit Hours: 1.00 to 3.00. Supervised aviation experience directed toward providing orientation, background, and insight into flight or ground operations. Permission of department required. **Credits:** 1.00 to 3.00

AT 43500 - Supervised Instructional Experience

Credit Hours: 1.00 to 4.00. This course provides students with experience as instructors in an aviation classroom or laboratory environment under the supervision of faculty. In addition to the supervisory skills gained, students will become knowledgeable in task planning and communication techniques. Permission of department required. **Credits:** 1.00 to 4.00

AT 43800 - Airline Operations

Credit Hours: 3.00. Students in this course study airline operations in depth. Topics include marketing, route analysis, aircraft selection, financial analysis, federal regulations, and scheduling. Currently industry problems are discussed as well. **Credits:** 3.00

AT 43900 - Aviation Command Leadership

Credit Hours: 2.00. Examination of pilot professional development and strategies for career planning and industry advancement. Emphasis is placed on leadership, command training, and mentorship for pilots throughout their career.**Credits:** 2.00

AT 44502 - Aircraft Electronics

Credit Hours: 3.00. A study of the computer-based electronic systems used to control both flight and engine parameters on modern aircraft. The course examines the various systems with an emphasis on how each component integrates into the electronic structure of the aircraft. **Credits:** 3.00

AT 45100 - Airport Operations

Credit Hours: 3.00. This course is an in-depth examination of airport operations for air carrier and general aviation airports, with a strong emphasis on practical problem solving of current operational issues facing local and area airports. **Credits:** 3.00

AT 45200 - Aviation Global Experience Seminar

Credit Hours: 1.00. This course prepares students for faculty-led study trips and similar international experiences for which direct course credit is not available. **Credits:** 1.00

AT 45300 - Aviation Global Experience

Credit Hours: 0.00 to 3.00. Supervised international study experience for AT students for which direct course credit not available. Specific objectives, requirements, and credit determined by the Aviation Technology department. **Credits:** 0.00 to 3.00

AT 45400 - Human Factors In Aviation

Credit Hours: 3.00. Students investigate the disciplines known as human factors and ergonomics and how they apply to various aviation career areas from a management perspective. Common industry models and error management strategies will be studied and evaluated. **Credits:** 3.00

AT 45900 - Airport Manager Certification

Credit Hours: 3.00. This course prepares students for the certified manager exam offered by the American Association of Airport Executives (AAAE). This certificate is the first step toward industry accreditation as an airport manager and director. **Credits:** 3.00

AT 47200 - Advanced Composite Technology

Credit Hours: 3.00. Students will perform a variety of fabrication, testing, and repair tasks using specialized composite fibers, matrices, and core materials.**Credits:** 3.00

AT 47500 - Aviation Law

Credit Hours: 3.00. A study of the fundamental legal and aviation law principles as they apply to the various participants in the aviation industry. Special emphasis is placed on contemporary aviation law issues such as pilot, flight instructor, and mechanic liability; product liability; and aviation insurance. **Credits:** 3.00

AT 47600 - Aircraft Gas Turbine Engine Technology II

Credit Hours: 3.00. This is a study of turbofan engines and systems. Engine installation, testing, and operational procedures are stressed. Emphasis is placed on performance evaluation, data calculations, and predictions of operational properties. Turbofan design theory, operational efficiencies, and fault isolation are discussed. **Credits:** 3.00

AT 47700 - Aircraft Maintenance Practicum

Credit Hours: 1.00. This course provides the knowledge, information and experience required for aviation professionals to interact safely in a general aviation environment.**Credits:** 1.00

AT 47900 - Control Tower Operator

Credit Hours: 3.00. This course includes a review of air traffic control procedures, federal aviation regulations, and aviation weather observation and reporting. It is designed to prepare students to pass the FAA Control Tower Operators Examination. **Credits:** 3.00

AT 48000 - Advanced Aviation Manufacturing (Lean Six Sigma Methodologies)

Credit Hours: 3.00. Course is a selective choice in the AET program. This is a study of advanced aviation manufacturing principles, lean six sigma methodologies and project management basics. Permission of instructor required. **Credits:** 3.00

AT 48100 - Aviation Safety Problems

Credit Hours: 3.00. This course provides the opportunity for students to study problems associated with aviation safety. Particular attention will be given to the formulation of specific recommendations for improvements in aviation safety. **Credits:** 3.00

AT 48700 - Transport Aircraft Simulation Laboratory

Credit Hours: 2.00. This is a laboratory course conducted in a turbine-type aircraft simulator. This course emphasizes normal instrument and aircraft procedures as well as aircraft systems and cockpit resource management. Permission of department required.**Credits:** 2.00

AT 49000 - Aviation Project

Credit Hours: 1.00 to 6.00. Independent study for junior and senior students who wish to pursue study and developmental work in special areas. Subject matter must be arranged with the instructor before enrolling in the course. Permission of instructor required. **Credits:** 1.00 to 6.00

AT 49200 - Aircraft Airworthiness Assurance

Credit Hours: 3.00. Students apply foundational airworthiness assurance principles from the aviation and aerospace industries, performing maintenance and inspection tasks on the school's large transport category laboratory aircraft. They research OEM data to develop and test air vehicle work instructions, incorporating modern maintenance and inspection practices like MSG-3, Reliability Centered Maintenance, and global Safety and Quality standards and Industry 4.0 data science frameworks relating to air vehicle maintenance. They also practice essential participative team and leadership competencies, taking on leadership roles with their laboratory peers as technical team members in a live airport ramp environment.**Credits:** 3.00

AT 49300 - Industrial Practice V

Credit Hours: 1.00. Industrial practice and experience in participating industry. Requires written report of the experience. **Credits:** 1.00

AT 49401 - Capstone Project Proposal

Credit Hours: 2.00. Students will study all aspects of a possible capstone project and will develop a proposal for conducting an applied research project.**Credits:** 2.00

AT 49501 - Applied Capstone Research Project

Credit Hours: 1.00. Students will complete the applied capstone project defined in AT 49401. **Credits:** 1.00

AT 49600 - Applied Research Proposal

Credit Hours: 2.00. Students perform a structured analysis of an industry-based problem or design challenge, producing a professionally written project proposal. Students engage all aspects of a product or process engineering design proposal including problem analysis, identifying design requirements, conceptualizing, and communicating a solution. Students incorporate rigorous research and industry methodologies like Quality Functional Deployment, Failure Mode and Effects Analysis, literature reviews, and project cost/ROI estimates to create and defend a written project proposal.**Credits:** 2.00

AT 49700 - Applied Research Project

Credit Hours: 3.00. Students transform their product/process design proposal created in the proposal design course into a requirements-driven, functional product. During design, they employ rigorous R&D criteria and metrics, global quality, safety, and other industry-based standards, tracking and reporting project development using Technology Readiness Level criteria. For deployment and test phases they incorporate human subject certification, protocols, and develop user-test measures using quantitative and qualitative analysis. The course deliverable is a final written report and functional project demonstration/presentation.**Credits:** 3.00

AT 49800 - Aviation Technology Capstone

Credit Hours: 3.00. The Aviation Technology Capstone course encourages teamwork in small groups on a substantial project. The intent of this course is to provide a capstone experience that integrates the material and previous experience of the student's curriculum. It also provides an opportunity for students to recognize and evaluate the interrelationship of their general education courses with the courses taken for their major. **Credits:** 3.00

AT 49900 - Aviation Technology

Credit Hours: 1.00 to 4.00. Hours, credit, and subject matter to be arranged by staff. Permission of department required. **Credits:** 1.00 to 4.00

AT 50500 - Research Methods In Aviation

Credit Hours: 3.00. This course explores the practical approach to research as it applies to identifying and exploring pragmatic problems in aviation industry settings. Industry based problems and issues often require a diversity of research skills, both quantitative and qualitative, in order to effectively address dynamic problems in complex and often high-risk work environments. This course offers an overview of mixed research methods which lends itself well to practical problem solving in industry. This course may also be offered in an online format. Permission of instructor required. **Credits:** 3.00

AT 50600 - MS Capstone Research Project

Credit Hours: 3.00. A formal investigation of a particular problem under the guidance of the advisory committee. Not applicable to a thesis option plan of study. Enrollment during at least two consecutive terms for a total of three credits is required. Permission of instructor required. **Credits:** 3.00

AT 50700 - Quantitative Research Methodologies In Transportation

Credit Hours: 3.00. This course provides an introduction to business statistics with a specific focus on data analyses and managerial decision making in the transportation industry. Topics include descriptive statistics, probability models, estimation, hypothesis testing, and regression analysis. Students use software to perform their own analyses. Permission of instructor required. **Credits:** 3.00

AT 50800 - Quality And Productivity In Industry And Technology

Credit Hours: 3.00. (IET 50800) Examines the contemporary issues of continuous improvement in quality and productivity in manufacturing and service industries. Includes a close examination of the evolving philosophies bearing on the scope, improvement, and costs of quality assurance programs in industry and technology. **Credits:** 3.00

AT 51900 - Aviation Geographic Information Science Applications

Credit Hours: 3.00. This course provides a core set of skills essential for understanding geospatial science and using Geographic Information Systems as a tool to conduct research with a spatial component. The student will learn how to acquire, process, analyze, and interpret geospatial data using real-world data sets in applied situations.**Credits:** 3.00

AT 52000 - Operational Assessment And Improvement

Credit Hours: 3.00. This course focuses on developing the skills to analyze, formulate, and apply techniques for work task improvement. Concepts to be studied include workflow enhancement, critical element streamlining, and value added analysis. Students will explore process map construction, process ownership, measurement system validation, standards creation, and decision factors. An industry project will be assigned and used to facilitate course objectives. Permission of instructor required. **Credits:** 3.00

AT 52100 - Resource Analysis And Optimization

Credit Hours: 3.00. This course provides the student with insight to develop and apply business models that adjust and adapt to the changing climate of daily operations in support of aviation customers and product movement. The course uses a combination of lecture and group discussion, as well as project activity to address resource analysis topics, such as queuing fundamentals, swarm theory, and forecasting models. Permission of instructor required.**Credits:** 3.00

AT 52400 - Managerial Economic Decision Making

Credit Hours: 3.00. This course explores managerial decision making, using economic and strategic impacts of new technology and transformation methodologies on the enterprise system. Management planning and decision making, process costing and allocation, operational control, management control, activity-based costing, and multi-attribute decision-making models are covered. Theory of constraints and lean implementations in aviation are studied to understand the short and long-term effects on financial measures. **Credits:** 3.00

AT 52500 - Process Improvement And Simulation

Credit Hours: 3.00. This course explores process modeling and simulation as applied to decision-making for process design and improvement. Emphasis is placed on understanding the application of process simulations to business problems including using fundamental statistical methods in the solution of an industry relevant problem. By planning and executing a computer-based simulation supporting an aviation or aerospace process design and improvement project, students improve analysis and project management skills. In addition to simulation, preparing visualizations of the process is also included for increased understanding of process interactions. **Credits:** 3.00

AT 52600 - Aviation Leadership

Credit Hours: 3.00. This course is intended for future aviation and aerospace managers. Using foundational readings, case studies, and critical analysis techniques, the contribution of past and contemporary aviation leaders will be reviewed. Permission of department required. **Credits:** 3.00

AT 52800 - Management And Design Of Training Systems

Credit Hours: 3.00. This course will examine the practical applications of managing the training process in industry and educational settings, including the development of instructional materials from an adult learner perspective. Curriculum design using various forms of media and delivery strategies will be emphasized. This course may also be delivered in an online format. Permission of department required. **Credits:** 3.00

AT 53000 - Multi-Cultural Issues In Team Operations

Credit Hours: 3.00. This course explores the nature and origins of professional, national, and organizational culture and their role in multi-disciplinary team activities. Power distance, individualism/collectivism, gender differences, and uncertainty avoidance are examined in terms of research by Hofstede. Management studies of several international air carriers will be utilized to highlight how cultural differences can affect perceptions. Permission of department required. **Credits:** 3.00

AT 53100 - International Civil Aviation Regulatory Systems

Credit Hours: 3.00. This course provides extensive multi-modal transportation security experience. Students will receive detailed information on air, maritime, rail, mass transit, trucking and oil pipeline security programs, as well as applicable threat mitigation processes. Completion of an undergraduate course in either aviation law or aviation security is recommended. This course may be applicable to undergraduates with appropriate experience and background in aviation or other transportation systems. There are no citizenship or security clearance requirements for this course. **Credits:** 3.00

AT 53200 - Contemporary Issues In Transportation Security

Credit Hours: 3.00. This course provides extensive multi-modal transportation security experience. Students will receive detailed information on air, maritime, rail, mass transit, trucking and oil pipeline security programs, as well as applicable threat mitigation processes. Completion of an undergraduate course in either aviation law or aviation security is recommended. This course may be

applicable to undergraduates with appropriate experience and background in aviation or other transportation systems. There are no citizenship or security clearance requirements for this course. **Credits:** 3.00

AT 53300 - Aviation Graduate Professional Practice Internship

Credit Hours: 1.00 to 3.00. This course involves a practical internship experience within the aviation industry that provides exposure to the roles and duties commensurate with the student's graduate program focus. Prerequisite: Completion of one term of graduate studies and the instructor will validate that the student has an offer letter from an approved company. Permission of assigned graduate chair is required. Permission of instructor required. **Credits:** 1.00 to 3.00

AT 54200 - Aviation Fuels And Exhaust Emissions

Credit Hours: 3.00. This course focuses on aviation fuels, including engine operation with fuel, combustion principles, chemistry, exhaust emissions, and fuel testing procedures. Additionally, the topics of greenhouse gases, global warming, oil reserves, fuel costs, and other factors driving the development of alternative aviation fuels will be covered. Current research in these areas will be discussed and testing procedures will be studied. Students will research new fuels in development, and will analyze the sustainability and potential for success promised by the new technologies in comparison with existing fuels. **Credits:** 3.00

AT 54300 - Contemporary Issues In Airport & Airline Finance

Credit Hours: 3.00. This course provides an overview of aviation financial management and is intended for current and future aviation and aerospace leaders and managers. Taking a global view, the course opens with the tremendous economic impact of the aviation sector that both drives and enables the interdependent global economy. The course material covers the unique business models and best practices in financial management for both the airport and airline industries and analyzes the relationship between the two (including the complications implicit in highly divergent planning horizons). The complexity of aircraft financing decisions is covered that lead up to building a fleet to serve the airlines' forecast growth. The course uses relevant readings and case studies as well as statistical data in time series to demonstrate the way financial management has evolved to improve performance in both the airport and airline industries. Permission of department required.**Credits:** 3.00

AT 54400 - Aircraft Lifecycle Management Innovations

Credit Hours: 3.00. This course explores sustainability as applied to aviation and aerospace industries and agencies, both in the private sector and public sector. Students improve analysis skills, and knowledge of the reasoning and application of sustainability. Emphasis is placed on understanding the global and national policies that lead to the regulations and practices in aviation and aerospace. Using a balanced scorecard and a triple bottom line approach, students will develop a project using aviation and aerospace publications to analyze an industry-relevant project using sustainability in the analysis. **Credits:** 3.00

AT 54600 - Aviation Financial Instruments And Operations

Credit Hours: 3.00. The course concentrates on increasing the understanding of financial expertise in analyzing trading and hedging programs for application in reducing aviation operational risk exposure. The studies include research into the development and use of operational indexes and their possible relation to hedging with commodity and security instruments. Emphasis will be placed on the understanding of current operational measurements and correlations to trading and hedging financial instruments in providing improved risk management in operational environments.**Credits:** 3.00

AT 54700 - Airline Revenue Management

Credit Hours: 3.00. This course aims to provide students with experience in airline revenue management applications. Primarily focusing on the commercial operation of airlines, this course covers various contemporary topics such as the segmentation,

inventory control, forecasting, budgeting and pricing. This course will use simulations to enhance the overall learning-teaching experience. **Credits:** 3.00

AT 54800 - Aircraft Asset Management

Credit Hours: 3.00. This course provides the student with a detailed exploration of aircraft asset management programs in both airlines and business aviation organizations. Students analyze and study the critical components of an asset management program, the financial methods in aircraft asset management, acquisition proposals, and development plans of aircraft acquisitions in this course. An airline industry-relevant project is used to improve student reasoning and application of industry standard aircraft asset management analysis procedures to include forecasting techniques, present value calculations, and benefit-cost analyses. This course serves as the foundational knowledge required for AT 54900. **Credits:** 3.00

AT 54900 - Aircraft Leasing

Credit Hours: 3.00. This course provides students with training and experience managing aircraft leases using financial and risk management methodologies specific to the airline and business aviation industries. Students conduct financial evaluations of leasing versus ownership programs of airlines, as well as analyze debt, equity and capital markets for aircraft financing. The course includes an examination of taxation issues related to aircraft leasing, maintenance reserves, and auditing of aircraft financial performance. The prerequisite for this course is AT 54800. **Credits:** 3.00

AT 55000 - Critical Systems Thinking

Credit Hours: 3.00. This course explores the application of critical systems thinking to complex problems. Using systems theory and case studies developed by technology visionaries, students will investigate alternative solutions to difficult industrial problems with global impact. Outcomes for this course include written assignments, oral presentations, and a final project that addresses a major industrial problem. **Credits:** 3.00

AT 55100 - Graduate Aviation Research Seminar

Credit Hours: 1.00. This course provides graduate students with an opportunity to present and develop ongoing research activity in a seminar setting. Individual student research designs, report/thesis structures, and project issues are developed in open forum. Permission of instructor required. **Credits:** 1.00

AT 57200 - Human Error And Safety

Credit Hours: 3.00. Explores the definition and nature of human error, error chains, and causal factors in error generation. Error taxonomies are reviewed in order to provide a classification scheme for grouping errors and assessing error criticality. Methods for assessing risk and predicting error generation potentials are learned, as well as strategies for controlling or eliminating errors. Case studies are utilized throughout the course to illustrate course concepts. Permission of instructor required. **Credits:** 3.00

AT 57300 - Managing The Risk Of Organizational Accidents

Credit Hours: 3.00. Examines strategies various industries use to assess the risk of organizational accidents and to develop safety management programs to prevent, capture, and recover from conditions that lead to disastrous outcomes. Strategies such as High Reliability Organizations, Operational Risk Management, Behavioral Based Safety, Tripod Delta, and Safety Cultures are explored as successful methods for improving organizational safety in high-risk environments and endeavors. Permission of instructor required. **Credits:** 3.00

AT 57400 - Exploratory Studies In Aviation Human Factors

Credit Hours: 3.00. Exploration of contemporary issues and research related to human factors theory and program strategies as they relate to the aviation industry. The course ventures beyond ergonomic issues into more diverse human factors considerations, while discussing an industry-wide and organizational perspective. The course utilizes a combination of lecture, group discussion, and independent study into issues relevant to student interests and career goals. Permission of instructor required. **Credits:** 3.00

AT 58100 - Workshop In Aviation Technology

Credit Hours: 0.00 to 8.00. Advanced study of technical and professional topics. Emphasis is on new developments relating to technical, operational, and training aspects of industry and technology education. **Credits:** 0.00 to 8.00

AT 59000 - Special Problems In Aviation Technology

Credit Hours: 1.00 to 12.00. Independent study of a special problem under the guidance of a member of the staff. Does not substitute for either M.S. thesis or M.S. project credit. Permission of instructor required. **Credits:** 1.00 to 12.00

AT 60700 - Aviation Applications Of Bayesian Inference

Credit Hours: 3.00. This course provides a critical foundation necessary for understanding Bayesian theory and employing that theory in the analysis of typical data generated in industry. The course will focus specifically on solutions of aviation-related problems through data analysis. Material includes overview and implementation of relevant statistical software applications. Practical skills in presenting advanced analyses to both professional and scientific audiences is a key component of the course. Prerequisites: AT 50700 OR IT 50700 OR STAT 30100 OR STAT 50100 OR STAT 51100. Permission of instructor required. **Credits:** 3.00

AT 64000 - Aviation And Aerospace Sustainability

Credit Hours: 3.00. This course explores sustainability as applied to aviation and aerospace industries and agencies, both in the private sector and public sector. Emphasis is placed on understanding aviation and aerospace sustainability academic literature and on connecting the global and national policies that lead to the regulations and practices. Aviation sustainability is comprised of multiple areas of impact such as economic, environmental, operational, and social. Students develop an understanding of existing sustainability assessment frameworks such as GRI that have general sustainability assessments along with specialized aviation industry frameworks. Using a multiple attribute analysis approach, students develop metrics and analyze the potential impact of sustainability initiatives in the aviation and aerospace industry. Prerequisites: STAT 30100 or STAT 31100 or STAT 50100 or STAT 51100 or IT 50700 or an instructor-approved statistical foundations course. Proficiency in statistical foundations is required to understand and evaluate environmental, economic and social sustainability data, information and methods presented in this course. **Credits:** 3.00

AT 65900 - Airport And Transportation Sustainability

Credit Hours: 3.00. AT 65900 Airport and Transportation Sustainability is a doctoral format course about the methods and practice of sustainability for airports and transportation. Sustainability in planning, design, construction and operation of airports and transportation facilities and infrastructure are addressed. Prerequisites: Successful completion of at least one statistics course covering descriptive and inferential statistics, an airport management course (e.g., AT 35900) and admission to doctoral program. Permission of instructor required. **Credits:** 3.00

AT 67500 - Aviation Safety Program Development

Credit Hours: 3.00. This course is designed to provide graduate students with essential information and practical activities necessary to develop and manage effective and comprehensive safety programs for a wide variety of aviation operations.

Students will conduct safety research, analyze data, and make presentations based on developed safety systems. Instructor permission required. **Credits:** 3.00

AT 68100 - Seminar In Aviation Technology

Credit Hours: 1.00 to 3.00. This variable title course will be used for temporary course offerings for doctoral-level students. Permission of Instructor required. **Credits:** 1.00 to 3.00

AT 69000 - Independent Study In Air Transportation

Credit Hours: 1.00 to 6.00. Intensive individual study of selected current developments and issues in air transportation. A faculty sponsor is required for this course. Prerequisite: Doctoral student standing. Permission of instructor required. **Credits:** 1.00 to 6.00

AT 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

AT 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. This course involves intensive research and writing activity associated with a doctoral dissertation. Prerequisite: Doctoral candidate status. Permission of instructor required. **Credits:** 1.00 to 18.00

Bands

BAND 11000 - Marching Band

Credit Hours: 2.00. Open through audition. Additional lab and activity fees involved. Mandatory participation required in Marching Band Workshop one week prior to start of fall classes which conflicts with Boilermaker Gold Rush. Workshop covers similar orientation to Gold Rush. Do enroll in BAND 11000 during summer registration prior to the workshop and audition process. **Credits:** 2.00

BAND 11100 - Symphony Orchestra

Credit Hours: 2.00. Open through audition. Additional lab and activity fees involved. **Credits:** 2.00

BAND 11200 - American Music Review

Credit Hours: 2.00. Singers and pianists only. American Music Review is a jazz big band plus 4-5 singers open through audition. Additional lab and activity fees involved. **Credits:** 2.00

BAND 11300 - Jazz Ensemble

Credit Hours: 2.00. Open through audition. Additional lab and activity fees involved. Permission of instructor required. **Credits:** 2.00

BAND 11400 - Basic Jazz

Credit Hours: 2.00. Open through audition. Additional lab and activity fees involved. **Credits:** 2.00

BAND 11500 - String Orchestra

Credit Hours: 2.00. The rehearsal, study, and performance of string orchestra music from the classical, romantic and contemporary areas of composition. **Credits:** 2.00

BAND 11600 - Symphonic Band

Credit Hours: 2.00. Open through audition. Additional lab and activity fees involved. **Credits:** 2.00

BAND 11700 - Concert Band

Credit Hours: 2.00. Open through audition. Additional lab and activity fees involved. **Credits:** 2.00

BAND 11800 - Collegiate Band

Credit Hours: 2.00. Open through audition. Additional lab and activity fees involved. **Credits:** 2.00

BAND 11900 - Varsity Band

Credit Hours: 2.00. Open through audition. Additional lab and activity fees involved. **Credits:** 2.00

BAND 12000 - Applied Music Studies

Credit Hours: 1.00. Private study on individual wind, string, and percussion instruments. Additional fees involved. Permission of instructor required. **Credits:** 1.00

BAND 12100 - Symphony Orchestra

Credit Hours: 2.00. Symphony Orchestra. **Credits:** 2.00

BAND 12200 - American Music Review

Credit Hours: 2.00. American Music Review. **Credits:** 2.00

BAND 33000 - Summer Concert Bands

Credit Hours: 2.00. Continuation of BAND 32000. **Credits:** 2.00

BAND 33100 - Summer Jazz Bands

Credit Hours: 2.00. Continuation of BAND 33000. **Credits:** 2.00

BAND 34000 - Renaissance Ensemble

Credit Hours: 2.00. A survey of renaissance and baroque ensemble literature to be played on appropriate instruments. Reproductions of renaissance and baroque wind, stringed, and brass instruments are available for use in the Department of Bands. **Credits:** 2.00

BAND 34100 - Renaissance Ensemble

Credit Hours: 2.00. A survey of renaissance and baroque ensemble literature to be played on appropriate instruments. Reproductions of renaissance and baroque wind, stringed, and brass instruments are available for use in the Department of Bands. **Credits:** 2.00

BAND 35000 - Wind Ensemble I

Credit Hours: 2.00. The University Wind Ensemble is an organization composed of 42 instrumentalists selected by audition from staff, graduate students, and symphony band members. Concentrating on the rehearsal and performance of contemporary wind music of a highly virtuoso and concertante nature, it offers its members extensive opportunities to rehearse and study works of considerable difficulty from the contemporary area of composition as well as some aspects of the baroque and classical fields. This organization meets once a week throughout the academic year. Permission of instructor required. **Credits:** 2.00

BAND 35100 - Instrument Ensemble Colloquium

Credit Hours: 2.00. Instrument Ensemble Colloquium. **Credits:** 2.00

BAND 36000 - Wind Ensemble II

Credit Hours: 2.00. The University Wind Ensemble is an organization composed of 42 instrumentalists selected by audition from staff, graduate students, and symphony band members. Concentrating on the rehearsal and performance of contemporary wind music of a highly virtuoso and concertante nature, it offers its members extensive opportunities to rehearse and study works of considerable difficulty from the contemporary area of composition as well as some aspects of the baroque and classical fields. This organization meets once a week throughout the academic year. **Credits:** 2.00

BAND 36100 - Instrument Ensemble Colloquium

Credit Hours: 2.00. Instrument Ensemble Colloquium. **Credits:** 2.00

BAND 43000 - Summer Concert Bands

Credit Hours: 2.00. Summer Concert Bands. **Credits:** 2.00

BAND 43100 - Summer Jazz Bands

Credit Hours: 2.00. Summer Jazz Bands. **Credits:** 2.00

BAND 44000 - Renaissance Ensemble

Credit Hours: 2.00. A survey of renaissance and baroque ensemble literature to be played on appropriate instruments. Reproductions of renaissance and baroque wind, stringed, and brass instruments are available for use in the Department of Bands. **Credits:** 2.00

BAND 44100 - Renaissance Ensemble

Credit Hours: 2.00. A survey of renaissance and baroque ensemble literature to be played on appropriate instruments. Reproductions of renaissance and baroque wind, stringed, and brass instruments are available for use in the Department of Bands. **Credits:** 2.00

BAND 47000 - Wind Ensemble III

Credit Hours: 2.00. The University Wind Ensemble is an organization composed of 42 instrumentalists selected by audition from staff, graduate students, and symphony band members. Concentrating on the rehearsal and performance of contemporary wind music of a highly virtuoso and concertante nature, it offers its members extensive opportunities to rehearse and study works of considerable difficulty from the contemporary area of composition as well as some aspects of the baroque and classical fields. This organization meets once a week throughout the academic year. **Credits:** 2.00

BAND 47100 - Ensemble Colloquium

Credit Hours: 2.00. Ensemble Colloquium. **Credits:** 2.00

BAND 48000 - Wind Ensemble IV

Credit Hours: 2.00. The University Wind Ensemble is an organization composed of 42 instrumentalists selected by audition from staff, graduate students, and symphony band members. Concentrating on the rehearsal and performance of contemporary wind music of a highly virtuoso and concertante nature, it offers its members extensive opportunities to rehearse and study works of considerable difficulty from the contemporary area of composition as well as some aspects of the baroque and classical fields. This organization meets once a week throughout the academic year. **Credits:** 2.00

BAND 48100 - Ensemble Colloquium

Credit Hours: 2.00. Ensemble Colloquium. **Credits:** 2.00

Basic Medical Sciences

BMS 11500 - Anatomy For Veterinary Technicians I - DL

Credit Hours: 2.00. This course is the first of two courses in the distance learning program that presents an introduction to the study of the major body systems and topographic relationships of the major domesticated species, with emphasis on the carnivore. **Credits:** 2.00

BMS 11600 - Anatomy For Veterinary Technicians II - DL

Credit Hours: 2.00. This course is the second of two courses in the distance learning program that presents an introduction to the study of the major body systems and topographic relationships of the major domesticated species, with emphasis on the carnivore. **Credits:** 2.00

BMS 13500 - Physiology For Veterinary Technicians I - DL

Credit Hours: 1.00. This course is the first of two courses in the distance learning program that presents an introduction to general physiology of the mammalian body systems and the general physiological process with emphasis on domestic animals. This course will address the functions of the different systems and homeostasis; the functions of the cell; the different compartments and solute transport; blood and defense; general functions of the nervous system, reflexes and special senses; the function of the nerve and muscle; cardiovascular system; and digestive system. **Credits:** 1.00

BMS 13600 - Physiology For Veterinary Technicians II - DL

Credit Hours: 1.00. This course is the second of two courses in the distance learning program that addresses the functions of the kidney and its role in regulation of extracellular volume and acid-base; respiration, mechanics of respiration and its control, transport of gases and hypoxia; physiology of the endocrine system, functions of the gonads, fertilization, pregnancy, parturition and lactation. **Credits:** 1.00

BMS 20100 - Applied Domestic Animal Anatomy With Clinical Correlations I

Credit Hours: 2.00. This course is the first of two in the Purdue College of Veterinary Medicine, Department of Basic Medical Sciences distance learning program covering the basic anatomy of common domestic animals. We will focus on the canine and comparative anatomy of the equine, ruminant, and human, especially where species differentiations exist. The information is organized according to body systems. Clinical correlations are used to emphasize the importance of the basic anatomy. Permission of instructor required. **Credits:** 2.00

BMS 20200 - Applied Domestic Animal Anatomy With Clinical Correlations II

Credit Hours: 2.00. This course is the second of two in the Purdue College of Veterinary Medicine, Department of Basic Medical Sciences distance learning program covering the basic anatomy of common domestic animals. We will focus on the canine and comparative anatomy of the equine, ruminant, and human, especially where species differentiations exist. The information is organized according to body systems. Clinical correlations are used to emphasize the importance of the basic anatomy. In this second course we cover thoracic, abdominal and head anatomy. Permission of instructor required. **Credits:** 2.00

BMS 23100 - Anatomy-VN

Credit Hours: 4.00. Gross and microscopic study of body systems and topographic relationships in major animal species. Laboratory consists of dissection as well as study of living animals.**Credits:** 4.00

BMS 23200 - Physiology-VN

Credit Hours: 2.00. Basic mammalian physiology, which covers general physiological processes with emphasis on domestic animals. Laboratory experiences and demonstrations form a major part of the laboratory instruction.**Credits:** 2.00

BMS 23300 - Introduction To Pharmacology-VN

Credit Hours: 0.50. This course introduces the concepts and terminology of pharmacology including basic terminology, pharmacokinetics, and pharmacodynamics.**Credits:** 0.50

BMS 23400 - Clinical Physiology: A Problem Solving Approach-Distance Learning

Credit Hours: 1.00. This course will provide the physiological basis for clinical functions and medical interventions of the animal. The course is designed to: 1. Complement and expand students' understanding of concepts taught in the general physiology course (BMS 23200, Physiology for Veterinary Technicians); 2. Emphasize how understanding basic physiological concepts can help in solving clinical cases; 3. Promote critical thinking, team work, communication skills and problem solving. **Credits:** 1.00

BMS 23500 - Pharmacology VT-DL

Credit Hours: 1.00. This course is the first of two courses in the distance learning program that presents an introduction to the principles of pharmacy and pharmacology for the veterinary technician. Emphasis will be placed upon key concepts of how drugs

work, terminology commonly used with therapeutic agents, important mechanisms and side effects of commonly used veterinary drugs, and dosage calculations. **Credits:** 1.00

BMS 23600 - Pharmacology II VT-DL

Credit Hours: 1.00. This course is the second of two courses in the distance learning program that presents an introduction to the principles of therapeutics and pharmacology for the veterinary technician. Emphasis will be placed upon key concepts of how drugs work, terminology commonly used with therapeutic agents, important mechanisms and side effects of commonly used veterinary drugs. **Credits:** 1.00

BMS 23700 - Applied Physiology With Clinical Correlations I

Credit Hours: 2.00. This course introduces students to the general physiology of mammalian body systems and physiological processes. This course will address the functions of the different systems and homeostasis; the functions of the cell and its different compartments; solute transport, blood and immunity; general functions of the nervous system, reflexes and special senses; the functions of the nerve and muscle, the cardiovascular system; and the digestive system. The course provides the basic physiological concepts of various organ systems and clinical correlations that emphasize how understanding of basic physiological concepts help students solve problems. The clinical correlations and the students-centered learning activities are deigned to promote critical thinking, team work, communication skills, and problem solving. The targeted undergraduate students are: Pre-vet students, animal science majors, wildlife majors, and students in biological sciences and biomedical engineering, and other students interested in use of animals as models for human diseases. Permission of instructor required.**Credits:** 2.00

BMS 23800 - Applied Physiology With Clinical Correlations II

Credit Hours: 2.00. This course introduces students to general physiology of mammalian body systems and general physiological processes, with emphasis on domestic animals. The course addresses the functions of the different systems, and the specific functions of the respiratory, renal, endocrine, and reproductive systems. Students will be introduced to ailments that result from malfunctions in each system. The course provides the basic physiological concepts of various organ systems and clinical correlations that emphasize how understanding basic physiological concepts can help in solving problems. The clinical correlations and the students-centered learning activities are deigned to promote critical thinking, team work, communication skills, and problem solving. The targeted undergraduate students are: Pre-vet, students, animal science majors, wildlife majors, and other interested students in biological sciences and biomedical engineering. Permission of instructor required. **Credits:** 2.00

BMS 33100 - Pharmacology-VN

Credit Hours: 1.50. This course introduces the concepts of drugs used in the different body systems. Mechanisms of action, side effects, and therapeutic applications are presented.**Credits:** 1.50

BMS 51700 - Problems In Basic Medical Sciences

Credit Hours: 0.50 to 8.00. Studies or investigations in the various disciplines of the basic medical sciences of man and domestic animals for advanced undergraduate and beginning graduate students. Permission of instructor required. **Credits:** 0.50 to 8.00

BMS 52400 - Introduction To Confocal Microscopy And Image Analysis

Credit Hours: 1.00. Introduction to the principles of confocal microscopy and rudiments of image analysis. Confocal microscopy can be used in biological and nonbiological systems and is, therefore, an interdisciplinary tool in the modern research laboratory. The three-dimensional reconstruction of images allows discovery of complex structures. Deals with fluorescence excitation and emission, optical design, basic image analysis principles, and application areas for which the technology has been targeted. The student will have a good understanding of the application and use of the technology by the end of the course. **Credits:** 1.00

BMS 52900 - Basic Bone Biology

Credit Hours: 3.00. This course is designed to present the fundamentals of bone biology. Approximately 45 hours of lecture will help the learner achieve the objectives outlined. Lectures will be given to present information and tie into information learners have acquired or will acquire in other courses (e.g. biomechanics, physiology, molecular biology, etc.) to assist them in combining all of their courses and research experiences together into one interdisciplinary learning experience. It is expected that students take additional time outside of scheduled class time to further learning. Materials for the learners will be posted on the course's website. These materials will include: Lecture notes and PowerPoints: Each lecturer will post his/her lecture notes and associated PowerPoint slides prior to the lecture. Additional information: As the course progresses, instructors may come across additional information that they may find useful for student learning of the material. These materials will be posted for students to utilize as they see fit. * *Materials found on other sites (e.g. social networking sites) will not be official course materials, so use at your own risk.* Permission of instructor required.**Credits:** 3.00

BMS 53400 - Systemic Mammalian Physiology

Credit Hours: 4.00. This course is a 4 credit hour course that provides fundamental concepts of mammalian physiology in nervous, muscular, blood and cardiovascular, respiratory, renal, digestive, endocrine, and reproductive systems. The major physiological functions of these systems will be explained at the organ as well as the cellular level. The structure and function relationships will be studied in detail. At the end of the course, the students are expected to have a solid understanding of basic functions of the human body. In addition, the student will be exposed to the current topics and key concepts of experimental research. This course offers an excellent opportunity for those students who are looking to either learn or refresh their physiological knowledge that can benefit a variety academic and professional career goals. **Credits:** 4.00

BMS 59800 - Introduction To Research In Basic Medical Sciences

Credit Hours: 1.00 to 3.00. Introduction to research in pharmacology and physiology under the direction of a member of the departmental graduate faculty. Permission of instructor required. **Credits:** 1.00 to 3.00

BMS 60200 - Special Topics In Basic Medical Sciences

Credit Hours: 0.50 to 8.00. Advanced studies of organismic, cellular, and molecular processes in the basic medical sciences of man and domestic animals. Permission of instructor required. **Credits:** 0.50 to 8.00

BMS 63100 - Flow Cytometry: Theory

Credit Hours: 2.00. A thorough excursion into the theory of flow cytometry. An understanding of what the technology is, how it operates, and where the applications exist. Covers optical systems, including filters, light excitation and emissions, fluorescent dyes and fluorescent molecules, electronics including detection systems, signal processing, data analysis, and computer applications. A discussion of lasers and other light sources, as well as quality control. Overview of the application areas in medical sciences, biological research, and other possible areas of use. **Credits:** 2.00

BMS 69200 - Seminar In Basic Medical Sciences

Credit Hours: 0.00 or 1.00. Oral presentation of assigned or selected topics pertaining to physiology and pharmacology. **Credits:** 0.00 or 1.00

BMS 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

BMS 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

BMS 80100 - Gross Anatomy Of The Dog And Cat

Credit Hours: 3.50. Study of the anatomy of the body systems and the topographic relationships of the dog and cat. **Credits:** 3.50

BMS 80200 - Comparative Anatomy

Credit hours: 4.00. A comparative study of the body systems and the topographic relationships of the major domestic species. This course is an extension of BMS 801 and will continue to build on anatomical knowledge so that it may be applied to multiple domestic species. **Credits:** 4.00

BMS 80300 - Applied Anatomy Of The Dog And Cat

Credit Hours: 1.00. Consists of seven 50-minute lectures and/or discussion periods and seven 150-minute laboratory sessions, plus a comprehensive final exam. This course builds on basic anatomical knowledge and explores, in depth, the anatomy relevant to medical and surgical conditions of the dog and cat. Laboratory will utilize anatomical models, cadavers as animal models, electronic resources, and limited use of live animals for clinical examinations. **Credits:** 1.00

BMS 80400 - Applied Anatomy Of The Horse

Credit Hours: 1.00. Consists of seven 50-minute lectures and/or discussion periods and seven 120-to-150-minute laboratory sessions, plus a comprehensive final exam. Course material is based upon clinical conditions of the horse that have an anatomical basis or emphasis. Laboratory sessions include topographical anatomy; joint and nerve injections and performance of other clinical procedures; use of multimedia learning aids; and dissection of the head, neck, viscera, and legs. **Credits:** 1.00

BMS 80500 - Applied Anatomy Of Production Animals

Credit Hours: 1.00. Consists of seven 50-minute lectures and/or discussion periods and seven 120-to-150-minute laboratory sessions, plus a comprehensive final exam. Course material is based upon clinical conditions of the production animals that have an anatomical basis or emphasis. Laboratory sessions include topographical anatomy; joint and nerve injections and performance of other clinical procedures; use of multimedia learning aids; and dissection of the head, neck, viscera, and legs. **Credits:** 1.00

BMS 80700 - Veterinary Cell And Tissue Biology Design I

Credit hours: 2.50. The first of a two-semester sequence of courses, emphasizing developmental and microstructural foundations of structural differentiation of cell, tissue, and organ systems. Emphasis is placed upon principles, fundamental concepts, and applicable details as well as comparative aspects of general importance for veterinary medicine and biomedical research. That you have some background in biochemistry and cell biology is assumed. **Credits:** 2.50

BMS 80800 - Veterinary Cell And Tissue Biology Design II

Credit hours: 2.00. All lectures will focus on mammalian microanatomy with species differences and aim to include also a brief comparative description for Avian microanatomy when applicable. Structural and molecular basis of cellular processes that are the foundation of fertilization, embryogenesis, histogenesis, and basic tissue specialization in domesticated animals. Structure and function of macromolecules and organelles that mediate signal transduction, differentiation, and integration within a whole animal. **Credits:** 2.00

BMS 81000 - Foundations In Basic Medical Sciences

Credit Hours: 1.50. The overall objective of this course is to provide the incoming first year DVM students the basic, foundational science principles upon which they will base study of the DVM curriculum. Emphasis is upon basic principles and fundamental concepts of: animal body organization and terminology; cellular and whole body metabolism; macromolecules, membranes, transport, biosynthetic processes, cellular communication/signal transduction, cell cycle and growth regulation, gene expression and embryonic development. **Credits:** 1.50

BMS 81100 - Physiology Of Domestic Animals I

Credit Hours: 3.00. General physiological process of mammals with special emphasis on domestic animals; normal interactions between large populations of cells, organs, organ systems and integrated functions of an entire animal; homeostatic mechanisms, physiology of body fluids and blood formed elements, muscle and cardiovascular systems. **Credits:** 3.00

BMS 81200 - Physiology Of Domestic Animals II

Credit Hours: 4.00. Continuation of Physiology of Domestic Animals I (BMS 81100). Survey of the principles, concepts and mechanisms of physiological processes with special emphasis on interactions between large populations of cells, tissues, organ systems and integrated functions of domestic animals of importance to veterinary medicine. The organ systems covered are respiratory, renal, digestive, endocrine, and reproductive. **Credits:** 4.00

BMS 81300 - Principles Of Pharmacology

Credit Hours: 1.50. Introduction to pharmacokinetics and pharmacodynamics, ethical dimensions of drug use in veterinary medicine, and drug categories that integrate well with other first-year subjects (e.g., drugs that alter endocrine/reproductive function). Emphasis is placed on general principles and prototypical drugs. **Credits:** 1.50

BMS 81400 - Basic And Applied Pharmacology I

Credit Hours: 3.00. BMS 81400 follows BMS 81300 and includes the study of drugs with actions related to the nervous system and the immune system at large, anticancer drugs, antiviral drugs, and drugs targeted to organ specific pathologies - e.g. cardiac, intestinal, pulmonary, and renal pathologies. **Credits:** 3.00

BMS 81401 - Pharmacology Principles And Applications

Credit Hours: 4.00. This is the first of two pharmacology courses in the DVM curriculum. The first part of this course encompasses an introduction to basic concepts necessary to understand and optimally administer and deliver therapeutic drugs, such as pharmacokinetics, pharmacodynamics, dose forms, dosing regimen and prescriptions. In the second part of the course, drugs are studied not only based on their pharmacological class, but also based on the organs and systems on which they act (e.g. heart and vascular system, lungs, autonomous neuronal pathways, respiratory system, endocrine system, etc). This course also covers the pharmacology of cancer therapy and drugs used to fight pathogens (antifungals, antibiotics, antivirals, antiparasitics). Journal club sessions are included to directly relate pharmacology instruction to topics currently debated in the field. **Credits:** 4.00

BMS 81500 - Veterinary Neuroscience

Credit hours: 2.00. This course provides an introduction to neuroscience and its diagnostic application in veterinary medicine. Students will acquire terminology describing the anatomy and basic physiology that characterize neural systems. Integration of function/structure relationships will be introduced in lectures and laboratories, by reference to case studies, and by problem-solving. **Credits:** 2.00

BMS 81600 - Applied Pharmacology II

Credit Hours: 1.50. This DVM curriculum course covers drugs used to fight pathogens (antifungals, antibiotics, antivirals, antiparasitics), and drugs for immunomodulation and cancer therapy. New topics are introduced according to upcoming developments in drug use such as pharmacogenomics. A journal club session is included to directly relate pharmacology instruction to topics currently debated in the field. **Credits:** 1.50

BMS 81800 - Basic And Applied Pharmacology II And Principles Of Toxicology

Credit Hours: 2.00. A continuation of BMS 81400. Includes the study of drugs with actions related to the nervous system, and chemotherapeutic agents (including antibacterial, antifungal, and antiparasitic drugs). Principles of toxicology are introduced. **Credits:** 2.00

BMS 81900 - Endocrine And Neural Basis Of Seasonal Activities Of Birds And Mammals In The Wild

Credit Hours: 1.00. This one-credit elective course will be offered to first and second year veterinary students annually (third year students may also take it). The course will explore the physiological basis of seasonal activities of mammals and birds in the wild. An emphasis will be placed on the neural and endocrine changes that are associated with the seasonal and cyclical activities including breeding, hibernation, migration, etc. **Credits:** 1.00

Biochemistry

BCHM 10000 - Introduction To Biochemistry

Credit Hours: 2.00. A survey of modern biochemistry using case studies that highlight general theories and unifying concepts. This course is open to all majors and does not require any college science courses as background or prerequisite. **Credits:** 2.00

BCHM 10100 - Introduction To Biochemistry Laboratory

Credit Hours: 1.00. An entry-level laboratory course to help freshmen students become interested and excited about scientific research, and at the same time, gain the skills necessary to become better prepared for undergraduate research opportunities. Students perform real-world experiments to identify single base-pair changes in a DNA sequence that can change a protein-protein interaction. Students learn common laboratory skills such as pipetting, centrifugation, and sterile technique. Students also learn how to display and interpret scientific results in written form. **Credits:** 1.00

BCHM 22100 - Analytical Biochemistry

Credit Hours: 3.00. Discussion of qualitative and quantitative analysis of biological compounds including pH measurement and control, spectrophotometry, measurement of radioactivity; theoretical basis of various separation techniques, including chromatography and electrophoresis; application of these methods to separation and analysis of biological compounds. Laboratory sessions will provide practical experience in the use of these methods. This course is designed for biochemistry majors. **Credits:** 3.00

BCHM 27500 - Honors Course - Lower Division

Credit Hours: 1.00 to 4.00. Utilized to offer a new honors course for a maximum of three years. Variable title, credit, and instructional type. Course may be repeated for credit if content and titles are different. Offered primarily to first- and second-year

students. Courses offered must be approved by departmental faculty and College of Agriculture Honors Committee. Restriction: Enrollment in an honors program. Permission of instructor required. **Credits:** 1.00 to 4.00

BCHM 29000 - Experimental Design Seminar

Credit Hours: 2.00. Introduction to fundamentals of scientific principles and practice in biochemistry. Students will learn how to develop hypotheses, design experiments, and critically analyze results to create new knowledge. Intended for sophomores. **Credits:** 2.00

BCHM 29800 - Introduction To Biochemistry Research

Credit Hours: 1.00 or 2.00. Supervised individual research. This course is intended to provide an introduction to independent undergraduate research. The primary goal of this experience is to learn the mechanics of laboratory science. Students will learn to work in a real laboratory situation where experiments are not preassembled for them. Students will record their data in laboratory notebooks, and gain experience in trouble-shooting and critically analyzing the results of their experiments. Permission of instructor required. **Credits:** 1.00 or 2.00

BCHM 29801 - Head Start To Introductory Biochemistry Research

Credit Hours: 0.50 or 1.00. Supervised individual research. Weeks 9-16. This course is intended to provide a brief introduction to independent undergraduate research. Students should plan on continuing their research in the same laboratory in the following semester. The primary goal of this course is to gain experience working side-by-side with researchers in a real laboratory setting. Students will begin to learn how to best record their data in laboratory notebooks, and gain experience in trouble-shooting and critically analyzing the results of their experiments. Permission of instructor required. **Credits:** 0.50 or 1.00

BCHM 30700 - Biochemistry

Credit Hours: 3.00. Students will have an understanding of the following content areas: structure/function of amino acids, carbohydrates, lipids and nucleic acids; protein structure, function and purification; basic enzymology; replication, transcription and translation; intermediary metabolism including glycolysis, the citric acid cycle, oxidative phosphorylation, photosynthesis. Students will also develop an appreciation for some of the contributions that have been made by biochemistry to society, including improvements to medicine, agriculture, and the economy. **Credits:** 3.00

BCHM 30900 - Biochemistry Laboratory

Credit Hours: 1.00. Experiments that introduce methods for analysis and separation of biological molecules and that illustrate the biochemical and metabolic concepts covered in BCHM 30700. **Credits:** 1.00

BCHM 32200 - Analytical Biochemistry II

Credit Hours: 2.00. Modern biochemical techniques for the purification and characterization of biological proteins. This is a project-oriented course where students begin by purifying a recombinant enzyme by affinity chromatography and then characterize various biochemical properties of the enzyme throughout the semester. Emphasis will be placed on quantitative analyses, including measurements of enzyme activity and inhibition, molecular interactions, and oligomeric state. Students will learn basic principles of designing assays to measure biochemical phenomena. Use of bioinformatics and computational modeling tools for protein structure analysis will be integrated. The course will culminate with preparation of a manuscript-style report describing the enzyme characterization. **Credits:** 2.00

BCHM 36100 - Molecules

Credit Hours: 3.00. A lecture course that relates biochemistry to organic chemistry. Chemical principles relevant to the assembly and function of macromolecules, the logic of biological free energy conversion, and enzyme catalysis are emphasized, all of which provide a foundation for the study of metabolism. **Credits:** 3.00

BCHM 39000 - Professional Development Seminar

Credit Hours: 1.00. The objective of this course is to help biochemistry students with professional development and career planning. Students will learn about career possibilities, interview skills, job search strategies, graduate and professional school applications, resume construction and industrial practices. Intended for juniors. **Credits:** 1.00

BCHM 39100 - Internship In Biochemistry

Credit Hours: 0.00. Professional internship with biochemistry related employers in industry, government or small business. Permission of department required.**Credits:** 0.00

BCHM 40000 - Biochemistry Study Abroad

Credit Hours: 0.00 to 8.00. Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities. **Credits:** 0.00 to 8.00

BCHM 42100 - R For Molecular Biosciences

Credit Hours: 3.00. Students will acquire, assess, clean, visualize and analyze biological data sets with R. Students will be able to describe the link between complex biological phenomena and the data captured through human observation or scientific instrumentation. Students will learn how to organize data sets to optimize clarity and analytic possibilities while minimizing errors with examples drawn from the literature or biological databases. R will be taught starting with small-scale data such as drug sensitivity assays moving to genome-scale analyses such as gene expression and pathway analysis later in the course. These skills will be taught in the light of increasing data literacy and enabling reproducible research through clear documentation of data and communication of analyses. Relevant concepts from biology and statistics will be reviewed.**Credits:** 3.00

BCHM 42200 - Computational Genomics

Credit Hours: 3.00. This course introduces students to modern genomics and computational tools that will be used for screening. Students will review the notion of gene, genomic, transcriptome, and epigenome, and show how next generation sequencing technologies are utilized to measure these with cell.**Credits:** 3.00

BCHM 43400 - Medical Topics In Biochemistry

Credit Hours: 3.00. This course applies the principles of biochemistry and metabolic regulation to understand the diagnosis and treatment of human disease. The course emphasizes the biochemistry relevant to diabetes, blood disorders and the medical consequences of liver disease and aging. Roughly half of the class time is focused on small group activities including team-based learning and problem-based learning using patient cases. Students will search authoritative sources to discover links between biochemistry and clinical symptoms and communicate that information to their peers. **Credits:** 3.00

BCHM 46200 - Metabolism

Credit Hours: 3.00. A lecture course to provide students with a broad and thorough understanding of core metabolic pathways and how they are resulted. Anabolic and catabolic processes of metabolic pathways will be studied at the biochemical, structural, genetic and molecular levels. Students will learn to appreciate how the various metabolic pathways are integrated and how the fundamental metabolic pathways relate to medicine, agriculture and human disease. **Credits:** 3.00

BCHM 46500 - Biochemistry Of Life Processes

Credit Hours: 2.00. Major questions in biochemistry and contemporary approaches to these problems. Material covered in class will primarily be derived from primary literature. Students will continue to develop the skills needed to critically read, evaluate, and assimilate the primary scientific literature. **Credits:** 2.00

BCHM 47500 - Honors Course - Upper Division

Credit Hours: 1.00 to 4.00. Utilized to offer a new honors course for a maximum of three years. Variable title, credit, and instructional type. Course may be repeated for credit if content and titles are different. Offered primarily to third- and fourth-year students. Courses offered must be approved by departmental or program faculty and College of Agriculture Honors Committee. Permission of instructor required. **Credits:** 1.00 to 4.00

BCHM 49000 - Undergraduate Seminar

Credit Hours: 1.00. Discussion of individual student's research projects. Preparation of posters and public seminars based upon research results. Permission of instructor required. **Credits:** 1.00

BCHM 49500 - Special Assignments

Credit Hours: 1.00 to 3.00. Special work in biochemistry not included in other courses. Permission of instructor required. **Credits:** 1.00 to 3.00

BCHM 49800 - Research In Biochemistry

Credit Hours: 1.00 to 6.00. Supervised individual research. This course is intended to provide the opportunity for in-depth, independent undergraduate research. The students enrolled in this course will learn how to devise hypotheses, design experiments that test their hypotheses, record their data in laboratory notebooks, critically analyze the results of their analyses, and present their findings to others in written form. Permission of instructor required. **Credits:** 1.00 to 6.00

BCHM 49801 - Head Start To Biochemistry Research

Credit Hours: 0.50 to 2.00. Supervised individual research. Weeks 9-16. This course is intended to provide a brief research experience in preparation for in-depth, independent undergraduate research the following semester. The students enrolled in this course will begin to learn how to devise hypotheses, design experiments that test their hypotheses, record their data in laboratory notebooks, critically analyze the results of their analyses, and present their findings to others in written form. Permission of instructor required. **Credits:** 0.50 to 2.00

BCHM 49900 - Honors Thesis In Biochemistry

Credit Hours: 3.00. This course is intended to provide the opportunity for in-depth, independent undergraduate research. The students enrolled in this course will learn how to devise hypotheses, design experiments that test their hypotheses, record their data in laboratory notebooks, critically analyze the results of their analyses, and present their findings to others in the form of a written thesis. Permission of instructor required. **Credits:** 3.00

BCHM 52100 - Comparative Genomics

Credit Hours: 3.00. The course provides an understanding of the forces that act on genome content and organization, and the ability to interpret genetic variation between genomes. Students will acquire skills to utilize public genome databases, visualize genomic regions/features of interest using a genome browser, and perform phylogenetic analysis. The knowledge gained is

central within the fields of genetics, bioinformatics, microbiology, and evolutionary biology and have important applications in numerous related fields including medicine, biotechnology, agriculture, and ecology. **Credits:** 3.00

BCHM 53600 - Biological And Structural Aspects Of Drug Design And Action

Credit Hours: 3.00. (BIOL 53601) This course is aimed at expanding students' fundamental interests in biology, chemistry and biochemistry to how drugs work. The course will provide an overview of the modern day drug discovery pipeline and an in-depth look at the basic biology, structure, and mechanisms-of-action behind marketed therapeutics. The course will start with a historical account of the discovery of natural product drugs such as aspirin and penicillin and will then venture into the modern day era of drug discovery including structure-based drug design. We will explore different classes of antibiotics, antiviral, and anti-cancer drugs and their targets including small molecule drugs and modern biologics-based drugs. **Credits:** 3.00

BCHM 56100 - General Biochemistry I

Credit Hours: 3.00. This course provides upper-division undergraduate and graduate students with basic understanding of biochemical and structural properties of amino acids, nucleic acids, lipids, and carbohydrates. This course allows students to connect the relationship between structure and function of biomolecules. In addition, students learn to understand enzyme properties, enzyme mechanism of action, and enzyme regulation. **Credits:** 3.00

BCHM 56200 - General Biochemistry II

Credit Hours: 3.00. This course provides upper-division undergraduate and graduate students with an understanding of core metabolic pathways. Anabolic and catabolic processes of metabolic pathways are studied. Biochemical and structural knowledge is used to determine how enzymes and coenzymes are needed to regulate and control metabolic pathways. **Credits:** 3.00

BCHM 59500 - Current Topics In Biochemistry

Credit Hours: 1.00 to 4.00. Critical examination of developments in specialized fields of biochemistry not taught in other courses. Some topics include lecture, lab, directed reading or independent study. Permission of Instructor required. **Credits:** 1.00 to 4.00

BCHM 60100 - Critical Thinking And Communication In Biochemistry I

Credit Hours: 2.00. The objective of this course is to assist students in acquiring the skills needed to read critically, evaluate, and assimilate the primary scientific literature. This objective will be accomplished by instructor-guided discussions of the hypotheses, experimental data, conclusions, and scientific merit of assigned manuscript(s) taken from the fields of biochemistry and molecular biology. Topics for discussion initially will focus on the structure, organization, review process, and ethical issues related to scientific manuscripts. As the semester progresses, discussions will focus on the hypotheses being tested, quality of the data, and validity of the conclusions. Permission of instructor required. **Credits:** 2.00

BCHM 60200 - Critical Thinking And Communication In Biochemistry II

Credit Hours: 2.00. Builds on the skills developed in BCHM 601. Students will continue to enhance their analytical skills, and class discussions will be conducted at a more sophisticated level and will go into greater depth. Class discussions will focus more on the analysis and evaluation of current methodologies and hypotheses in the biochemical and molecular biological literature. Students will be evaluated primarily on their preparation and participation in each class discussion. Prerequisite: BCHM 60100. Permission of instructor required. **Credits:** 2.00

BCHM 60300 - Introduction To Graduate Research In Biochemistry I

Credit Hours: 6.00. This course is intended to provide the opportunity for in-depth, mentored graduate research in two biochemistry laboratories. Students enrolled in this course will learn how to devise hypothesis, design experiments that test their hypotheses, accurately record their data in laboratory notebooks, critically analyze the results of their analyses and present their findings to others in written and oral presentations. They will fully participate in laboratory group meetings, the Biochemistry seminar series, and presentations by other students and postdoctoral fellow. Co-requisites: BCHM 60100 and BCHM 60501. Permission of department required. **Credits:** 6.00

BCHM 60400 - Introduction To Graduate Research In Biochemistry II

Credit Hours: 3.00. This course builds upon BCHM 60300 to provide continued opportunity for in-depth, mentored graduate research in one biochemistry laboratory. Students enrolled in this course will learn how to devise hypothesis, design experiments that test their hypotheses, accurately record their data in laboratory notebooks, critically analyze the results of their analyses and present their findings to others in written and oral presentations. They will fully participate in laboratory group meetings, the Biochemistry seminar series, and presentations by other students and postdoctoral fellows. Co-requisite: BCHM 60200 and Prerequisites: BCHM 60300 and BCHM 60501. Permission of department required. **Credits:** 3.00

BCHM 60501 - Macromolecules

Credit Hours: 3.00. This course will provide students with an understanding of the basic principles that underlie the secondary and tertiary structure of proteins and nucleic acids which contribute to their function. It will inform students of current efforts to engineer macromolecules with novel functions. Students will become familiar with methods used to determine the three-dimensional structures of macromolecules, and they will learn to critically evaluate the accuracy of structural models. Special topics in the current literature, including membrane proteins, drug design and ribozymes, will be covered. The class will typically include students from a variety of departments, graduate programs, and scientific backgrounds. The course will be taught primarily from various textbook and from the primary literature. A biochemistry course designated for majors is a prerequisite of the course. Lack of the prerequisite will require approval of the instructor. Permission of Department required. **Credits:** 3.00

BCHM 61000 - Regulation Of Eukaryotic Gene Expression

Credit Hours: 3.00. This course will provide students with a basic understanding of gene expression mechanisms with a s specific focus on newly emerging topics. This course will be taught from current primary literature, using a textbook as a background resource. Topics will include transcription, messenger RNA decay, microRNAs and connections between gene expression steps. Students will learn how to read and interpret scientific literature through class presentations, discussions and take home assignments. Additionally, students will gain experience in developing and testing hypotheses within the class topic areas and writing a research proposal. Prerequisites: BCHM 56100 and 56200, or BCHM 60501. Lack of these prerequisites will require approval by the instructor. **Credits:** 3.00

BCHM 61100 - Chromatin Biology And Chromosome Dynamics

Credit Hours: 2.00. An exploration of current models and recent discoveries in chromatin biology and the relationship between chromatin and gene expression, as well as other aspects of chromosome structure and function. Prerequisites: BCHM 56100 and BCHM 56200 or BCHM 60501. **Credits:** 2.00

BCHM 61200 - Bioinformatic Analysis Of Genome Scale Data

Credit Hours: 3.00. This course provides a hands-on experience for life science researchers in the bioinformatic analysis of genome-scale data. The various disciplines in the life sciences are generating a wealth of experimental and annotation data. Today's graduate students need experience with modern tools that can help them to access, explore, analyze, interpret and manage the data that they generate in the lab. Students will use the R programming language and packages from Bioconductor, the R bioinformatics project, as their principal tools for this course. Students will develop workflows in R that bridge established algorithms for bioinformatics such as limma, edgeR or DESeq2, incorporating methods to import, QC, transform and visualize

genome-scale datasets derived from next generation sequencing experiments. A critical aspect of bioinformatics that is often inadequate is workflow documentation. This course will use Rmarkdown to integrate computer code, data and results to manage complex bioinformatics projects. The class has lecture, lab and distance components. Lectures will focus on the theoretical and biological aspects of bioinformatics analysis using recent examples from the literature. In lab, students will work on programming exercises or projects using published datasets. Advanced students will also have the opportunity to work with their own data. Distance instruction will include R tutorials and videos that students can work through at their own pace (subject to completion deadlines). Particular emphasis will be placed on the theoretical and practical limitations of next generation sequencing data. No prior computer programming experience is required, but it is assumed that students have a firm grasp of the fundamental principles of molecular biology and how they relate to complex processes such as gene expression and genome organization. Permission of instructor required.**Credits:** 3.00

BCHM 61501 - Pathways

Credit Hours: 3.00. An advanced level cell biology course offered to first or second year graduate students. Students will learn the major intracellular signaling pathways and cell cycle regulation of eukaryotes. Readings will be from the primary literature. Prerequisites: BCHM 65100 and BCHM 56200; or, BCHM 60501 (can be taken concurrently). **Credits:** 3.00

BCHM 62000 - Protein Mass Spectrometry And Proteomics

Credit Hours: 2.00. The goals of this course are to introduce students to 1) basic principles of mass spectrometry, 2) the most common instruments used for protein mass spectrometry including the advantages and disadvantages of each, 3) the most common applications of protein mass spectrometry in biological research, 4) current approaches to quantitative protein mass spectrometry and their use in proteomic studies 5) the skills necessary to analyze mass spec data from a variety of experiment types including the ability to use and understand common database search programs, and 6) contemporary issues associated with large-scale proteomics experiments (including technical challenges and limitations) culminating in the ability to design appropriate experiments to answer a specific proteomic question. Prerequisite: Students need to have taken an undergraduate level biochemistry course and be familiar with basic aspects of protein structure that are taught in such courses. In the absence of an undergraduate biochemistry course, students should discuss their qualifications with the instructor before registering. **Credits:** 2.00

BCHM 64000 - Metabolic Plant Physiology

Credit Hours: 3.00. (AGRY 64000, BIOL 64000, BTNY 64000 , HORT 64000) Topics include photosynthesis, respiration, carbohydrate and lipid metabolism, and nitrogen, sulfur, and secondary metabolism. This course is the third in a series of core courses in the Purdue Plant Biology Program graduate curriculum. Prerequisite: BCHM 56100, BTNY 55300 or HORT 55300, Prerequisite: BIOL 55100 or HORT 55100. **Credits:** 3.00

BCHM 69000 - Seminar In Biochemistry

Credit Hours: 1.00. Seminary In Biochemistry. Permission of instructor required. **Credits:** 1.00

BCHM 69500 - Special Topics In Biochemistry

Credit Hours: 1.00 to 4.00. Critical examination of developments in specialized fields of biochemistry. Open to candidates for the Ph.D. degree in biochemistry; others by special permission of the professor in charge. Permission of instructor required. **Credits:** 1.00 to 4.00

BCHM 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

BCHM 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Biological Sciences

BIOL 101KN - Concepts Of Biology I

Credit Hours: 4.00 or 5.00. An introductory course emphasizing the principles of cellular biology; molecular biology; genetics; and plant anatomy, diversity, development, and physiology.**Credits:** 4.00 or 5.00

BIOL 5560N - Physiology I

Credit Hours: 3.00. General and comparative physiology. Principles of physiology. Nerve and muscle, temperature regulation, ion and water balance. The critical evaluation of original research papers.**Credits:** 3.00

BIOL 5590N - Endocrinology

Credit Hours: 3.00. The study of hormone function. Consideration will be given to the role of hormones in growth, development, metabolism, homeostasis, and reproduction.**Credits:** 3.00

BIOL 5610N - Immunology

Credit Hours: 3.00. Introduction to the basic principles and experimentation in cellular and humoral immunology.**Credits:** 3.00

BIOL 11000 - Fundamentals Of Biology I

Credit Hours: 4.00. This course is designed primarily to provide an introduction to the principles of biology for students in agriculture and health sciences. Principles of biology, focusing on diversity, ecology, evolution, and the development, structure, and function of organisms. **Credits:** 4.00

BIOL 11100 - Fundamentals Of Biology II

Credit Hours: 4.00. This course is designed primarily to provide an introduction to the principles of biology for students in agriculture and health sciences. Continuation of BIOL 11000. Principles of biology, focusing on cell structure and function, molecular biology, and genetics. **Credits:** 4.00

BIOL 11200 - Fundamentals Of Biology

Credit Hours: 2.00. This course is designed primarily to provide an introduction to the principles of biology. BIOL 11200, 11300 is a two-semester principles of biology sequence that introduces students to the major concepts of the discipline, with emphasis on the experimental and logical basis of the information presented. BIOL 11200/11300 includes lectures on diversity and evolution, and on the development, structure, and function of organisms, cell structure, cell function, ecology, genetics, biochemistry, and molecular biology. **Credits:** 2.00

BIOL 11300 - Fundamentals Of Biology

Credit Hours: 2.00. This course is designed primarily to provide an introduction to the principles of biology. BIOL 11200, 11300 is a two-semester principles of biology sequence that introduces students to the major concepts of the discipline, with emphasis on the experimental and logical basis of the information presented. BIOL 11200/11300 includes lectures on diversity and evolution, and on the development, structure, and function of organisms, cell structure, cell function, ecology, genetics, biochemistry, and molecular biology. **Credits:** 2.00

BIOL 11500 - Biology Resource Seminar

Credit Hours: 1.00. This course is designed to help integrate new biology students into the Department of Biological Sciences, to help them adjust to university life, and to assist them in developing academic and intellectual survival skills using the medium of introductory Biology courses. The course meets twice a week in groups of 20-25 students. Each section is led by an academic advisor and an undergraduate teaching intern. The class periods have an on-going emphasis on connecting students to one another as resources while learning information, critical thinking skills and problem-solving strategies. Topics include bioethics, time management, available academic resources, biology majors and curricula and career development. Students are exposed to opportunities in undergraduate research, summer internships, the study abroad program, and teaching internships. Throughout the course, students are encouraged to plan their college education rather than merely choose their courses. Permission of department required. **Credits:** 1.00

BIOL 12100 - Biology I: Diversity, Ecology, And Behavior

Credit Hours: 2.00. Creates a framework for ordering biology by examining the unity and diversity of life on earth with an emphasis on ecology, genetics, population biology, evolution, and behavior. **Credits:** 2.00

BIOL 13100 - Biology II: Development, Structure, And Function Of Organisms

Credit Hours: 3.00. Principles of development of plants and animals and the relationship between the structure and function of selected systems of these organisms. **Credits:** 3.00

BIOL 13500 - First Year Biology Laboratory

Credit Hours: 2.00. Laboratory exercises emphasizing student mastery of basic laboratory skills needed to succeed in the biological sciences; intended for beginning (first-year) biology majors. **Credits:** 2.00

BIOL 14501 - First Year Biology Laboratory With Neuro Research Project

Credit Hours: 2.00. This laboratory course has been designed under the goals of the Center for Authentic Science Practice in Education (CASPiE) which aims to expose students to novel research as a means to teach them laboratory science. This course is designed to engage students in authentic research while acquiring necessary skills and concepts to be successful as a biology major. Our topic is Neuroanatomy of Auditory Pathways. We will begin with a series of skills and knowledge building weeks and then transition into independent research projects that culminate in a public presentation of the data in a poster session. In this course, students will learn the fundamentals in neurobiology as well as use sophisticated analysis and instrumentation to answer a research question. Critical thinking in experimental design as well as interpretation and communication of data will be stressed. The goals for this course are to gain a foundation in basic biological measurements and techniques, hone the analytical skills, appreciate the excitement of scientific discovery, and have fun along the way. Permission of department required. **Credits:** 2.00

BIOL 14503 - First Year Biology Lab: Disease Ecology-Honors

Credit Hours: 2.00. The course will engage students in authentic research and acquiring the necessary skills and concepts to be a successful biology major. Our research topic will be disease ecology in freshwater systems. Disease ecology is a growing field investigating the causes and effects of pathogen transmission and epidemics, primarily in natural populations. We will begin with a series of skill and knowledge-building laboratories, and then transition into student-led research projects that culminate in a

presentation of the results in a poster session. Students will learn the fundamentals of disease ecology, basic laboratory techniques, how to perform scientific experiments, and gain experience communicating findings to other scientists and the public. **Credits:** 2.00

BIOL 14504 - First Year Lab: Diet Disease And Immune System-Honors

Credit Hours: 2.00. We are what we eat! The food we put into our bodies not only gives us the nutrients, vitamins and minerals we need to live, but it can also influence other ways in which our bodies function, right down to how well our immune system works. The immune system plays a critical role in defending our body from infection, but can also contribute to autoimmune disease when the immune response becomes dysregulated. Importantly, autoimmune disease is currently skyrocketing in countries that consume a "Western Diet" (i.e., high salt, high sugar, low fiber), suggesting that these dietary components, or lack thereof, may contribute to dysregulation of the immune response. CD4+ T cells, a kind of immune cell, play an important role in the immune system as they control the balance between protective immunity and autoimmune disease. Recent evidence indicates a strong correlation between "Western Diet" and dysfunction of this important immune cell type. Therefore, our goal is to examine the effects of these dietary components on CD4+ T cell function and how this might contribute to autoimmune disease. Students will work in teams and cover a distinct subset of microbial or dietary components. As such, each student will learn the necessary skills to perform scientific experiments starting from the literature search, experimental design, carrying out controlled experiments, interpreting results and conveying the results to the greater scientific community.**Credits:** 2.00

BIOL 14505 - First Year Biology Lab: Phages To Folds-Honors

Credit Hours: 2.00. Students will learn how to use bioinformatics to study a gene sequence of their choice from the local SEA-PHAGES program. Students will then use molecular biology and biophysical techniques to characterize their gene product. The goal of each project will be to gain insight into the 3-dimensional fold of each of these mysterious novel phage genes. Students will work in teams but will have their own individual project such that each student will learn the necessary skills to perform scientific experiments starting from the bioinformatics to cloning to purification to structural characterization to communicating their findings to others.**Credits:** 2.00

BIOL 19500 - Special Assignments

Credit Hours: 0.00 to 18.00. Reading, discussions, written reports, seminar presentations, and field or laboratory work provided for enrichment in special areas of the biological sciences. Permission of instructor required. **Credits:** 0.00 to 18.00

BIOL 19700 - Biology Freshman Honors Seminar

Credit Hours: 1.00. Discussion meetings with Freshman Honors students to cover various aspects of freshman biology, research opportunities in biology, and career choices in biology. Open only to students in the Biological Sciences Honors Program. The credit may be used only toward free electives. Permission of department required. **Credits:** 1.00

BIOL 20100 - Human Anatomy And Physiology

Credit Hours: 2.00. A survey of normal structure and function of the human organism. The human is treated as an open system with the capacity to transport material, transform energy, and maintain a homeostatic state. The capacities and limitations of the human to cope with changes in the environment are emphasized. All major systems of the human body and their functions are examined in relation to the living organism. Not available for credit toward graduation for majors in the Department of Biological Sciences. **Credits:** 2.00

BIOL 20200 - Human Anatomy And Physiology

Credit Hours: 2.00. BIOL 20200 is the second semester of a two-semester course that includes two 50-minute lectures designed to give the student a basic understanding of the anatomy, organization and function of the human body. To assist the student in

mastering the subject matter, there will be introductory lectures on the basic concepts of biochemistry and cell biology before the major topics of the course are dealt with. These topics include the organization of the human body; muscle and bone; the nervous system (including the special senses); the cardiovascular system, respiration; digestion; metabolism; excretion; fluid, electrolyte, and acid-base balance; the endocrine system; reproduction and genetics. The subject matter will be related to relevant questions of clinical or health-related importance. Not available for credit toward graduation for majors in the Department of Biological Sciences. **Credits:** 2.00

BIOL 20300 - Human Anatomy And Physiology

Credit Hours: 4.00. A survey of normal structure and function of the human organism. The human is treated as an open system with the capacity to transport material, transform energy, and maintain a homeostatic state. The capacities and limitations of the human to cope with changes in the environment are emphasized. All major systems of the human body and their functions are examined in relation to the living organism. Integrated into the study of the human organism are laboratory exercises that emphasize the essentials of human anatomy and physiology. Not available for credit toward graduation for majors in the Department of Biological Sciences. **Credits:** 4.00

BIOL 20400 - Human Anatomy And Physiology

Credit Hours: 4.00. Continuation of BIOL 20300. Not available for credit toward graduation for majors in the Department of Biological Sciences. **Credits:** 4.00

BIOL 20500 - Biology For Elementary School Teachers

Credit Hours: 3.00. Unifying concepts of biology taught with materials appropriate for future elementary school teachers. Does not satisfy requirements for College of Science Majors. Not available for credit toward graduation for majors in the Department of Biological Sciences. **Credits:** 3.00

BIOL 20600 - Biology For Elementary School Teachers

Credit Hours: 3.00. Continuation of BIOL 20500. Does not satisfy requirements for College of Science Majors. Not available for credit toward graduation for majors in the Department of Biological Sciences. **Credits:** 3.00

BIOL 22100 - Introduction To Microbiology

Credit Hours: 4.00. The isolation, growth, structure, function, heredity, identification, classification, and ecology of microorganisms; their role in nature; and significance to man. Not available for credit toward graduation for majors in the Department of Biological Sciences. CTL: Microbiology for the Health Sciences **Credits:** 4.00

BIOL 23000 - Biology Of The Living Cell

Credit Hours: 3.00. An introduction to modern cell biology for students who may not have taken a previous college course in biology. All students with the appropriate prerequisites are welcome, and this course will be of special interest to students from engineering, chemistry, physics and computer science. This course will provide a solid foundation in modern cell biology concepts for engineers and students from other disciplines.**Credits:** 3.00

BIOL 23100 - Biology III: Cell Structure And Function

Credit Hours: 3.00. An introduction to modern cell biology through an examination of the physical and chemical properties that lead to an understanding of the molecular basis for cell function. **Credits:** 3.00

BIOL 23101 - Bioinstrumentation Lab

Credit Hours: 1.00. Introduction of laboratory instruments used to measure physiological events. Stimulation and conduction of electric signals within the mammalian nervous system and other excitable tissues are demonstrated. Fundamental circuit elements and concepts include resistance, capacitance, inductance, op-amps, impedance, voltage, current, power, and frequency, following the content introduced in BME 231. Fundamental analog measurement concepts include adequate bandwidth and amplitude and phase linearity. Integrative design project emphasizes the practical aspects of quantitative physiological measurements. This course is to prepare learners with sufficient physics knowledge and lab skills to pursue the Bioinstrumentation and Imaging Depth Areas. Moreover, students are introduced to programming (using Python) to deepen the understanding of basic concepts and learn basic skills in data processing. SPICE software will be used throughout the course to design/simulate various analog circuits.**Credits:** 1.00

BIOL 23200 - Laboratory In Biology III: Cell Structure And Function

Credit Hours: 2.00. Laboratory exercises designed to illustrate the properties, functions, and growth of prokaryotic and eukaryotic cells and to introduce the student to modern experimental methods used to study cells and their separated components. **Credits:** 2.00

BIOL 24100 - Biology IV: Genetics And Molecular Biology

Credit Hours: 3.00. An introduction to the principles of classical genetics and to molecular genetics. Topics covered are transmission of the genetic material (both in eukaryotes and prokaryotes); changes in the genetic material, structure, and function of the genetic material; and the manipulation of genetic material (recombinant DNA technology). **Credits:** 3.00

BIOL 24200 - Laboratory In Biology IV: Genetics And Molecular Biology

Credit Hours: 2.00. Experiments in classical and modern genetics and exercises to acquaint the students with basic techniques in molecular biology. **Credits:** 2.00

BIOL 28600 - Introduction To Ecology And Evolution

Credit Hours: 2.00. Evolutionary processes and ecological principles associated with individuals, populations, communities, and ecosystems. Topics include genetic drift, natural selection, adaptation, life tables, population dynamics, competition, predation, biodiversity, and ecological stability, with emphasis on natural systems.**Credits:** 2.00

BIOL 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in biological sciences. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required.**Credits:** 0.00

BIOL 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in biological sciences. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required.**Credits:** 0.00

BIOL 29300 - Sophomore Seminar: Planning Your Future In Biology

Credit Hours: 1.00. Biology 29300 is a one-credit course designed for sophomores in the Department of Biological Sciences. This course will help students maximum the remainder of their undergraduate career. The course will cover biology career information and suggestions for professional development. Students will learn about the various disciplines that make up modern Biological Sciences. Students will learn about opportunities in undergraduate research and tour a research laboratory. In-depth presentations from biology alumni from a variety of fields are featured. Assignments include a Plan of Study, a resume, and a written paper evaluating the career path of one alumni speaker and describing the student's response to the presentation. **Credits:** 1.00

BIOL 29400 - Biology Research

Credit Hours: 1.00 to 4.00. Supervised individual research performed by freshman and sophomores. Project must be approved by the Honors Committee, Department of Biological Sciences. Honors Research Program students should register for BIOL 49900. Permission of department required. **Credits:** 1.00 to 4.00

BIOL 29500 - Special Assignments

Credit Hours: 0.00 to 18.00. Reading, discussions, written reports, or laboratory work selected for enrichment in special areas of the biological sciences. Permission of instructor required. **Credits:** 0.00 to 18.00

BIOL 31200 - Great Issues Genomics And Society

Credit Hours: 3.00. The course will revolve around genomics, the science and technology involved in determining the sequence of the entire DNA complement in an organism. Almost everyone has heard of the human genome project, but fewer are aware of the spectacular technical progress in this field and the fact that many thousands of genomes have been sequenced. Until recently, most of these have been microorganisms, but technological and computational progress has made it progressively easier and cheaper to sequence the genomes of higher organisms. This field may have more of an impact on your future lives than almost any other field of the life sciences - mostly because it touches on all areas of study. The course will focus on the impact that genomes will have in selected areas. It will begin with a basic understanding of the science and technology that gave rise to our current capabilities in sequencing and the fact that technology continues to provide greater capacity and cheaper prices. You will soon see that every field in the College of Science is well represented in the science and technology. We will then go on to see how genomics influences many topics that affect our daily lives and can possibly provide answers to some critical questions (or at least pose better questions): What is the basis of personalized medicine? What does genomics tell us about the genealogy of mankind? What impact will genomics have on our future food supply and our ability to feed a population of 9 billion people? What is the human microbiome and what does that mean to me? Similarly, what is the gut microbiome, the mouth microbiome, etc? What impact will genomics have on the development of alternative energy sources, especially biofuels? In every area, we will discuss the scientific challenges, but also the ethical and societal implications. In most cases, there is no one right answer, but a series of choices that can be guided by ethical considerations. **Credits:** 3.00

BIOL 31800 - The COVID-19 Pandemic

Credit Hours: 3.00. The course will cover the COVID-19 pandemic caused by the SARS-CoV-2. It will provide a window onto the intersection of science and society and the challenges created when leaders and the populace are inadequately informed. We will explore the biology of the virus and the disease caused by it. The primary literature will be reviewed with the aim of critically evaluating data and understanding the basis of inferences or lack thereof. Vaccine and antiviral approaches will be discussed. Historical approaches to pandemics, comparative analyses of responses by countries and states, investigations into the origins of SARS-CoV-2, and various conspiracy theories will be topics of deliberation. We will see how achieving scientific understanding is a dynamic process. The COVID-19 scientific literature will be dissected with a focus on publication ethics. Students will each make an oral presentation and write an essay on a relevant topic thereby allowing them to fulfill graduation requirements. These assignments will require the demonstration of the capacity to report data, organize the material, and convey it using formal English. All sources will need to be documented and assessed for credibility. The initial tranche of classes will be lectures by the Professor with discussion. Most of the remaining classes will be student presentations on assigned topics with moderation by the Professor. Guest lectures by appropriate experts will also be included. **Credits:** 3.00

BIOL 32101 - Experimental Design And Quantitative Analysis Honors

Credit Hours: 3.00. This course is aimed at preparing students in experimental design and quantitative analysis specifically as applied to Life Sciences in order to read the scientific literature critically, generate scientific questions, hypotheses and predictions, design research studies, analyze the data statistically, and communicate results. The course will use R and RStudio, which are open-source platforms that are increasingly used in the scientific community to analyze data quantitatively. **Credits:** 3.00

BIOL 32701 - Bioanalytical Chemistry

Credit Hours: 4.00. This course focuses on the detection, quantification, and characterization of proteins, nucleic acids, lipids, carbohydrates, and small bioactive molecules. Principles and applications of various analytical techniques, including spectroscopy, chromatography and mass spectrometry, will also be discussed.**Credits:** 4.00

BIOL 32800 - Principles Of Physiology

Credit Hours: 4.00. This course is designed to provide students with an introduction to physiology with an emphasis on cellular mechanisms that underlie anatomical and physiological adaptations used by animals to survive in their habitat. Topics covered will range from cellular respiration to the physical limits of animal performance as we deconstruct and then reconstruct the body to examine how animals can live in extreme environments. Goals for this course are for students to gain a foundation in basic physiological principles, to learn about the integrative nature of the systems of animals, and to appreciate how and why animals have evolved and strategies to help them survive in their unique environment. **Credits:** 4.00

BIOL 34010 - Silvics Of North America

Credit Hours: 3.00. Characteristics of trees and forest stands, including influences on growth, development, and reproduction. Additionally, the course will cover field identification and taxonomy of common trees and shrubs from North America.**Credits:** 3.00

BIOL 34900 - Environmental Science

Credit Hours: 3.00. Examines current major environmental issues through an investigation of the biological and political aspects of human population growth, degradation of natural resources, and environmental regulations. Cannot be used as a Group A or B elective for biology majors.**Credits:** 3.00

BIOL 36700 - Principles Of Development

Credit Hours: 2.00. This course deals with the process by which genes in a fertilized egg control cell behavior in the embryo and so determine the nature of the animal or plant. The emphasis is on early development and the laying down of body plan and organ systems in various model systems (Drosophila, nematode, Arabidopsis, zebrafish, mouse, chick, and frog). **Credits:** 2.00

BIOL 36701 - Principles Of Development Lab

Credit Hours: 1.00. This laboratory will offer students the experience working with different model systems to observe developmental processes, examine key regulatory gene expression, and manipulate gene functions used in different biochemical, molecular and genetic approaches. **Credits:** 1.00

BIOL 38700 - Macromolecules

Credit Hours: 2.00. The goal is to expose students to the world of macromolecules, their physicochemical properties, the influence of these properties on function and structure, and how these properties are determined and exploited. Permission of department required.**Credits:** 2.00

BIOL 39300 - Preparing For Your Future In Biology

Credit Hours: 1.00. Biology 39300 is a one-credit course for junior and seniors in the Department of Biological Sciences. This course will help students begin to prepare for life after Purdue. Students will learn about interviewing, job searching, graduate and professional school searching, resumes, industrial practices, and how to evaluate job/school offers. Construct a polished image on top of your solid biology foundation! Get the job or get admitted to the school you want. **Credits:** 1.00

BIOL 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in biological sciences. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required.**Credits:** 0.00

BIOL 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in biological sciences. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required.**Credits:** 0.00

BIOL 39500 - Special Assignments

Credit Hours: 0.00 to 18.00. Reading, discussions, written reports, seminar presentations, and field or laboratory work provided for enrichment in special areas of the biological sciences. Permission of instructor required. **Credits:** 0.00 to 18.00

BIOL 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in biological sciences. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required.**Credits:** 0.00

BIOL 39600 - Premedical Planning Seminar

Credit Hours: 0.00. This course is designed for sophomore and junior students who are planning to attend medical school. The course offers information and advice on the MCAT, the application process, the personal statement, the interview, and letters of recommendation. Students in the course will also formulate an alternative career plan. The course meets the first 10 weeks of the semester. **Credits:** 0.00

BIOL 39699 - Professional Practice Internship

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Permission of department required. **Credits:** 0.00

BIOL 39800 - Biology Teaching

Credit Hours: 3.00. Supervised teaching experience for juniors. Must have approval of course instructor in advance. Permission of instructor required. **Credits:** 3.00

BIOL 41500 - Introduction To Molecular Biology

Credit Hours: 3.00. An introduction to modern molecular biology techniques and how they are used to address current topics in gene regulation. Emphasis will be placed on experimental procedures and model systems, such as site-directed mutagenesis of isolated genes and their subsequent introduction into prokaryotic and eukaryotic cells. Topics will address the molecular control mechanisms associated with DNA replication, RNA transcription, RNA processing, and differential gene expression. **Credits:** 3.00

BIOL 41600 - Viruses And Viral Disease

Credit Hours: 3.00. The objective of this course is to provide students with an introductory understanding of viruses and their impact on human health. The course will be divided into two sections. During the first section, we will discuss the cellular and organismal events that occur following virus infection, including viral entry, replication, modulation of cell biology by viral proteins, the host immune response to infection, evasion of the immune response by viruses, and resulting virus-induced disease. The emphasis of this first section will be on the general strategies used by viruses to establish and maintain infection in a population. In the second section, we will discuss in relative detail our current understanding of select important human viruses including influenza, HIV, smallpox, the herpesviruses, and tumor-causing viruses. The objective of this section will be to understand how the unique aspects of each virus's biology affect the outcome of infection with these pathogens. In addition to virus-associated diseases, we will discuss potential ways that viruses may provide symbiotic benefits to their hosts and thereby shape the course of human evolution. Throughout the course, we will emphasize societal and political aspects of virology and virus-derived technologies, including vaccine development, the use of viruses as gene therapy vectors, and the threat of viral bioterror of bio-error. **Credits:** 3.00

BIOL 42000 - Eukaryotic Cell Biology

Credit Hours: 3.00. Composition, structure, regulation, and growth of eukaryotic cells. **Credits:** 3.00

BIOL 43200 - Reproductive Physiology

Credit Hours: 3.00. This course provides an integrated approach to examining how tissues interact to regulate reproductive processes. Each section begins by describing fundamental commonalities of a reproductive event in a variety of species. This is followed by an emphasis on the difference in the details of that event among species. Students will be strongly encouraged to initiate and participate in discussions related to course topics during class. To gain a deeper understanding of physiological processes, students are asked to select a current research article related to reproductive physiology. Students are then required to present an analysis of article to the class in a formal presentation. Some of the topics to be covered in lecture include ovarian and testicular function, the hypothalamic-pituitary-gonadal axis, fertilization, establishment of the placenta, maternal support of pregnancy, parturition, and lactation. **Credits:** 3.00

BIOL 43600 - Neurobiology

Credit Hours: 3.00. This course will cover key aspects in molecular, cellular, and developmental neurobiology. Topics include: Cell biology of neurons and glia, electrophysiological properties of neurons, electrical and chemical signaling between neurons, synaptic integration and plasticity, development and regeneration of the nervous system, nervous system diseases. Up-to-date research findings and techniques will be included. A basic knowledge of cell biology and protein structure and function is strongly recommended. **Credits:** 3.00

BIOL 43800 - General Microbiology

Credit Hours: 3.00. An examination of microbial diversity that emphasizes the interrelationship of bacteria and their environments. This includes aspects of cell composition, metabolism, and growth of microorganisms. **Credits:** 3.00

BIOL 43900 - Laboratory In General Microbiology

Credit Hours: 2.00. Includes enrichment cultures to isolate microorganisms, studies of cell composition, measurements of cell growth, and examination of enzyme regulation. **Credits:** 2.00

BIOL 44100 - Biology Senior Seminar In Genetics

Credit Hours: 1.00. This is a required course for genetics majors. It provides exposure to current research in genetics and molecular biology via invited faculty speakers. Students enrolled in the course who have actively participated in research also give a presentation on their own work. Other students are assigned to review current literature in one aspect of the semester's topic. The topic selected for review is in an area of current research in genetics and may vary from year to year. **Credits:** 1.00

BIOL 44201 - Introductory Module: Protein Expression

Credit Hours: 2.00. This is a project-oriented course designed to give the student exposure to laboratory research through a series of five-week modules. During this five-week introductory module, the students will learn the basics of expression, isolation, and characterization of recombinant proteins in *E. coli* using SDS-PAGE and Western blotting. In the first half of the course, students work initially with one recombinant DNA construct and then are given a second construct to use to identify the protein expressed. *Note: additional hours as needed for particular experiments. **Credits:** 2.00

BIOL 44202 - Animal Physiology

Credit Hours: 2.00. This is a project-oriented course designed to give the student exposure to laboratory research through a series of five-week modules. This module involves measurements of respiratory, cardiovascular, neural and renal function. When appropriate measurements are made in both rats and humans. **Credits:** 2.00

BIOL 44203 - Bacterial Synthetic Biology Laboratory

Credit Hours: 1.00. This course will provide an introduction to state-of-the-art bacterial molecular genetics using the intestinal bacterium *Escherichia coli* as a model cell. **Credits:** 1.00

BIOL 44205 - Introduction To LabVIEW

Credit Hours: 1.00. This is an introductory course for LabVIEW programming. During this five-week module students will learn proper data acquisition techniques and be introduced to the fundamentals of the LabVIEW graphical programming environment. Through LabVIEW, students will learn the tools to develop programs capable of acquiring, processing, analyzing, saving and displaying data for engineering and scientific applications. **Credits:** 1.00

BIOL 44207 - Exploration Of Protein Structure

Credit Hours: 1.00. This module is a hands-on exploration of the principles of enzyme structure. Students will use computers to retrieve and inspect protein structures from publicly available databases. Through the performance and analysis of sequence structural alignments, students will explore the relationship between primary, secondary and tertiary structures and the final active form of a protein. **Credits:** 1.00

BIOL 44211 - Laboratory In Anatomy And Physiology

Credit Hours: 1.00. This module will study various organs, and also discuss diseases associated with it. The heart, brain, kidney, stomach, liver etc. will be studied in detail using histology, dissection, and instrumentation. Emphasis will be placed on problem solving using various case studies. The students will be required to give presentation. **Credits:** 1.00

BIOL 44212 - Microscopy And Cell Biology

Credit Hours: 1.00. In this five-week module, students will learn how to prepare specimens for viewing by fluorescence microscopy. Specimens include mammalian tissue culture cells and zebrafish embryos. The emphasis will be on the staining of the cytoskeleton in these preparations, utilizing antibodies and fluorescence probes. The specimens will be viewed by wide-field and confocal laser scanning fluorescence microscopy. Images will be acquired, processed and analyzed by modern computational methods. Students will learn the basics of cell culture, immunocytochemistry, fluorescence microscopy, digital image processing and data analysis. At the end of the course, students prepare a PowerPoint presentation of their images and data. **Credits:** 1.00

BIOL 44215 - Multidisciplinary Design Of Systems And Devices For Physiology Measurements

Credit Hours: 2.00. This physiology laboratory course will provide an opportunity for undergraduates from the College of Science (Department of Biology) to collaborate with students in other colleges (Agriculture, Education, Engineering, Health and Human Science & Technology) to experience and learn how to operate effectively as part of an interdisciplinary team to address physiological problems in the cardiovascular system, respiratory system and in biological transport. Specifically it will emphasize how these teams can use information, tools, techniques and theories from their disciplines to solve problems that are beyond the scope of any single discipline. In this process, the students will develop an appreciation of both engineering design and the classic hypothesis-driven experimental science as tools to solve complex real-world problems. This course will promote effective communication, systems thinking, laboratory skills, self-management and professional ethics. Students will learn to measure and quantify biological changes, analyze data (including statistical analysis) and interpret its meaning as it applied to the larger physiological question at hand. These skills will be necessary for teams to efficiently function in an interdisciplinary setting both in future courses and more importantly when they enter the workforce.**Credits:** 2.00

BIOL 44400 - Human Medical Genetics

Credit Hours: 3.00. An intermediate-level survey course of human genetics with a balanced review of both Mendelian and molecular aspects. Review of current development and application of DNA technology emphasized.**Credits:** 3.00

BIOL 44600 - Molecular Bacterial Pathogenesis

Credit Hours: 3.00. This course will focus on the interface of classical cell biology and microbiology, with emphasis on the exploitation of mammalian host cell by medically relevant pathogens, such as Yersinia, Salmonella, and Listeria. This course will cover the molecular mechanisms of infectious diseases. It will introduce modern cellular microbial strategies for studying the complex interaction between pathogens and their host cells. Topics and readings will be prepared from the most current literature. **Credits:** 3.00

BIOL 47500 - Senior Seminar In Neurobiology

Credit Hours: 1.00. Students are required to give a 30-45 minute talk based on primary journal articles chosen from a list on current developments in neuroscience or a related topic of the students choice. They are also required to read and contribute questions about each paper, and to provide anonymous feedback to each presenter. **Credits:** 1.00

BIOL 47800 - Introduction To Bioinformatics

Credit Hours: 3.00. (CS 47800) Bioinformatics is broadly defined as the study of molecular biological information, targeting particularly the enormous volume of DNA sequence and functional complexity embedded in entire genomes. Topics will include understanding the evolutionary organization of genes (genomics), the structure and function of gene products (proteomics), and the dynamics of gene expression in biological processes (transcriptomics). Inherently, bioinformatics is interdisciplinary, melding various applications of computational science with biology. This jointly taught course introduces analytical methods from biology, statistics and computer science that are necessary for bioinformatics investigations. The course is intended for junior and senior undergraduates from various science backgrounds. Our objective is to develop the skills of both tool users and tool designers in this important new field of research. **Credits:** 3.00

BIOL 48100 - Eukaryotic Genetics

Credit Hours: 3.00. This course presents the fundamental concepts of classical and modern molecular genetics in eukaryotic systems, using examples from the model genetic organisms, yeast, Drosophila, Caenorhabditis, Arabidopsis, maize, mice and humans. These concepts are applied to solving problems of genetic analysis. Recent advances in developmental, cancer, and behavioral genetics and genomics, and applications of genetic technology, are used to demonstrate the impact that modern genetics makes at the cutting edge of biological research. **Credits:** 3.00

BIOL 48300 - Great Issues: Environmental And Conservation Biology

Credit Hours: 3.00. Concerned with the application of ecological principles to environmental issues, the course introduces fundamental ecology, emphasizing the interplay of theoretical models, natural history, and experimentation. New research developments are stressed, with the outlook for application to environmental management and restoration. Whole-biosphere issues, such as the loss of biological diversity, frame a focus at the population level to understand local and global extinction and community stability. In-depth case studies of endangered ecosystems (both temperate and tropical), with computer modeling, field trips, and discussions of policy formulation, demonstrate the range of tools and information necessary to accomplish coexistence of humans with the rest of nature. **Credits:** 3.00

BIOL 49400 - Biology Research

Credit Hours: 1.00 to 4.00. Supervised individual research performed by juniors and seniors. Project must be approved by the Honors Committee, Department of Biological Sciences. Honors Research Program students should register for BIOL 49900. Permission of department required. **Credits:** 1.00 to 4.00

BIOL 49500 - Special Assignments

Credit Hours: 0.00 to 18.00. Readings, discussions, written reports, seminar presentations, and field or laboratory work provided for enrichment in special areas of the biological sciences. Permission of instructor required. **Credits:** 0.00 to 18.00

BIOL 49700 - Biology Honors Seminar

Credit Hours: 1.00. Required of all students participating in honors research. Discussions and presentations of research, including seminars by those students who are completing their honors research thesis. **Credits:** 1.00

BIOL 49800 - Biology Teaching

Credit Hours: 3.00. Supervised teaching experience for juniors and seniors. Must have approval of course instructor in advance. Permission of instructor required. **Credits:** 3.00

BIOL 49900 - Biology Honors Thesis Research

Credit Hours: 1.00 to 4.00. Research under the guidance of a scientist. Submission of honors tutorial petition and consent of faculty tutor and Honors Committee. Permission of department required. **Credits:** 1.00 to 4.00

BIOL 50330 - Disturbance Ecology

Credit Hours: 3.00. In the current age of the Anthropocene, the geological age of human activity, ecosystems throughout the world are subjected to both natural disturbance regimes (e.g. fire, floods) and anthropogenic disturbance (e.g., urbanization, dams, pollution). Over the centuries, the amount of anthropogenic disturbance has drastically increased, to the point that there are likely very few truly untouched ecosystems in the world. Thus, it is important for future environmentally driven professionals (really, anyone that will work with natural areas; conservationists, policymakers, etc.) to understand what are the causes and effects of disturbance, how ecosystems recover from disturbance events, and how disturbance can be used as a management tool. The purpose of this course is to provide students with an in-depth understanding of these, and more, topics while also providing them with practical experience in disturbance ecology research and management.**Credits:** 3.00

BIOL 50700 - Principles Of Molecular Biology

Credit Hours: 3.00. Molecular aspects of structure and function of nucleic acids and proteins, including recombinant DNA research. Prokaryotic and eukaryotic molecular biology are given equal weight.**Credits:** 3.00

BIOL 51099 - Neural Mechanisms In Health And Disease

Credit Hours: 3.00. An examination of the mechanisms by which nervous systems process information in normal and pathologic states. Cellular and systems-level information processing will be studied with a focus on sensory and motor systems. Students will gain some hands-on experience in the analysis of neural data. Some neuroanatomy will be included to understand how nervous systems are organized. Pathological states such as Alzheimer's, autism, and aging will be studied, both in terms of understanding the systems and cellular deficits as well as examining potential solutions to improve the outcomes for these neural disorders. **Credits:** 3.00

BIOL 51101 - Intro To X-Ray Crystallography

Credit Hours: 3.00. This course will provide an introduction to structure determination of macromolecules using X-ray crystallography and will attempt to balance theory and practice, consisting of ~60% lectures and ~40% lab modules. The course is divided into five 3-week modules covering (i) Crystallization, (ii) Data Collection, (iii) Molecular Replacement, (iv) Experimental Phasing, and (v) Model Building and Refinement, Validation, and Visualization. The goal of the course is to equip students with the necessary tools to develop and execute an X-ray crystallography project, starting from construct design to publication. By the end of the course, students should be familiar with the (i) structure determination pipeline, (ii) theory behind X-ray diffraction methods, (iii) methods for crystallization, (iv) phasing options for solving a crystal structure, and (v) contemporary crystallography software.**Credits:** 3.00

BIOL 51202 - Methods And Measures In Biophysical Chemistry

Credit Hours: 3.00. Biological applications of physical methods including absorption spectroscopy (UV-Vis, FTIR and Raman and CD spectroscopy), fluorescence spectroscopy and super high-resolution imaging, spin resonance methods (NMR and ESR spectroscopy), mass and thermodynamic based methods (thermophoresis, analytical ultracentrifugation, ITC and surface plasmon resonance) and diffraction/structural methods using NMR, cryo-EM and X-ray scattering/crystallography. Each topic is treated at an introductory level with examples from the literature. The course objective for students is to obtain a general understanding of the physical principles underlying each of the techniques, as well as the basic ability to apply the technique to biological systems of interest.**Credits:** 3.00

BIOL 51600 - Molecular Biology Of Cancer

Credit Hours: 3.00. A detailed course examining the molecular mechanisms controlling the growth of animal cells. Emphasis will be placed on current experimental approaches to defining the molecular basis of growth regulation in developing systems and the uncontrolled proliferation of cells in metabolic disorders, such as cancer. **Credits:** 3.00

BIOL 51606 - Pathways In Human Health And Disease

Credit Hours: 3.00. This course is intended for both upper-level undergraduate and graduate students. It will cover major intracellular signaling pathways in eukaryotes and their roles in human disease, with an emphasis on cancer but also touching on other major modern diseases such as COVID-19. We will explore avenues being pursued to target signaling mechanisms for therapeutic benefit. Topics include G protein-coupled receptors, receptor tyrosine kinases, nuclear hormone receptors, protein kinases and phosphatases, mTOR, the Wnt/s-catenin pathway, cell cycle control, DNA damage checkpoint control, regulated proteolysis, and programmed cell death. The course will be taught from current primary literature using a textbook as a background resource. Students will learn how to read and interpret scientific data through regular lectures, extramural seminars, in-class presentations, and take-home assignments.**Credits:** 3.00

BIOL 51700 - Molecular Biology: Proteins

Credit Hours: 2.00. Principles of protein three-dimensional architecture. The molecular and structural basis of protein folding, function, and evolution. **Credits:** 2.00

BIOL 52101 - Experimental Design And Quantitative Analysis In The Life Sciences

Credit Hours: 3.00. This course is aimed at preparing our students in experimental design and quantitative analysis specifically applied to the Life Sciences in order to read the scientific literature critically, generate scientific questions, hypotheses and predictions, design research studies, analyze the data statistically, and communicate results. The course will use R and RStudio, which are open-source platforms that are increasingly used in the scientific community to analyze data quantitatively.**Credits:** 3.00

BIOL 52900 - Bacterial Physiology

Credit Hours: 3.00. A detailed consideration of the central metabolic routes, their role in generation of energy and key intermediates, and the conversion of those intermediates to small molecule building blocks. Regulatory mechanisms will be stressed. **Credits:** 3.00

BIOL 52905 - Disease Ecology

Credit Hours: 3.00. Study of the ecological and evolutionary complexity inherent to host-pathogen interactions. Includes case studies from a diverse array of systems, including plants, animals, aquatic and terrestrial systems. Emphasis is on the interactions between multiple hosts and pathogens within complex, dynamic environments. Introduction to parasite and pathogen diversity, host-pathogen coevolution, community ecology and the importance of pathogens in conservation and management.**Credits:** 3.00

BIOL 53000 - Introductory Virology

Credit Hours: 3.00. Detection, titration, and chemistry of viruses; viral host interactions: bacteriophage-bacterium, animal virus-animal cell, plant virus-plant cell; tumor viruses: infection and transformation.**Credits:** 3.00

BIOL 53300 - Medical Microbiology

Credit Hours: 3.00. Host-parasite relationships. Immunology. Bacteria and viruses associated with infectious diseases. **Credits:** 3.00

BIOL 53601 - Biological And Structural Aspects Of Drug Design And Action

Credit Hours: 3.00. (BCHM 53600) This course is aimed at expanding students' fundamental interests in biology, chemistry and biochemistry to how drugs work. The course will provide an overview of the modern day drug discovery pipeline and an in-depth look at the basic biology, structure, and mechanisms-of-action behind marketed therapeutics. The course will start with a historical account of the discovery of natural product drugs such as aspirin and penicillin and will then venture into the modern day era of drug discovery including structure-based drug design. We will explore different classes of antibiotics, antiviral, and anti-cancer drugs and their targets including small molecule drugs and modern biologics-based drugs. **Credits:** 3.00

BIOL 53700 - Immunobiology

Credit Hours: 3.00. Readings and discussion in the structural, cellular, and genetic basis of the immune response. BIOL 42000 recommended as a prerequisite. **Credits:** 3.00

BIOL 53800 - Molecular, Cellular, And Developmental Neurobiology

Credit Hours: 3.00. Molecular mechanisms of neural cell biology and development are considered. Topics and readings are drawn from the current primary literature. BIOL 42000 recommended as a prerequisite. **Credits:** 3.00

BIOL 54100 - Molecular Genetics Of Bacteria

Credit Hours: 3.00. Advanced bacterial genetics, with emphasis on the use of genetics as a powerful and creative intellectual activity that enables us to discover biological functions and to construct new organisms by the manipulation of DNA. Major topics include: mutations, genetic selections, recombination, regulatory mechanisms, and genomic evolution. **Credits:** 3.00

BIOL 54200 - Modular Upper-Division Laboratory Course

Credit Hours: 1.00 or 2.00. This is a project-oriented course designed to give the student exposure to laboratory research through a series of 5-week modules. The student must complete the introductory 5-week module or have the consent of the instructor before taking the other modules. Topics may include animal cell culture, cloning and blot analysis, DNA fingerprinting, analysis of nucleic acid sequences, animal physiology, bacterial genetics, advanced neurophysiology, chromatin structure, eukaryotic gene expression, genomics, yeast molecular biology, and molecular virology, etc. **Credits:** 1.00 or 2.00

BIOL 54410 - Sensory Systems

Credit Hours: 3.00. The goal of Sensory Systems is to gain an understanding of the mechanisms that underlie sensory perception at the molecular, cellular, and systems level. This will be accomplished by examining how various forms of energy are transduced into the electrochemical messages of the nervous system, what pathways the information travels within the nervous system, and how this information is processed and perceived.**Credits:** 3.00

BIOL 54900 - Microbial Ecology

Credit Hours: 2.00. A study of microbial interactions with other organisms and the environment. Aquatic and terrestrial ecosystems as well as interactions between nonpathogenic microbes and plants and animals will be discussed. Offered in alternate years. **Credits:** 2.00

BIOL 55000 - Plant Molecular Biology

Credit Hours: 3.00. A comprehensive study of plant molecular biology and plant molecular genetics. Topics will include the structure and expression of plant nuclear, chloroplast, and mitochondrial genomes, and plant viruses.**Credits:** 3.00

BIOL 55001 - Eukaryotic Molecular Biology

Credit Hours: 4.00. This is a general survey course intended for advanced undergrads and beginning grad students. The course will draw upon examples from the plant, animal, and fungal kingdoms, and will familiarize students with the basic principles of molecular biology analyses as they apply to eukaryotic organisms. By the end of the course students should have knowledge of these molecular processes and should be able to design and analyze experiments dealing with these topics. This is not a first course in molecular biology. Permission of department required. **Credits:** 4.00

BIOL 55101 - Theory Of Molecular Methods

Credit Hours: 3.00. This course will introduce upper-level undergraduate students and graduate students to the theory and practice of many commonly used molecular biology methods. Emphasis will be placed on understanding the theoretical basis for these techniques, their utility in various circumstances, and their limitations. Although taught as a lecture, students should be able to take this knowledge back to the laboratory to help them in their research efforts. The course will be as close as possible to a laboratory experience without being in an actual laboratory setting. This course is designed to prepare students for other in-depth scientific courses, for graduate rotations, and for future laboratory work. Exams will be experimental in nature (e.g. design an experiment to do something or in this type of situation, which technique/vector/etc. would best be used, and why). Permission of instructor required.**Credits:** 3.00

BIOL 55600 - Physiology I

Credit Hours: 3.00. General and comparative physiology. Principles of physiology. Nerve and muscle, temperature regulation, ion and water balance. The critical evaluation of original research papers.**Credits:** 3.00

BIOL 55700 - Physiology II

Credit Hours: 3.00. A study of the human cardiovascular, pulmonary, blood, and gastrointestinal systems. Higher neuronal functions and intersystem interactions will be discussed.**Credits:** 3.00

BIOL 55900 - Endocrinology

Credit Hours: 3.00. The study of hormone function. Consideration will be given to the role of hormones in growth, development, metabolism, homeostasis, and reproduction. **Credits:** 3.00

BIOL 56010 - Clinical And Molecular Aspects Of Neurodegenerative Diseases

Credit Hours: 3.00. This course focuses on the molecular and clinical aspects of neurodegenerative diseases. The first part of the course will briefly introduce critical brain structures, with a focus on neurons and glia and will evaluate molecular mechanisms that underlie protein aggregation and cell death. The remainder of the course will focus on the multiple aspects of specific neurodegenerative diseases. Permission of instructor required.**Credits:** 3.00

BIOL 56100 - Immunology

Credit Hours: 3.00. Introduction to the basic principles and experimentation in cellular and humoral immunology.**Credits:** 3.00

BIOL 56200 - Neural Systems

Credit Hours: 3.00. (SLHS 50700, PSY 51200) Overview of the structure and function of neural systems including those involved with motor, somatosensory, visual, auditory, learning, memory, and higher cortical processes. Molecular and cellular

aspects of neural function are integrated with discussion of relevant neuroanatomy. Background in cell biology, psychobiology, physiology or anatomy is recommended. **Credits:** 3.00

BIOL 56310 - Protein Bioinformatics

Credit Hours: 3.00. Accumulation of biological data, such as genome sequences, protein structures and sequences, metabolic pathways, opened up a new way of research in biology-bioinformatics. Through the survey of the various active research topics in bioinformatics, in this course we will learn bioinformatics databases, tools, and algorithms behind these tools. Special emphasis is placed on protein sequence and structure analyses. Covered topics will include methods for protein sequence comparison, protein structure comparison, protein structure prediction/modeling, protein docking prediction, protein function prediction, and protein network analysis. **Credits:** 3.00

BIOL 56400 - Molecular Genetics Of Development

Credit Hours: 3.00. The course examines the genetics and developmental bases as well as phenotypes of 40 genetic disorders. Chromosomal, single gene, complex and developmental genetic disorders are studied in detail. Emphasis is placed on molecular techniques and understanding current primary literature.**Credits:** 3.00

BIOL 56600 - Developmental Biology

Credit Hours: 3.00. (West Lafayette, Fort Wayne, IUPUI, North Central) 4.00 (Calumet) Principles of development with emphasis on concepts and experimental evidence for underlying mechanisms, including molecular, cellular, and supracellular approaches.**Credits:** 3.00

BIOL 57110 - Advanced Cell Biology

Credit Hours: 3.00. In this lecture only course, we will explore in-depth cell structure and function. Topics covered include: protein structure; methods used to explore molecular mechanisms and visualize cell structures; membrane structure and transport; electrical properties of membranes; protein sorting and trafficking; structure and function of the cytoskeleton; cell signaling and communication; apoptosis, the cell cycle and how it is controlled; and cancer. Primary research studies will be incorporated to reinforce lecture topics. Prerequisites are BIOL 24300 Cell Biology and BIOL 24400 Genetics, or permission of instructor.**Credits:** 3.00

BIOL 57310 - Stem Cell Biology

Credit Hours: 3.00. In this course students will develop a clear understanding of stem cells' defining features, activities and potential utility. Stem cell research is pursued in nearly all areas of medicine. This course focuses on important definitions and characteristics of stem cells and develops a general overview of stem cell biology. The course builds on this overview of stem cell biology by examining specific example of developmental biology, methodology and the potential applications of stem cell therapy.**Credits:** 3.00

BIOL 58000 - Evolution

Credit Hours: 3.00. A study of evolution as a basic concept of the biological sciences; an examination of current methods of experimentation within the area, as well as evidences for the possible mechanisms of evolutionary change. **Credits:** 3.00

BIOL 58010 - Teaching Evolution: Online Course

Credit Hours: 3.00. Evolution is one of the most important and most widely misunderstood concepts in science. Teaching Evolution is an online course to help you deepen your understanding of evolutionary concepts, develop instructional strategies, and address obstacles in the teaching of evolution. **Credits:** 3.00

BIOL 58210 - Ecological Statistics

Credit Hours: 3.00. This course covers topics that are useful for successfully designing and analyzing statistically observational and experimental studies in ecology, animal behavior, evolutionary biology, forestry, wildlife sciences, fisheries, etc. Some topics are: differences between hypotheses and predictions, design of an ecological study, general linear models, assumptions, different types of designs (factorial, nested, repeated measures, blocks, split-plots, etc.), fitting models to data, etc. The course will focus on the conceptual understanding of these topics (e.g., interpreting the results of statistical tests) and practice with statistical programs and real datasets. **Credits:** 3.00

BIOL 58601 - Ecology

Credit Hours: 3.00. This is an advanced ecology course that examines the ecological process and dynamics of populations, communities, and ecosystems. Topics include the physical, physiological, behavioral, and population genetic factors that influence how organisms interact with one another and their environment, the nature of population growth, and attributes of community structure. Course material integrates case studies from field and laboratory experiments, simulations, and theoretical models to understand life histories, species interactions, and community and ecosystem processes.**Credits:** 3.00

BIOL 58602 - Laboratory In Ecology

Credit Hours: 1.00. This course is intended to complement many of the concepts discussed in BIOL 58601 Ecology Lecture. By studying selected topics in depth, both experimentally and through primary literature, you should gain a greater understanding of ecological principles and the process of science as it is applied to a variety of ecological topics. Permission of department required.**Credits:** 1.00

BIOL 58705 - Animal Communication

Credit Hours: 3.00. This course will be a broad-scaled analysis of animal communication. Topics will include the physics of sound- and light-signal production, propagation and reception of signals, the use of communication as a means of information transfer, and the evolution of signaling systems. Mathematical principles are covered (e.g. in the evolution of signals), so some background in mathematics (e.g. calculus or algebra and introductory physics) is helpful. **Credits:** 3.00

BIOL 59100 - Field Ecology

Credit Hours: 3.00 or 4.00 (West Lafayette); 4.00 (Fort Wayne, Northwest). A field course in ecology that stresses natural history and testing ecological theory under natural conditions. Group and individual projects include observational and experimental approaches. Emphasis is on the study of plant and animal species interactions in terrestrial (including montane and coastal) and aquatic habitats. Issues in community, population, behavioral, and conservation biology are addressed. Several all-day Saturday and two weekend field trips. Offered in alternate years. Permission of instructor required. **Credits:** 3.00 or 4.00

BIOL 59200 - The Evolution Of Behavior

Credit Hours: 3.00. An investigation of behaviors as adaptations: specializations of sensory and motor mechanisms involved in behavior; animal communication systems; behavioral ecology; patterns of social behavior as solutions to ecological problems, such as predator avoidance and resource exploitation. Emphasis will be on theoretical principles; examples will be broadly comparative, ranging from microorganisms to mammals. Offered in alternate years. **Credits:** 3.00

BIOL 59500 - Special Assignments

Credit Hours: 0.00 to 18.00. Special work, such as directed reading, independent study or research, supervised library, laboratory, or field work, or presentation of material not available in the formal courses of the department. The field in which work is offered will be indicated in the student's record. Permission of instructor required. **Credits:** 0.00 to 18.00

BIOL 60000 - Bioenergetics

Credit Hours: 2.00. Energy transduction in biological membranes: physical chemical foundations; electron transfer, proton translocation; and active transport. Atomic structures of integral membrane protein complexes responsible for respiratory, photosynthetic generation of electrochemical potential; ATPase motor, and structure-based mechanisms. Offered in alternate years. Prerequisite: BCHM 56100, BCHM 56200 and CHM 37300. **Credits:** 2.00

BIOL 60200 - Cellular Neurobiology

Credit Hours: 3.00. This course covers principles of neurophysiology and cell, molecular and developmental neurobiology for graduate students from a wide range of disciplines. Course material will involve lectures and assigned textbook readings, homework problems and in-class discussions based on selected readings of the primary literature, and computer-based simulations of neurophysiology. Grades will be based on participation in class discussions, graded homework sets and exams (a midterm and a final exam). **Credits:** 3.00

BIOL 61100 - Crystallography Of Macromolecules

Credit Hours: 3.00. The special techniques required in the structure determination of biological macromolecules. Symmetry of macromolecules. Data collection and processing. The isomorphous replacement technique. The molecular replacement technique. Use of anomalous dispersion. Restraint and constraint refinement. Computational techniques. Prerequisite: BIOL 51100. Permission of instructor required. **Credits:** 3.00

BIOL 62000 - Advanced Topics In Eukaryotic Cell Biology

Credit Hours: 3.00. A study of current areas of cell biological research, including the cytoskeleton, the regulation of the cell cycle, and the functions and dynamics of membrane-bound organelles. **Credits:** 3.00

BIOL 64700 - Membrane Protein Structural Biology

Credit Hours: 2.00. This course focuses on the structural basis of the functions and dysfunctions of diverse membrane proteins, analyzed by X-ray, electron microscopy, and spectroscopy. The functions include transport, biogenesis, and transmembrane signaling. Unique problems associated with the structure analysis of integral membrane proteins are discussed. **Credits:** 2.00

BIOL 65001 - Techniques In Molecular Biology

Credit Hours: 1.00. Techniques in Molecular Biology will introduce graduate students to the theory and practice of many commonly used methods. Emphasis will be placed on understanding the theoretical basis for these techniques, their utility in various circumstances, and their limitations. Although taught as a lecture, students should be able to take this knowledge back to the laboratory to help them in their research efforts. The course will be as close as possible to a laboratory experience without being in an actual laboratory setting. This course is designed to prepare students for other in-depth 600-level scientific courses, for their rotations, and for future laboratory work. Exams will be "experimental" in nature (e.g., "design and experiment to do something..." or "in this type of situation, which technique/vector/etc. would best be used, and why..."). **Credits:** 1.00

BIOL 65200 - Advanced Ecology Discussion

Credit Hours: 1.00. Weekly meetings to discuss and evaluate seminal papers in the fields of evolutionary, population, and community ecology. During the last week, students will critically evaluate a contemporary paper on a topic related to the "classic" papers discussed during the semester. Students will have a choice among papers submitted by participating faculty members; their critique will be assessed on content, originality, rigor, and clarity. **Credits:** 1.00

BIOL 66200 - Seminar Methods And Professional Development I

Credit Hours: 1.00. An introduction for incoming graduate students to methods of seminar presentation and critique and to various guidelines for professional development during their graduate school experience. Topics include research laboratory safety (REM), how to give a talk, acclimating to graduate studies (especially time management), how to select a major professor and an advisory committee, how to prepare for qualifying exams, Purdue University guidelines for responsible conduct of research, how to organize a poster presentation, how to negotiate with mentors, and expectations for success. The course also serves to socialize the incoming cohort of students among themselves and with more senior students in the broad range of research disciplines available. **Credits:** 1.00

BIOL 66300 - Seminar Methods And Professional Development II

Credit Hours: 1.00. This course is a continuation of BIOL 66200 and expands the introduction for incoming graduate students to methods of seminar presentation and critique and to various guidelines for professional development during their graduate school experience. Topics include seminar topic selection and 20-minute seminar design, tutorials on electronic services at the PU Library and Citation Management programs, and evaluating classmate presentations. Using the skills learned the previous semester, each student is required to make a 20-minute PowerPoint presentation to the class, based on a pre-approved topic of their choice. The speaker is asked questions and the presentation receives written evaluations by all members of the class. Each student practices with the course instructor prior to the public presentation. The course also continues to socialize the incoming cohort of students among themselves and with more senior students in the broad range of research disciplines available. **Credits:** 1.00

BIOL 69100 - Biological Research Methods

Credit Hours: 1.00. Open to graduate students in the Department of Biological Sciences and designed primarily for students in their first year of graduate study. The course consists of two laboratory assignments, each of which lasts about two months. Students may take one or two of these per semester. During each laboratory assignment, the student will be exposed to methods, equipment, and experimental procedures currently in use in a particular departmental research laboratory selected by the student and through arrangement with the professor in charge of that laboratory. Admission by consent of the departmental Graduate and Advanced Studies Committee. **Credits:** 1.00

BIOL 69500 - Special Assignments

Credit Hours: 0.00 to 18.00. Special work, such as directed reading; independent study or research; supervised library, laboratory, or field work; or presentation of material not available in the formal courses of the department. The field in which work is offered will be indicated in the student's record. Primarily for Ph.D. candidates. Permission of instructor required. **Credits:** 0.00 to 18.00

BIOL 69600 - Seminar

Credit Hours: 1.00. Each semester there are several separate seminar offerings. They will likely be on the following topics: biochemistry, crystallography, ecology and population biology, genetics, mechanisms of development, microbiology, neurobiology, and plant physiology. The student's record will indicate the specific seminars in which he/she has participated. Oral presentations required. At least two credits are required of Ph.D. candidates. **Credits:** 1.00

BIOL 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

BIOL 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Biomedical Engineering

BME 19500 - Selected Topics In Biomedical Engineering

Credit Hours: 0.00 to 4.00. Specialized topic areas in BME for which there are not specific courses, workshops, or individual study plans, but having sufficient student interest to justify the formalized teaching of a course. **Credits:** 0.00 to 4.00

BME 20200 - Thermodynamics In Biomedical Engineering

Credit Hours: 3.00. The major objective for this course is to understand and exploit basic principles of thermodynamics as they apply to biological systems and biological processes. Specifically, the course will focus on biological processes across scales: from the nanometer scale of biomolecules, the micrometer scale of cells, the millimeter and meter scales of tissues and organisms, all the way up to the 100+ meter scale for bioprocess equipment and industry-scale production with a focus on dynamic behaviors of systems. The course can be loosely classified into two parts: (i) guiding principles and fundamental equations for thermodynamics in biological and biomedical engineering, and (ii) applications of engineering principles to the study of biological systems.**Credits:** 3.00

BME 21400 - Introduction To Biomechanical Analysis

Credit Hours: 3.00. The goal of this course is to provide a foundation in biomechanics (analysis of forces, moments, and stresses) that will allow students to quantify the loads in the skeleton as well as design surgical tools and total joint replacements. In addition to the topics on vectors, particle equilibrium, and rigid body mechanics one would expect in a classical mechanics course, biomedical engineers must also have a working knowledge of skeletal anatomy. Consequently, anatomical descriptions and anthropometric data will be incorporated throughout the course. As part of the implant design, students will also be introduced to more advanced topics in mechanics such as Hertz contact theory, shear-lag theory, and composite beam theory.**Credits:** 3.00

BME 21401 - Biomechanical Analysis Laboratory

Credit Hours: 1.00. This course provides hands-on training in engineering and biological principles of biomechanics. Topics include translation of theoretical vector and equilibrium calculations to three-dimensional body problems, computer aided design and finite element analysis, harvest and storage of biological samples, and tension, compression and bending testing with mechanical testers. A design project reinforces the mechanical testing skills learned in class, combining skill-building in group work and experimental design. This course will prepare students for deeper study of biomechanics.**Credits:** 1.00

BME 22000 - Biomolecules: Structure, Function, And Engineering Applications

Credit Hours: 3.00. Classes of molecules (biomolecules) such as sugars, lipids, proteins, and nucleic acids that form the cellular components of living organisms. Explores the chemistry behind the structure and function of these important classes of biological molecules. Hydrogen-bonding, hydrophobic forces, electrostatic interactions along with other weak interactions discussed with reference to their importance in biomolecular systems in an engineering context.**Credits:** 3.00

BME 22201 - Introductory Biomeasurements

Credit Hours: 3.00. The foundations of basic circuit theory are introduced including voltage-current characteristics of resistive and reactive elements, Ohm's and Kirchhoff's Laws, equivalent sources, transformations and superposition, transient response, instantaneous and average power, AC impedance, dynamic response of first and second order systems. Permission of department required.**Credits:** 3.00

BME 22400 - Biomeasurements Lab

Credit Hours: 1.00. Laboratory exercises will reinforce the foundations of basic circuit theory. Electronic instruments are used in the context of biomedical signal measurement and processing and include the use of oscilloscopes, function generators, transducers, electrodes, biopotential amplifiers and digital data collection and analysis. Laboratory exercises utilize industrially relevant instruments for measurement and acquisition of time varying signals arising from electronic and bioelectric sources. Permission of department required.**Credits:** 1.00

BME 23100 - Bioinstrumentation and Circuit Theory

Credit Hours: 3.00. In this course, we'll delve into the core principles of circuit theory, covering topics such as voltage-current relationships in resistive and reactive components, Ohm's Law, Kirchhoff's Laws, and source equivalency. We will also explore advanced concepts like transient responses, AC impedance, and the dynamic behavior of first and second-order systems. Students will gain proficiency in phasor analysis of sinusoidal signals, complex number calculations, signal sampling, and spectral analysis. We'll also touch on linear time-invariant systems, frequency response, and both the design and implementation of filters. A portion of the course will focus on control systems via the s-domain. To enrich your understanding and skill set, we will also introduce programming through Python, which will facilitate data processing and deepen your conceptual grasp. This course serves as a preparatory steppingstone for BME 33000 (Bioelectricity), equipping you with the essential physics knowledge and skills required for more advanced studies.**Credits:** 3.00

BME 23101 - Bioinstrumentation and Circuit Theory Lab

Credit Hours: 1.00. Introduction of laboratory instruments used to measure physiological events. Stimulation and conduction of electric signals within the mammalian nervous system and other excitable tissues are demonstrated. Fundamental circuit elements and concepts include resistance, capacitance, inductance, op-amps, impedance, voltage, current, power, and frequency, following the content introduced in BME 231. Fundamental analog measurement concepts include adequate bandwidth and amplitude and phase linearity. Integrative design project emphasizes the practical aspects of quantitative physiological measurements. This course is to prepare learners with sufficient physics knowledge and lab skills to pursue the Bioinstrumentation and Imaging Depth Areas. Moreover, students are introduced to programming (using Python) to deepen the understanding of basic concepts and learn basic skills in data processing. SPICE software will be used throughout the course to design/simulate various analog circuits.**Credits:** 1.00

BME 24101 - Introductory Biomechanics

Credit Hours: 3.00. This course uses didactic lecture material to introduce students to the principles of mechanics and how these concepts apply to musculoskeletal tissues. Permission of department required.**Credits:** 3.00

BME 24300 - Biomechanics Laboratory

Credit Hours: 1.00. This course uses laboratory experiments to introduce students to the principles of mechanics and how these concepts apply to musculoskeletal tissues. Permission of department required.**Credits:** 1.00

BME 25600 - Physiological Modeling In Human Health

Credit Hours: 3.00. Introduction to the physiology and medicine underlying practical problems in biomedical engineering, especially with respect to medical device development. Engineering skills taught and practiced within the context of human

disease, injury, and illness on extended problem sets which include mathematical modeling and problem solving with appropriate documentation. Main physiological systems of focus are cardiovascular, pulmonary, and renal, and common afflictions thereof. **Credits:** 3.00

BME 28000 - Frontiers In Biomedical Engineering

Credit Hours: 1.00. This course introduces the rapidly emerging field of biomedical engineering by exposing students to a wide range of research activities in the Weldon School and to a variety of experiential learning opportunities. Topics addressed include career paths, professional development opportunities, and career development skills including creating a plan of study, informational and job interviewing, writing a resume, technical writing, preparing effective oral presentations, and peer-editing.**Credits:** 1.00

BME 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in biomedical engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

BME 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in biomedical engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

BME 29500 - Selected Topics In Biomedical Engineering

Credit Hours: 1.00 to 4.00. Specialized topic areas for which there are no specific courses, workshops, or individual study plans, but having sufficient interest to justify the formalized teaching of a course. Permission of instructor required. **Credits:** 1.00 to 4.00

BME 29600 - Biomedical Engineering Projects

Credit Hours: 1.00 to 4.00. Individual research projects to be approved by the supervising faculty member before registering for the course. An approved written report is required. Permission of instructor required. **Credits:** 1.00 to 4.00

BME 30200 - Professional Development And Design In Biomedical Engineering

Credit Hours: 2.00. This course explores design, career, and professional topics in Biomedical Engineering. To prepare students for capstone and engineering practice, students will engage in case study design encompassing conceptualization, requirements generation and system design. Essential design elements such as user need, ideation, constraints, regulatory, and documentation will be reviewed and applied. Additional career and professional topics include resume writing, interviewing, and professional conduct; post-graduate education and life-long learning; and industrial, clinical, and research opportunities in Biomedical Engineering.**Credits:** 2.00

BME 31300 - Biofluid Mechanics

Credit Hours: 3.00. Fundamental concepts and principles of fluid mechanics in the context of biomedical applications. Governing equations of flow and transport are derived from the first principles and applied to conditions characteristic of the human circulatory system.**Credits:** 3.00

BME 31400 - Experimental Methods In Biomechanics

Credit Hours: 3.00. This course focuses on the concepts and applications of mechanics, imaging, and instrumentation methods towards evaluating experimental biomechanics at multiple length scales. Core concepts include mechanics of materials, dynamics, contact theory, and the simplifying assumptions and standardizations often needed to conduct experiments on biomaterials and living systems. Experimental methods may include atomic force microscopy, digital image correlation, and motion analysis.**Credits:** 3.00

BME 32000 - Introduction To Biomaterials Science And Engineering

Credit Hours: 3.00. This junior-level course will introduce fundamental materials science and biomaterial concepts to BME students and will lay the foundation for more advanced courses in biomaterials and tissue engineering. The course will introduce the vocabulary and technical concepts in biomaterials science relevant for problems in medical device, biotechnology, or biomaterials industries. The course material will present phenomena at the intersection of materials science and biology.**Credits:** 3.00

BME 32001 - Biomolecules And Biomaterials Laboratory

Credit Hours: 1.00. Introductory laboratory experience focused on engineering concepts and practices in the analysis of biomolecules and cells. Topics include fundamental quantitative techniques of analysis, methods of isolation, identification, and quantification of biomolecules and cells, and analysis of integrated biosystems. Concludes with student-driven design project.**Credits:** 1.00

BME 32200 - Probability, Statistics, And Applications In Biomedical Engineering

Credit Hours: 3.00. Probability theory and statistical methods are developed for life science applications. Analytical tools such as hypothesis testing, estimation of moments, sampling theory, correlation and spectral analysis are developed and applied to identifying underlying processes in biological systems, developing realistic models of physiological processes, designing experiments, and interpreting biological data.**Credits:** 3.00

BME 33000 - Bioelectricity

Credit Hours: 3.00. Fundamentals of bioelectricity of the mammalian nervous system and other excitable tissues. Passive and active forms of electric signals in both the single cell and cell-cell communication, tissue and systematic bioelectricity, mathematical analysis including Nernst equation, Goldman equation, linear cable theory, and Hodgkin-Huxley Model of action potential generation and propagation.**Credits:** 3.00

BME 33100 - Biosignals And Systems

Credit Hours: 3.00. This course applies mathematical analysis tools to biological signals and systems. Frequency analysis, Fourier and Laplace transforms, and state equations are used to represent and analyze continuous and discrete-time biosignals. Classic feedback analysis tools are applied to biological systems that rely on negative feedback for control and homeostasis. **Credits:** 3.00

BME 33400 - Biomedical Computing

Credit Hours: 3.00. This course explores computational approaches to analyzing biological data and solving biological problems. Students will fit and interpret biological data, apply probabilistic and differential equation modeling techniques to biological processes, and assess numerical tools for biomedical applications. Special attention is given to the built-in analysis functions of MATLAB.**Credits:** 3.00

BME 35200 - Cell And Tissue Mechanics

Credit Hours: 3.00. This course will explore the biological principles of cellular/tissue behaviors and properties. Topics include: fundamental concepts of cellular structure and tissue organization, biomolecular elements and their properties, cell shape, cell adhesion and migration, mechanotransduction, pattern formation in embryos, and stem cell and tissue regeneration.**Credits:** 3.00

BME 35400 - Cell And Tissue Laboratory

Credit Hours: 1.00. This course develops quantitative biomechanical methods to analyze cell/tissue behavior and properties and to solve biomechanical engineering problems. Topics include: bio viscoelasticity, failure, filament dynamics, membrane dynamics, biofluid dynamics, cellular dynamics, and tissue dynamics.**Credits:** 1.00

BME 35600 - Mathematical Models And Methods In Physiology

Credit Hours: 3.00. This course uses real-world engineering problems to introduce advanced analytical tools and concepts relevant to biomedical engineering design. Each topic is briefly introduced, and students work in small teams to investigate physical mechanisms involving human anatomy and physiology using mathematical models and methods. Group work is done during scheduled class periods and other times by arrangement. Topics include brain concussions and protective helmets, origin of the electrocardiogram and bi-ventricular pacing, and deep brain stimulation for Parkinson's disease. Mathematical methods include coupled linear and nonlinear differential equations, finite element analysis, and simulated annealing. Creation of custom computer code is required. Students prepare extensive and detailed written technical reports. A midterm and a final examination encourage individual accountability and understanding. **Credits:** 3.00

BME 35700 - Foundations Of Biomedical Data Science

Credit Hours: 3.00. This course presents foundational data science methods for analysis of complex biological datasets encountered in biomedical engineering research and applications. After a brief (1-2 weeks) introduction and review of mathematical concepts necessary for data science, the course will cover representative areas of regression, supervised machine learning, unsupervised machine learning, model evaluation, and uncertainty quantification. Assignments and exams will focus on practical examples spanning basic science, engineering, and medical applications.**Credits:** 3.00

BME 36000 - Introduction To Biomedical Imaging

Credit Hours: 3.00. The main focus of this course is on basic principles and modes of major bioimaging modalities. This course covers image characterization, interactions of electromagnetic radiation with tissue, fundamental principles in imaging and detection, and modes of imaging modalities (e.g., reflection, transmission, absorption, and emission). Conventional bioimaging modalities will be used to teach the topics. This course is particularly aimed at students in science and engineering interested in gaining a conceptual understanding of several critical biological and biomedical imaging methods, including optical microscopy, ultrasound, X-ray imaging, computed tomography, nuclear medicine, magnetic resonance imaging, and mobile health. Overall, this course provides a conceptual framework for biomedical imaging in a reasonably concise and understandable format (with minimal mathematical approaches). **Credits:** 3.00

BME 38000 - Professionalization In Biomedical Engineering

Credit Hours: 2.00. This active learning course covers standards of practice, regulatory and legal requirements, and moral and ethical issues; increases awareness of career paths; and addresses current and emerging trends and challenges at the frontiers of the field of biomedical engineering. Most class sessions will consist of a short introduction to a topic followed by a breakout session for active investigation of the topic. During the breakout sessions, course instructors will be available to guide discussion and answer questions. **Credits:** 2.00

BME 38100 - Implantable Materials And Biological Response

Credit Hours: 3.00. BME 381 combines biomaterials, their biological response, and interactions between implantable materials and biological systems. Materials science of implantable materials; overview of implantable biomaterials and interactions between implants and biosystem; in vitro and in vivo biocompatibility tests; and specific examples on implant-tissue interactions, biocompatibility, and evaluation tools are presented.**Credits:** 3.00

BME 38300 - Implantable Materials Laboratory

Credit Hours: 1.00. BME 38300 is a corequisite course to BME 38100, supplementing the basic science of BME 38100 with quantitative, analytical examples and problems related to fundamental engineering principles in implantable materials. Topics include: microstructure, phase transformation, processing and design issues related to major engineering materials used for implantation purposes.**Credits:** 1.00

BME 38800 - Applied Biomaterials

Credit Hours: 3.00. This course covers foundational knowledge in the fields of materials science and engineering. Emphasis is placed on the materials used in biomedical applications and the relationship between material properties and the performance of these biomaterials.**Credits:** 3.00

BME 38900 - Junior Experimental Design Laboratory

Credit Hours: 2.00. Practical experience with engineering design principles is presented through inquiry-based modules. Each module contains computer simulation, experimental design, implementation, and data analysis. Modules address biomedical applications in different areas of BME.**Credits:** 2.00

BME 39000 - Professional Development And Design In Biomedical Engineering

Credit Hours: 2.00. Introduction to a diverse spectrum of current topics relevant to the technical, professional, and career aspects of Biomedical Engineers. The course topics will focus on the early stages of the design process (e.g. need identification, problem formulation, innovation and idea generation), professional communication skills (e.g. written and oral reporting and documentation), and ethics of biomedical design and research (e.g. ethical codes and decision making, animal care and use in research and testing, authorship and intellectual property, social and environmental impact of design).**Credits:** 2.00

BME 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in biomedical engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

BME 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in biomedical engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

BME 39500 - Selected Topics In Biomedical Engineering

Credit Hours: 1.00 to 4.00. Specialized topic areas for which there are no specific courses, workshops, or individual study plans, but having sufficient student interest to justify the formalized teaching of a course. Permission of instructor required. **Credits:** 1.00 to 4.00

BME 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in biomedical engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

BME 39699 - Professional Practice Internship

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Permission of department required. **Credits:** 0.00

BME 40100 - Mathematical & Computational Analysis Of Complex System Dynamics In Biology, Medicine, & Healthcare

Credit Hours: 3.00. An introduction to analysis of complex system dynamics that appear in biology, medicine, and healthcare. Key topics include nonlinear dynamical concepts associated with phase plane, bifurcation, stability diagram, oscillation, and chaotic systems along with concepts from discrete systems and stochastic processes. These topics are taught within the context of mathematical and computational models related to both non-communicable diseases (i.e. cancer) and communicable diseases (i.e. HIV/AIDS). Courses projects are drawn from recent literature. **Credits:** 3.00

BME 40500 - Biomedical Engineering Design Project

Credit Hours: 4.00. Design and management of biomedical engineering projects. Teams design and implement a solution to a biomedical engineering problem utilizing skills gained in previous course work. Oral and written presentation of design and demonstration of function are required. **Credits:** 4.00

BME 41100 - Quantitative Physiology

Credit Hours: 3.00. This course applies systems theory and explores feed forward and feedback control in the context of physiological systems. Control, frequency response, and linear systems concepts are applied to action potential generation, motor control, heart rate regulation, and other physiological processes.**Credits:** 3.00

BME 41101 - Quantitative Physiology In Biomedical Engineering

Credit Hours: 4.00. This course is an introductory course in physiological systems and an introductory course in classical feedback control theory for biomedical engineers. It aims to apply systems theory and classical feedforward and feedback control in the context of physiological. Control, frequency response, and linear systems concepts are applied to action potential generation, motor control, heart rate regulation, and other physiological processes. Approximately a third of the course will be devoted to physiological systems, a third to classical control theory and a third to the application of classical control and systems theory to physiological systems.**Credits:** 4.00

BME 41400 - Computational Mechanics In Biomedical Engineering

Credit Hours: 3.00. Teaches modeling methods for biomedical engineering problems with focus on fluid/solid mechanics. Students are introduced to the most common numerical techniques in biomedical engineering and will learn the applications of these techniques to biomechanical problems at various length scales, such as cardiac contraction and blood flow. The first half of

this course focuses on modeling based on ordinary differential equation (ODE) and partial differential equation (PDE) as well as on how we integrate these equations analytically or numerically using software packages such as MATLAB. The other half focuses on fundamentals of fluid/solid mechanics and also on the application of COMSOL or similar software to solving relevant biomechanical problems.**Credits:** 3.00

BME 43000 - Introduction To Bioimaging

Credit Hours: 3.00. Provides a conceptual framework for understanding the theory and technical principles behind major Bioimaging modalities. The main focus is on basic principles and modes of imaging involving interactions of electromagnetic radiation with biological tissue. Main concepts include imaging and detection, modes of imaging modalities (e.g. reflection, transmission, absorption, and emission), and basic image characterizations. Applications include several critical biological and biomedical imaging methods, such as optical microscopy, ultrasound, X-ray imaging, computed tomography, positron emission tomography, and magnetic resonance imaging. Demonstrations of conventional Bioimaging modalities are used to teach the topics. **Credits:** 3.00

BME 43100 - Neural Engineering

Credit Hours: 3.00. An introduction to Neural Engineering - an emerging field of developing and applying engineering solutions to research or translational problems concerning the brain. The course will cover a broad range of topics about neural sensing, modeling, stimulation, interface, and prosthetics. Course projects are drawn from real-world problems and experimental data.**Credits:** 3.00

BME 44200 - Biofluid Mechanics

Credit Hours: 3.00. This course explores fluid mechanics in the context of the human circulatory system. Principal equations are derived from differential analysis of fluid flow, and models of characteristic flow conditions are fully analyzed. Biofluid mechanics, vessel biomechanics, and hemodynamic analysis of the circulation system will also be discussed.**Credits:** 3.00

BME 45000 - Deep Learning For Medical Imaging

Credit Hours: 3.00. Teaches the foundation of neural network (aka "Deep Learning") approaches and applications to medical imaging: or how to create computable models of biological neural systems, in particular large-scale neural networks, for processing medical images and data. Drawing inspiration from neuroscience and statistics, Deep Learning introduces the basic background on neural networks, presents computable neuron models and extends to large networks of neurons. Students study deep learning with both real and artificial neural networks, along with methods of deep learning about the environment by applying back propagation, Boltzmann machines, auto-encoders, convolutional neural networks and recurrent neural networks. Students will explore how Deep Learning is impacting our understanding of intelligence and contributing to the practical design of automatic medical imaging tools that are able to augment expert medical personnel, enhance diagnosis accuracy and speed, and lower health-care costs. **Credits:** 3.00

BME 46000 - Cardiovascular Mechanical Support And Devices

Credit Hours: 3.00. Designed to expose students to state-of-the-art medical technologies being utilized in the treatment of patients with cardiovascular diseases, the course emphasizes the role of the biomedical engineer in the design, development and implementation of these technologies for therapeutic impact. Students completing this course will have an understanding of the role of biomedical engineers in clinical engineering and clinical research. The three components of the course, didactic presentations and discussions, laboratory dissections, and clinical shadowing are integrated throughout to teach concepts such as cardiovascular physiology, heart failure and vascular disease, treatments and treatment complications, and future directions. Clinical experts in cardiovascular diagnosis and treatment are frequent guest lecturers.**Credits:** 3.00

BME 46100 - Transport Processes In Biomedical Engineering

Credit Hours: 3.00. This course explores engineering principles in mass and other transport processes in biological systems. Topics covered include diffusion, convection, reaction kinetics, transport in porous and fluid mediums, etc. Mathematical models of transport are developed and applied to biomedical problems and physiological systems such as the kidney/renal and oxygen/arterial systems.**Credits:** 3.00

BME 47000 - Biomolecular Engineering

Credit Hours: 3.00. The course covers key chemical concepts one needs in order to modify existing biomolecules, link biomolecules with other (bio)molecules, link biomolecules with inorganic entities, create composite (bio)structures, modify specific properties of biomolecules, alter/enhance biomolecule functionality. Taken together, the rational application of these biological, chemical, and engineering tools can be used to; engineer new biomolecules, design sensors for molecular detection, create diagnostic tests, develop new imaging modalities, and design and test novel biomaterials, to name a few examples. **Credits:** 3.00

BME 48901 - Senior Design Project Lab

Credit Hours: 3.00. The biomedical engineering design process is completed starting from a preparatory design course, BME 39000, through a preliminary system design, build and test in Senior Design Project Lab. Students will work with their teammates to implement (e.g. build, test, iterate and evaluate) a solution to address a biomedical engineering problem statement and meet the technical specifications set forth. The resulting project design is presented and evaluated through an oral presentation, laboratory demonstration, and a final written document.**Credits:** 3.00

BME 49000 - Professional Elements Of Design

Credit Hours: 1.00. This course advances and enhances design tools, concepts, and knowledge relevant to biomedical engineering design. Students work individually and in small teams to investigate the topic within the context of their specific senior design project in preparation for their lab. Topics include project management, human and animal subjects, ethics, regulatory affairs, literature and patent searching, and entrepreneurship. **Credits:** 1.00

BME 49100 - Biomedical Engineering Design I

Credit Hours: 3.00. This course prepares students for engineering practice through a major design experience, encompassing conceptualization, requirements generation, and system and detailed design. Essential design constraints will be reviewed and applied including: safety, economics, and manufacturability. The course encompasses lectures, case studies, team formation, project assignments and generation of initial design.**Credits:** 3.00

BME 49101 - Biomedical Engineering Design

Credit Hours: 2.00. This course prepares students for engineering practice through a major design experience, encompassing conceptualization, requirement generation, and system and detailed design. Essential design constraints will be reviewed and applied including: safety, economics, and manufacturability. The course encompasses lectures, case studies, team formation, project assignments and generation of initial design.**Credits:** 2.00

BME 49200 - Biomedical Engineering Design II

Credit Hours: 3.00. This course continues the design experience from BME 491 with verification, validation, and re-design of student projects. Regulatory and ethical design constraints will be discussed. Oral presentation and report writing are required.**Credits:** 3.00

BME 49500 - Selected Topics In Biomedical Engineering

Credit Hours: 1.00 to 4.00. Specialized topic areas for which there are no specific courses, workshops, or individual study plans, but having sufficient student interest to justify the formalized teaching of a course. Permission of instructor required. **Credits:** 1.00 to 4.00

BME 49800 - Biomedical Engineering Projects

Credit Hours: 1.00 to 4.00. Individual research projects to be approved by the supervising faculty member before registering for the course. An approved written report is required. Permission of instructor required. **Credits:** 1.00 to 4.00

BME 50000 - Biomedical Engineering Graduate Seminar

Credit Hours: 0.00. A -0- credit hour graduate seminar course consisting of weekly, one hour technical presentations by Department of Biomedical Engineering and other engineering faculty at IUPUI, researchers from local and national academia, representatives from industry and peer graduate students in the BME Department. These seminars introduce graduate BME students to a wide variety of bioengineering related topics in academic research and commercial industries. The students are exposed to research questions, methodologies and technical developments both inside and outside of their topical concentration areas. Through open inquiry, discourse and application of the Socratic method the course moderator helps the BME graduate students enhance and refine their critical thinking and technical presentation skills. Permission of department required.**Credits:** 0.00

BME 50100 - Multivariate Analyses In Biostatistics

Credit Hours: 3.00. This course focuses on fundamental principles of multivariate statistical analyses in biostatistics, including multiple linear regression, multiple logistic regression, analysis of variance, and basic epidemiology. The fundamental theories are applied to analyze various biomedical applications ranging from laboratory data to large-scale epidemiological data. **Credits:** 3.00

BME 51000 - Neural Mechanisms In Health And Disease

Credit Hours: 3.00. An examination of the mechanisms by which nervous systems process information in normal and pathologic states. Cellular and systems-level information processing will be studied with a focus on sensory and motor systems. Students will gain some hands-on experience in the analysis of neural data. Some neuroanatomy will be included to understand how nervous systems are organized. Pathological states such as Alzheimer's, autism, and aging will be studied, both in terms of understanding the systems and cellular deficits as well as examining potential solutions to improve the outcomes for these neural disorders.**Credits:** 3.00

BME 51100 - Biomedical Signal Processing

Credit Hours: 3.00. An introduction to the application of digital signal processing to practical problems involving biomedical signals and systems. Topics include: overview of biomedical signals; filtering to remove artifacts; event detection; analysis of waveshape and waveform complexity; frequency domain characterization; modeling biomedical signal-generating systems; analysis of non-stationary signals; pattern classification and diagnostic decisions, MATLAB is used throughout to apply the theory and techniques discussed to biomedical signals. **Credits:** 3.00

BME 51500 - Practical MRI And Applications

Credit Hours: 1.00. This course covers basic theory and practical training for magnetic resonance imaging (MRI). Weekly labs allow students to directly train on an MRI system within the Purdue MRI Facility. Weekly lectures are provided on a broad range of applied and relevant topics, including image formation and contrast, pulse sequence basics, artifacts, advanced sequences, and safety. The course is ideally designed for students who want to make use of MRI to advance their research.**Credits:** 1.00

BME 52100 - Biosensors: Fundamentals And Applications

Credit Hours: 3.00. (ABE 56000) An introduction to the field of biosensors and an in-depth and quantitative view of device design and performance analysis. An overview of the current state of the art to enable continuation into advanced biosensor work and design. Topics emphasize biomedical, bioprocessing, environmental, food safety, and biosecurity applications. **Credits:** 3.00

BME 52500 - Neural Engineering

Credit Hours: 3.00. Neural engineering is an emerging engineering discipline that combines the various disciplines of engineering with the biological, physical and material sciences to find the means to access, understand, manipulate, and perhaps enhance the nervous system and the information it contains. The aim of this course is to provide an introduction to the field of neural engineering and will start with the introduction of the neuron, the bioelectric phenomenon and the neural/electronic interfaces placed in the extracellular space on the peripheral nervous system. These topics will be reinforced through hands-on practical experiments using electrodes for stimulation and recording.**Credits:** 3.00

BME 52600 - Cardiac Electrophysiology

Credit Hours: 3.00. This course will introduce the basic principles of cardiac-generated bioelectricity as measured at cellular, extracellular and body surfaces. The generation, detection and classification of abnormal cardiac rhythms will be emphasized. Clinical and engineering principles of relevant electro-therapies will also be studied including cardiac pacemakers, defibrillators and ablation therapies involving cardiac mapping and a variety of ablative energy sources. Modern signal processing methods as applied to electrocardiography will also be presented. Permission of department required.**Credits:** 3.00

BME 52700 - Implantable Systems

Credit Hours: 3.00. The course material and lectures will focus upon how the anatomy and physiology of the target organ system impacts the design specifications for biomedical and implants and the biosensors that can be part of the command and control strategy for the implant. The course material is roughly organized according to motor (skeletal, cardiac) and sensory (vision, audition, olfaction, touch) and visceral (lungs) organ systems. For each topic area there will be a brief introduction to the physiology and neuroanatomy of the target organ system or biological environment (e.g. subcutaneous implants). Each topic area will have companion lectures demonstrating the extent to which biomedical engineers have been able to fabricate functional replacement (prosthetic) or assistive (orthotic) devices and tissue interfaces (electrodes). For example, issues related to performance, powering, communications, command control and user interfaces for auditory and visual neuroprosthesis are presented immediately following lecture materials describing these organ systems. Although not central to the course content, tissue and cellular responses to materials will be stressed throughout the semester. Topics will include normal wound healing processes, host response to implants and general biocompatibility. Lectures will emphasize fundamental principles of bioengineering as related to the design of implantable systems and will require student participation in classroom discussions. Permission of instructor required. Permission of department required.**Credits:** 3.00

BME 52800 - Measurement And Stimulation Of The Nervous System

Credit Hours: 3.00. (ECE 52800) Engineering principles addressing questions of clinical significance in the nervous system: neuroanatomy, fundamental properties of excitable tissues, hearing, vision, motor function, electrical and magnetic stimulation, functional neuroimaging, disorders of the nervous system, development and refinement of sensory prostheses. **Credits:** 3.00

BME 53000 - Imaging Diagnostic Technologies For Medical And Biological Applications

Credit Hours: 3.00. This gateway course teaches the physics, engineering techniques associated with modern imaging and diagnostic tools for biological and medical applications. The course covers fundamental principles of radiology, optics, contrast generation (including genetically encoded probes and physiological indicators), image formation, detection, and analysis. The specific biomedical imaging modalities covered include: x-ray, computed tomography, nuclear medicine imaging, ultrasound,

optical microscopy and tomography, and MRI. The specific biological microscopy modalities covered include: phase contrast, DIC, confocal microscopy, two-photon microscopy and super-resolution microscopy. The course also teaches the principle concepts of adaptive optics, light sheet microscopy, 4Pi microscopy, and modern super-resolution microscopy techniques (PALM/STORM, STED and ISM). To bridge the technology and physics with the latest diagnostic advances and biomedical discoveries, research progresses in specific biomedical applications are presented by leading experts in their respective biomedical field such as OCT, ultrasound, MRI, fluorescence microscopy, electron microscopy, concurrent MRI and optical functional imaging, and super-resolution fluorescence microscopy. This course also includes a crash sub-course on MATLAB programming including both introductory content and contents of MATLAB-C API and MATLAB-C-CUDA (GPU computing).**Credits:** 3.00

BME 53700 - Experimental Methods In Biomedical Engineering

Credit Hours: 3.00. A 3-credit graduate level engineering course that covers issues related to general laboratory practice, techniques, instrumentation and analysis methods utilized by Biomedical Engineering researchers working in the life sciences. Both theoretical and practical aspects of experimental design and data analysis are covered using select examples from BME life science researchers here on the IUPUI campus. Most topic areas are presented from a decidedly analytical and engineering viewpoint. Students should have successfully completed courses in elementary analog electronic circuits and ordinary differential equations, and should be prepared to solve related homework problems using any available software programming tools (e.g. Matlab, Maple, Visual C, Visual Basic, etc.). No prior knowledge of the biological sciences is required although participants would benefit from having taken a first year undergraduate course in Chemistry and/or Biology. Permission of instructor required. Permission of department required.**Credits:** 3.00

BME 54000 - Biomechanics

Credit Hours: 3.00. Application of engineering mechanics to the study of normal and diseased musculoskeletal systems, including bone and soft tissue biology, musculoskeletal statics and dynamics, mechanical properties of biological tissues, and structural analysis of bone-implant systems. Permission of instructor required. **Credits:** 3.00

BME 54200 - Cell & Tissue Mechanics

Credit Hours: 3.00. This course develops and applies scaling approaches and simplified models to biomechanical phenomena at molecular, cellular, and tissue level. Topics include: Molecular forces; Viscous drag; Brownian motion; Diffusion; Polymer mechanics; Polymer dynamics; Molecular motors; Cytoskeleton; Viscoelasticity; Membrane; Cell migration; Cell adhesion; Mechanobiology; Mechanotransduction; Elastic, viscoelastic. and poroelastic behavior or tissues & Cell-matrix interaction.**Credits:** 3.00

BME 54400 - Musculoskeletal Biology And Mechanics

Credit Hours: 3.00. This course will cover topics relevant to skeletal tissues (bone, tendon, ligament, cartilage and meniscus, muscle) including skeletal morphology, physiology, cell biology, development, adult osteogenesis, tissue mechanics, mechanical adaptation, failure (fracture) and fracture fixation. Students will gain a working understanding of tissue biology and physiology and mechanical principles governing tissue formation, maintenance and adaptation and failure. Prerequisites: BME 24100 or comparable mechanics course. Note: Students with advanced math backgrounds as well as biochemistry and cell biology may be prepared to take this course at the discretion of the instructor. Permission of instructor required.**Credits:** 3.00

BME 54500 - Orthopaedic Tissue Mechanics

Credit Hours: 3.00. Orthopaedic tissues, such as bone, cartilage, tendon and ligament, serve functions that are largely mechanical in nature and that are critical for our health. This course is structured around classical topics in mechanics of materials and their applications in biomechanics and musculoskeletal tissues. Primary emphasis will be on the mechanical behavior of tissues, including elastic and failure properties as well as more advanced topics such as anisotropy, nonlinearity,

viscoelasticity, poroelasticity, damage, and fatigue. Importantly, the theories used to describe these mechanical properties were originally developed for advanced engineering materials such as fiber composites, polymers, elastomers, hydrogels, etc. Thus, while the theories will be presented in the context of biological materials, potential applications are much broader. Tissue microstructure and its importance to the material properties will be covered. Mechanics of whole bones and implants (composite and asymmetric beam theories) and the mechanical function of native and artificial joints (contact mechanics, lubrication and wear) may also be discussed, time permitting. Some homework assignments will emphasize the use of experimental data to develop and test theoretical models via nonlinear curve fitting and optimization using Matlab. Students will receive an introduction to tissue mechanics literature to better understand how the concepts presented in class are used in the research setting. Permission of department required.**Credits:** 3.00

BME 55100 - Tissue Engineering

Credit Hours: 3.00. (BMS 52300) Integrates the principles and methods of engineering and life sciences toward the fundamental understanding of structure-function relationships in normal and pathological mammalian tissues, especially as they relate to the development of biological substitutes to restore, maintain, or improve tissue/organ function. Current concepts and strategies, including drug delivery, tissue and cell transplantation, bioartificial organs, and in vivo tissue regeneration are introduced, as well as their respective clinical applications. Permission of instructor required. **Credits:** 3.00

BME 55300 - Biomedical Optics

Credit Hours: 3.00. Optical methods applied to address biological and biomedical problems. The course includes two parts: fundamentals of optical microscopy and advanced techniques that are currently used to probe and/or manipulate cell and tissue samples. Permission of instructor required. **Credits:** 3.00

BME 55500 - Magnetic Resonance Imaging Theory

Credit Hours: 3.00. This course covers fundamental aspects of magnetic resonance imaging systems with an emphasis on theory, methodology, and instrumentation. Key principles are derived from the Bloch equations and Maxwell's equations. Topics include pulse sequences, signal acquisition, spatial encoding in k-space, image reconstruction, and tissue contrast. Major components of an MRI scanner are examined, including the static magnet, gradient and shim coils, transmit and receive chains, and radiofrequency coils and arrays. Learning outcomes are assessed by solving problem sets integrating theory with practical applications. As a final research project, students survey recent literature to identify a specialized topic of interest and deliver a peer-evaluated presentation to the class. **Credits:** 3.00

BME 55600 - Introduction To Clinical Medicine For Engineering Solutions

Credit Hours: 3.00. This course introduces students to the physiology and medicine underlying major human diseases likely to become research targets in biomedical engineering and medical device development. It encourages students to upgrade research target selection to include projects that promise to improve patient care, with a major emphasis on pathophysiology and disease mechanisms. The information and intellectual approach offered will help students recognize needs for engineering solutions to current challenges in medicine. The course also previews the intellectual content of medical school, including rigor and level of detail, for engineering students considering designing medical solutions or translational engineering research as a career, emphasizing the key "11-points" necessary for practical understanding of any disease: definition of the condition, causes, functional abnormalities, structural abnormalities, early signs, history and physical findings, differential diagnosis, special studies (lab, imaging, etc.), treatment strategy, specific steps of treatment, and follow up, as well as current clinical needs for innovation and research opportunities for the future. To avoid possible redundancy with the Weldon School undergraduate curriculum, focal areas of the course include topics and body systems not covered in BME 25600, including infectious diseases, cardiopulmonary diseases, hematology-oncology, and gastrointestinal diseases. **Credits:** 3.00

BME 56100 - Preclinical And Clinical Study Design

Credit Hours: 3.00. Medical devices are developed, manufactured, and distributed in a highly regulated environment. This course concerns the preclinical and clinical study design processes for obtaining FDA marketing approval for biomedical devices. Prior to marketing a medical device in the US, specific governmental approval is required dependent on the type of device and the risk associated. This course is part of a three-course series dealing with various aspect of regulatory science. Regulatory science considers the scientific and technical foundations that support the practical testing and regulations that ensure the safety and effectiveness of medical devices. This course covers the responsible conduct of clinical and preclinical research, including evaluation of device tissue interactions and how they may be studied with preclinical animal models to predict safety and performance in human clinical trials that are necessary to gain regulatory approval for marketing. In the section on ethics we will cover several topics related to responsible conduct of clinical and preclinical research, including informed consent, risk assessment and ethical decisions, IRB oversight and ethical study design. **Credits:** 3.00

BME 56200 - Regulatory Issues Surrounding Approval Of Biomedical Devices

Credit Hours: 3.00. Medical devices are developed, manufactured, and distributed in a highly-regulated environment. This course primarily concerns the processes for obtaining FDA marketing approval or clearance for biomedical devices. Prior to marketing a medical device in the US, a specific governmental approval or clearance is required depending on the type of device and the risk associated with the device. This course is part of a three-course series dealing with various aspects of regulatory science. Regulatory processes for class I, II, and III devices, including combination devices, are covered with specific focus on 510(k) and PMA requirements. Approval requirements in the EU, Japan and other countries will also be briefly considered. Throughout the course, emphasis will be placed on regulatory science, regulatory strategy and principles of interacting with regulatory agencies. **Credits:** 3.00

BME 56300 - Quality Systems For Regulatory Compliance

Credit Hours: 3.00. Medical devices are developed and manufactured in a highly regulated environment. This course will provide an introduction, overview, and systematic study of the intent and impact of the major federal laws and regulations governing the development, manufacturing, distribution, and marketing of medical devices. Focus is on understanding the critical elements of regulatory science and quality compliance from a design control perspective. Instruction and mentoring in regulatory science skills is provided by academics and industry representatives with expertise in their fields. This course is part of a three-course series. **Credits:** 3.00

BME 56400 - Ethical Engineering Of Medical Technologies

Credit Hours: 3.00. This course examines many of the ethical challenges surrounding the design, development, and deployment of medical technologies. Issues will be analyzed from multiple frameworks and perspectives including industry, government, and society. Students will learn and practice identification and analysis of ethical issues. They will develop empathic and decision-making skills designed to prepare them as engineers to deal productively and ethically with issues in professional practice. **Credits:** 3.00

BME 57100 - Drug Delivery

Credit Hours: 3.00. This course explores the principles, techniques, and applications for therapeutic drug delivery and administration. This course will start with the fundamentals of drug administration: engineering principles such as diffusion and mass transport, with specific emphasis on transport in biological systems and barriers, pharmacokinetics, and drug distribution. We will examine the existing state of art in drug delivery systems: controlled release, biomaterials, and polymer-based delivery systems. Finally, we will also discuss the current field of biotechnology and biopharmaceutical: identification of novel drug targets, latest development in drug discovery, development, clinical trials, and product development, going from research to market using the latest examples from the pharmaceutical industry. Prerequisites: Basic mass transport background. Permission of instructor required.**Credits:** 3.00

BME 58100 - Bio-Micro-Electro-Mechanical Systems (BioMEMS) & Biomedical Microsystems

Credit Hours: 3.00. This course covers key topics in bio-micro-electro-mechanical systems (BioMEMS) and micro-integrated systems. Properties of useful materials will be discussed in context to BioMEMS. Micro-electronics process modules used in the design and fabrication of BioMEMS and micro-integrated systems will be presented. Applications of these systems in a variety of medical practices will be discussed in detail.**Credits:** 3.00

BME 58200 - Advanced Biomedical Polymers

Credit Hours: 3.00. This is an advanced polymer course that provides the most recent development of biomedical polymers and their applications and covers a variety of biomedical areas such as in cardiovascular, dental, orthopedic, ophthalmologic and wound healing research. Drug, cellular and gene delivery are also covered. This course is designed for all the graduate students (M.S. and Ph.D. level) in biomedical areas. Permission of instructor required.**Credits:** 3.00

BME 58300 - Biomaterials

Credit Hours: 3.00. Discussion of principles of biomaterial design, synthesis, and evaluation for various tissues/organs of the body, including orthopaedic/dental, cardiovascular, kidney, liver, lung, skin, nerve, and brain. Topics include fundamentals of materials science and engineering integrated into biology for the better regeneration of tissue. Offered in alternate years. Permission of instructor required. **Credits:** 3.00

BME 59500 - Selected Topics In Biomedical Engineering

Credit Hours: 1.00 to 3.00. This course is designed primarily for specialized topic areas for which there is no specific course, workshop, or individual study plan, but having enough student interest to justify the formalized teaching of a course. Permission of instructor required. **Credits:** 1.00 to 3.00

BME 60000 - Mentoring For Combined Degree (MD/PhD) Students In BME

Credit Hours: 0.00. Specialized course for M.D./Ph.D. students that is intended to maintain communication and orientation to the BME graduate program during the first two years of the combined degree program when students are completing medical school requirements on the Indianapolis campus. Requirements include attendance at one or more BME seminars on the West Lafayette campus; at least two research planning sessions with BME faculty members, BME graduate program coordinator, or assistant head; and participation in one additional graduate program activity. Permission of department required. Prerequisite is admissions to the Combined MD/PhD Degree program. **Credits:** 0.00

BME 64600 - Deep Learning - Theory And Practice Of Deep Neural Networks

Credit Hours: 3.00. This course teaches the theory and practice of deep neural networks from basic principles through state-of-the-art methods. The class blends hands-on programming, using a variety of state-of-the-art programming frameworks, with theoretical treatment based on current literature. Implementation will emphasize the use of the Pytorch language and the use of dynamic computational graphs. Some previous experience with optimization techniques is important for success in the course. **Credits:** 3.00

BME 68300 - Polymers In Biomedical And Pharmaceutical Systems

Credit Hours: 3.00. This course is designed to provide backgrounds in basic polymer chemistry, synthesis, characterization, solution properties, and recent advances in polymers for applications in drug delivery, biomedical devices, tissue engineering, biotechnology, and nanotechnology. **Credits:** 3.00

BME 69000 - Seminar In Biomedical Engineering

Credit Hours: 0.00. Seminar course covering a broad range of current research topics spanning Biomedical Engineering. Seminar presentations by representatives from industry and faculty from Purdue University and other external institutions. Required of Biomedical Engineering graduate students at Purdue; M.S. and Ph.D. students must complete two and four semesters (respectively) prior to graduation. **Credits:** 0.00

BME 69500 - Advanced Topics In Biomedical Engineering

Credit Hours: 1.00 to 3.00. This course is designed primarily for specialized topic areas for which there is no specific course, workshop, or individual study plan, but having enough student interest to justify the formalized teaching of an advanced course. Permission of instructor required. **Credits:** 1.00 to 3.00

BME 69600 - Advanced Biomedical Engineering Projects

Credit Hours: 1.00 to 6.00. Individual research projects to be approved by the supervising faculty member before registering for the course. An approved written report is required. Permission of instructor required. **Credits:** 1.00 to 6.00

BME 69699 - Biomedical Engineering Professional Practice Graduate Internship

Credit Hours: 0.00. Graduate-level internship course in Biomedical Engineering providing training in the professional skills that lead to career success in the biomedical field. Permission of instructor required. **Credits:** 0.00

BME 69700 - Directed Reading In Biomedical Engineering

Credit Hours: 1.00 to 3.00. Individualized reading course supervised by an appropriate faculty member. Approval for each reading course must be obtained from the department prior to registration. Permission of instructor required. **Credits:** 1.00 to 3.00

BME 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

BME 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required.**Credits:** 1.00 to 18.00

Botany and Plant Pathology

BTNY 11000 - Introduction To Plant Science

Credit Hours: 4.00. An introduction to the major groups in the plant kingdom, their origin, classification, and economic importance. The areas of anatomy, morphology, cytology, physiology, biochemistry, molecular biology, genetics, and ecology will be explored as they relate to plant sciences and agriculture. Course may also be offered for dual credit with cooperating Indiana high schools upon documented approval by the Department of Botany and Plant Pathology.**Credits:** 4.00

BTNY 12000 - Principles Of Plant Biology I

Credit Hours: 4.00. This course is the first of a two-semester series that introduces fundamental biological concepts and prepares students for more specialized plant biology studies. Lectures and laboratory exercises will cover the topics of plant diversity, morphology, physiology, and ecology. Throughout the course, emphasis will be placed on how scientific data is collected and interpreted, and the lab component will perfect key observational skills in botany. Our goal is to provide essential foundational knowledge in plant biology for progression to upper-level courses. **Credits:** 4.00

BTNY 12100 - Principles Of Plant Biology II

Credit Hours: 4.00. This course is an introduction to fundamental biological concepts designed to prepare students for more specialized study. Lectures and laboratory exercises will cover mechanisms and processes of genetics, molecular biology and cell biology. Our goal is to convey how these levels of organization are integrated. Throughout the course, emphasis will be made on the means by which scientific data is collected and interpreted, and key experiments performed in the lab component will be used to illustrate this process. **Credits:** 4.00

BTNY 20700 - The Microbial World

Credit Hours: 3.00. This course delivers a broad synthesis of microbiology, discussing all taxa of the microbial world. The course also discusses a wide range of subjects related to microbiology, including medical microbiology, but it has a strong emphasis on the botanical and environmental sciences. One particular characteristic that separates it from other microbiology courses is the reduced emphasis upon bacteriology, with discussions of the protists and viruses and, especially of the fungi, occurring in greater detail than the other general microbiology courses available. **Credits:** 3.00

BTNY 20800 - Introduction To Plant Science Research

Credit Hours: 1.00. The course is designed to expose students to the diversity of Plant Science research at Purdue and help students to get started in research and in the fantastic world of scientific discovery. Students will learn the importance of Plant Science research in society and how to become active participants of Purdue research discoveries. Students will learn about the scientific method and how discoveries are made to find answers to world problems. The students will explore department and campus resources to identify areas of research interest, learn how to search and apply for research/internship opportunities and find faculty that can serve as professional models and mentors. We will provide opportunities for students to interact and network with faculty members, professionals from industry and students involved in diverse research areas. **Credits:** 1.00

BTNY 26200 - Plant Structure And Tissue Biology

Credit Hours: 3.00. This course focuses on fundamental knowledge of the internal structure of plants, including distinct cell types, tissues, tissue systems, and organs that make up a plant. Lectures and laboratories will cover the structural parts that comprise the plant body including three major vegetative organs (roots, stems, and leaves) and a set of reproductive organs (flowers, fruits, and seeds). The goal of this course is to understand the internal organization of plants, to learn multiple lab techniques critical for plant science research, and to develop critical thinking and problem solving skills. **Credits:** 3.00

BTNY 27500 - Honors Course - Lower Division

Credit Hours: 1.00 to 4.00. Utilized to offer a new honors course for a maximum of three years. Variable title, credit and instructional type. Course may be repeated for credit if content and titles are different. Offered primarily to first-and second-year students. Courses offered must be approved by department or program faculty, and College of Agriculture Honors Committee. Permission of department required. **Credits:** 1.00 to 4.00

BTNY 28500 - Plants And Civilization

Credit Hours: 3.00. This course, intended primarily for non-majors, covers the history of agriculture, with focus on the centers of origin of our major food, fiber, and medicinal plants, and their historical, cultural, and economic relevance. The course also

surveys the biology of crop plants, with respect to taxonomy, anatomy, cell structure, physiology, development, and genetics. Discussions also center on the roles plant biotechnology may play in sustainable agriculture and in helping to alleviate problems caused by overpopulation and ecological stress. **Credits:** 3.00

BTNY 29800 - Research In Plant Science

Credit Hours: 1.00 to 3.00. Supervised individual laboratory or field research for freshmen and sophomore undergraduate students. A written report of work accomplished will be required. Up to 3 credits can be earned in BTNY 29800. Permission of department required.**Credits:** 1.00 to 3.00

BTNY 30100 - Introductory Plant Pathology

Credit Hours: 3.00. Basic principles of plant pathology, including etiology, symptomatology, control, and epidemiology of representative diseases of plants.**Credits:** 3.00

BTNY 30200 - Plant Ecology

Credit Hours: 3.00. This course will provide an introduction to the broad field of plant ecology. Through lectures and lab assignments, students will gain an in-depth understanding of ecological concepts regarding the distribution and abundance of plant species and populations. Students will also gain insights into the application of these concepts to the conservation and management of plant species and populations. **Credits:** 3.00

BTNY 30400 - Introductory Weed Science

Credit Hours: 3.00. A survey of the scientific principles underlying weed control practices; emphasis is on the ecology of weeds and control in crop associations. It is recommended that this course be followed by BTNY 50400. **Credits:** 3.00

BTNY 30500 - Plant Evolution And Taxonomy

Credit Hours: 3.00. This course focuses on the systematics and evolution of land plants, with an emphasis on plant identification in both laboratory and field. Topics covered include the diversity and evolution of land plants, plant systematics and biogeography. This is a lab and field intensive course consisting of multiple field trips and hands-on laboratories. Students will master the skills required for plant identification anywhere in the world. **Credits:** 3.00

BTNY 35000 - Biotechnology In Agriculture

Credit Hours: 3.00. (HORT 35000) A study of the methods used to produce genetically modified organisms, primarily using gene transfer technology, and the application of these organisms in agriculture. The uses of microbes, plants, and animals in agricultural biotechnology are examined. Social, economic, and ethical issues related to biotechnology are discussed. **Credits:** 3.00

BTNY 35700 - The Intoxicated Botanist - Flora Of Indiana

Credit Hours: 1.00. Over millions of years, plants have evolved the ability to biosynthesize thousands of compounds. In only the last few thousand years, humans have cultivated plants for their ability to feed, heal, intoxicate and even poison-depending upon the plant and the compounds they produce. The objective of this course is to learn and apply plant taxonomy to identify and study the regional flora of Indiana with a focus on flora used in the production 'intoxicants'. Individuals must be 21 years of age no later than the first day of class. Permission of instructor required.**Credits:** 1.00

BTNY 35710 - The Intoxicated Botanist - Study Abroad

Credit Hours: 3.00. Over millions of years, plants have evolved the ability to biosynthesize thousands of compounds. In only the last few thousand years, humans have cultivated plants for their ability to feed, heal, intoxicate and even poison-depending upon the plant and the compounds they produce. The objective of this course is to learn and apply plant taxonomy to identify and study the flora of Slovenia with a focus on flora used in the production 'intoxicants'. Permission of instructor required.**Credits:** 3.00

BTNY 39000 - Selected Topics In Plant Science

Credit Hours: 1.00 to 3.00. This course deals with special topics in botany not covered in regular undergraduate coursework. Credit depends upon work done. May be repeated once for credit. Permission of instructor required. **Credits:** 1.00 to 3.00

BTNY 40000 - Botany And Plant Pathology Study Abroad

Credit Hours: 0.00 to 8.00. Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities. **Credits:** 0.00 to 8.00

BTNY 42000 - Plant Cellular And Developmental Biology

Credit Hours: 3.00. This course will focus on the fundamentals of plant cellular and developmental biology. Topics to be covered include: the structure and function of plant organelles and membranes; the cell cycle; DNA, RNA and protein synthesis; the secretory pathway, and the cellular basis of development and whole plant morphogenesis. **Credits:** 3.00

BTNY 43100 - Planning For International Engagement Methods

Credit Hours: 1.00. A team-based laboratory course for students who seek experience working with international partners to plan and conduct quality service-learning projects. Using established partner relationships, students will work with international partners to address hands-on, real-world, identified challenges to learn the principles of extension methodology and sustainable community development by integrating their discipline knowledge and technical skills from previous courses. Students will also learn the intercultural communication, market analysis, project design and planning, entrepreneurial business planning for micro-credit loans and business ventures, and cultural factors affecting community food security while they work in bi-national teams to determine how best to apply their classroom knowledge and experience to respond to partners' needs and local resource constraints. **Credits:** 1.00

BTNY 43110 - International Engagement Methods

Credit Hours: 1.00 to 3.00. Using established partner relationships, students will travel to and live in Cap Haitien for 8-10 days and work with Haitian partners and students to learn the principles of extension methodology, sustainable community development, and how to most effectively work with local leaders. Students will also learn the intercultural communication, entrepreneurial business planning, and cultural factors affecting community food security status while they work bi-national teams to determine how best to apply their classroom knowledge and experience. **Credits:** 1.00 to 3.00

BTNY 43120 - Evaluating International Engagement Methods

Credit Hours: 1.00. Designed for students who have just returned from the Engagement Methods for Int'l Food Security course or have previous experience working with our partners. In order to 1) fully comprehend the impact of the experience and 2) foster true long-term relationships with and service to our partners, it is required to work on our projects when we return. Matt McGregor, Former Exec. Dir. of Timmy Global Health, told us that "it's not really about the trip". It is essential that we accomplish: 1) Closure of trip experiences with partners and contacts - thank you's and complete follow-up; 2) Reflection of Purdue student experiences and personal goals/follow-up actions; 3) Promotion of food insecurity realities and opportunities for support; and 4) Planning, recommendations, and promotion of future service learning courses.

Credits: 1.00

BTNY 47500 - Honors Course - Upper Division

Credit Hours: 1.00 to 4.00. Utilized to offer a new honors course for a maximum of three years. Variable title, credit and instructional type. Course may be repeated for credit if content and titles are different. Offered primarily to third-and fourth-year students. Courses offered must be approved by department or program faculty, and College of Agriculture Honors Committee. Permission of department required. **Credits:** 1.00 to 4.00

BTNY 49700 - Undergraduate Seminar

Credit Hours: 1.00. Professional preparation for careers in plant sciences. Career development activities including resume and cover letter preparation, job search and interview preparation, and participation in career fairs. In addition, the student will polish skills in preparation of seminar, extension publications, press releases and communicating science to lay personnel based on current issues in pest management and crop protection. **Credits:** 1.00

BTNY 49800 - Research In Plant Science

Credit Hours: 1.00 to 3.00. Supervised individual laboratory or field research. A written report of work accomplished will be required. May be repeated once for credit. Permission of instructor required. **Credits:** 1.00 to 3.00

BTNY 49900 - Thesis Research

Credit Hours: 1.00 to 6.00. Thesis research. Admission to the honors program. Permission of instructor required. **Credits:** 1.00 to 6.00

BTNY 50400 - Advanced Weed Science

Credit Hours: 3.00. Emphasizes the mode and mechanism of herbicide action and herbicide interaction with plants, and the biology and ecology of weedy plants. Offered in odd-numbered years. **Credits:** 3.00

BTNY 50500 - Advanced Biology Of Weeds

Credit Hours: 3.00. Principles of weed biology and ecology, with focus on reproduction and ecophysiology, population dynamics, community ecology, and ecosystem level phenomena. Instruction will emphasize the development and refinement of critical thinking skills. Offered in even-numbered years. **Credits:** 3.00

BTNY 52500 - Intermediate Plant Pathology

Credit Hours: 3.00. Examines the biological and pathological characteristics of major causal agents; concepts of epidemiology and disease assessment; physiology, genetics, and molecular biology of host-pathogen interactions; disease management practices; and methods of disease diagnosis. **Credits:** 3.00

BTNY 53500 - Plant Disease Epidemiology

Credit Hours: 3.00. Plant disease epidemics occur due to the suitable combination of various elements of the agroecosystem. Many plant pathogens and diseases have increased their geographic distribution and intensity in the U.S. and the world. A lack of epidemiological understanding can exacerbate problems and significantly challenge the management of diseases at the field level. This course is an introduction to the epidemiological basis of disease management strategies. The course includes concepts in botanical epidemiology, disease assessment and measurement, disease modeling, epidemics comparison, and a revision of the traditional plant disease control principles. *Plant Disease Epidemiology* is an upper-level course for students interested in plant pathology, agronomy, data-driven Ag, national or international agriculture, or closely related areas. Although some pathosystems

are used as model systems, Plant Disease Epidemiology is not a "how-to" course on controlling specific plant diseases. **Credits:** 3.00

BTNY 55000 - Biology Of Fungi

Credit Hours: 3.00. Lectures cover general features of fungi, unique characteristics of major fungal groups, fungal interactions with other organisms, and principles of fungal genetics. Lab exercises include examination of representative species from major groups of fungi and classical and molecular manipulations of fungi. **Credits:** 3.00

BTNY 55101 - Plant Responses To The Environment

Credit Hours: 3.00. Future agricultural production and the environment will encounter multifaceted challenges from global climate change, heat and drought incidence and severity, and limited land and resources. An understanding of how plant responds to these changes is essential to develop new technologies and systems approaches to mitigate the negative impacts and enhance agricultural crop productivity. This is an advanced plant biology course covering the present state of understanding of phenological, physiological, and molecular and genetic mechanisms and processes by which plants acclimate to transient and chronic environmental extremes.**Credits:** 3.00

BTNY 55200 - Molecular Approaches In Plant Biology

Credit Hours: 3.00. This is mainly a laboratory exercise course designed to help students to be more familiar with common molecular techniques used in plant pathology studies. Techniques will include DNA/RNA isolation, hybridization, sequence analyses, various PCR reactions, library construction and screening, protein isolation, and plant transformation. Lectures will cover basic principles and applied aspects of molecular studies in plant pathology, and recent advances in genomics and proteomics techniques. **Credits:** 3.00

BTNY 55300 - Plant Growth And Development

Credit Hours: 3.00. (HORT 55300) Topics include seed dormancy, cell expansion and plant growth, pattern formation, phase transition, flowering, pollination and fertilization, seed development, fruit development, and senescence. This course is the second in a series of team-taught courses in the core curriculum of the Purdue Plant Biology Program. **Credits:** 3.00

BTNY 55800 - Pathogens Of Plants

Credit Hours: 3.00. Plant pathology is the science of plant diseases and of the microorganisms that cause them and of our attempts to manage plant diseases. The ultimate goal of plant pathologists is to reduce the losses caused by diseases, thereby, increasing both the quality and quantity of the world food supply. Plant diseases are caused by the same types of microorganisms that cause disease in animals and humans and, as such, many of the principles that apply to human and animal medicine apply to plant diseases. It is the objective of this course to introduce students to the major types of plant pathogens (plant pathogenic bacteria, viruses, nematodes, and fungi), their basic biology and examples of the types of diseases they cause. It will be expected that students have knowledge in plant pathology. **Credits:** 3.00

BTNY 56100 - Survey Of Mathematical Biology

Credit Hours: 3.00. This course is intended to help students understand why having some kind of model is probably essential to the scientific process. The intent is to show students that they probably already have a model in their heads, and they just don't know it! Few biologists realize that when they can draw a picture of their system, or explain important pathways in words, that this is a model. From there, it isn't hard to start some basic math. The course will be a broad overview of different techniques that can be used to model biological systems. Each lecture topic in this course could itself form an entire course, so students will not complete the course as experts in mathematical modeling. Instead, the objectives are to: 1) expose students to a number of tools

in mathematical modeling; 2) give students some practical experience with these tools; and 3) develop a component of their thesis research into a model. Permission of instructor required. **Credits:** 3.00

BTNY 56200 - Plant Hormone Biology

Credit Hours: 3.00. This course will provide a broad and integrated overview of the current status of plant hormone research. All aspects of plant hormones including biosynthesis, metabolism, transport, signal transduction will be discussed in relation to the role of hormones in plant growth and developmental processes. Cross-talk between hormones and how plants use hormones to integrate developmental or environmental signals to regulate plant growth will be included. In addition, practical aspects of hormones in the agriculture, horticulture, and pathogen responses will be covered to demonstrate the impacts of basic plant science to a modern agriculture. The course will consist of lecture and discussion of primary research papers. Upon completion of the course, the students will acquire a comprehensive knowledge of the action of plant hormones as growth regulators, critical thinking skills, and ethical research. **Credits:** 3.00

BTNY 59000 - Special Problems

Credit Hours: 1.00 to 3.00. Open to graduate students and qualified undergraduates who desire to study special problems in plant science not covered in regular coursework. Credit dependent upon work done. Permission of instructor required. **Credits:** 1.00 to 3.00

BTNY 60500 - Diagnosis Of Plant Diseases

Credit Hours: 2.00. Symptomatology and diagnosis of diseases of field crop, vegetable, fruit, ornamental, and tree plants. Emphasis is on the collection and study of diseases in field, greenhouse, and storage. Prerequisite: BTNY 30100. **Credits:** 2.00

BTNY 61300 - Advanced Plant Pathology

Credit Hours: 3.00. This course makes an exhaustive attempt to dissect the nature of plant disease and resistance mechanisms in plants. Special emphasis is placed on emerging concepts and paradigms that underlie a wide variety of plant-pathogen interactions, and how the knowledge gleaned from these studies is being used to devise effective and environmentally safe strategies of plant protection. It is expected that students have knowledge in genetics, molecular biology, biochemistry, and plant pathology. **Credits:** 3.00

BTNY 62000 - Plant Disease Management

Credit Hours: 3.00. Plant diseases cause billions of dollars in crop losses worldwide and play a large role in food security and the viable production of agronomic and horticulture crops. This course will center on the various aspects of managing these diseases. Specific focus areas include the effect of cultural practices and planting decisions (i.e., crop rotation, fertility, host resistance), pesticide delivery formulation, chemistry and mode of action, and integrated systems of organic and hybrid disease management. Prerequisite: BTNY 30100 or equivalent.**Credits:** 3.00

BTNY 66000 - Scientific Writing

Credit Hours: 3.00. This is a course on coping with publication in professional journals. It covers the full range of activities involved in carrying a piece of original research to completion as a primary research article in a refereed journal. Emphasis is on principles of clear and concise technical reporting. Topics include: research and writing goals; journals' policies; data presentations; effective style; organizing, writing, revising, and processing manuscripts; proofreading; peer review; ethics; and grant proposals. Students will use their own data to prepare a manuscript as if for publication. Permission of instructor required. **Credits:** 3.00

BTNY 69100 - Skills For Success In Grad School

Credit Hours: 1.00. This course is aimed at first year graduate students in the Botany department. Its purpose is to introduce the students to the department, teach them what it takes to be a successful graduate students, and to help them develop effective written and oral communication skills. **Credits:** 1.00

BTNY 69200 - Graduate Professional Practice

Credit Hours: 0.00 to 3.00. An internship experience with a for-profit, non-profit, or governmental entity to complement the student's academic coursework. The student must present a letter from the proposed employer documenting the work and expectations expected to be undertaken and must find a Botany and Plant Pathology faculty advisor/instructor to oversee the experience. Course may be taken in successive semesters. Must be enrolled in a Master's or PhD degree program in Botany and Plant Pathology and in good academic standing (cumulative GPA greater than 3.00). Permission of instructor required.**Credits:** 0.00 to 3.00

BTNY 69700 - Seminar In The Plant Sciences

Credit Hours: 1.00. Advanced study of contemporary topics in plant biology, plant pathology, and weed science. Graduate students enrolled will receive training and experience in preparing and presenting seminars. **Credits:** 1.00

BTNY 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

BTNY 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Building Construction Management Technology

BCM 11201 - Construction Surveying Fundamentals

Credit Hours: 2.00. Introduction to basic surveying measurement and computations. Development of the surveying skills necessary to measure distances, angles, and elevations to required construction accuracies by eliminating mistakes and reducing errors. Calculation of corrections, traverse closures, coordinates, areas and construction layout data. Emphasis is placed on proper instrument use and note-keeping techniques. **Credits:** 2.00

BCM 17500 - Construction Materials And Methods

Credit Hours: 4.00. Students acquire basic skills in construction methods, quantity estimating, plan reading, and project documentation through hands-on laboratory experience assembling construction materials. Computer utilization includes word processing, spreadsheets, and computer graphics. **Credits:** 4.00

BCM 21200 - Construction Layout

Credit Hours: 3.00. Application of surveying skills relevant to the field of construction. Projects include layout of buildings, route centerlines, indirect determination of elevation and distance, referencing, establishment of grade, topographic mapping, and earthwork computations. Instruments used will include transit, theodolite, automatic level, laser, and EDM. **Credits:** 3.00

BCM 21500 - Mechanical Construction

Credit Hours: 3.00. Principles of code, design, methods, and materials are applied to plumbing, heating, ventilation, and air conditioning systems for buildings. The comprehension of mechanical construction plans and specifications is emphasized through exercises in mechanical estimating. **Credits:** 3.00

BCM 21601 - Electrical Construction

Credit Hours: 2.00. Principles of code and basic concepts in electrical theory, materials, methods, design and estimating are applied to electrical systems for buildings. Comprehension of electrical construction plans and specifications as well as installation exercises are emphasized through lab experiences. **Credits:** 2.00

BCM 23000 - Mechanical And Electrical Systems

Credit Hours: 3.00. Not open to building construction management technology students. An introductory study of piping, HVAC, and electrical systems, and related materials used in buildings. This course is a composite of BCM 23100, 23200, and 23300. **Credits:** 3.00

BCM 25001 - Construction Project And Administrative Management

Credit Hours: 2.00. The study of administrative functions and project delivery methods common in the construction industry. Documentation from project startup through closeout will be covered as well as ethics and professionalism and written and oral communications in construction. **Credits:** 2.00

BCM 27500 - Construction Plans And Measurements

Credit Hours: 3.00. Principles of graphic communication are applied to drawing and reading construction plans with emphasis on the use of computer-aided design software. Techniques for measuring items of construction work from plans and specifications are also covered. **Credits:** 3.00

BCM 28500 - Construction Mechanics

Credit Hours: 4.00. Principles of statics and strength of materials including properties of materials, forces, equilibrium, stresses, and strains are studied. Emphasis is placed on understanding the behavior of structural components associated with the construction process. **Credits:** 4.00

BCM 30101 - Introduction To Construction Company Financial Management

Credit Hours: 2.00. An introduction to methods for recognizing revenue for long-term construction contracts and each method's impact on financial statements. Includes introduction to analysis of financial statements and their use in developing company budgets, projecting cash needs, pricing construction projects, and forecasting the impact of business decisions on construction company profit. **Credits:** 2.00

BCM 31500 - Mechanical Construction Estimating

Credit Hours: 3.00. Costs conditioned by the contract documents for building mechanical systems are studied. The course will focus on the methods used to estimate the cost of commercial plumbing, heating, ventilating, and air conditioning systems. The course will utilize computer estimating systems. **Credits:** 3.00

BCM 31600 - Electrical Construction Estimating

Credit Hours: 3.00. Costs dictated by the contract documents for the electrical systems in residential, commercial, industrial, specialty, and line construction projects are studied. The course will utilize computer estimating systems. **Credits:** 3.00

BCM 31700 - Mechanical And Electrical Construction Management

Credit Hours: 3.00. The principles of project management are applied to case studies of mechanical and electrical construction projects. Topics include estimating, trade coordination, labor productivity, labor relations, scheduling, management of subcontractors and general contractors, document control and administration, contract law, and subcontractor's risk. **Credits:** 3.00

BCM 32000 - Introduction To Disaster Restoration And Reconstruction Management

Credit Hours: 3.00. Introductory topics in the DRR concentration are discussed; causes of disasters and dimensions of their effects, protocols, equipment, and techniques of restoration and reconstruction, including project and business management practices and imperatives of DRR contractors. **Credits:** 3.00

BCM 33000 - Introduction To Demolition And Reconstruction Management

Credit Hours: 3.00. This course introduces the opportunities and challenges in demolition and reconstruction management. Topics include: introduction to industry regulation, project planning, labor and equipment utilization, techniques and technologies, hazardous materials, issues involving historic properties, material reuse and recycling, safety and risk management, estimating and cost control, project feasibility, issues of ethics, and company management. **Credits:** 3.00

BCM 34000 - Introduction To Healthcare Construction Management

Credit Hours: 3.00. This course explores the allocation and distribution of construction resources in the healthcare construction sector and an overview of current theories and research. Topics include the demand for health care, health insurance, hospitals and the services of all the possible healthcare professional stakeholders. A thorough understanding of the environment of care and all codes and standards relative to the constructors approach to this complex environment. **Credits:** 3.00

BCM 34100 - Advanced Topics In Healthcare Construction Management

Credit Hours: 3.00. A study of all facilities used in the health-care industry, ranging from hospitals and clinics to nursing homes and laboratories, emphasizing the interrelationship of planning, design, and construction. Topics include infectious materials control, disruption avoidance, rapid technology changes, and advanced/non-typical mechanical and electrical systems. **Credits:** 3.00

BCM 34500 - Scheduling

Credit Hours: 3.00. A study of the planning and control of construction projects. Time schedules for materials, labor, and equipment. Emphasis is on critical path method (CPM) scheduling. **Credits:** 3.00

BCM 35000 - Construction Site Planning

Credit Hours: 3.00. A study of material handling principles and their application in preparing a site utilization plan. The selection and use of construction equipment are emphasized. **Credits:** 3.00

BCM 35501 - Construction Site Supervision

Credit Hours: 2.00. A study of the required skills, duties, responsibilities, and leadership of construction on-site supervisory personnel and how they related to managing people on a jobsite. Emphasis is placed on understanding the multiple stakeholders, communication, collaboration, planning, and problem-solving. This course will examine how the success of overall construction project is directly tied to the skills of key supervisors or superintendents. **Credits:** 2.00

BCM 36000 - Residential Construction

Credit Hours: 3.00. A study of the best building practices in residential construction, based upon green building standards, energy star, and other national programs. Course content includes partial fulfillment of the requirements for the certified green professional designation (CGP) from the National Association of Home Builders. **Credits:** 3.00

BCM 36200 - Construction Competition

Credit Hours: 2.00. This is a multi-disciplinary course where students from several majors work together as a team, developing a proposal for a construction of development project, which is presented at a student competition. Topics include a variety of project types, including land development, design/build, residential, commercial and heavy highway. Permission of instructor required. **Credits:** 2.00

BCM 37500 - Estimating

Credit Hours: 3.00. A study of the methods and procedures used to identify, measure, and value items of construction work. Application of computer software to estimating tasks is featured. **Credits:** 3.00

BCM 38000 - Concrete Construction

Credit Hours: 3.00. An overview of concrete construction, including material composition, behavior and handling of concrete, formwork, and concrete reinforcement. **Credits:** 3.00

BCM 38501 - Soils In Construction

Credit Hours: 2.00. This course is a study of the properties of soils as related to construction. Students will be introduced to soil testing and classification, subsurface soil investigation, soil compaction and stabilization, stress distribution in soil, strength, strength of soil, soil consolidation and related structure settlement. Other topics include earth pressure on retaining structures, stability analysis of slopes, and productivity/cost of earthmoving equipment. **Credits:** 2.00

BCM 41200 - Field Engineering

Credit Hours: 3.00. A study of the duties of the field engineer and their applications to projects involving construction surveying techniques, site utilization, and daily scheduling. Field trips required. **Credits:** 3.00

BCM 41700 - Design/Build For Mep Contractors

Credit Hours: 3.00. The student will study, develop, and analyze conceptual design and conceptual estimating of mechanical, electrical, plumbing, fire protection, and specialty systems in construction. The principles of design/build construction will be applied to case studies of actual residential, commercial, industrial, and specialty construction projects. Topics include building systems, criteria and selection, economic feasibility, value engineering, customer control, and value-added construction services. **Credits:** 3.00

BCM 45500 - Construction Company Management

Credit Hours: 3.00. Business policy and management aspects of construction companies are studied. Included are ethics, public relations, business development, business plans, bonds, insurance, and human resource management considerations. **Credits:** 3.00

BCM 45701 - Construction Safety

Credit Hours: 3.00. This course will examine the impact of safety on the construction industry, including in-depth discussions on the application of the Occupational Safety & Health Administration (OSHA) Safety and Health Standards for the construction industry. The emphasis of this course is to provide training for job sited supervisory personnel. This course will also fulfill the requirements for the OSHA 30-Hour Card. **Credits:** 3.00

BCM 46200 - Residential Design Build

Credit Hours: 2.00. A study of the design/build project delivery system for residential construction, including home design fundamentals, construction methods, disability code requirements, building code requirements. Course content includes partial fulfillment of the requirements for the National Association of Home Builders, Certified Aging-In-Place (CAPS) designation. **Credits:** 2.00

BCM 47500 - Construction Costs

Credit Hours: 3.00. A study of construction costs, including analysis of field records, job cost accounting, job cost control, and determination of unit prices. **Credits:** 3.00

BCM 48701 - Construction Capstone

Credit Hours: 3.00. This course provides a comprehensive summary of the construction industry. Emphasis is placed on the "big picture" and how the stakeholders, processes, and tasks come together to complete a complex construction project. Skills attained in previous coursework and internships will be used in industry simulations and comprehensive projects. Industry participants will provide real world coursework challenges. **Credits:** 3.00

BCM 49700 - Special Topics In Construction

Credit Hours: 0.00 to 4.00. Hours, subject matter, and credit to be arranged by staff. **Credits:** 0.00 to 4.00

BCM 49900 - Special Assignments

Credit Hours: 1.00 to 4.00. Special assignments for students who wish to undertake individual study on approved topics. Permission of instructor required. **Credits:** 1.00 to 4.00

BCM 51000 - Topics In Environmentally Sustainable Construction, Design And Development

Credit Hours: 3.00. This course explores environmental sustainability in all its forms, starting with the historical and theoretical basis and continuing through an understanding of sustainable building construction, design, development, and renewable energy strategies/management tools and how these can be applied in practice. **Credits:** 3.00

BCM 53500 - Construction Accounting And Financial Management

Credit Hours: 3.00. Accounting techniques, financial methods, and financial management for construction firm management. Analysis techniques for contemporary construction company accounting and finance practice with an emphasis on cash flow analysis and cash management. **Credits:** 3.00

BCM 54000 - Law For Construction Managers

Credit Hours: 3.00. A study of the legal system and its impact on the construction process. The focus is on the legal obligations, rights and remedies pertaining to the construction company. Topics include bidding, contracts, and construction changes.**Credits:** 3.00

BCM 57200 - Construction Research Fundamentals

Credit Hours: 1.00. Construction Research Fundamentals focuses on helping students to develop their thesis research through lecture and faculty guided individual or group activities. Using common research methodologies for construction research as a theme for discussion each week, students work together to build a better understanding of how to approach thesis research for their topic of interest and research topics chosen by other students in the class. **Credits:** 1.00

BCM 58100 - Workshop In Building Construction Management Technology

Credit Hours: 0.00 to 8.00. Advanced study of technical and professional topics. Emphasis is on new developments relating to technical, operational, and training aspects of industry and technology education. **Credits:** 0.00 to 8.00

Chemical Engineering

CHE 20000 - Chemical Engineering Seminar

Credit Hours: 1.00. An orientation course to inform students of the various areas in chemical engineering, to assist them in selection of electives suited to their particular abilities and interest, and to instill a sense of professional ethics and responsibility. Lectures drawn from all fields of chemical engineering. **Credits:** 1.00

CHE 20100 - Cooperative Seminar I

Credit Hours: 0.00. Lectures by faculty and students on subjects that relate the academic work and the industrial experience. Written reports on the industrial experience are required and will include a documentation of the student's success in finding application of specified academic activities. For students returning from the first and second work periods. **Credits:** 0.00

CHE 20500 - Chemical Engineering Calculations

Credit Hours: 4.00. Quantitative applications of steady-state mass and energy balances to solve problems involving multi-component systems and multi-unit chemical processes. Single-component and multi-component phase equilibria, single-reaction and multiple-reaction stoichiometry, coupled mass and energy balances, chemical processes involving bypass and recycle streams.**Credits:** 4.00

CHE 21100 - Introductory Chemical Engineering Thermodynamics

Credit Hours: 4.00. Basic principles and concepts of thermodynamics applied to chemical engineering problems; use of basic thermodynamic functions of enthalpy, entropy, free energy to solutions, phase equilibria, and chemical equilibria; thermodynamic processes and efficiencies; equations of state; and relation of macroscopic to molecular properties. **Credits:** 4.00

CHE 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in chemical engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CHE 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in chemical engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CHE 30000 - Chemical Engineering Seminar

Credit Hours: 1.00. Continuation of CHE 20000. Lectures to acquaint the junior students with professional ethics, career choices, including graduate studies, and services of professional societies.**Credits:** 1.00

CHE 30100 - Cooperative Seminar II

Credit Hours: 0.00. Continuation of CHE 20100. For students returning from the third and fourth work periods. **Credits:** 0.00

CHE 30600 - Design Of Staged Separation Processes

Credit Hours: 3.00. The application of equilibria and mass and energy balances for the design of staged separation processes. Use of various equilibrium data and thermodynamic principles for the design of batch and continuous distillation, absorption, stripping, and extraction systems. Stagewise calculations and graphical methods for design of binary systems. Design of multicomponent separators. Determination of stage efficiency and column size. **Credits:** 3.00

CHE 32000 - Statistical Modeling And Quality Enhancement

Credit Hours: 3.00. Statistical modeling methods, design of experiments, error analysis, curve fitting and regression, analysis of variance, confidence intervals, quality control and enhancement: emphasizes preparation for designing chemical engineering laboratory experiments and analyzing data.**Credits:** 3.00

CHE 33000 - Principles Of Molecular Engineering

Credit Hours: 3.00. Application of concepts of atomic and molecular bonding, solid microstructure, phase equilibria, and rate processes to the design of solid materials for specific engineering objectives. **Credits:** 3.00

CHE 34800 - Chemical Reaction Engineering

Credit Hours: 4.00. Application of kinetic rate equations, mass balances and energy balances to the analysis and design of chemical reactors involving homogeneous and heterogeneous chemical reactions. Chemical equilibria, kinetic rate equations for homogeneous and heterogeneously catalyzed reactions, design of ideal isothermal reactors, effects of non-isothermal operation, effects of diffusion in porous catalysts and non-ideal mixing in continuous flow reactors. **Credits:** 4.00

CHE 37700 - Momentum Transfer

Credit Hours: 4.00. Differential (microscopic) and integral (macroscopic) mass, momentum, and energy balances. Newtonian and non-Newtonian fluids. Fluid statics. One-dimensional steady and transient laminar flows. Turbulence. Dimensional analysis and similarity. Friction factors and drag coefficients. Applications to engineering analysis of practical problems. Introduction to numerical analysis and visualization of flows. **Credits:** 4.00

CHE 37800 - Heat And Mass Transfer

Credit Hours: 4.00. Macroscopic and differential energy balances. Heat transfer coefficients for free and forced convection and phase change. Conductive and radiative heat transfer. Applications to heat transfer equipment design and compressible fluid flow. Macroscopic and differential species balances. Mass transfer coefficients and analogies. Mass transfer with and without chemical reaction. Mass transfer equipment design. **Credits:** 4.00

CHE 38199 - Professional Practice Co-Op I

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Permission of department required. **Credits:** 0.00

CHE 38299 - Professional Practice Co-Op II

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Permission of department required. **Credits:** 0.00

CHE 38399 - Professional Practice Co-Op III

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Permission of department required. **Credits:** 0.00

CHE 38499 - Professional Practice Cooperative IV

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Permission of department required.**Credits:** 0.00

CHE 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in chemical engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CHE 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Permission of department required.**Credits:** 0.00

CHE 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in chemical engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CHE 39699 - Professional Practice Internship

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Permission of department required. **Credits:** 0.00

CHE 40000 - Chemical Engineering Seminar

Credit Hours: 1.00. Continuation of CHE 30000. Lectures to acquaint the senior students with professional ethics, services of professional societies, and help them in the transition from being an undergraduate student to becoming a successful professional or graduate student.**Credits:** 1.00

CHE 40100 - Cooperative Seminar III

Credit Hours: 1.00 to 3.00. Continuation of CHE 30100. For senior students returning from the last work period. **Credits:** 1.00 to 3.00

CHE 41100 - ChE Undergraduate Research

Credit Hours: 1.00 to 4.00. Experience in chemical engineering science research or development; either directed or independent work that can be experimental or theoretical. Permission of instructor required. **Credits:** 1.00 to 4.00

CHE 41200 - Chemical Engineering Design Research Problems

Credit Hours: 1.00 to 4.00. Experience in chemical engineering design research or development; either directed or independent work that can be experimental or theoretical. Permission of instructor required. **Credits:** 1.00 to 4.00

CHE 42000 - Process Safety Management And Analysis

Credit Hours: 3.00. Develop knowledge of process safety management and analysis in the process industries, including hazard identification, hazard analysis and risk management. **Credits:** 3.00

CHE 43500 - Chemical Engineering Laboratory

Credit Hours: 4.00. Quantitative experimental study of projects involving problems in fluid mechanics and heat and mass transfer or operation and evaluation of equipment; projects include analysis and data-based design of operations involving mass transfer such as distillation, absorption, drying, humidification, etc; study of rates and equilibria in simple chemical reaction systems; study of chemical processes; application of methods of data analysis in practice; some library work; emphasis on group work, report writing, and oral communication. **Credits:** 4.00

CHE 44200 - Chemistry And Engineering Of High Polymers

Credit Hours: 3.00. Introduction to basic principles of polymer engineering, including the chemical structure and use of a variety of industrial polymers, polymerization mechanisms and kinetics, techniques for molecular and morphological characterization, polymer processing, and a variety of engineering properties. **Credits:** 3.00

CHE 45000 - Design And Analysis Of Processing Systems

Credit Hours: 4.00. Use of process synthesis methods and concepts; detailed design of unit operation equipment, the economics of chemical plants and flow sheet optimization methods. Synthesize, develop, and evaluate a preliminary design of a chemical

process that meets market requirements for a specific product. Analysis of design alternatives using case studies and optimization methods. **Credits:** 4.00

CHE 45600 - Process Dynamics And Control

Credit Hours: 3.00. Dynamic response and control of chemical processing equipment, such as heat exchangers, chemical reactors, and absorption towers. Use is made of fundamental techniques of servomechanism theory, such as block diagrams, transfer functions, and frequency response. Introduction to advanced control techniques. **Credits:** 3.00

CHE 46100 - Biomedical Engineering

Credit Hours: 1.00. An introduction to the field of biomedical engineering, with particular stress on the chemical engineer's role. **Credits:** 1.00

CHE 46300 - Applications Of Chemical Engineering Principles

Credit Hours: 3.00. Team-based design projects in materials transport, heat transfer, mass transfer, separations, chemical reactors. Emphasis on team operation and decision-making. Consideration of current technical challenges, societal and economic issues. **Credits:** 3.00

CHE 49500 - Chemical Engineering Study Abroad

Credit Hours: 1.00 to 3.00. Short term study abroad experience to expose chemical engineering undergraduate students to the academic and industrial environments across the globe. Each experience location play an important economic role and offer good examples of industrial and engineering development, as well as allow for interaction with Purdue alumni, and cultural aspects through immersion during their time abroad.**Credits:** 1.00 to 3.00

CHE 49700 - Special Topics In Chemical Engineering

Credit Hours: 1.00 to 4.00. Primarily designed for subject areas for which there is no specific course offered. Areas of study will deal with topics that have enough student interest to justify the teaching of specialized courses on a trial basis. The course can be repeated by a student as long as the topic being taught is not repeated. Permission of instructor required. **Credits:** 1.00 to 4.00

CHE 49800 - Undergraduate Thesis Research I

Credit Hours: 3.00. Individual research projects for students completing an undergraduate thesis. Requires prior approval of, and arrangement with, a faculty research advisor. Permission of instructor required. **Credits:** 3.00

CHE 49900 - Undergraduate Thesis Research II

Credit Hours: 3.00. Individual research projects for students completing an undergraduate thesis. Continuation of CHE 49800. Includes submission of written thesis and public oral presentation. Permission of instructor required. **Credits:** 3.00

CHE 50100 - Medical Devices - Development And Clinical Application

Credit Hours: 3.00. This course is an introduction to the medical device field, with emphasis on the ways in which chemical engineering processes provide the foundation for many device-related therapies. The course involves the application of several fundamental chemical engineering principles, including those related to mass transfer, separations, and fluid flow, to devices used for extracorporeal therapies and other treatments. The first part of the course addresses the relevant physiology and

pathophysiology serving as a foundation for subsequent clinical material. With the focus on extracorporeal devices, the interactions between blood and biomaterials in a general sense are also explored. The second part of the course assesses the extracorporeal treatment of kidney failure by dialysis, which is highlighted as the only long-term, device-based replacement therapy for terminal organ failure (end-stage renal disease). This analysis will not only consider the evolution of dialysis therapy from a technology perspective but also the forces that have shaped its development into a market generating annual revenue of nearly $100 billion on a global basis. In addition, extracorporeal support therapies used clinically not only for failure of other organs (namely the heart, liver, and lungs) but also systemic inflammation secondary to severe infection (sepsis) will be presented. The third segment of the course addresses industry-focused concepts pertaining to medical device development, including verification/validation, lean manufacturing, project management, and regulatory issues. Providing a real-world perspective based on broad experience in the medical device field, Ms. Michelle Chutka (see below) will lead this third part of the course. Permission of instructor required.**Credits:** 3.00

CHE 50200 - Analytical Approach To Healthcare Delivery

Credit Hours: 3.00. This course provides a "real world" overview of healthcare delivery in the United States (US). The major medical technology segments (pharmaceutical compounds and medical devices) are a significant focus, including their research and development processes, regulatory framework, and market approaches. Another highlight of the course is an assessment of a series of critical medical conditions having the highest impact on the US healthcare system. Clinical cases illustrating these conditions along with case studies designed to provide practical examples of healthcare developments and challenges are included. A number of emerging healthcare developments, including precision medicine, artificial intelligence, digital health, and value-based care, are addressed. In addition, the numerous ways in which the COVID-19 pandemic has affected patients and the manner in which they receive healthcare are discussed. Permission of instructor required.**Credits:** 3.00

CHE 52100 - Principles Of Tissue Engineering

Credit Hours: 3.00. This course is designed to provide background for the application of engineering principles with the life sciences to facilitate understanding of normal and pathological mammalian tissues. Applications of drug delivery, tissue and cell transplantation, bioartificial organs, tissue regeneration, disease models, and applications in clinical practice will be explored.**Credits:** 3.00

CHE 52300 - Engineering Applications Of Biological Molecules

Credit Hours: 3.00. This course introduces the applications of biological molecules in different engineering fields. The first part of the course will provide a general overview of fundamental molecular and cell biology, biophysics and biomechanics. The second part of the course will focus on three specific areas, namely 1) biopolymer, 2) nanobiotechnology and 3) genetic engineering. For each focus area, a general overview will be provided followed by in-class discussions of seminal papers of the field and team-based case studies. The goal of the course is to introduce the recent advances in the interface of biology and engineering to our students and prepare them for research and development work in interdisciplinary environments. **Credits:** 3.00

CHE 52500 - Biochemical Engineering

Credit Hours: 3.00. Enzyme kinetics, mathematical models of microbial growth, bioreactor design and operation, genetic and metabolic engineering, plant and animal cell culture, and purification of biological products. **Credits:** 3.00

CHE 53600 - Particulate Systems

Credit Hours: 3.00. A broad overview of the fundamental concepts in particulate systems including particle characterization, particle size measurement, sedimentation, fluidization, gas and liquid conveying, particle storage, fluid-particle separation, particle size enlargement and reduction, particle mixing and hazards associated with the handling of particulate solids. Practical applications are emphasized, with a focus on how particles behave differently than fluids. **Credits:** 3.00

CHE 53800 - Design And Processing Of Particulate Products

Credit Hours: 3.00. Characterization particulate systems, use of population balances to describe processes that make or transform particles, applications in important unit processes including crystallization, granulation, milling, aerosol processes. **Credits:** 3.00

CHE 54000 - Transport Phenomena

Credit Hours: 3.00. Continuation of CHE 37700 and CHE 37800. Topics in fluid mechanics, heat transfer and mass transfer including unsteady state transport problems, stream functions, potential flow, hydrodynamic and thermal layers, turbulence, and multicomponent diffusion. **Credits:** 3.00

CHE 54300 - Polymerization Reaction Engineering And Reactor Analysis

Credit Hours: 3.00. Polymerization kinetics, polycondensation, gelation, radical polymerization, ionic polymerization, copolymerizations, Ziegler-Natta polymerizations, polymerization in bulk, solution, suspension and emulsion, modeling, stochastic processes, Z-transforms, batch, CSTR and tubular reactors, stability analysis, computer control, separation, and drying. **Credits:** 3.00

CHE 54400 - Structure And Physical Behavior Of Polymer Systems

Credit Hours: 3.00. Statistical mechanics of chain molecules, thermodynamics of polymer solutions, phase separations, experimental methods of molecular weight determination, crystallization of polymers, polymer physics, rubber elasticity, viscoelasticity. **Credits:** 3.00

CHE 55100 - Principles Of Pharmaceutical Engineering

Credit Hours: 3.00. This course is designed to provide engineering, science and pharmacy students with an understanding of the structure, economic and regulatory context, product discovery and development pipeline dynamics, intellectual property considerations and common manufacturing technology of the global pharmaceutical industry. **Credits:** 3.00

CHE 55300 - Pharmaceutical Process, Development And Design

Credit Hours: 3.00. This course introduces the engineering methodologies involved in translating a laboratory recipe for a drug compound produced via synthetic organic chemistry methods to an industrial process. The basic features of common unit operations used in the pharmaceutical industry will be reviewed, including batch reaction, solid-liquid separation, crystallization, drying, mixing, batch distillation and other separation systems. Both dedicated and multi-product production system design and batch and semi-continuous operating modes will be covered. **Credits:** 3.00

CHE 55400 - Smart Manufacturing In Process Industries

Credit Hours: 3.00. This course surveys the tools and techniques, which are relevant to support the multiple levels of technical decisions that arise in modern integrated operation of manufacturing facilities in the chemical related process industries. The linkage of these decisions levels and sharing of associated data and knowledge via effective IT methodology is currently termed Smart Manufacturing in the US and Industry 4.0 in Europe. The topics covered in the course include the structure of the operations decision hierarchy, role of online process measurements, elements of sensor network design, information systems to support process operations, plant data reconciliation, detection and diagnosis of process faults, plant wide control, real time process optimization, production planning and scheduling, and supply chain management. Each topic will be addressed by first summarizing the basic role and scope of that component, then discussing the structure of the decision problem, and then will outline some representative tools available to address that decision problem. Each major topic will include a lecture given by an

industrial practitioner who will offer a perspective on the state of industrial practice. Permission of instructor required.**Credits:** 3.00

CHE 55500 - Computer Integrated Process Operations

Credit Hours: 3.00. Introduction to computer-aided process operations management. Topics include: process monitoring, regulatory control, data reconciliation, unit and plant-wide optimization, process fault diagnosis, supervisory control, planning, and scheduling. A design project involving a unified application of the presented methodologies is taken from a published industrial benchmark problem. **Credits:** 3.00

CHE 55800 - Rate-Controlled Separation Processes

Credit Hours: 3.00. Rate-controlled separation processes based on solute movement (adsorption, chromatography and ion exchange), membranes (reverse osmosis, ultrafiltration, and gas permeation), and crystallization. **Credits:** 3.00

CHE 56000 - Introduction To Energy Storage Systems

Credit Hours: 3.00. Energy Storage Systems Laboratory course is designed to introduce fundamentals of electrochemistry and electrochemical engineering of rechargeable lithium ion batteries (LIBs) to undergraduate and graduate students. The course will be reviewing working principles of LIBs, hands-on experience on their assembly, charge-discharge testing, data analysis and related safety aspects. Strong emphasis will be given on the Li-ion battery technology, nanotechnology implementation and the materials design. Beyond conventional Li-ion systems and Pb-acid batteries, next generation Na-ion, K-ion and Li-S batteries will be discussed and designed. Students will be fabricating and testing high energy density batteries utilizing engineered electrodes, electrolytes and separators. Broader perspectives on sustainable, cost effective, longer lasting battery manufacturing will be provided. **Credits:** 3.00

CHE 56200 - Battery Systems

Credit Hours: 3.00. This course is designed to introduce fundamentals of electrochemistry and electrochemical engineering of primary and rechargeable lithium ion batteries (LIBs) to undergraduate and graduate students. The course will be reviewing working principles of LIBs. Strong emphasis will be given on the Li-ion battery technology, primary batteries, nanotechnology implementation and the materials design. Beyond conventional Li-ion systems and Pb-acid batteries, next generation Na-ion, K-ion and Li-S batteries will be discussed. Students will be understanding energy density calculations, fabrication and testing mechanism of batteries utilizing engineered electrodes, electrolytes and separators. Broader perspectives on sustainable, cost effective, longer lasting battery manufacturing will be provided.**Credits:** 3.00

CHE 56400 - Organic Electronic Materials And Devices

Credit Hours: 3.00. This course introduces the synthesis, optoelectronic properties, transport physics, and device operation of organic and hybrid electronic materials and devices. This course will review how the molecular architecture of small molecule and polymer semiconductors can be tuned to alter the optoelectronic properties of the materials in solution and in the solid state. A number of relevant materials interactions will be covered, including: photoexcitation and recombination, intermolecular charge transport mechanisms, and energy transfer processes. Additionally, we will observe how these processes are relevant to applications such as organic field-effect transistors (OFETs), organic light-emitting diodes (OLEDs), organic photovoltaic (OPV) devices, and organic memory elements. Finally, a new type of organic-inorganic hybrid material called hybrid halide perovskite will be introduced.**Credits:** 3.00

CHE 59700 - Special Topics In Chemical Engineering

Credit Hours: 0.00 to 18.00. Hours and credits to be arranged. Permission of instructor required. **Credits:** 0.00 to 18.00

CHE 60000 - Approaches To Graduate Research In Chemical Engineering

Credit Hours: 3.00. This course is designed to prepare and enable students to make a rapid start on their research. Additionally, key skills in critical analysis of the literature, technical writing and delivery of oral presentations are included. **Credits:** 3.00

CHE 61000 - Advanced Chemical Engineering Thermodynamics

Credit Hours: 3.00. Properties of pure fluids and mixtures are described in the context of classical and statistical thermodynamics. Equations of state and solution theories are developed for this description of fluid phase equilibrium and chemical equilibrium. Fluids encountered in mass transfer and separation operations are treated. **Credits:** 3.00

CHE 61100 - Molecular Thermodynamics

Credit Hours: 3.00. This course aims at providing a systematic treatment of the microscopic foundation of thermodynamics as well as a working knowledge of the statistical formalism needed to predict microscopic properties from molecular interactions. Topics covered include kinetic theory of gases, statistical-mechanical ensembles and their correspondence with thermodynamics, ideal and imperfect gases, distribution function theory of liquids, lattice models of liquid and polymer solutions, and molecular simulation methods. Offered in alternating years. Prerequisite: CHE 61000. **Credits:** 3.00

CHE 62000 - Advanced Transport Phenomena I

Credit Hours: 3.00. Analysis of transport of momentum, energy, and mass by molecular and turbulent mechanisms. Prerequisite: CHE 52700. **Credits:** 3.00

CHE 62100 - Advanced Transport Phenomena II

Credit Hours: 3.00. Topics included are momentum transfer with interfacial effects, transport in porous and multiphase media, transport in dispersed phase systems, heat transfer, and multicomponent mass transfer. Prerequisite: CHE 62000 **Credits:** 3.00

CHE 62300 - Separation Processes

Credit Hours: 3.00. Design of binary and multicomponent separation processes. Analysis and synthesis of adsorption, ion exchange, and chromatography in packed beds, moving beds, simulated moving beds, and in cyclic operation. Design and operation of membrane separation techniques including dialysis, reverse osmosis, ultrafiltration, and dynamic membranes. Offered in alternate years. **Credits:** 3.00

CHE 63000 - Applied Mathematics For Chemical Engineers

Credit Hours: 3.00. Determinants and matrices: solution of a system of algebraic equations; applications to dimensional analysis, stoichiometry, thermodynamics, kinetics of first order reaction systems, and stagewise operations. Differential equations: series solutions, Sturm-Liouville systems, boundary value problems, applications to heat and mass transfer and chemical reactor problems. Elements of complex variables: LaPlace and infinite Fourier transforms, applications to heat and mass transfer problems. First order partial differential equations: applications to separation processes, chromatography. Prerequisite: MA 26200. **Credits:** 3.00

CHE 63200 - Linear Operator Methods In Chemical Engineering

Credit Hours: 3.00. Application of the spectral theory of linear self-adjoint and non-self-adjoint operators on abstract Hilbert spaces to problems in chemical engineering. Symmetrizable non-self-adjoint problems in finite and infinite dimensional spaces with applications to physical and chemical rate processes in homogeneous and composite media. Solution of transport equations

governing heat and mass transfer in deforming and chemically reacting media. Introduction to non-self-adjoint problems in chemical engineering. Offered in alternate years. Prerequisite: CHE 63000. **Credits:** 3.00

CHE 63300 - Probabilistic Methods In Chemical Engineering

Credit Hours: 3.00. Introduction to probability, random variables, and stochastic processes. Ito calculus and stochastic differential equations. Brownian dynamics and Bridge processes. Applications to chemical engineering systems. Master equations and system size expansion concepts to nonequilibrium processes. Stochastic point processes and population balance. Theory of fluctuations. Prerequisite: CHE 63000. **Credits:** 3.00

CHE 65500 - Safety In Chemical Engineering

Credit Hours: 1.00. This course will provide you with necessary safety information to comply with Purdue and other federal requirements (OSHA29 CFR 1910.1450 standard) for working safely in a chemical engineering laboratory setting/environment. The course will cover general safety principles (electrical safety, hazard assessment and controls, etc.) and fundamentals of laboratory safety practices specific to experimental work in chemical engineering laboratories. The course will provide valuable information on how to find, read, interpret and use the information in Safety Data Sheets (SDSs), chemical labels and other printed chemical safety information. Other topics covered include: gas cylinder safety, safety equipment (fume hoods, fire protection systems and building elements, eyewash stations and safety showers, etc.), laboratory equipment safety, hazard assessment and understanding of administrative and engineering controls, selection of suitable personal protective equipment (PPE) necessary for laboratory work with chemicals, etc. **Credits:** 1.00

CHE 65600 - Advanced Process Control

Credit Hours: 3.00. Topics in linear and nonlinear system theory applied to automatic control of processes. Subjects include stability analyses, phase plane methods, statistical disturbances, sampled systems, theoretical and experimental determination of process dynamics, optimization, and computer control. Prerequisite: CHE 45600. **Credits:** 3.00

CHE 66000 - Chemical Reaction Engineering

Credit Hours: 3.00. Heat, mass, and momentum transfer in the design and analysis of chemical reactor systems. Optimization techniques applied to reactor design. Prerequisite: CHE 34800. **Credits:** 3.00

CHE 66200 - Catalysis

Credit Hours: 3.00. Analysis of the kinetics of heterogeneous catalytic reactions, including the application of collision and transition state theories to the estimation of rate constants and calculation of rates over energetically nonuniform surfaces. Discussion of the chemical and physical properties of solid surfaces that influence catalytic reactions, and illustration of concepts of catalytic behavior with specific examples from catalytic cracking, reforming, oxidation, and hydrodesulfurization. Offered in alternate years. Prerequisite: CHE 34800. **Credits:** 3.00

CHE 66600 - Methods In Catalysis

Credit Hours: 3.00. Various spectroscopic and other techniques for characterizing catalysts and for probing the chemistry of solid surfaces and their interactions with adsorbing and reacting gases are discussed. Topics include infrared, X-ray photoelectron, Mossbauer, and secondary ion mass spectroscopies. Emphasis is on understanding the principles underlying each method and gaining an awareness of the kind of information each can provide in a broad spectrum of research problems. Offered in alternate years. **Credits:** 3.00

CHE 66800 - Colloidal And Interfacial Phenomena

Credit Hours: 3.00. Preparation, characterization, and stability of emulsions, aerosols, and other multiphase dispersions. Interparticle forces, electrokinetics, thermodynamics and kinetics of coagulation. Techniques for determining size, shape, orientation, and charge of particles. Capillary and wetting phenomena. Thermodynamics of interfacial tension and adsorption. Applications to surfactants, polymers, biodispersions, flotation, separations, oil recovery, etc. Offered in alternate years. **Credits:** 3.00

CHE 68500 - Educational Methods In Engineering

Credit Hours: 3.00. (ENE 68500) Students will learn how to teach in an engineering environment where both classroom and laboratory instruction is intertwined. Classroom techniques, such as lectures, cooperative groups, mastery and PSI, TV and video, and guided design will be studied, in addition to class preparation issues, such as ABET accreditation and design content. Students will study motivation, learning theories and cycles, and personality types. Includes teaching practice and group projects. Permission of Instructor required. **Credits:** 3.00

CHE 69000 - Seminar In Chemical Engineering

Credit Hours: 0.00. Required of all graduate students. **Credits:** 0.00

CHE 69700 - Special Topics In Chemical Engineering

Credit Hours: 0.00 to 18.00. Topics vary. Permission of instructor required. **Credits:** 0.00 to 18.00

CHE 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

CHE 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Chemistry

CHM 1110N - Elementary Chemistry I

Credit Hours: 3.00 to 5.00. Essential principles of chemistry; atomic and molecular structure; bonding; properties and reactions of elements and compounds; stoichiometry; solutions; acids and bases. For students who are not planning careers in the sciences and for those with no previous course work in chemistry. Note: Most degree programs that include C1010 require the concurrent laboratory, C1210.**Credits:** 3.00 to 5.00

CHM 2610N - Organic Chemistry I

Credit Hours: 3.00. Comprehensive study of organic compounds. Valence bond theory, stereochemistry, and physical properties of organic compounds are discussed in detail. Introduction to reaction mechanisms and to spectroscopic identification. Synthesis and reactions of selected compounds are also discussed.**Credits:** 3.00

CHM 2650N - Organic Chemistry Laboratory I

Credit Hours: 1.00 or 2.00. Fundamental laboratory techniques of organic chemistry, introduction to spectroscopic methods of compound identification, and general synthetic methods.**Credits:** 1.00 or 2.00

CHM 10000 - Preparation For General Chemistry

Credit Hours: 3.00. An introduction to the basic ideas and laboratory techniques of chemistry, together with relevant parts of algebra and elementary physics. Intended for those whose background does not permit them to proceed directly with a general chemistry course. Not available for credit toward graduation in the School of Science. **Credits:** 3.00

CHM 11100 - General Chemistry

Credit Hours: 3.00. A basic introduction to the principles of chemistry including matter and energy, nomenclature, measurement, atomic structure, nuclear chemistry, chemical bonding, stoichiometry, classification of chemical reactions, kinetics, equilibria, gas laws, liquids, and solids. **Credits:** 3.00

CHM 11200 - General Chemistry

Credit Hours: 3.00. Continuation of CHM 11100. Liquids and solids; solutions; chemical kinetics; equilibrium; acids and bases; oxidation and reduction; electrochemistry; descriptive chemistry of the metals and nonmetals; introduction to organic chemistry; nuclear chemistry. Not available for credit toward graduation in the School of Science. **Credits:** 3.00

CHM 11500 - General Chemistry

Credit Hours: 4.00. Stoichiometry; atomic structure; periodic properties; ionic and covalent bonding; molecular geometry; gases, liquids, and solids; crystal structure; thermochemistry; descriptive chemistry of metals and non-metals. One year of high school chemistry or one semester of college chemistry required. CTL:IPS 1721 General Chemistry I w/lab **Credits:** 4.00

CHM 11510 - General Chemistry I

Credit Hours: 3.00. The foundational general chemistry course for engineering, science, and some agricultural majors. Prior knowledge of chemistry is strongly suggested. Topics covered can include thermochemistry, nuclear chemistry, quantum theory and atomic structure, periodic trends, models in bonding, shapes of molecules, intermolecular forces, organic chemistry, synthetic and biological polymers, and phase changes.**Credits:** 3.00

CHM 11520 - General Chemistry I - Laboratory

Credit Hours: 1.00. In-person laboratory class to accompany CHM 11510. Topics covered can include lab safety, measurement, thermodynamics, quantitative analysis, stoichiometry, chromatography, and crystallography.**Credits:** 1.00

CHM 11530 - General Chemistry I - Virtual Laboratory

Credit Hours: 1.00. Online laboratory class to accompany CHM 11510. Topics covered can include safety, measurement, thermodynamics, quantitative analysis, stoichiometry, chromatography, and crystallography.**Credits:** 1.00

CHM 11600 - General Chemistry

Credit Hours: 4.00. A continuation of CHM 11500. Solutions; quantitative equilibria in aqueous solution; introductory thermodynamics; oxidation-reduction and electrochemistry; chemical kinetics; qualitative analysis; further descriptive chemistry of metals and nonmetals. CTL:IPS 1722 General Chemistry II w/lab **Credits:** 4.00

CHM 11610 - General Chemistry II

Credit Hours: 3.00. A continuation of CHM 11510 (General Chemistry I). Topics covered can include solutions, quantitative equilibria in aqueous solutions, thermodynamics, oxidation-reduction and electrochemistry, chemical kinetics, qualitative analysis, and further descriptive chemistry of metals and nonmetals.**Credits:** 3.00

CHM 11620 - General Chemistry II - Laboratory

Credit Hours: 1.00. In-person laboratory class to accompany CHM 11610. Topics covered can include chemical reactions, thermodynamics, equilibrium, rates, kinetics, quantitative analysis, and acid-base equilibria.**Credits:** 1.00

CHM 11630 - General Chemistry II - Virtual Laboratory

Credit Hours: 1.00. Online laboratory class to accompany CHM 11610. Topics covered can include chemical reactions, thermodynamics, equilibrium, rates, kinetics, quantitative analysis, and acid-base equilibrium.**Credits:** 1.00

CHM 12500 - Introduction To Chemistry I

Credit Hours: 5.00. Principles of chemistry including stoichiometry; atomic structure and chemical bonding; properties of gases, liquids, and solids; thermochemistry; descriptive inorganic chemistry. Recommended for entering students intending to major in chemistry. One year of high school chemistry or one semester of college chemistry required. **Credits:** 5.00

CHM 12600 - Introduction To Chemistry II

Credit Hours: 5.00. A continuation of CHM 12500. Properties of solutions; chemical equilibrium calculations; elementary thermodynamics; oxidation-reduction reactions and electrochemical cells; rates of reaction; qualitative analysis; descriptive chemistry. **Credits:** 5.00

CHM 12901 - General Chemistry With A Biological Focus

Credit Hours: 5.00. An accelerated and comprehensive one-semester general chemistry course that emphasizes principles that are important in biological systems. This course is designed to cover the essential elements of general chemistry traditionally covered in a two semester series. Topics to be covered include: Stoichiometry and chemical equations; atomic theory and structure; periodic properties; electronegativity; ionic and covalent bonding; non-covalent forces; bond energies; Lewis structures; molecular geometry; gases, liquids, and solids; solutions, quantitative equilibria in aqueous solution; acid/base chemistry and buffers; introductory thermodynamics; oxidation-reduction; electrochemical and membrane potential; colligative properties; chemical and enzyme kinetics; nuclear chemistry; coordination chemistry. One year of high school chemistry is required.**Credits:** 5.00

CHM 13600 - General Chemistry Honors

Credit Hours: 4.00. A sophisticated treatment of the principles of chemistry. Atomic structure and bonding, spectroscopy, equilibria, thermodynamics and kinetics. Includes weekly laboratory experiments. Two years of high school chemistry recommended. Students with a grade of C or better in CHM 13600 who need 8 hours of credit in general chemistry may request credit for CHM 11500.**Credits:** 4.00

CHM 18300 - Cooperative Work Experience I

Credit Hours: 0.00. Cooperative Work Experience. Must be accepted for the program by the Cooperative Education Program coordinator. **Credits:** 0.00

CHM 18400 - Cooperative Work Experience II

Credit Hours: 0.00. Cooperative Work Experience. **Credits:** 0.00

CHM 19400 - Freshman Chemistry Orientation

Credit Hours: 1.00. Designed to provide incoming chemistry majors with the academic, survival, and computational skills to make a successful transition from high school to college. Discussion of opportunities within the chemistry department including degree options, co-op program, undergraduate research, careers in chemistry, use of spreadsheet software, graphing packages, and drawing programs for chemical structures. Attendance and performance on assigned projects are the basis of the assigned grades. **Credits:** 1.00

CHM 19700 - Chemistry Freshman Honors Research

Credit Hours: 1.00. Supervised individual research performed by student. **Credits:** 1.00

CHM 20000 - Fundamentals Of Chemistry

Credit Hours: 2.00. Integrative study of core concepts in chemistry that play a major role in governing the physical world. These core concepts are taught within the framework of important societal issues, such as atmospheric chemistry and nutrition. The pedagogy of this course is designed to provide reflective, interactive and hands-on-learning experiences that will assist elementary education majors to develop useful instructional strategies for their own classrooms. Required of students in elementary education program in the School of Education. Not available for credit toward graduation in the School of Science. **Credits:** 2.00

CHM 22400 - Introductory Quantitative Analysis

Credit Hours: 4.00. Introduction to titrimetric, gravimetric, and instrumental methods of analysis; principles of separation processes, including chromatography; recognition and evaluation of possible sources of error. Required of students majoring in biology who do not take CHM 32100. **Credits:** 4.00

CHM 24100 - Introductory Inorganic Chemistry

Credit Hours: 4.00. Descriptive inorganic chemistry dealing in a systematic way with the elements and the structures, properties, and reactions of their compounds. Required of students majoring in chemistry. **Credits:** 4.00

CHM 25500 - Organic Chemistry For The Life Sciences I

Credit Hours: 3.00. A study of aliphatic and aromatic hydrocarbons and their simple derivatives in terms of (a) structure, bonding, etc.; (b) general syntheses and reactions; and (c) a logical modern rationale for fundamental phenomena as supported by reactivity orders, orientation effects, stereochemistry, and relative rates. Recommended for biology majors.**Credits:** 3.00

CHM 25501 - Organic Chemistry For The Life Sciences Laboratory I

Credit Hours: 1.00. Laboratory experiments to accompany CHM 25500, illustrating methods of separation, instrumental methods of analysis, and the more common techniques and methods for preparing various types of organic compounds.**Credits:** 1.00

CHM 25600 - Organic Chemistry For The Life Sciences II

Credit Hours: 3.00. A continuation of CHM 25500 with various functional groups such as the carboxyl, amino, etc., and including such polyfunctional natural products as carbohydrates and peptides.**Credits:** 3.00

CHM 25601 - Organic Chemistry For The Life Sciences Laboratory II

Credit Hours: 1.00. A continuation of CHM 25501. Experiments are designed to illustrate principles discussed in CHM 25600. **Credits:** 1.00

CHM 25700 - Organic Chemistry

Credit Hours: 4.00. Introductory organic chemistry. Emphasis is on structure, nomenclature, reactions, and theory as applied to simple organic compounds. This course is designed for students who require a one semester overview in preparation for biochemistry. Not recommended for majors in the College of Science. Both CHM 25700 + CHM 25701= CTL:IPS 1723 Organic And Biochemistry w/lab **Credits:** 4.00

CHM 25701 - Organic Chemistry Laboratory

Credit Hours: 1.00. Laboratory experiments designed to accompany CHM 25700 and to illustrate methods of separation, identification, and preparation of selected organic molecules. Both CHM 25700 + 25701 = CTL:IPS 1723 Organic And Biochemistry w/lab **Credits:** 1.00

CHM 26100 - Organic Chemistry I

Credit Hours: 3.00. A comprehensive study of the chemical principles underlying aliphatic and aromatic compounds. The syntheses and reactions of these materials are discussed. Modern theory and stereochemistry are stressed to illustrate the logic inherent in the subject matter and to demonstrate the predictability of many chemical transformations. Recommended for students majoring in chemical engineering. If not a chemical engineering major, see CHM 26505 Organic Chemistry.**Credits:** 3.00

CHM 26200 - Organic Chemistry II

Credit Hours: 3.00. A continuation of CHM 26100, but a broader scope. The chemistry of a variety of functional groups is discussed. Theory is employed extensively to demonstrate the coherence underlying seemingly diverse transformations. Qualitative organic analysis is introduced, with particular emphasis on spectroscopic methods. **Credits:** 3.00

CHM 26300 - Organic Chemistry Laboratory I

Credit Hours: 1.00. Laboratory experiments designed to illustrate the lecture material of CHM 26100. Elementary laboratory techniques essential to organic chemistry are introduced, followed by the actual syntheses and purification of compounds discussed in CHM 26100. **Credits:** 1.00

CHM 26400 - Organic Chemistry Laboratory II

Credit Hours: 1.00. A continuation of CHM 26300 in that the experiments are designed to illustrate principles discussed in CHM 26200. A major portion of the course is devoted to methods employed in organic qualitative analysis. The student is expected to identify several unknown compounds and mixtures. **Credits:** 1.00

CHM 26500 - Organic Chemistry Laboratory I

Credit Hours: 2.00. Similar to CHM 26300 except that a larger number and more sophisticated organic syntheses are required. The preparations are designed not only to illustrate the classical reactions discussed in CHM 26100 or 26505, but to allow for an extrapolation of the principles involved to other systems. **Credits:** 2.00

CHM 26505 - Organic Chemistry I

Credit Hours: 3.00. A comprehensive study of the chemical principles underlying aliphatic and aromatic compounds. The syntheses and reactions of these materials are discussed. Modern theory and stereochemistry are stressed to illustrate the logic inherent in the subject matter and to demonstrate the predictability of many chemical transformations. Recommended for students majoring in chemistry. **Credits:** 3.00

CHM 26600 - Organic Chemistry Laboratory II

Credit Hours: 2.00. A continuation of CHM 26500. All experiments are designed to illustrate the principles discussed in CHM 26200 or 26605. A major portion of the course is devoted to the methods employed in organic qualitative analysis. The student is expected to identify unknowns and mixtures and is introduced to some modern instrumental techniques. **Credits:** 2.00

CHM 26605 - Organic Chemistry II

Credit Hours: 3.00. A continuation of CHM 26505, but a broader scope. The chemistry of a variety of functional groups is discussed. Theory is employed extensively to demonstrate the coherence underlying seemingly diverse transformations. Qualitative organic analysis is introduced, with particular emphasis on spectroscopic methods. **Credits:** 3.00

CHM 26700 - Organic Chemistry Laboratory I Honors

Credit Hours: 2.00. Laboratory experiments designed to accompany the lecture material of CHM 26505, but at an advanced level. Modern instrumentation is introduced to supplement the usual elementary laboratory techniques of organic chemistry. Multistep syntheses are employed to illustrate and supplement the reactions discussed in CHM 26505. **Credits:** 2.00

CHM 26800 - Organic Chemistry Laboratory II Honors

Credit Hours: 2.00. A continuation of CHM 26700. Experiments, more sophisticated than those in CHM 26600, are designed to illustrate and extend the concepts presented in CHM 26605. A major portion of the course is devoted to organic qualitative analysis. The student is expected to identify unknown compounds by classical methods as well as by the use of modern instrumentation like infrared gas chromatography and nuclear magnetic resonance. **Credits:** 2.00

CHM 28400 - Cooperative Work Experience III

Credit Hours: 0.00. Cooperative Work Experience. **Credits:** 0.00

CHM 29000 - Selected Topics In Chemistry For Lower-Division Students

Credit Hours: 1.00 to 4.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 4.00

CHM 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in chemistry. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CHM 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in chemistry. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CHM 29400 - Sophomore Chemistry Seminar

Credit Hours: 1.00. Discussion of undergraduate research opportunities, upper-division courses, career opportunities, laboratory safety, use of the library and chemical information, and topics of current interest in chemistry. Required of sophomores majoring in any chemistry curriculum. **Credits:** 1.00

CHM 32100 - Analytical Chemistry I

Credit Hours: 4.00. Quantitative measurements on complex chemical systems that show matrix effects or require isolation of a component prior to its determination; general approaches to quantitative problems at the trace level; critical comparisons of competitive procedures with emphasis on principles of separation processes, including chromatography; recognition and evaluation of possible sources of error; approaches for optimizing conditions so as to minimize time and/or effort required to attain prescribed levels of accuracy and precision. Required of students majoring in chemistry. **Credits:** 4.00

CHM 32300 - Analytical Chemistry I Honors

Credit Hours: 4.00. Open to students in the chemistry honors program. Topical coverage similar to CHM 32100. Laboratory will include a group of core experiments plus special experiments designed by students and staff to study original problems related to analytical chemistry.**Credits:** 4.00

CHM 32700 - Bioanalytical Chemistry

Credit Hours: 4.00. This course focuses on the detection, quantification, and characterization of proteins, nucleic acids, lipids, carbohydrates, and small bioactive molecules. Principles and applications of various analytical techniques, including spectroscopy, chromatography and mass spectrometry, will also be discussed.**Credits:** 4.00

CHM 33300 - Principles Of Biochemistry

Credit Hours: 3.00. Structure and function of biologically important molecules. Intended for students in life sciences. **Credits:** 3.00

CHM 33900 - Biochemistry: A Molecular Approach

Credit Hours: 3.00. This is a comprehensive one-semester biochemistry course that emphasizes molecules and molecular reaction mechanisms, building upon the principles conveyed in general chemistry and organic chemistry. This course is designed to cover the essential elements of biochemistry traditionally covered in a two semester series. Topics to be covered include: Amino acids, peptides and proteins, molecular models and structure-function relationships, enzymes, enzyme kinetics and enzyme mechanisms, carbohydrates and carbohydrate metabolism, aerobic metabolism, lipids and membranes, lipid metabolism, nitrogen metabolism and integration and regulation of metabolism. Special emphasis will be placed on connections between biochemical principles and the fields of medicine, human health and disease, nutrition and biotechnology. This course should serve as excellent preparation for higher-level biochemistry courses as well as standardized pre-health professional exams. CHM 33900 was designed as the 4lh semester of the 1-2-1 competency-based curriculum transformation in chemistry as it applies to pre-health professional and life science students at Purdue. However, this course is open to other students who meet the prerequisites.**Credits:** 3.00

CHM 33901 - Biochemistry Laboratory

Credit Hours: 1.00. CHM 33901 is a laboratory course based on two modules from the Undergraduate Research Inspired Experimental Chemistry Alternatives (URIECA) developed at MIT that are designed to introduce students to cutting-edge research topics in biochemistry. The course provides students with a research-inspired laboratory experience that introduces standard biochemical techniques in the context of investigating a current research topic, for example, acquired resistance to cancer drugs. Techniques include protein expression, purification, and gel analysis, PCR, site-directed mutagenesis, kinase activity assays, and protein structure viewing. CHM 33901 was designed as the 4th semester of the 1-2-1 competency-based curriculum transformation in chemistry as it applies to pre-health professional and life science students at Purdue. However, the course is open to other students who meet the prerequisites.**Credits:** 1.00

CHM 34200 - Inorganic Chemistry

Credit Hours: 3.00. Interpretation and correlation of the reactions and properties of inorganic compounds in terms of their electronic and molecular structures. A survey of the preparations and reactivities of important compounds of the representative elements, with an emphasis on group trends. The elementary chemistry of the transition metals, including magnetic and spectral properties of coordination compounds.**Credits:** 3.00

CHM 34201 - Inorganic Chemistry Laboratory

Credit Hours: 1.00. Laboratory work to accompany CHM 34200. **Credits:** 1.00

CHM 34800 - Bioinorganic Chemistry

Credit Hours: 3.00. The fundamentals and applications of metals in biology.**Credits:** 3.00

CHM 37000 - Topics In Physical Chemistry

Credit Hours: 3.00. Kinetic theory of gases; statistical thermodynamics; quantum mechanics; atomic and molecular structure and spectroscopy; properties of ionic phases. May not be used to satisfy requirements for graduation in chemistry.**Credits:** 3.00

CHM 37200 - Physical Chemistry

Credit Hours: 4.00. Principles of physical chemistry with emphasis on chemical thermodynamics and kinetics, illustrated examples from the biological sciences. Intended primarily for students in the life sciences. Other topics include physical and chemical equilibria, quantum mechanics, and spectroscopy.**Credits:** 4.00

CHM 37300 - Physical Chemistry I

Credit Hours: 3.00. Physical chemistry of matter. Properties of gases, liquids, and solids; equations of state; thermodynamics; energy, heat, and work; entropy; spontaneity and equilibrium; chemical potential; chemical equilibrium; phase diagrams; colligative properties.**Credits:** 3.00

CHM 37301 - Physical Chemistry Laboratory I

Credit Hours: 1.00. A physical chemistry laboratory course that will provide students with hands-on experience that illustrates the core concepts presented in the associated physical chemistry lecture course CHM 37300.**Credits:** 1.00

CHM 37400 - Physical Chemistry II

Credit Hours: 3.00. Physical chemistry of molecules. Wave properties of matter; quantum mechanics of translation, rotation, and vibration; atomic structure; molecular orbitals; quantum states; statistical mechanics; chemical kinetics; collision theory; transition state theory.**Credits:** 3.00

CHM 37401 - Physical Chemistry Laboratory II

Credit Hours: 1.00. A physical chemistry laboratory course that will provide students with hands-on experience that illustrates the core concepts presented in the associated physical chemistry lecture course CHM 37400.**Credits:** 1.00

CHM 37409 - Professional Practice I

Credit Hours: 0.00. Professional practice with qualified employers within industry, government, or small business. Industrial practice fee is attached to this course. **Credits:** 0.00

CHM 37509 - Professional Practice II

Credit Hours: 0.00. Professional practice with qualified employers within industry, government, or small business. Industrial Practice fee is attached to this course. **Credits:** 0.00

CHM 38600 - Cooperative Work Experience IV

Credit Hours: 0.00. Cooperative Work Experience. **Credits:** 0.00

CHM 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in chemistry. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CHM 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in chemistry. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CHM 39500 - Chemistry Honors Seminar

Credit Hours: 1.00. Seminar for junior honors students. **Credits:** 1.00

CHM 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in chemistry. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CHM 39699 - Professional Practice Internship

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. **Credits:** 0.00

CHM 42400 - Instrumental Analysis

Credit Hours: 4.00. Principles and application of optical and electrical methods of chemical analysis, including topics in instrumentation.**Credits:** 4.00

CHM 43300 - Biochemistry

Credit Hours: 3.00. A rigorous one-semester introduction to biochemistry, with in-depth coverage of biology at a molecular level. Topics covered include the classes of biological macromolecules, enzyme kinetics and inhibition, and significant metabolic pathways.**Credits:** 3.00

CHM 43800 - Introduction To Molecular Biotechnology

Credit Hours: 3.00. An examination of modern tools for the characterization, manipulation, and design of nucleic acids and proteins. Topics include DNA technology, recombinant proteins, bioinformatics, genetic modifications, gene expression and the interactions between nucleic acids and proteins. **Credits:** 3.00

CHM 44400 - Cosmochemistry

Credit Hours: 3.00. Stellar evolution, nucleosyntheses, and chemical abundances. Origin, composition, and structure of the solar system and objects in it. Cosmochronology with particular emphasis on meteorites. Emphasis upon recent developments in planetology. Offered in alternate years. **Credits:** 3.00

CHM 46200 - Intermediate Organic Chemistry

Credit Hours: 3.00. Theory and application of organic chemistry and reaction mechanisms to organic synthesis and contemporary research topics in closely related areas. Topics include stereochemistry, reactive organic intermediates, molecular orbital theory, photochemistry, organic materials chemistry, and chemical biology. **Credits:** 3.00

CHM 47509 - Professional Practice III

Credit Hours: 0.00. Professional practice with qualified employers within industry, government, or small business. Industrial Practice fee is attached to this course. **Credits:** 0.00

CHM 48100 - Environmental Chemistry

Credit Hours: 3.00. Survey of chemical aspects of environmental problems and the application of chemistry to their solution. Topics will include atmospheric pollution problems, groundwater pollution and waste disposal problems, inorganic water pollutants, and the occurrence and fate of toxic organic compounds and other substances in the environment. **Credits:** 3.00

CHM 48700 - Cooperative Work Experience V

Credit Hours: 0.00. Cooperative Work Experience. **Credits:** 0.00

CHM 49000 - Selected Topics In Chemistry For Upper-Division Students

Credit Hours: 1.00 to 4.00. Topics vary. **Credits:** 1.00 to 4.00

CHM 49400 - Junior-Senior Chemistry Seminar

Credit Hours: 1.00. Major emphasis on developing skills in oral and written presentations by students. The subject matter can be library material and/or accomplishments in undergraduate or co-op research. Department permission required.**Credits:** 1.00

CHM 49900 - Special Assignments

Credit Hours: 1.00 to 5.00. Undergraduate research. Individual research projects undertaken under faculty direction. Permission of instructor required.**Credits:** 1.00 to 5.00

CHM 50200 - Modern Chemistry In The High School

Credit Hours: 3.00. A critical discussion of the means by which the fundamentals of modern chemistry can best be introduced at the high school level. The laboratory will deal with the manufacture and use of lecture demonstration equipment, the use of films and film strips, and the problems involved in organizing and running a high school chemical laboratory. **Credits:** 3.00

CHM 51300 - Chemical Literature

Credit Hours: 1.00. Types of information in technical publications; exercises in finding, assembling, and using such data. **Credits:** 1.00

CHM 53300 - Introductory Biochemistry

Credit Hours: 3.00. A rigorous one-semester introduction to biochemistry. **Credits:** 3.00

CHM 53800 - Molecular Biotechnology

Credit Hours: 3.00. An examination of modern tools for the characterization, manipulation, and design of nucleic acids and proteins. **Credits:** 3.00

CHM 54800 - Radiochemistry

Credit Hours: 3.00. Nuclear properties, structure, and reactions; radioactive decay; interaction of radiation with matter; radioactivity in the environment; nuclear applications in chemistry. **Credits:** 3.00

CHM 56000 - Organic Spectroscopic Analysis

Credit Hours: 3.00. Identification of organic compounds and characteristic groups by the use of mass spectrometry, infrared, nuclear magnetic resonance, and ultraviolet spectroscopy. **Credits:** 3.00

CHM 57900 - Computational Chemistry

Credit Hours: 3.00. Theoretical basis and practical applications of computational methods relevant to chemical and biochemical research problems. **Credits:** 3.00

CHM 58100 - Atmospheric Chemistry

Credit Hours: 3.00. (EAPS 52100) An introduction to the chemistry of the earth's atmosphere. Covers evolution of the earth's atmosphere, its physical and chemical structure, its natural chemical composition and oxidative properties, and human impacts, including increasing tropospheric ozone, decreasing stratospheric ozone, climate change, and acidic deposition. **Credits:** 3.00

CHM 59900 - Special Assignments

Credit Hours: 1.00 to 4.00. Directed reading or special work not included in other courses. Permission of instructor required. **Credits:** 1.00 to 4.00

CHM 60500 - Safety In The Chemistry Laboratory

Credit Hours: 0.00. Lectures on safe practices in the chemistry laboratory. Required of students doing research in chemistry. **Credits:** 0.00

CHM 61000 - Topics In Chemical Education

Credit Hours: 2.00 or 3.00. A variable topics course for graduate students in chemistry, chemical engineering, medicinal chemistry, and biochemistry. This course provides an overview of the literature in one of the areas of chemical education, such as: chemistry misconceptions and conceptual change; theories of learning, from Piaget and Vygotsky to radical constructivism; distributed cognition; and developing and assessing instructional materials. Offered in alternate years. **Credits:** 2.00 or 3.00

CHM 61100 - Formulas For Successful Teaching

Credit Hours: 2.00. An introduction to the issues of successful teaching of chemistry at the college/university level for graduate students in chemistry, chemical engineering, medicinal chemistry, and biochemistry who are interested in academic careers. Offered in alternate years. **Credits:** 2.00

CHM 61500 - Principles Of NMR Spectroscopy

Credit Hours: 3.00. The course is intended to provide in-depth coverage of fundamental concepts in modern NMR spectroscopy. Included are the vector model of spin resonance, topics in signal processing, product operator formalism, discussion of important 2D experiments, Redfield relaxation theory, and methods for molecular structure determination. The emphasis is on general spectroscopic concepts, also used outside spin resonance spectroscopy. Spectrometer operation and data processing are also demonstrated. Prerequisite: Undergraduate degree or completed advanced coursework in chemistry, physics, biology, or engineering. Basic knowledge of NMR is expected, but not required. **Credits:** 3.00

CHM 61600 - Advanced Experimental Nuclear Magnetic Resonance Spectroscopy

Credit Hours: 2.00. The theory and practice of multidimensional nuclear magnetic resonance spectroscopy and advanced NMR techniques. Prerequisite: CHM 56000, CHM 61500. **Credits:** 2.00

CHM 62000 - Spectrochemical Instrumentation

Credit Hours: 3.00. A critical review of instrumental methods of analysis, with particular emphasis on spectroscopic techniques. Topics include: methods of measurement; analog and digital electronics; optics and spectrophotometric modules; and instrumental methods in UV-visible, infrared, and NMR spectroscopies. Prerequisite: introductory analytical and two semesters of physical chemistry. **Credits:** 3.00

CHM 62100 - Advanced Analytical Chemistry

Credit Hours: 3.00. A critical survey of recent developments in chemical and instrumental methods of analysis. Prerequisite: CHM 32100, CHM 42400. **Credits:** 3.00

CHM 62200 - Chemical Aspects Of Mass Spectrometry

Credit Hours: 3.00. A graduate-level treatment of chemical aspects of mass spectrometry. No prior knowledge in mass spectrometry is required. Prerequisite: Bachelor's degree in Chemistry. **Credits:** 3.00

CHM 62400 - Particle Spectroscopy

Credit Hours: 3.00. Introduction to the application of ion and electron beams in the chemical analysis of gases and of surfaces. Emphasis is on the unity of the phenomena that underlie the preparation, manipulation, and analysis of ion and electron beams and on the analogies between inelastic reactions of ions and electrons, including those with both gaseous and solid targets. Mass spectrometry is covered in some depth, and a number of newer aspects of particle spectroscopy are treated, including ion scattering spectrometry, Rutherford scattering, energy loss spectrometry (ion and electron), ion kinetic energy spectrometry, ion cyclotron resonance and Auger spectrometry. Applications of these techniques feature structural analysis (compositions of mixtures, molecular structure of organics, electronic state assignment in simple ions), chemical preparations (ion implantation), and isotopic analysis. The underlying chemistry is explored, particularly in considering the kinetics and dynamics of unimolecular fragmentation and in terms of the factors that affect the cross-sections of inelastic collisions. Offered in alternate years. Prerequisite: CHM 42400. **Credits:** 3.00

CHM 62900 - Chromatographic Methods Of Analysis

Credit Hours: 3.00. Principles underlying chemical separations are discussed, including mechanisms of selective transport and zone broadening. Relations are shown between chromatography and electrophoresis, as well as other separation methods. Current applications and current research activity in the field of chemical separations are included. Prerequisite: CHM 42400. Permission of department required. **Credits:** 3.00

CHM 63100 - Magnetic Resonance Spectroscopy

Credit Hours: 2.00. Theory, experimental practice, and current applications to biological systems of nuclear magnetic resonance spectroscopy and, to a lesser extent, electron paramagnetic resonance spectroscopy. Offered in alternate years. Prerequisite: CHM 53300, 56100, 57700, 57800. **Credits:** 2.00

CHM 63200 - Membranes: Structure And Function

Credit Hours: 3.00. The structure and molecular properties of biological membranes and appropriate model systems. Offered in alternate years. **Credits:** 3.00

CHM 63400 - Biochemistry: Structural Aspects

Credit Hours: 3.00. Chemistry of materials of biochemical interest; carbohydrates, lipids, proteins, amino acids, nucleic acids, porphyrins; biochemistry of blood. Prerequisite: CHM 26200, CHM 32100, CHM 37400. **Credits:** 3.00

CHM 63500 - Biochemistry: Dynamic Aspects

Credit Hours: 3.00. Enzymes, metabolism, and protein and nucleic acid biosynthesis. Prerequisite: CHM 63400. **Credits:** 3.00

CHM 63800 - Biophysical Chemistry

Credit Hours: 3.00. Applications of the principles and methods of physical chemistry in biochemistry with emphasis on the behavior of macromolecules in solution. Protein engineering. Offered in alternate years. Prerequisite: CHM 57800, CHM 63400. **Credits:** 3.00

CHM 64100 - Advanced Inorganic Chemistry

Credit Hours: 3.00. Survey of main group and transition metal chemistry. Main group special topics, bonding and structure of boron hydrides. Coordination chemistry, bonding models in coordination compounds. Transition metal organometallic chemistry, ligand types and reactivity patterns. Survey of inorganic NMR spectroscopy. Prerequisite: CHM 34200. **Credits:** 3.00

CHM 64200 - Advanced Inorganic Chemistry

Credit Hours: 3.00. Physical inorganic chemistry. Applications of group theory to chemistry and spectroscopy, especially vibrational and electronic spectra of transition metal complexes. Molecular orbital theory and theoretical bases for reactivity. Magnetic properties and electron paramagnetic resonance (EPR) spectroscopy of inorganic materials. Prerequisite: CHM 34200. **Credits:** 3.00

CHM 64400 - Solid State Chemistry

Credit Hours: 3.00. The chemistry of solids, including a discussion of ionic crystals, metals, alloys, and binary compounds, and their characterizations by various physical methods. Description of chemical reactions, phase changes, and catalysis in terms of current theories of the solid state. Prerequisite: CHM 34200, CHM 37400. **Credits:** 3.00

CHM 64600 - Kinetics And Mechanisms Of Inorganic Reactions

Credit Hours: 3.00. Chemical kinetics, reaction orders, mechanisms and rate expressions; experimental techniques; transition state theory; reactions in solution; complex mechanisms; linear free-energy relationships; acid-base catalysis and proton-transfer reactions; redox reactions (electron and atom transfer, oxidative addition-reductive elimination); substitution reactions of metal ion and organometallic complexes; homogeneous catalysis; and heterogeneous reactions. Prerequisite: CHM 34200. **Credits:** 3.00

CHM 64700 - Transition Metal And Organometallic Chemistry

Credit Hours: 3.00. A study of the chemistry and physical properties of compounds of the transition metals. Halides, oxides, and oxy-salts; transition metal carbonyls and derivatives; pi-bonded organometallic compounds; catalysis; spectral and magnetic properties of compounds. Prerequisite:CHM 64100. **Credits:** 3.00

CHM 64800 - Bioinorganic Chemistry

Credit Hours: 3.00. Provides a detailed perspective on the roles of metals in biology. Emphasis is placed upon principles guiding the field. The basics of biochemistry and inorganic chemistry are provided such that students from diverse backgrounds may participate. Readings are from the research literature. Offered in alternate years. **Credits:** 3.00

CHM 65100 - Advanced Organic Chemistry

Credit Hours: 3.00. Modern structural organic chemistry, including introductions to molecular orbital theory and reaction mechanisms. Prerequisite: a year's course in organic chemistry. **Credits:** 3.00

CHM 65200 - Synthetic Organic Chemistry

Credit Hours: 3.00. An advanced treatment of methods for preparing major types of organic functionalities and bonds, stressing stereochemical control and involving mechanisms for understanding the reactions employed. Prerequisite: CHM 65100. **Credits:** 3.00

CHM 66800 - Physical Organic Chemistry

Credit Hours: 3.00. The theoretical and mechanistic bases for structure and reactivity in organic chemistry is discussed. Individual topics include kinetics and thermodynamics, molecular orbital theory, stereochemistry and reactive intermediates as applied to the mechanisms of organic reactions. Prerequisite: CHM 56300 or 65100. **Credits:** 3.00

CHM 67100 - Advanced Physical Chemistry

Credit Hours: 3.00. Selected topics, including atomic and molecular structure and modern theories underlying thermodynamics and chemical kinetics. Prerequisite: CHM 57800. **Credits:** 3.00

CHM 67200 - Quantum Chemistry

Credit Hours: 3.00. Basic principles of classical and quantum mechanics, exact solutions for simple systems, approximation methods, atomic structure, spectroscopy, application of group theory, theory of molecular binding. Prerequisite: CHM 67100. **Credits:** 3.00

CHM 67300 - Computational Quantum Chemistry

Credit Hours: 3.00. Semiempirical and molecular-mechanics treatments of large molecules, ab initio methods, modern density functional theory, Green's functions, multichannel quantum defect theory, global optimization methods. Prerequisite: CHM 67100. **Credits:** 3.00

CHM 67500 - Chemical Kinetics

Credit Hours: 2.00 or 3.00. Experimental and theoretical consideration of chemical reaction rates and mechanisms. **Credits:** 2.00 or 3.00

CHM 67605 - Molecular Spectroscopy

Credit Hours: 3.00. Theoretical and experimental fundamentals of the interactions between molecules and electromagnetic waves. Topics include electronic, vibrational, and rotational spectroscopies, and laser-based methods. Prerequisites: CHM 67100. **Credits:** 3.00

CHM 67900 - Chemical Thermodynamics

Credit Hours: 3.00. Advanced thermodynamics of chemical and phase equilibria, of electrolytic and nonelectrolytic solutions, and of imperfect gases. Prerequisite: CHM 57800. **Credits:** 3.00

CHM 68200 - Statistical Thermodynamics

Credit Hours: 3.00. Application of statistical mechanics to the description of imperfect gases, liquids, and solutions; to order-disorder phenomena in solids and surfaces; and to absolute reaction rate theory. Prerequisite: CHM 67100, CHM 67900. **Credits:** 3.00

CHM 69500 - Seminar

Credit Hours: 0.00 or 1.00. Groups meeting for review and discussion of important current literature in analytical, biological, inorganic, organic, and physical chemistry. Each graduate student is required to attend the seminar of his or her major subject. **Credits:** 0.00 or 1.00

CHM 69600 - Special Topics In Chemistry

Credit Hours: 1.00 to 3.00. Lectures on selected topics of current interest. **Credits:** 1.00 to 3.00

CHM 69699 - Chemistry Graduate Internship

Credit Hours: 0.00. Graduate internship experience. Students submit final work report and company evaluation. Permission of instructor required.**Credits:** 0.00

CHM 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

CHM 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Chinese

CHNS 10100 - Chinese Level I

Credit Hours: 4.00. A comprehensive course in elementary Mandarin, designed to develop basic proficiency in listening, speaking, reading, and writing. Systematic coverage of syntactical patterns. After oral foundation work, 20 characters are introduced each lesson in unsimplified and simplified forms. **Credits:** 4.00

CHNS 10200 - Chinese Level II

Credit Hours: 4.00. A continuation of the study of elementary Mandarin. Students will complete study of basic syntactical patterns. Character recognition will be built to 500. **Credits:** 4.00

CHNS 20100 - Chinese Level III

Credit Hours: 4.00. A course in intermediate Mandarin, with integrated spoken and written tracks emphasizing the cultural contexts of usage. Mastery of more advanced syntactic patterns, with enriched vocabulary. Character recognition built to 800. Introduction to Chinese dictionaries. **Credits:** 4.00

CHNS 20200 - Chinese Level IV

Credit Hours: 4.00. A continuation of the study of intermediate Mandarin. Development of enhanced oral narrative skills and listening comprehension skills through audio-visual supplements. Short exercises in expository composition. Character recognition built to 1,100-plus. Introduction to Chinese newspaper. **Credits:** 4.00

CHNS 24100 - Introduction To The Study Of Chinese Literature

Credit Hours: 3.00. Class reading and discussion of selected Chinese poetry, prose, and drama; introduction to the methods of literary criticism, applied to the reading of Chinese literary discourse. Texts, discussion, and written assignments primarily in Chinese. Permission of instructor required. **Credits:** 3.00

CHNS 28000 - Topics In Chinese Civilization And Culture

Credit Hours: 3.00. Selected topics on Chinese civilization and culture including history and geography, Confucianism, contemporary China, education, family, international cultural and economic cooperation. Course materials also cover most current issues on and in Chinese-speaking communities. Lectures in English. **Credits:** 3.00

CHNS 28100 - Introduction To Chinese Food Culture

Credit Hours: 3.00. Selected topics on Chinese food history, production, preparation, festivals, as well as food in literature, film, business and folk beliefs. Discussion will also include civilization and food as cultural diplomacy. Lectures in English. **Credits:** 3.00

CHNS 28500 - Chinese Calligraphy

Credit Hours: 1.00. Principles and techniques of writing Chinese characters. The aesthetics of Chinese calligraphy, its function as an art form, and its role in Chinese culture. Emphasis on training and practice in calligraphic writing. Conducted in English. **Credits:** 1.00

CHNS 30100 - Chinese Level V

Credit Hours: 3.00. Continued development of Chinese speaking, listening, reading, and writing abilities, using materials dealing primarily with everyday life and civilization from a variety of sources, e.g., newspapers, magazines, television, recent literature, etc. **Credits:** 3.00

CHNS 30200 - Chinese Level VI

Credit Hours: 3.00. Continued development of Chinese speaking, listening, reading, and writing abilities, using materials dealing primarily with everyday life and civilization from a variety of sources with stronger emphasis on authentic texts, e.g., newspapers, magazines, television, recent literature, etc. **Credits:** 3.00

CHNS 31300 - Reading And Writing Practice

Credit Hours: 3.00. Concentration on further development of reading and writing abilities for students with conversational proficiency, using materials primarily from modern social and cultural studies, including annotated literary texts. Conducted in Chinese. **Credits:** 3.00

CHNS 33000 - Introduction To Chinese Cinema

Credit Hours: 3.00. This course surveys the development of the Chinese cinema from its beginning to the present. Films from the mainland as well as Taiwan and Hong Kong will be examined in-depth for their aesthetic quality and techniques, and equally important, against their socio-historical, political, economic and cultural contexts. The class is conducted in English. Films are all in Chinese with English subtitles. **Credits:** 3.00

CHNS 34100 - Chinese Literature I: Traditional Chinese Literature

Credit Hours: 3.00. Reading and discussion of selected classical Chinese texts from major writers and genres. Introduction to methods of literary criticism as applied to Chinese literature. Texts, discussion, and written assignments are largely in Chinese. **Credits:** 3.00

CHNS 34200 - Chinese Literature II: Modern Chinese Literature

Credit Hours: 3.00. Study of selected poetry, drama, and fiction from the twentieth century. Students will read and discuss major authors and texts and will write critical essays on literary topics. Texts, discussion, and written assignments are largely in Chinese. **Credits:** 3.00

CHNS 39900 - Special Study Abroad Credit In Chinese

Credit Hours: 1.00 to 4.00. This course number is for assignment after the fact of credits in Chinese earned while enrolled at a foreign university on a Study Abroad program which cannot be appropriately accommodated under an established Purdue course number. It is not for use for courses offered at or conducted by Purdue. **Credits:** 1.00 to 4.00

CHNS 40100 - Chinese Level VII

Credit Hours: 3.00. Continued development of Mandarin Chinese speaking, listening, reading, and writing skills. Emphasis will be upon modern, everyday language and culture (with some introduction to traditional culture) using various sources such as textbooks, newspapers, and literary works. **Credits:** 3.00

CHNS 40200 - Chinese Level VIII

Credit Hours: 3.00. Further development of Mandarin Chinese speaking, listening, reading, and writing skills. Materials will include advanced textbooks and original texts such as newspapers and literary works. **Credits:** 3.00

CHNS 49000 - Special Topics In Chinese Language

Credit Hours: 1.00 to 3.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 3.00

CHNS 49300 - Special Topics In Chinese Literature

Credit Hours: 1.00 to 3.00. Study of a selected topic in Chinese literature. The topic will be announced in advance. Conducted in English; readings in English. Permission of department required. **Credits:** 1.00 to 3.00

CHNS 59400 - Special Topics In Chinese Literature

Credit Hours: 1.00 to 4.00. Special topics in Chinese Literature. Permission of instructor required. **Credits:** 1.00 to 4.00

Civil Engineering

CE 19100 - Civil Engineering Practice I

Credit Hours: 0.00. Practice in industry and written reports of this practice. For cooperative program students only. **Credits:** 0.00

CE 20300 - Principles And Practice Of Geomatics

Credit Hours: 4.00. This course provides a broad overview of geomatics engineering including fundamental principles required for practical geomatics applications. This course includes subjects in traditional surveying, GPS surveying, remote sensing, photogrammetry, laser scanning, and Geographic Information Systems (GIS). Basic concepts on these subjects are applied to solve practical problems in various civil engineering applications; including computations for engineering project control and construction layout; theory of error propagation; fundamental concepts of horizontal and vertical curves; topographic mapping using various geospatial data acquisition technologies from ground, air, and space; GIS for visualization and analysis of geospatial data. **Credits:** 4.00

CE 21101 - Thermal And Energy Sciences

Credit Hours: 3.00. This course includes applications of thermal science and energy fundamentals to civil engineering topics. Emphasis is placed on fundamental concepts of properties of materials, work, heat, internal energy, entropy, equilibrium, and relations derived from the first and second laws of thermodynamics. Example applications include: power plants; fluid flow in ducts/pipes; thermal properties of building/construction materials and processes; geothermal systems; heating, ventilation, and air conditioning (HVAC) processes; energy balances in buildings; refrigeration; hydroelectric power; contaminant transport in air, water, and soil; climate change; the urban heat island effect; and energy use in the transportation sector. **Credits:** 3.00

CE 22200 - Life Cycle Engineering And Management Of Constructed Facilities

Credit Hours: 3.00. The objective of this course is to introduce concepts relating to the engineering and construction of facilities throughout their life cycle. Topics that will be explored include the nature of the construction industry, construction contracts, legal and management organization of construction companies, basics of the design and construction process, as well as an introduction to the role estimating and project scheduling. Cost, time, safety and quality concepts of construction management relationships will also be discussed. **Credits:** 3.00

CE 23100 - Engineering Materials I

Credit Hours: 3.00. Nature and performance of materials under load. Structure of materials. Elastic, inelastic, and time-dependent behavior. Influences of composition and processing upon material properties. Composite materials particulate systems. Chemical effects on materials. **Credits:** 3.00

CE 27000 - Introductory Structural Mechanics

Credit Hours: 4.00. Loads; structural forms; analysis of axially loaded members, flexural members, torsional members; combined loading conditions; buckling. Basic behavioral characteristics of structural elements and systems illustrated by laboratory experiments. **Credits:** 4.00

CE 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in civil engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CE 29202 - Contemporary Issues In Civil Engineering

Credit Hours: 2.00. This course provides a forum on issues in the civil engineering profession in a contemporary context. Topics include professionalism and ethics, entrepreneurship, cultural differences, and collaborating globally. Students have interactions with engineering faculty and professionals outside the University. Guidance on the preparation of individual plans of study and information on civil engineering career options are provided. Students learn and apply fundamental aspects of written communication in professional settings. Emphasis is placed on delivery of technical and managerial content. Students will

compile a professional portfolio of communication assignments, including lab reports prepared in other CE courses. **Credits:** 2.00

CE 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in civil engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CE 29700 - Basic Mechanics I (Statics)

Credit Hours: 3.00. Statics of particles. Rigid bodies: equivalent systems of forces, equilibrium. Centroids and centers of gravity. Static analysis of trusses, frames, and machines. Friction. Area moments of inertia. **Credits:** 3.00

CE 29800 - Basic Mechanics II Dynamics

Credit Hours: 3.00. Kinematics of particles. Kinetics of particles and systems of particles. Kinematics of rigid bodies. Mass moments of inertia. Kinetics of rigid bodies. Mechanical vibrations. **Credits:** 3.00

CE 29900 - Civil Engineering Projects

Credit Hours: 0.00 to 18.00. Topics vary. Projects, special topics, or supplemental instruction. Arrange Hours and Credit. Permission of instructor required. **Credits:** 0.00 to 18.00

CE 30300 - Engineering Surveying

Credit Hours: 3.00. Horizontal and vertical control surveys on site and route projects for engineering design and construction layout. Geometric design of horizontal circular curves, spiral easement curves, and vertical parabolic curves. Earthwork volume computation and balancing. Use of coordinate geometry (COGO) design software including terrain and design surface modeling. Methods and tools used for construction layout, as-built surveys, and industrial measurements. **Credits:** 3.00

CE 31100 - Architectural Engineering

Credit Hours: 3.00. This course introduces energy efficiency, thermal comfort, indoor environmental quality and green building design concepts. The course covers engineering fundamentals required for the design and analysis of building systems such as thermodynamics, fluid mechanics, heat and mass transfer, light and sound transmission. The course presents engineering principles and selected applications related to hydrothermal analysis of building enclosures, air conditioning processes in heating, ventilating and air conditioning systems, building illumination, and building acoustics.**Credits:** 3.00

CE 32201 - Project Control And Life Cycle Execution Of Constructed Facilities

Credit Hours: 3.00. The objective of this course is to continue an introduction to construction management and engineering concepts for future engineers, contractors and owner representatives involved at different stages in the life-cycle of constructed faculties. Building on the broad framework introduced in the prerequisite course, this course develops further ability with analytical tools and extends the basic foundation for advanced topics in construction engineering and management. Specifically, this course focuses on the principles, tools, and procedures used in the construction industry for project selection and financing, advanced planning and scheduling techniques, resource management, and project monitoring. **Credits:** 3.00

CE 33100 - Engineering Materials II

Credit Hours: 3.00. A continuation of CE 23100. **Credits:** 3.00

CE 33500 - Civil Engineering Materials

Credit Hours: 4.00. An introduction to the relationships between fundamental structure of materials and their properties presented through a combination of materials science and engineering approaches. Emphasis on materials of particular interest for civil engineering applications, including metals, aggregates, portland cement concrete, bituminous materials, asphalt binders, asphalt mixtures, wood, polymers, composites, and masonry. Laboratory exercises illustrate atomic structure, elastic and inelastic properties, and demonstrate applications of selected principle of mechanics, testing of aggregates, as well as designing and testing of asphalt and concrete mixtures.**Credits:** 4.00

CE 34000 - Hydraulics

Credit Hours: 3.00. Fluid properties; hydrostatics; kinematics and dynamics of fluid flows; conservation of mass, energy, and momentum; flows in pipes and open channels. Formal laboratory experiments. **Credits:** 3.00

CE 34300 - Elementary Hydraulics Laboratory

Credit Hours: 1.00. The laboratory covers basic concepts in analysis of experimental data and methods in hydraulic measurements. A variety of simple laboratory experiments illustrating the principles of hydraulics are performed. **Credits:** 1.00

CE 35000 - Introduction To Environmental And Ecological Engineering

Credit Hours: 3.00. Introduction to water pollution, air pollution, noise, hazardous and solid wastes, and their control. Environmental impact statements and global pollution issues. Field trips required. **Credits:** 3.00

CE 35500 - Engineering Environmental Sustainability

Credit Hours: 3.00. (EEE 35500) An introduction to the examination of global-scale resource utilization, food, energy and commodity production, population dynamics, and their ecosystem impacts. **Credits:** 3.00

CE 36100 - Transportation Engineering

Credit Hours: 3.00. Transportation functions; transportation systems, including land, air, and marine modes; transportation system elements, including traveled way, vehicle, controls, and terminals; techniques of transportation system planning, design, and operation. **Credits:** 3.00

CE 37100 - Structural Analysis I

Credit Hours: 3.00. Stress resultants (reactions, axial forces, shear forces, and bending moments) for beams and framed structures. Deflections of beams and frames by geometric methods (moment-area theorems and applications; conjugate beam analogy). Analysis of statically indeterminate beams and frames by classical stiffness methods; slope deflection and moment distribution. Influence functions and their applications. **Credits:** 3.00

CE 38199 - Professional Practice Co-Op I

Credit Hours: 0.00. Professional experience in civil engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CE 38299 - Professional Practice Co-Op II

Credit Hours: 0.00. Professional experience in civil engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CE 38300 - Geotechnical Engineering I

Credit Hours: 3.00. Introduction to the nature and origin of soils and rocks; engineering significance of geologic landforms and soil deposits; identification and engineering classification of soils; engineering behavior and properties of soils; permeability, compressibility, shearing resistance; soil compaction. **Credits:** 3.00

CE 38399 - Professional Practice Co-Op III

Credit Hours: 0.00. Professional experience in civil engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CE 39201 - Technical Communication In Civil Engineering

Credit Hours: 2.00. This course will build upon the technical communication components of CE 29202, adding instruction in oral communication, projects, and working in teams. This course involves both individual and team assignments intended to offer students the opportunity to practice preparing and delivering written correspondence and reports, as well as oral presentations. These activities may be coordinated with other CE courses being taken by students in CE 39201. **Credits:** 2.00

CE 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in civil engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CE 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in civil engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CE 39500 - Fundamentals Of Innovation Theory And Practice

Credit Hours: 3.00. This course is designed to provide students with initial exposure to the fundamental patterns, mindsets, behaviors, attributes, tools, and methods employed in the innovative activity of individuals and organizations. Emphasis is placed on understanding and effectively utilizing techniques to systematically drive innovation that are drawn from the fields of business, design, problem-solving, engineering, and the social sciences. Lecture, in-class small group activities, and individual and team assignments are employed across an array of contemporary socio-technical challenges to provide students with the opportunity to apply conveyed theory and methods to rigorously structure problems, understand involved stakeholders, utilize innovation motifs and analogical reasoning to develop robust views of potential solutions spaces, tailor solution design to stakeholder context, consider the full suite of functional, social, and emotional dimensions that could influence solution prioritization, and document and systematically assess underlying solution assumptions to iterate toward a viable and sustainable forward-looking plan that could achieve target outcomes. This course counts toward, serves as a required entry course for, the College of Engineering Minor in Innovation and Transformational Change. **Credits:** 3.00

CE 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in civil engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CE 39699 - Professional Practice Internship

Credit Hours: 0.00. Professional experience in civil engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Permission of department required. **Credits:** 0.00

CE 39700 - Undergraduate Professional Internship

Credit Hours: 0.00. Professional experience in Civil Engineering. This internship experience is intended to complement the student's academic coursework and help prepare the student for a career as a practicing engineer. Program coordinated by school with cooperating employers. A written report is required. Permission of department required. **Credits:** 0.00

CE 39800 - Introduction To Civil Engineering Systems Design

Credit Hours: 3.00. An introduction to engineering economy and systems analysis. A systematic approach to the engineering method of design and problem solving. **Credits:** 3.00

CE 40800 - Geographic Information Systems In Engineering

Credit Hours: 3.00. This course provides an introduction to the application of geographic information systems (GIS) to civil engineering problems. GIS is a tool for analysis, modeling, and evaluation of civil engineering problems. The design of spatial databases, assembly of requisite data, and the development of analysis tools within GIS are presented. This course will address: definition of spatial data, data types, spatial relationships, computer operation on spatial data, topology in spatial data, representation of features in a GIS, data models, data dictionaries, data capture techniques; database types, composition of spatial queries, analysis of engineering data using a GIS, complex analysis of polygon and linear features, presentation of results, use of a GIS as an engineering model test bed. **Credits:** 3.00

CE 41300 - Building Envelope Design And Thermal Loads

Credit Hours: 3.00. This course discusses the basic thermal processes in buildings and presents comprehensive methods for thermal design of envelope assemblies in commercial and residential buildings. The first part of the course includes steady-state transient conduction through envelope assemblies, convection and radiation heat transfer in buildings, solar radiation and solar gains, thermal performance of windows, internal gains, ventilation and infiltration. The second part of the course considers surface and room energy balance equations and presents analytical and computational models for calculation of hourly heating and cooling loads throughout the year. Climate-based standards, passive solar design, advanced energy guides, and innovative technologies for high performance buildings are discussed. The course also includes a design project on analytical heating/cooling load calculations for a commercial building. **Credits:** 3.00

CE 41400 - Building Mechanical And Electrical System Design

Credit Hours: 3.00. This course covers the design of building mechanical and electrical systems. In the first part of the course students learn principles of designing and integrating heating, ventilation, and air conditioning systems into building air delivery systems, mechanical cooling and heating technologies, duct design and layout, blower and pump selection, and hydronic systems. They also learn to design heating, ventilation, and air conditioning systems within the constraint of achieving satisfactory

occupant thermal comfort in buildings. The second part of the course covers design concepts related to building electrical systems; including, single and three-phase power systems, motors, transformers, switching, and relays. The course includes a design project related to mechanical and electrical systems for a commercial building. **Credits:** 3.00

CE 44000 - Urban Hydraulics

Credit Hours: 3.00. Sources and distribution of water in urban environment, including surface reservoir requirements, utilization of groundwater, and distribution systems. Analysis of sewer systems and drainage courses for the disposal of both wastewater and storm water. Pumps and lift stations. Urban planning and storm drainage practice. **Credits:** 3.00

CE 44200 - Introduction To Hydrology

Credit Hours: 3.00. Description, measurement, and analysis of hydrologic processes: precipitation, evapotranspiration, infiltration, and runoff. Hydrograph analysis: unit and synthetic unit hydrographs and flood routing. Statistical analysis of hydrologic data. Fundamentals, budget, and yield analysis of groundwater flows; well hydraulics. Case studies illustrating the application of principles in both surface and groundwater flows. **Credits:** 3.00

CE 44300 - Introductory Environmental Fluid Mechanics

Credit Hours: 3.00. Kinematics of fluid flow. Differential equations for environmental fluid flows, including effects of variable density and rotation. Ideal fluid flow; boundary layer approximation; turbulence; water waves. **Credits:** 3.00

CE 45600 - Wastewater Treatment Processes

Credit Hours: 3.00. (EEE 45600) Fundamental design principles and practice of wastewater treatment to prepare students for designing wastewater treatment systems. The major topics include design and construction process, preliminary treatment of wastewater, primary treatment, wastewater microbiology, secondary treatment, nitrogen removal, phosphorus removal, attached microbial growth, secondary settling, disinfection and post-aeration, tertiary treatment, and wastewater plant residuals management. **Credits:** 3.00

CE 45700 - Air Pollution Control And Design

Credit Hours: 3.00. Fundamental concepts and design procedures for the removal of particulates, gases, and toxic air pollutants from waste gas streams. Problem assessment; characterization of exhaust gas streams; fan characteristics. **Credits:** 3.00

CE 46100 - Roadway And Pavement Design

Credit Hours: 3.00. Design of highway and airport pavement systems, subgrades, subbases and bases, soil stabilization, flexible and rigid pavements; cost analysis and pavement selection; quality control; drainage; earthwork; pavement evaluation and maintenance. **Credits:** 3.00

CE 46300 - Highway Transportation Characteristics

Credit Hours: 3.00. Analysis of basic characteristics of highway transportation systems and the elements influencing these characteristics: drivers, vehicles, pedestrians, flow, density, speed, travel time, delay, stream flow, intersection performance, capacity, accidents, traffic demand, and parking. Techniques used include experimental observation, deterministic and probabilistic queueing theory, probability and statistics, and graphical analysis. **Credits:** 3.00

CE 47000 - Structural Steel Design

Credit Hours: 3.00. The elements of structural steel design, including tension members and their connections; structural connections, including welding, and high-strength bolts; compression members; rolled and built-up flexural members; and combined axial and flexural loading effects. **Credits:** 3.00

CE 47300 - Reinforced Concrete Design

Credit Hours: 4.00. Design and behavior of reinforced concrete beams, one-way slabs, and columns. **Credits:** 4.00

CE 47400 - Structural Analysis II

Credit Hours: 3.00. Determination of deflections by the method of virtual work; analysis of trusses, continuous beams, and frames by direct stiffness method; approximate methods of analysis. **Credits:** 3.00

CE 47900 - Design Of Building Components And Systems

Credit Hours: 3.00. Design of simple floor and roof systems and load bearing walls; uses of building materials; fundamentals of design of metal form decking, steel joists, masonry (beams, columns and load bearing walls), and timber (beams, trusses, and mechanical connections). **Credits:** 3.00

CE 48300 - Geotechnical Engineering II

Credit Hours: 3.00. Subsurface investigations and techniques for sampling soils, lateral earth pressures, and stability of retaining structures; stability of earth slopes; shallow and deep foundations design. **Credits:** 3.00

CE 49700 - Civil Engineering Projects

Credit Hours: 0.00 to 18.00. Topics vary. Permission of instructor required. **Credits:** 0.00 to 18.00

CE 49800 - Civil Engineering Design Project

Credit Hours: 3.00. Planning, design, and analysis of a civil project; an integrated and realistic group project involves as much as possible all major aspects of the civil engineering profession. **Credits:** 3.00

CE 49900 - Research In Civil Engineering

Credit Hours: 0.00 to 18.00. Credit arranged. Permission of instructor required. **Credits:** 0.00 to 18.00

CE 50101 - Map Projection And Geometric Geodesy

Credit Hours: 3.00. The course will cover topics necessary for the modern "3D surveyor": it will give an overview of coordinate frames used in geodesy, surveying and mapping. What are the relationships between the various (3D) coordinate frames? How are the results of 1D/2D/3D surveys being mapped to a 2D, not necessarily flat, surface? Mapping models (projecting equations) and their characteristics will be discussed, based on the fundamentals of differential geometry and curvilinear coordinates. (Differential) Geometry and Multivariate Calculus: Cartesian, Spherical and Ellipsoidal coordinates and transformations between them. Radius of curvature. Jacobian and Metric Matrices. Geometric Geodesy: Earth-fixed frames. Geocentric, topocentric and local frames. Radius of curvature in the meridian and the prime vertical. [Differential coordinate transformations. Commutative diagram.] Reference sphere. Shortest distance over the sphere/ellipsoid. Reference ellipsoid. Reductions to the ellipsoid. Map projections: Basics of mapping. Conformal mapping. Mercator, Lambert, Stereographic. State Plane Coordinate Systems. Intro to Physical Geodesy: Shape of the Earth. Earth rotation. Inertial frames. Precession, Nutation, Polar Motion, Length of Day. Time

Systems. Gravity and Gravitation. Potential Energy. Equipotential surfaces. Geoid. Height differences and the flow of water. Orthometric heights. Geodetic Reference Datums/Frames/Systems: NAD27, NGVD29, IGSN71, WGS72, GRS80, NAD83, WGS84, NAVD88, IERS Standards 1992, HARNs, GEOID90, GEOID93, GEOID96, GEOID99, GEOID2003, GEOID2009. **Credits:** 3.00

CE 50301 - Digital Photogrammetric Systems

Credit Hours: 3.00. This course deals with various aspects related to 3D reconstruction from 2D imagery. The course starts with comprehensive coverage of data acquisition systems while focusing on different factors that affect the quality of image measurements. Then, the course focuses on the mathematical details for deriving 3D information from imagery including 2D/3D rotation, collinearity equations, projective transformation, direct linear transformation, theory of orientation, bundle adjustment, image resampling according to epipolar geometry, image matching, and orthophoto generation. The course also covers the similarities/differences between photogrammetric and computer vision approaches toward 3D reconstruction. **Credits:** 3.00

CE 50401 - Laser Scanning

Credit Hours: 3.00. This course covers laser scanning data acquisition and processing activities. The first half of the course deals with the operational principles of laser scanning including laser light generation, laser scanning patterns, georeferencing, point positioning equation, impact of random and systematic errors on derived point clouds, and system calibration. The second half deals with point cloud data processing including characterization, data structures, segmentation, quality control, and product delivery. The course also covers the similarities/differences between photogrammetric and laser scanning approaches for 3D reconstruction.**Credits:** 3.00

CE 50501 - UAS-Based Mapping: Basic Principles

Credit Hours: 1.00. This module covers the fundamentals of UAS-based mapping from imaging and ranging systems - including system integration, calibration strategies, and 3D reconstruction techniques.**Credits:** 1.00

CE 50502 - UAS-Based Photogrammetric Mapping

Credit Hours: 1.00. This module covers the principles and mathematical details of photogrammetric 3D reconstruction from imaging systems onboard UAVs.**Credits:** 1.00

CE 50503 - UAS-Based LiDAR Mapping

Credit Hours: 1.00. This module covers the principles and mathematical details of laser scanning-based 3D reconstruction using ranging sensors onboard UAVs.**Credits:** 1.00

CE 50601 - Adjustment Of Geospatial Observations

Credit Hours: 3.00. This course presents a thorough and comprehensive look at the topic of fitting data to a mathematical model. The techniques presented will free the scientist or engineer from dependence on restrictive software applications, and allow customization of solutions using weighting, constraints, parameter dependencies, and robust techniques which minimize the influence of blunders. Example applications include 2D/3D ranging, 2D/3D triangulation, curve and surface fitting, coordinate transformations, leveling, and image triangulation. Pre-analysis and design techniques permit the precision of unknown parameters to be determined in advance, prior to expending time and effort in field measurements. **Credits:** 3.00

CE 50701 - Geospatial Data Analytics

Credit Hours: 3.00. The course will introduce fundamental theories, analytical methods and programming skills that are needed to work with geospatial data. Students will learn the theories, methods, and techniques to visualize, analyze and model various geospatial data through hands-on computer programming practice based on various open source geospatial libraries. To be specific, the course will use R and its related packages as the basic tool for implementation. The goal is to enable the learners to develop their own geospatial analytical applications. **Credits:** 3.00

CE 50801 - Geographic Information Systems

Credit Hours: 3.00. This course covers a range of fundamentals in geographic information science and technology. Students will learn the use of current popular geographic information system (GIS) tools to handle various geographic data. Through working on real world geospatial problems, students shall gain extensive and hands-on experience in geographic data manipulation, visualization, and analysis. Course assignments are focused on both GIS theoretical basics and practical skills for students to achieve expected proficiency. The course will work with geospatial data in geography, topography, environmental science, hydrology, transportation, and geosocial science. It is targeted to students with interest in civil and environmental engineering, agriculture, geography, earth science, natural resources, smart cities or other related subjects. **Credits:** 3.00

CE 51200 - Urban Planning And Analysis

Credit Hours: 3.00. An introductory course that provides a framework for better understanding of the current urban planning process. Concepts and emerging trends are covered as well as an elementary description of planning methods and techniques. For planning majors and those in related design, development, and socioeconomic disciplines. **Credits:** 3.00

CE 51300 - Lighting In Buildings

Credit Hours: 3.00. This course focuses on the design of illumination systems in buildings (electric and natural lighting) in order to achieve energy efficiency and visual comfort. The first part of the course includes analytical lighting calculation techniques, visual perception, radiative transfer, lamp characteristics, electric lighting system design and control for calculation of required indoor illuminance levels. The second part of the course covers daylighting (natural lighting) systems, including state-of-the-art daylighting prediction models as well as design and control of such devices and advanced metrics. The course also has a lab section, in which the students learn how to work with lighting and daylighting tools and build their own computational transient lighting models in open programming languages, in order to design illumination systems and predict electricity consumption and potential energy savings. **Credits:** 3.00

CE 51401 - Building Controls

Credit Hours: 3.00. This course is designed to provide students with the knowledge of fundamentals, design, and analysis for building control systems. It primarily consists of three parts. The first part covers basic concepts, terminology, procedures and computations of control systems including block diagrams & transfer function, open-loop & closed-loop control, control system modeling, time response, root locus techniques, design via root locus, and digital control systems. The second part focuses on issues surrounding the building controls: interfacing components such as sensors and actuators, problems encountered, and state-of-the-art solutions for building energy efficiency and thermal comfort. The third part aims to develop students' ability to convert control system concepts into real building control sytems. The course provides a hand-on opportunity for students to complete three projects associated with the three primary components during the semester: indoor environmental quality assessment, building HVAC system commissioning and its control analysis, and new control algorithm development for building energy efficiency, occupant health, and individual productivity. **Credits:** 3.00

CE 51501 - Building Energy Audits

Credit Hours: 3.00. This course is designed to provide students with the necessary skills to perform an energy audit on commercial and residential buildings. Energy accounting procedures for all major building subsystems are covered in detail, along with operational cost analysis of these systems. Students learn fundamental techniques for auditing the building envelope;

electrical and lighting systems; heating, ventilation, and air conditioning systems; internal thermal loads; and building maintenance and operation procedures. Students also learn to analyze electric and natural gas utility tariffs and rate structures and apply their findings to the energy auditing process. **Credits:** 3.00

CE 52000 - Construction Project Control Systems

Credit Hours: 3.00. Techniques used for planning and scheduling, estimating, and cost control for construction projects. The interface of cost control with the financial management at the company level will be considered. Work breakdown structure as a method of control will be developed. **Credits:** 3.00

CE 52100 - Construction Business Management

Credit Hours: 3.00. Develops students' understanding of the fundamental theories and applied principles of management of U.S. construction companies. Exposes students to the present and future practice of business management at the construction company level. Provides insight into basic construction business operations including strategic planning, organizational structure, marketing, accounting, financing, risk analysis, quality, and international construction business practice. **Credits:** 3.00

CE 52200 - Computer Applications In Construction

Credit Hours: 3.00. A study of current computer usage in the construction industry; basic computer hardware and software concepts; computer applications in construction; commercially available software applications. **Credits:** 3.00

CE 52300 - Selection And Utilization Of Construction Equipment

Credit Hours: 3.00. A study of economics and functional applications for major categories of construction equipment. Operational characteristics are identified for selected equipment items and are applied to typical construction situations. **Credits:** 3.00

CE 52400 - Legal Aspects In Engineering Practice

Credit Hours: 3.00. Legal principles and landmark cases relevant to engineering. Subjects covered include contracts, torts, agency, real property, environmental and labor laws, expert testimony, arbitration, patents and copyrights, sureties and ethics. Three evenings may be required. **Credits:** 3.00

CE 52501 - Built Environment Modeling

Credit Hours: 3.00. A study of computational tools to model, analyze, and manage the built environment, specifically, the civil infrastructure from a life cycle and system's perspective. Such computational tools include geospatial technologies, engineering sensing technologies, engineering database, building information modeling, object-oriented modeling, and spatial analytics. **Credits:** 3.00

CE 52700 - Analytical Methods For The Design Of Construction Operations Sem. 1

Credit Hours: 3.00. Provides an investigation of quantitative methods used for the design and analysis of construction operations to maximize productivity and minimize resource idleness. Includes discussions on queuing theory, line of balance techniques, linear programming, and simulation. Comprehensive group projects involve modeling and analyzing actual construction operations. **Credits:** 3.00

CE 52900 - Smart Construction

Credit Hours: 3.00. Technologies are embedded throughout all communities, and the boundaries between humans and technologies are shrinking considerably. As a result, the construction industry is also changing rapidly. The questions are: Are we ready for this change? What skills are required to be better prepared as a future workforce? This course covers how these smart and advanced technologies are set to revolutionize the construction industry to achieve specific mission objectives (e.g., improving safety, quality, and productivity). This course will give students the opportunity to learn conceptual and practical foundations for designing and developing systems while also learning to harness technology to ensure a new generation of technologies would include humans in the loop. This course will be project-based, and students learn by actively engaging in various real-world case studies. Other topics include challenges in human-computer interaction, the internet of things, human behavior modeling, VR/AR/MR, wearable sensors, machine learning and artificial intelligence, trust in human-robot interaction, and ethics and fairness in the emerging smart technologies in the construction industry. This course follows Bloom's taxonomy to increase knowledge (cognitive domain), develop skills (psychomotor domain), or develop emotional aptitude (affective domain). The instructor will incorporate various techniques in each of the course concepts to facilitate higher-order thinking in their students by building up from lower-level cognitive skills. Each concept will be taught in five phases: 1) Knowledge (i.e., Lecture, podcasts, readings before class); 2) Understanding (i.e., presentations, peer review, discussion); 3) Application (i.e., case studies, problem-solving demonstration); 4) Analyzing and Evaluating (i.e., simulation, discussion); 5) Creating, Reflecting, and Debriefing (i.e., group presentations, case studies, discussion, reflection).**Credits:** 3.00

CE 53000 - Properties And Production Of Concrete

Credit Hours: 3.00. Basic properties of hydraulic cements and mineral aggregates and their interactions in concrete. Properties of plastic and hardened concrete. Modifications through admixtures. Production, handling, and placement problems. Specifications; quality control and acceptance testing; lightweight, heavyweight, and other special concretes. A one-day field trip is required. **Credits:** 3.00

CE 53101 - Nanotechnology For Civil And Environmental Applications

Credit Hours: 3.00. This course will introduce students to the field of nanotechnology with a special emphasis on nanomaterials synthesis, characterizations and their applications in civil and environmental engineering. The specific applications will include, but not limited to, tailoring mechanical property, durability, self-cleaning, self-sealing, self-sensing, energy harvesting and other multi-functionality. It integrates the fields of materials science, civil engineering and electrical engineering. The basic concepts will be discussed including nano-scale effect, process-structure-property relationship, nano- and micro-structure property characterizations, multi-functional materials, nano-device fabrication and their applications for energy harvesting, water infiltrations and environmental sensing. lab will be provided to students enrolled in the course to learn nano and micro-structure characterizations skills. **Credits:** 3.00

CE 53500 - Bituminous Materials And Mixtures

Credit Hours: 3.00. Consideration of major types of bituminous materials-asphalt cements, cutback asphalts, asphalt emulsions, and tars. Influence of chemical composition upon physical properties. Desirable aggregate characteristics for bituminous mixtures. Construction techniques. Current practices for determining optimum asphalt contents. Two one-day field trips are required. **Credits:** 3.00

CE 53600 - Non-destructive Testing And Sensing For Civil Infrastructures

Credit Hours: 3.00. This course will equip students with necessary fundamental knowledge related to the Non-Destructive Testing methods. The topics will be discussed including fundamental materials mechanical properties and linear fracture mechanics of materials, testing procedures of commonly used civil materials and structures. The content such as, elasticity, fracture mechanics, and wave propagation, will be covered. Various case studies will be discussed to help students understand and apply the knowledge to field inspection or monitoring of civil materials and structures.**Credits:** 3.00

CE 53800 - Experimental Methods In Construction Materials Research

Credit Hours: 3.00. This course will introduce the student to the fundamental aspects of the computer control of experimental equipment. Emphasis is placed on the difficulties of interfacing computers and instruments. Experimental techniques for measuring important properties of construction materials are discussed. For example, techniques involving the use of strain gages, optical measurements, and measurement of properties such as pore structure and surface area are considered. Emphasis is placed on the effects of experimental techniques on the resulting measurements. **Credits:** 3.00

CE 54000 - Open Channel Hydraulics

Credit Hours: 3.00. Energy and momentum principles, design of open channels for uniform and nonuniform flow, boundary layer and roughness effects, flow over spillways, energy dissipation, flow in channels of nonlinear alignment and nonprismatic section. **Credits:** 3.00

CE 54200 - Hydrology

Credit Hours: 3.00. Meteorology; precipitation; stream flow, evaporation, and transpiration; subsurface flows, well hydraulics; runoff relations and hydrographs; elements of stream flow routing, frequency and duration studies; extreme values statistics applied to flood and drought forecasting; application of hydrologic techniques. **Credits:** 3.00

CE 54300 - Coastal Engineering

Credit Hours: 3.00. An introduction to coastal engineering with emphasis on the interaction between oceanic dynamic processes (waves, currents, and tides) and coastal regions (beaches, harbors, structures, and estuaries) and on the engineering approaches necessary to prevent adverse effects caused by this interaction. **Credits:** 3.00

CE 54400 - Subsurface Hydrology

Credit Hours: 3.00. Basic principles of fluid flow in saturated and unsaturated materials. Darcy's law, well hydraulics, determination of hydraulic properties of aquifers. Infiltration theory. Discussions of artificial recharge, land subsidence, saltwater intrusion, ground water quality and contamination. **Credits:** 3.00

CE 54500 - Sediment Transport Engineering

Credit Hours: 3.00. Sediment properties and the mechanics of sediment transport. Threshold of movement. Riverbed load and suspended load theories. Regime theory and stable channel design. River diversion problems. Erosion. Geomorphologic and water quality aspects. **Credits:** 3.00

CE 54700 - Transport Processes In Surface Waters

Credit Hours: 3.00. Four main topics are covered: (1) density-stratified two-layer systems in lakes and channels, with applications to mixed-layer growth, oil-spill containment, salinity intrusions, (2) advection-diffusion modeling in channels, including analytical solutions to steady and unsteady, one- and two-dimensional problems, (3) mechanisms of diffusional transport, including turbulence in channels and longitudinal shear dispersion, and (4) near-field analysis of discharges, including similarity analyses of jets and plumes. **Credits:** 3.00

CE 54900 - Computational Watershed Hydrology

Credit Hours: 3.00. Use of professional computer programs for the calculation of the runoff from complex basins. Generation of unit hydrographs. Calculation of losses, channel and reservoir routing, parameter optimization, and application of Kinematic wave technique to urban catchments. Offered in alternate years. **Credits:** 3.00

CE 55000 - Physico-Chemical Processes In Environmental Engineering I

Credit Hours: 3.00. This is the first of a two-course sequence and covers physico-chemical processes as applied in water and wastewater treatment. Topics include: reactor theory, mixing, gravity separation, centrifugation, adsorption, ion exchange, disinfection kinetics, acid/base chemistry, neutralization, precipitation, and corrosion. **Credits:** 3.00

CE 55201 - Environmental Biotechnology

Credit Hours: 3.00. This course focuses on fundamental of molecular biology and biotechnology for environmental applications. The major topics include activated sludge processes, stoichiometry, bioenergetics, anaerobic digestion, biological nitrogen and phosphorus removal, molecular microbiology tools, biofouling, antibiotic resistance, viruses and biofuels. **Credits:** 3.00

CE 55401 - Water Chemistry For Environmental And Ecological Engineering

Credit Hours: 3.00. Principles of chemistry applied to the analysis and distribution of the chemical composition of natural waters and engineered water systems. Course topics include acid/base, complexation, precipitation/dissolution, sorption and redox reactions in the context of environmental and ecological engineering. Case studies focus on water chemistry in research and practice, such as lead in drinking water, recovery of valuable products from wastewater, chemistry of engineered carbon dioxide capture, and engineered treatment of surface waters. Case studies vary each year.**Credits:** 3.00

CE 55700 - Air Quality Management

Credit Hours: 3.00. Discussion of fugitive, mobile, and point sources of air pollution with attendant effects on materials, plants, and humans. Development and status of state and federal regulations with emphasis on the development and use of mathematical dispersion models including meteorological fundamentals and atmospheric transport. Discussion of concepts for ambient air quality control strategies including urban planning and transportation considerations. **Credits:** 3.00

CE 55900 - Water Quality Modeling

Credit Hours: 3.00. Mathematical modeling of chemical and biological processes occurring in natural aquatic systems. Classical oxygen demand and nutrient processes are modeled, as well as chemical specific transport and fate processes. Emphasis is placed on deterministic models, mass balance approaches, and chemical specific coefficients or parameters. **Credits:** 3.00

CE 56000 - Public Mass Transportation

Credit Hours: 3.00. Public mass transportation system technologies, design, operation, and planning including vehicle characteristics, bus transit, light rail and rail rapid transit, schedules and networks, capacity, passenger characteristics, and paratransit. **Credits:** 3.00

CE 56100 - Transportation Systems Evaluation

Credit Hours: 3.00. Concepts and principles of transportation economic analysis, transportation costs and benefits, user and nonuser consequences, needs studies, finance and taxation, methods of evaluation of plans and projects, cost-effectiveness, environmental impact assessment. **Credits:** 3.00

CE 56200 - Geometric Design Of Highways

Credit Hours: 3.00. Development and applications of concepts of geometric design for rural and urban highways. Design controls and criteria, elements of design including sight distance and horizontal and vertical alignment, cross-section elements,

highway types, intersection design elements, types of interchanges and interchange design elements, grade separations and clearance. **Credits:** 3.00

CE 56201 - Vehicular Cyber-Physical Systems

Credit Hours: 3.00. Cyber-physical systems (CPS) are a new frontier for computational systems that transform the way people interact with engineered systems, which benefit applications in fields like transportation, aerospace, manufacturing, and health care. This course introduces students to the theoretical and practical foundations of CPS, with an emphasis on their usage in connected and automated vehicles (CAV).**Credits:** 3.00

CE 56300 - Airport Design

Credit Hours: 3.00. Airport design requirements derived from using aircraft design parameters and operational characteristics; airport configuration; runway length and orientation; geometric design of taxiways, exits, and runways; apron design; airspace obstacles; effects of air traffic control; lighting and marking; asphalt pavement and rigid concrete pavement design; pavement overlays; evaluation of runway pavement; drainage; earthwork; and project management. A field trip is required. **Credits:** 3.00

CE 56401 - Data Science For Smart Cities

Credit Hours: 3.00. The availability of low-cost and ubiquitous sensors in city infrastructure provides high granular data at unprecedented spatiotemporal scales. "Smart Cities" is a concept to utilize this data to provide a healthy, happy and sustainable urban ecosystem by integrating the information and communication technology, Internet of things, and citizen participation to effectively manage and utilize city's infrastructure and services. 'Data science' is an interdisciplinary field of scientific methods, processes, algorithms, and systems to extract knowledge from data in various forms. This course will introduce techniques that will allow the analysis, inference, and prediction of large-scale data (e.g., GPS trajectories, individual social networks, etc.) that are present in urban networks. The course will focus both on the methods and their application to smart city problems. Python will be used to demonstrate the application of each method on datasets available to the instructor. Examples of applications that will be discussed as an example of applications of data science for smart city applications include: ridesharing platforms, energy modeling, smart and energy-efficient buildings, evacuation modeling, decision-making during extreme events, and urban resilience.**Credits:** 3.00

CE 56500 - Traffic Engineering: Operations And Controls

Credit Hours: 3.00. Traffic laws and ordinances; design and application of signs, markings, and signals; timing of isolated and interconnected signals; speed regulation; one-way streets; pedestrian, bicycle, and mass transit considerations; traffic engineering administration. **Credits:** 3.00

CE 56600 - Transportation Planning

Credit Hours: 3.00. Fundamentals of transportation planning. Historical development and current status of techniques used in travel demand forecasting: trip generation, trip distribution, mode choice, traffic assignment. Data collection and use of surveys. Applications to passenger and freight movement in urban and statewide contexts. Implications for policy formulation and analysis. **Credits:** 3.00

CE 56601 - Network Models For Connected And Autonomous Vehicles

Credit Hours: 3.00. This course provides an introduction to mathematical foundations of the analysis of transportation networks. The course will be divided into two main sections. Section 1 will introduce the basic foundations of network routing problems including user equilibrium (selfish routing) and system optimal games on networks. Various optimization-based formulations, algorithms and extensions will be discussed. A particular emphasis will be on devising efficient algorithms and computation on city networks. Students will be expected to know how to design efficient algorithms for network analysis and implement them on

various datasets. The second half of the course will tailor the network models learned in the first half to understanding the impacts of connected and autonomous vehicles (CAVs). This will be done by taking specific example problems such as autonomous intersection control, parking design, network design for CAVs, etc. Recent research papers will form the basis for developing these models. Extensive use of intuitive arguments, counterintuitive phenomenon (paradoxes) and network structures will be utilized to illustrate many situations graphically. In addition, computing the solutions efficiently using various network algorithms will be discussed. The course is research based and students in addition to learning the concepts will extend the concepts to a research project to be finished within the semester.**Credits:** 3.00

CE 56700 - Highway Traffic And Safety Analysis

Credit Hours: 3.00. Traffic and safety studies including: traffic and safety impact studies, control and geometry improvements, hazard and countermeasures identification, predicting safety benefits, before-and-after studies; data collection and computer tools for highway traffic and safety evaluation. **Credits:** 3.00

CE 56800 - Highway Infrastructure Management Systems

Credit Hours: 3.00. Processes and techniques of managing rehabilitation and maintenance of highway infrastructure facilities including roads and bridges. Three management systems are examined: pavement, bridge, and roadway maintenance. The primary emphasis is on data collection, life cycle cost analysis, priority setting and optimization, program development strategies, and institutional issues. **Credits:** 3.00

CE 56901 - Smart Logistics

Credit Hours: 3.00. This course provides a foundation of analytical tools, methods and applications of logistics systems in the context of planning and operations of integrated supply chain systems. The material is useful for students interested in managing supply chain systems providing a background on where and how specific methods can be used for improving overall performance of the supply chain. The course is broadly divided into two parts: (1) Science of Logistics which provides an introduction to unique characteristics of supply chain management; demand forecasting, planning and management; inventory control and planning; operational transportation issues such as vehicle routing and supply chain contracts and network design. (2) Business of Logistics which discusses the applications of the science to real-world logistics systems. Real-world case studies from past problems will be the basis for discussion and will include the nature of costs in supply chain networks, operational issues, vehicle routing problems, interactions of carriers and shippers using auctions and yield management. The course will use intuitive arguments and mathematical optimization tools will be used to illustrate many situations in a rigorous fashion.**Credits:** 3.00

CE 57000 - Advanced Structural Mechanics

Credit Hours: 3.00. Studies of stress and strain, failure theories, and yield criteria; flexure and torsion theories for solid and thin-walled members; and energy methods. **Credits:** 3.00

CE 57100 - Earthquake Engineering

Credit Hours: 3.00. The objectives of the course are to: (1) expose the fundamentals of structural design in earthquake regions; (2) explain the functions of linear, nonlinear, and limit analyses with respect to design; (3) describe the complex relationships between ground motion models and structural response models in the linear and nonlinear response ranges; and (4) provide the students perspectives about the behavior of building structures in the earthquake environment. **Credits:** 3.00

CE 57200 - Prestressed Concrete Design

Credit Hours: 3.00. Behavior and design of prestressed concrete structures, prestress losses, composite construction, flexure and shear design, deflections, and special topics. **Credits:** 3.00

CE 57300 - Structural Dynamics

Credit Hours: 3.00. Analysis of structural members and systems subject to dynamic loads such as wind and earthquake loads; basic theory for single-degree-of-freedom and multi-degree-of-freedom analytical models of civil engineering structures; free vibration, harmonic and transient excitation, foundation motion, resonance spectrum, Lagrange's equation, modal analysis, lumped parameter methods, computer methods. **Credits:** 3.00

CE 57500 - Experimental Methods In Structural Engineering

Credit Hours: 3.00. Theory, methods, and techniques for experimental studies of structural members and systems. Measurements fundamentals; transducers for measuring strain, displacements, force and torque, pressure, and temperature. Physical modeling principles: similitude, materials and their properties, and loading systems for application to studies of elastic and inelastic models. Case studies. Individual project required of each student. Permission of instructor required. **Credits:** 3.00

CE 57600 - Advanced Reinforced Concrete Design

Credit Hours: 3.00. Design and behavior of columns, two-way slab and slab-beam floor systems, and beam-column joints; strut-and-tie models. **Credits:** 3.00

CE 57900 - Structural Stability

Credit Hours: 3.00. Bending of structural members subjected to axial and lateral loads; buckling of compression members and frames in elastic and inelastic ranges, local buckling, lateral buckling of beams, design criteria. **Credits:** 3.00

CE 57910 - Foundations Analysis And Design

Credit Hours: 3.00. Exploration and engineering evaluation of subsoil and groundwater conditions for selection and design of foundations for structures and earth masses. Permission of instructor required.**Credits:** 3.00

CE 58000 - Advanced Geotechnical Engineering

Credit Hours: 3.00. Advanced treatment of topics in geotechnical engineering, including the engineering response to loading, soil properties, earth pressures, shear strength, soil compaction and fabric, permeability, and consolidation and settlement analysis. **Credits:** 3.00

CE 58300 - Slopes And Retaining Structures

Credit Hours: 3.00. Selected topics in soil response and technology needed in conventional geotechnical analysis and design; shearing behavior in clays; subsurface investigation; lateral earth pressures, retaining walls, and sheet pile walls; stability of slopes. **Credits:** 3.00

CE 58400 - Foundation Analysis And Design

Credit Hours: 3.00. Design of shallow foundations (isolated, combined, and strip footings), with specific attention to issues of mutual concern and interest to geotechnical and structural engineers. Review of factors that serve as the basis for selection of foundation type. Interpretation of subsurface exploration results. Settlement analyses and limit bearing capacity analyses. Communications and interaction between geotechnical and structural engineers. Structure and contents of a geotechnical report. Detailed treatment of geotechnical/structural design criteria and methodologies for various types of shallow and deep foundations. **Credits:** 3.00

CE 58700 - Soil Dynamics

Credit Hours: 3.00. Vibration of elementary systems, foundation vibratory theory, foundation design for vibratory loads, foundation isolation, wave propagation theory, response of soils to dynamic loading, dynamic soil properties, dynamic behavior of waste materials, field and laboratory methods for evaluation of dynamic soil properties, liquefaction of sands, vibratory compaction of granular materials. **Credits:** 3.00

CE 59100 - Advanced Structural Steel Design

Credit Hours: 3.00. Design and behavior of plate girders; design of composite beam and column members; behavior and design of bolted and welded connections, including moment-resistant connections, seated connections, and gusset-plate connections. **Credits:** 3.00

CE 59300 - Environmental Geotechnology

Credit Hours: 3.00. Review of regulations related to hazardous and solid waste disposal, including hazardous waste characterization. Discussion of contaminant transport in porous media and relationship with remediation technologies for hazardous waste sites. Discussions of soil properties relative to waste containment systems, soil stability, and permeability. **Credits:** 3.00

CE 59400 - Transportation Systems Analysis

Credit Hours: 3.00. Identifies concepts fundamental to the planning, design, operation, and management of transportation systems. Aims to impart a systems perspective to transportation problems. Incorporates concepts from economics, engineering, operations research, management, psychology, and public policy analysis. Topics include supply-demand microeconomic framework, analysis of transportation demand, system performance, network equilibrium, and associated case studies. **Credits:** 3.00

CE 59500 - Finite Elements In Elasticity

Credit Hours: 3.00. Fundamentals of theory of elasticity; variational principles; one-, two-, and three-dimensional elasticity finite elements; interpolation methods; numerical integration; convergence criteria; stress interpretation. **Credits:** 3.00

CE 59601 - Entrepreneurship And Business Strategy In Engineering

Credit Hours: 3.00. This course offers students the opportunity to learn and apply the core skills required to build and grow engineering- and technology-based businesses through lecture, case discussions, and weekly activities tied to a semester-long team project. Course content includes market analysis techniques to link technology attributes to opportunity and vice versa, combinatorial business design and planning methods, strategic innovation theories, competitive analysis, methods of emergent strategy and risk mitigation, as well as examination of team building, firm influence and navigation, and organizational design principles. Emphasis throughout is placed on the implications of research and development uncertainty, long-lifecycle economics, and the management of subcontracts and multi-disciplinary teams often encountered when developing and delivering complex engineering outputs. Case studies are used to contrast the challenges faced when creating new businesses (entrepreneurial) with those encountered in attempts to grow an existing enterprise (intrapreneurial). Coursework and project activities also facilitate development of business acumen, and skill building in conceptual thinking, synthesis, and persuasive communication. This course is particularly relevant for engineering students intending to progress into managerial roles in technology or R&D driven organizations. This course can be counted toward the College of Engineering Minor in Innovation and Transformational Change and the Burton D. Morgan Center for Entrepreneurship (BDMCE) Certificate in Entrepreneurship and Innovation. **Credits:** 3.00

CE 59700 - Civil Engineering Projects

Credit Hours: 0.00 to 18.00. Hours and credits to be arranged. Permission of instructor required. **Credits:** 0.00 to 18.00

CE 59800 - Graduate Professional Internship

Credit Hours: 0.00. Professional experience in Civil Engineering. This internship experience is intended to complement the student's academic coursework and help prepare the student for a career as a practicing engineer. Program coordinated by school with cooperating employers. Must complete one academic year in Civil Engineering. A written report is required. (May be repeated but may not be taken in successive semesters.) Permission of instructor required. **Credits:** 0.00

CE 59801 - Breakthrough Thinking For Complex Challenges

Credit Hours: 3.00. This course helps students learn and effectively employ high-impact design principles and structured problem solving methods to address complex multi-stakeholder socio-technical challenges. Case discussions of historical and contemporary high impact solutions to complex challenges are used to introduce techniques to frame problems, structure ambiguity, intentionally design non-incremental solutions, and communicate, trial, and iterate solutions to drive adoption and multifaceted sustainability. Techniques are drawn from multiple schools of thought such as business, design, engineering, and the social sciences. Over the course of the term, multidisciplinary student teams directly apply cumulative learning to address a real-world complex societal challenge in close collaboration with a partner organization in an experiential learning format. The course can be counted toward the College of Engineering Minor in Innovation and Transformational Change and the Burton D. Morgan Center for Entrepreneurship (BDMCE) Certificate in Entrepreneurship and Innovation. **Credits:** 3.00

CE 61400 - Statistical And Econometric Methods I

Credit Hours: 3.00. Basic and advanced statistical and econometric methods as applied to engineering-related problems. Introduction to ordinary least squares regression, count-data models including Poisson and Negative binomial regressions and their extensions, simultaneous equations models, multinomial logit models, ordered probability models, joint discrete/continuous models, and hazard-based duration models. Prerequisites: STAT 51100. **Credits:** 3.00

CE 63100 - Advanced Concrete And Aggregates

Credit Hours: 3.00. Microstructure of concrete. Physicochemical properties of cements and their hydration. Nature of hardened cement paste. Properties of aggregates. Workability, strength, shrinkage, creep, and fracture of concrete. Durability, freezing and thawing, air-entertainment, reactions of aggregates, chemical attack. Influence of microstructure on engineering properties of concrete. Prerequisite: CE 53000. **Credits:** 3.00

CE 65000 - Photochemical Reactors: Theory, Methods, And Applications Of Ultraviolet Radiation

Credit Hours: 3.00. This course provides comprehensive coverage of the foundational principles of photochemistry and fundamental photochemical reactor theory. Contemporary analytical and numerical methods used to simulate and design photochemical reactors are also presented, along with detailed presentations of several common and emerging applications of these devices. Prerequisite: CE 55000 or graduate status.**Credits:** 3.00

CE 66100 - Algorithms In Transportation

Credit Hours: 3.00. Modeling and analysis of transportation network problems through the design, analysis, and implementation of algorithms. Emphasis on the use of quantitative techniques of operations research to model system performance. Covers fundamental data structures, complexity analysis, memory management, recursive programs, application of graph theory and

network analysis to transportation problems, analytical formulations and solution algorithms for traffic assignment problems, and dynamic traffic assignment. Prerequisite: CE 59600 or IE 50100. **Credits:** 3.00

CE 67100 - Behavior Of Metal Structures

Credit Hours: 3.00. Study of the behavior of metal structural components and metal structural systems. The performance of civil engineering type metal structures in various loading environments is examined, and correlations between behavioral characteristics and various design specification requirements are reviewed. Primary emphasis is placed on the behavior of steel structures, although other metal systems also are discussed. Specific topics include material behavior, manufacturing processes, fatigue and fracture, bolting and welding procedures, and repair and retrofit techniques. Course material is augmented with a number of case studies. Prerequisite: CE 59100. **Credits:** 3.00

CE 67200 - Advanced Topics In Structural Engineering

Credit Hours: 1.00 to 3.00. A series of minicourses on special topics offered as CE 67000, CE 67200, etc. These special topic minicourses provide an opportunity for introducing students to topics of contemporary importance or special interest which fall outside the scope of the regular structural courses. Information about current offerings may be obtained from the schedule of classes or the structural engineering. **Credits:** 1.00 to 3.00

CE 67401 - Bridge Engineering

Credit Hours: 3.00. This course reviews a number of fundamental topics related to the structural design of highway bridges. Some of the key features include bridge types, aesthetics, structural analysis methods, vehicle load distribution, deck design and detailing, steel girder design, concrete girder design, integral abutment design, bearings, and construction. Concurrent prerequisites: CE 57200 and CE 59100. **Credits:** 3.00

CE 67500 - Finite Element Analysis

Credit Hours: 3.00. Theoretical basis of the finite element method; elements for use in the solution of two- and three-dimensional stress problems, plate-bending problems and shell problems; static and dynamic loadings; vibration and stability problems; geometrical or material nonlinearities; flow problems. Prerequisite: CE 57700 or 57800. **Credits:** 3.00

CE 67600 - Behavior Of Reinforced Concrete Members

Credit Hours: 3.00. Studies of the behavior and strength of reinforced concrete members, behavior of beam-columns, deflections, shear, bond, and cracking. Review of research and pertinent literature. Emphasis is placed on the background, use, and limitations of present design specifications. Prerequisite: CE 57600. **Credits:** 3.00

CE 68100 - Engineering Properties Of Soils

Credit Hours: 3.00. Engineering properties of soils, including compaction phenomena, with emphasis on strength and compressibility. Experiments to examine the nature and validity of strength and compressibility theories and their application to stability and settlement analysis. Measures of soil fabric; behavior of waste/marginal materials. Prerequisite: CE 48300. **Credits:** 3.00

CE 68200 - Ground Water And Seepage

Credit Hours: 3.00. Hydromechanics of confined and unconfined flow of water through soils, potential theory, conformal mapping transient flow. Applications to design of earth dams. Prerequisite: CE 483000. **Credits:** 3.00

CE 68400 - Geological Engineering

Credit Hours: 3.00. Principles describing the mechanical response of geomaterials subjected to disturbance by man. Relation between geology and engineering. Weathering and hydrothermal alteration of rock masses. Weathered rocks, problem soils, and transitional materials. Soluble rock terrain (karst). Applied geomorphology. Civil engineering design factors and case histories that relate to the behavior of rocks and sediments. Characterization of geomaterials behavior, exploration and measurement of their engineering properties. The focus of the course is on theoretical and practical solution of engineering problems. Prerequisite: CE 483000. **Credits:** 3.00

CE 68500 - Rock Mechanics

Credit Hours: 3.00. Mechanical properties governing rock behavior, from intact rock to fractured rock masses. Laboratory experiments and field tests. Failure criteria. Linear Elastic Fracture Mechanics. Rock mass deformability. Analytical and empirical approaches for the design and construction of civil engineering structures in rock masses. Slope stability. Bearing capacity of shallow and deep foundations. Prerequisite: CE 48300. **Credits:** 3.00

CE 68600 - Underground Construction

Credit Hours: 3.00. Planning, analysis, design, and construction of underground structures in soft ground and rock. Ground structure interaction. Static and seismic stresses on tunnel support. Relative stiffness method. Ground deformations. Construction methods, types of support, and their effects on the surrounding ground. The focus of the course is on the understanding of the interaction between ground and structure. Prerequisite: CE 48300. **Credits:** 3.00

CE 68901 - Plasticity Theory

Credit Hours: 3.00. The course covers stress analysis, strains analysis, elastic and inelastic constitutive relations, with emphasis on plasticity, and the solution of plastic boundary-value problems for a wide range of materials, including metals, soils and alloys of various types. Specific topics covered by the course include: tensors, stress analysis, strain analysis, laws of thermodynamics, basic concepts from elasticity, viscoplasticity as an extension of viscoelastic concepts, classical plasticity, principle of maximum plastic dissipation, Drucker's inequality, yield function and yield surface, flow rule, hardening rule, classical models (Tresca, Von Mises, Mohr-Coulomb, Drucker-Prager), bounding-surface plasticity, thermodynamics and constitutive models, causes of plasticity at the microstructural level, noncoaxial plasticity, limit analysis, method of characteristics (slipline method) and cavity expansion analysis. Prerequisite: AAE 55300 or ME 61200. **Credits:** 3.00

CE 69100 - Civil Engineering Seminar

Credit Hours: 0.00. An interdisciplinary seminar which provides a forum for invited speakers and staff to discuss new developments in practice and current research in civil engineering. **Credits:** 0.00

CE 69500 - Probabilistic Methods In Geotechnical Engineering

Credit Hours: 3.00. Examines the nature of particulate media and their description and characteristics. Compares deterministic and probabilistic approaches to the action and reaction of structures of, on, or in soil when subjected to loadings. Considers uncertainties in material parameters and their effect on designs. Stability is assessed in terms of reliability as well as customary factors of safety. Prerequisite: CE 58000. **Credits:** 3.00

CE 69700 - Civil Engineering Projects

Credit Hours: 0.00 to 18.00. Topics vary. Permission of instructor required. **Credits:** 0.00 to 18.00

CE 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

CE 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Classics

CLCS 101CN - Ancient Greek Culture

Credit Hours: 3.00. This course is a historical and topical introduction to ancient Greek culture. From prehistorical to Hellenistic cultures, CLAS C1010 surveys the geography, economics, politics, philosophy, religion, society, technology, and daily lives of ancient Greeks by studying representative works of art, architecture, and literature.**Credits:** 3.00

CLCS 2350N - Classical Mythology

Credit Hours: 3.00. An introduction to Greek and Roman myths, legends, and tales, especially those which have an important place in the Western cultural tradition. Approved by Arts and Sciences for use in fulfilling the cultural studies requirement.**Credits:** 3.00

CLCS 18100 - Classical World Civilizations

Credit Hours: 3.00. Course introduces students to "Classical" civilizations on three continents (Europe, Africa, and Asia) demonstrably interconnected by an ancient world system. Course focuses on essential themes of past civilization: religion, philosophy, surviving texts, gender relations, urbanism, technology, social and political formations. **Credits:** 3.00

CLCS 22000 - Topics In Classical Literature

Credit Hours: 3.00. Selected topics in Greek and Roman literature. All readings in English translation. **Credits:** 3.00

CLCS 23010 - Survey Of Greek Literature In Translation

Credit Hours: 3.00. Introduction to Ancient Greek literature from homer to Plato. All readings in English. **Credits:** 3.00

CLCS 23100 - Survey Of Latin Literature

Credit Hours: 3.00. Highlights of literature written in Ancient Rome at times of political, social, and intellectual turbulence. Reading (all in English) includes Vergil's Aeneid, as well as selections from other influential Latin texts. **Credits:** 3.00

CLCS 23200 - Classical Roots Of English Words

Credit Hours: 3.00. This is an introduction to English etymology with emphasis on building vocabulary. Students will learn English derivatives from both classical Greek and Latin. All texts to be read in English. **Credits:** 3.00

CLCS 23300 - Comparative Mythology

Credit Hours: 3.00. Comparative study of the myths of major ancient cultures, with emphasis on shared typological features. **Credits:** 3.00

CLCS 23400 - Medical And Scientific Terminology From Greek And Latin Roots

Credit Hours: 3.00. Ninety to ninety-five percent of scientific technical vocabulary and medical terminology come from Latin and Greek roots and affixes. This course will enable students in scientific and medical disciplines to develop a foundational core of Greek and Latin roots and affixes from which they will be able to decipher and easily commit to memory the core terminology in the various sciences and medicine. **Credits:** 3.00

CLCS 23500 - Introduction To Classical Mythology

Credit Hours: 3.00. Study of the myths of western antiquity, as represented in ancient Greek and Latin texts and images. **Credits:** 3.00

CLCS 23600 - Ancient World Onscreen

Credit Hours: 3.00. How film represents ancient Mediterranean civilizations and retells ancient myths; how cinematic renderings of ancient history shape views of the past and how these are affected by contemporary sensibilities. No knowledge of Greek or Latin required. **Credits:** 3.00

CLCS 23700 - Gender And Sexuality In Greek And Roman Antiquity

Credit Hours: 3.00. How identities based on gender, sexual behavior and sexual desire, and socio-economic status are established in ancient Greece and Rome. Exploration of why these ancient views of gender and sexuality remain of continuing importance in the 21st century. All readings in English. **Credits:** 3.00

CLCS 23800 - The Tragic Vision

Credit Hours: 3.00. Greek and Roman tragedy from their beginnings until today. Readings in English from representative authors such as Aeschylus, Sophocles, Euripides, and Seneca; later receptions of ancient tragedy in drama and other media. Course may include performance, theories of comedy and tragedy, or recent and current expressions of the tragic in film and other media. **Credits:** 3.00

CLCS 23900 - The Comic Vision

Credit Hours: 3.00. This course investigates Greek and Roman comedy from their beginnings until today. The course will feature readings in English from representative authors such as Aristophanes, Menander, Plautus, and Terence, as well as later receptions of ancient comedy in drama and other media. This course may include performance, theories of comedy and tragedy, theories of humor, or recent and current expressions of the comic in film and other media. **Credits:** 3.00

CLCS 28000 - Topics In Classical Civilization

Credit Hours: 3.00. Selected topics in Ancient Civilization. **Credits:** 3.00

CLCS 33700 - The Ancient Epic

Credit Hours: 3.00. Study of the epic in four ancient cultures, with emphasis on its structure, nature, and social functions. Readings may include Gilgamesh, Iliad, Odyssey, Aeneid, Beowulf, Tain, Mahabharata, and others. **Credits:** 3.00

CLCS 38000 - Alexander The Great And Hellenistic World

Credit Hours: 3.00. Course examines the career of Alexander the Great and the rise of Macedonia in the Hellenistic Era. Topics include the emergence of Macedonia under Philip II; the achievements of Alexander the Great; and the wars of succession following his demise. **Credits:** 3.00

CLCS 38100 - Julius Caesar: Statesman, Soldier, Citizen

Credit Hours: 3.00. Course Examines the career of Julius Caesar by focusing on events from Caesar's birth (100 BCE) through his assassination in 44 BCE. Course places Caesar's complex personality within the context of political, military, economic, social, and cultural upheaval during the Late Roman Republic. **Credits:** 3.00

CLCS 38300 - The Roman Empire

Credit Hours: 3.00. Course examines developments from the Augustan Settlement to the end of the Roman Empire (27 BCE - 476 CE), along with aspects of religious, social, sexual and material culture throughout the Mediterranean at that time. **Credits:** 3.00

CLCS 38400 - Ancient Western Medicine

Credit Hours: 3.00. Historical and cultural study of Western medicine, from Mesopotamian origins to the late Roman Empire, based on written texts and archaeological evidence. Addresses the development of rational medical frameworks against the background traditional beliefs about illness as a sign of demonic possession, and charts the growth of the medical profession from individual avocation to institutional practice. **Credits:** 3.00

CLCS 38500 - Science, Medicine And Magic In The Ancient West

Credit Hours: 3.00. Study of the development of the idea of rationality in the West through examination of the evolution of Greek and Roman sciences, with emphasis on medicine and astronomy. **Credits:** 3.00

CLCS 38600 - Ancient Greek Religion

Credit Hours: 3.00. Study of the religious beliefs and practices of ancient Greece, based on written, artistic, and archaeological evidence of their forms and functions. **Credits:** 3.00

CLCS 38700 - Roman Religion

Credit Hours: 3.00. Study of the religious beliefs and practices of ancient Rome, based on written, artistic, and archaeological evidence of their forms and functions. **Credits:** 3.00

CLCS 48000 - Potters And Society In Antiquity

Credit Hours: 3.00. Course covers the range of eastern Mediterranean ceramics encountered in Rough Cilicia Archaeological Survey Project from the Bronze Age to the Later Roman Empire. Course also explores strategies employed by archaeologists and historians to exploit ceramics as research materials. **Credits:** 3.00

CLCS 48100 - Culture And Society In The Age Of Pericles

Credit Hours: 3.00. Course explores interrelationships between the emergence of Greek democracy and the cultural, political, social, and economic rise of Athens in the fifth century BCE. More broadly, course surveys history of the Greek world from the Late Bronze Age to 362 BCE. **Credits:** 3.00

CLCS 48300 - Republican Rome

Credit Hours: 3.00. Course examines the military, political, economic, and social developments that enabled the Roman people to expand from an Italian city-state to a trans-Mediterranean empire, and the consequences that initiated the decline and transition in their republican form of government. **Credits:** 3.00

CLCS 49900 - Special Topics In Classics

Credit Hours: 1.00 to 4.00. Special Topics in Classics. Permission of instructor required. **Credits:** 1.00 to 4.00

CLCS 59000 - Directed Reading In Classics

Credit Hours: 1.00 to 4.00. Directed readings in Classics. Permission of instructor required. **Credits:** 1.00 to 4.00

CLCS 59300 - Special Topics In Classical Literature

Credit Hours: 1.00 to 4.00. Special topics in Classical Literature. Permission of instructor required. **Credits:** 1.00 to 4.00

Clinical Pharmacy

CLPH 43500 - Pediatric Pharmacotherapy

Credit Hours: 2.00. This elective course will focus on the pharmacotherapeutics and pathophysiology of the more common disorders that apply to the pediatric population. The purpose of the course is to discuss the relevant differences between the adult and pediatric population in regards to the diagnosis, treatment options, desired therapeutic outcomes and therapeutic drug monitoring parameters. Instruction will be provided through a combination of lectures, case discussions, homework assignments, and group presentations. **Credits:** 2.00

CLPH 44800 - Therapeutic Case Studies

Credit Hours: 2.00. This course is intended to complement instruction of other courses in the second professional year of the Doctor of Pharmacy curriculum and to review many of the topics previously addressed in the Integrated Pharmacotherapy courses and Professional Program Laboratories. It is hoped that students who elect this course will enhance their development of a strong foundation of knowledge, clinical skills and abilities in order to meet the school's professional outcome abilities. Team-based problem-solving methodology will be utilized to discuss patient cases related to topics covered in the IP sequence. **Credits:** 2.00

CLPH 44900 - Introduction To Psychiatric Pharmacy Practice

Credit Hours: 1.00. This course that provides an overview of psychiatric pharmacy practice, introduction to stigma and diversity issues in mental illness, and disease state overviews in a lecture format. In one class period, the students are able to interact with 4th year pharmacy students and/or pharmacy residents who have worked or are working in the area of psychiatric pharmacy. Four of the class periods also provide live presentations and interactions with persons living with severe mental illness and mental health workers who work with them. Mental Health America of Tippecanoe County works with the instructor to schedule these

live presentations. Students are assessed for attendance and participation and also for a reflection written about each class period. **Credits:** 1.00

CLPH 45000 - Formulary Dossier Management

Credit Hours: 1.00. This course will focus on preparing students for competing in the annual Academy of Managed Care Pharmacy (AMCP) P&T Competition and is intended to give students a variety of experiences that will enhance their knowledge in analyzing complex therapeutic and pharmacoeconomic data, research and public presentation. The course offers an opportunity for students to engage in simulated formulary management by utilizing comparative studies andcost-effectiveness analysis to make real-life decisions on whether or not to add a drug to hospital or health plan formulary. Students will be paired into teams with each team consisting of 4 students. Each team will work independently to analyze the product dossier and prepare a monograph and presentation for the local and/or national competition. Course lectures will focus on information needed to accurately and adequately prepare students in completing the above noted tasks. Class participation is expected, and students will need to be able to engage in selfdirected learning outside of class to complete the project in a timely manner. All students are welcome. This course is not intended to focus on students from a specific professional year. **Credits:** 1.00

CLPH 45100 - Pharmacy Practical Training

Credit Hours: 1.00. Course allows students to gain practice-related employment experience in a pharmacy setting. Pre-approval of enrollment through ISS is required prior to employment experience. Permission of instructor required. **Credits:** 1.00

CLPH 45300 - Advanced Primary Literature Evaluation: A Focus On Therapeutic Issues

Credit Hours: 2.00. The purpose of this elective course is to enhance the primary literature evaluation skills of the student prior to clerkship rotations. The course is designed to meet the needs of students with an interest in pursuing post-graduate training programs to enhance their ability to discuss the medical literature. Instruction is provided through a combination of lectures and class discussions of recently published literature articles with a cardiovascular focus. **Credits:** 2.00

CLPH 45400 - Advanced Practice In Psychiatric Pharmacy

Credit Hours: 2.00. The purpose of this course is to provide the student with knowledge and insight regarding the use of medications in persons with mental illness. Instruction will be provided in the following areas (but not limited to): (1) psychiatric disease states; (2) psychiatric medications - usual dosing, adverse effects, drug interactions; (3) clinical use of psychiatric medications in psychiatric pharmacy practice; (4) useful and appropriate monitoring parameters; (5) the interaction of medical illness in the treatment of psychiatric disorders; (6) strategies to improve medication adherence and minimize adverse events; (7) utilization of recognized treatment guidelines in clinical care. Case-based learning will be utilized to emphasize important points in clinical use and monitoring of psychiatric medications and disorders. Permission of instructor required. **Credits:** 2.00

CLPH 45700 - Pharmaceutical Care In Developing Countries

Credit Hours: 2.00. This elective will emphasize the major disease states, rational drug selection, especially with a limited medication formulary, desired therapeutic outcomes, and the provision of complete pharmaceutical care to patients in developing countries. The impact of drug therapy on health care, economics, and quality of life for diverse populations will be emphasized. Students will prepare to provide care in a cross-cultural environment in which resources are limited. Instruction is provided through a combination of lectures, discussions, and presentations. Enrollment is limited to Doctor of Pharmacy students (068) DP-C status or by consent of course coordinator. **Credits:** 2.00

CLPH 45900 - International Advanced Pharmacy Practice Experience Preparation

Credit Hours: 1.00. This course is designed to help students who are participating in rotations based in London, Wales, Kenya or Colombia be prepared to practice upon arrival into your specified country. The course content will include intercultural learning, travel preparation and practice site knowledge. Permission of department and instructor permission required. **Credits:** 1.00

CLPH 49000 - Special Topics

Credit Hours: 1.00 to 3.00. An honors course to be used to relate to, and supplement, an existing course. Subject matter and method of approach individually directed by instructor. Permission of instructor required. **Credits:** 1.00 to 3.00

CLPH 63500 - Principles Of Pharmacokinetics And Pharmacodynamics

Credit Hours: 3.00. The goal of this is to provide students a comprehensive knowledge of concepts related to drug absorption, distribution, metabolism, excretion and action and the relationship to pharmacokinetics parameters such as bioavailability, clearance, volume of distribution, and half-life; and physiological and pharmacological factors affecting these parameters. At the end of the course, students are expected to communicate effectively, establish a basic understanding at a clinical utility skill level of fundamental PK and PD terminology and principles. Provide a working-knowledge level understanding of the mathematics of PK and PD. Clearly distinguish and characterize the use of PK/PD as tools in Research (Discovery), Drug Development (Characterize PK/PD), and Clinical Therapeutics (TDM, Drug Interactions). Provide participants with the basic skills of PK/PD providing an understanding of the scope, complexity and critical importance these disciplines to their use in Research, Drug Development, and Clinical Therapeutics. Permission of instructor required.**Credits:** 3.00

CLPH 65100 - Internship In Pharmacy Industry

Credit Hours: 0.00. The internship experience is a valuable opportunity for students to apply the procedures, theories, skills, and techniques learned in the graduate program to a professional work experience in the pharmaceutical industry or government agency. The internship is to be representative of the degree program and clinical work that provides students the opportunity to acquire invaluable work experience in the field outside of the academic setting. Permission of instructor required. **Credits:** 0.00

CLPH 65101 - Internship In Pharmaceutical Industry

Credit Hours: 1.00 to 3.00. The internship experience is a valuable opportunity for students to apply the procedures, theories, skills, and techniques learned in the graduate program to a professional work experience in the pharmaceutical industry or government agency. The internship is to be representative of the degree program and clinical work that provides students the opportunity to acquire invaluable work experience in the field outside of the academic setting. Permission of instructor required. **Credits:** 1.00 to 3.00

CLPH 69000 - Special Problems

Credit Hours: 1.00 to 3.00. Individual research topics pertaining to the practice of clinical pharmacy in institutions and the community. Permission of instructor required. **Credits:** 1.00 to 3.00

CLPH 69600 - Seminar In Pharmacy

Credit Hours: 1.00. Designed to provide the student with experience in the oral and written presentation of special topics of interest to clinical pharmacists and researchers. Discussion of current problems relating to the clinical practice of pharmacy. **Credits:** 1.00

Communication

COM 1140N - Fundamentals of Speech Communication

Credit Hours: 3.00. Theory and practice of public speaking; training in thought process necessary to organize speech content for informative and persuasive situations; application of language and delivery skills to specific audiences. A minimum of six speaking situations.**Credits:** 3.00

COM 10000 - Introduction To Communication Studies

Credit Hours: 1.00. This semester-long course will introduce students to many opportunities offered by the Brian Lamb School of Communication. Permission of department required. **Credits:** 1.00

COM 10200 - Introduction To Communication Theory

Credit Hours: 3.00. Overview of approaches treating communication as an individual, functional activity and as a social, structuring activity. Covers definitions and models of communication, core processes (interpretations, sending, receiving), structures (language, nonverbal behavior), and key contexts (personal, organizational, public). **Credits:** 3.00

COM 11400 - Fundamentals Of Speech Communication

Credit Hours: 3.00. A study of communication theories as applied to speech; practical communicative experiences ranging from interpersonal communication and small group process through problem identification and solution in discussion to informative and persuasive speaking in standard speaker-audience situations. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking**Credits:** 3.00

COM 20400 - Critical Perspectives On Communication

Credit Hours: 3.00. Introduction to critical thinking and writing about communication. Draws on humanistic and qualitative traditions to help students learn and apply critical approaches to understanding communication. **Credits:** 3.00

COM 21000 - Addressing Public Issues

Credit Hours: 3.00. Survey of argumentation and persuasion theories addressing contemporary public issues. Readings and discussions on cultural norms, audience reasoning, civic discourse, and constructing appeals addressing policies and practices. Preparation of appeals for public campaigns and social movements. **Credits:** 3.00

COM 21200 - Approaches To The Study Of Interpersonal Communication

Credit Hours: 3.00. A study of the basic characteristics of human communication and the theoretical and practical implications of these characteristics for various forms of oral communication. CTL:ICM 1101 Interpersonal Communication **Credits:** 3.00

COM 21700 - Science Writing And Presentation

Credit Hours: 3.00. Students learn to effectively communicate scientific and technical information both verbally and in writing to a variety of audiences.**Credits:** 3.00

COM 22400 - Communicating In The Global Workplace

Credit Hours: 3.00. This introductory course explores communication issues that arise in the global workplace. The course develops an appreciation of the relationship among culture, communication, and ways of organizing and doing business. **Credits:** 3.00

COM 25000 - Mass Communication And Society

Credit Hours: 3.00. A survey of the print, broadcast, and film media in their relationship and influence on society. Study topics include: mass communication theories, documentaries, commercialism, news media, media effects and control, feedback, educational broadcasting, and audience analysis. CTL:ICM 1102 Introduction To Mass Communication **Credits:** 3.00

COM 25100 - Communication, Information, And Society

Credit Hours: 3.00. This course provides an introduction to information and communication technologies, including media and computer-related technologies. Basic information and technical literacy skills are developed, while discussing fundamental concepts of mediated communication in 21st century contexts. **Credits:** 3.00

COM 25200 - Writing For Mass Media

Credit Hours: 3.00. Labor intensive course teaches basics of newspaper writing, broadcast writing, news releases, and online journalism. **Credits:** 3.00

COM 25300 - Introduction To Public Relations

Credit Hours: 3.00. An analysis of public relations theory and practice from their origins to the present. From a communication perspective, the course examines public relations environments, audiences, and message strategies. **Credits:** 3.00

COM 25600 - Introduction To Advertising

Credit Hours: 3.00. An analysis of commercial persuasion from colonial times to the era of mass communication. The course examines the structure of advertising messages, how they are adapted to specific audiences, and the social settings in which they occur.**Credits:** 3.00

COM 25700 - Public Relations Techniques

Credit Hours: 3.00. This class introduces students to a range of public relations techniques, with a focus on writing. From press releases to new media, this class offers practice and feedback on how to use common public relations tools. **Credits:** 3.00

COM 26099 - Professional Practice Parallel Co-Op Summer I

Credit Hours: 0.00. Cooperative Education (Co-Op) is an academic program with oversight provided by assigned Faculty Coordinators who serve as the Instructor for participating students. Parallel Co-Op program participants are undergraduate students, who work part-time (more than 11 hours per week and less than 30 hours per week) in paid positions during the academic year terms (fall and spring semesters) for an employer with a local business or office. During the summer term, Parallel Co-Op students work in part-time or full-time positions at any location offered by the employer. A minimum of a one-year commitment is required for Parallel Co-Op students and employers. During the academic year, Parallel Co-Op students register for 6 to 11 credit hours of academic course load, and also for an appropriate 0-credit hour Parallel Co-Op course that carries half-time student status to recognize the academic impact of the experience. The combination of both academic courses and Parallel Co-Op course registrations provides students with full-time status. During the summer term, Parallel Co-Op students register for a zero-credit hour Parallel Co-Op Summer course that carries full-time student status. Permission of Instructor required. **Credits:** 0.00

COM 26100 - Introduction To Digital Video Production

Credit Hours: 3.00. Basic production principles and practices. Emphasis on preplanning and conceptualizing skills in addition to practical production techniques. Required for admission to all television production courses. Permission of department required. **Credits:** 3.00

COM 27100 - Podcasting

Credit Hours: 3.00. This directed study is designed as an introduction to podcasting. Students in the course will learn about the structure and development of podcasting campaigns, then create their own weekly recording. Recording begins in the third week of classes, giving students 14 opportunities to develop their program.**Credits:** 3.00

COM 28500 - Introduction To Publication Design

Credit Hours: 3.00. Introduction to pre-press production of professional-quality publications. Emphasis on computer applications for publication layout, design and production. Topics include composition, readability, typography, graphic resolution, and color management systems.**Credits:** 3.00

COM 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in communication. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

COM 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in communication. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

COM 30300 - Intercultural Communication

Credit Hours: 3.00. Study of the complex relationship between culture and communication in a variety of interpersonal, group, organizational, and computer-mediated settings. Application of theory and research to development of the knowledge, attitudes, and skills associated with intercultural communication competence. **Credits:** 3.00

COM 30301 - Mentored Intercultural Communication Experience

Credit Hours: 1.00 to 3.00. This class is intended as a companion to a study abroad or international internship experience. Through a series of guided assignments that integrate experiential activities embedded in the host community with reflective writing that solicits feedback from both peers and an intercultural mentor, students will be challenged to develop intercultural competencies while living in a different culture.**Credits:** 1.00 to 3.00

COM 30390 - Intercultural Dialogue Facilitator Training

Credit Hours: 1.00. This theoretical and practical training introduces students to intercultural peer dialogue methodology and effective facilitation techniques. Students will engage in scaffolded dialogue experiences first as participants and then as co-leaders, building skills through reflection and guidance from a mentor. Permission from the Instructor is required.**Credits:** 1.00

COM 30399 - Intercultural Dialogue Facilitation Practicum

Credit Hours: 1.00. In an internship model, students apply the training they received in the Intercultural Dialogue Facilitator Training course. The aim of this course is to provide students with opportunities to hone their leadership and communication skills by facilitating peer dialogues. Each student taking this course is paired with a mentor who provides feedback to students and guides their goal-setting and reflection. The course may be repeated with other dialogue topics and/or participants for additional credit.**Credits:** 1.00

COM 30400 - Quantitative Methods For Communication Research

Credit Hours: 3.00. Introduction to the development and application of quantitative research methods pertinent to communication problems. Fundamental concepts of problem identification, reliability and validity of both measurement and research design, and statistical analyses of data. **Credits:** 3.00

COM 31100 - Copy Editing

Credit Hours: 3.00. Study of, and practice in, copyreading and headline writing. Laboratory practice includes copy editing on video-display terminals. **Credits:** 3.00

COM 31200 - Rhetoric In The Western World

Credit Hours: 3.00. An explanation of major theoretical and philosophical concepts concerning rhetoric; the relationships between rhetoric and political, social, and personal decisions are explored. Ancient and modern authors will be read. **Credits:** 3.00

COM 31400 - Advanced Presentational Speaking

Credit Hours: 3.00. Development of a marked degree of skill in the composition and delivery of various types of speeches including presentations in corporate board rooms, orientation meetings, banquet halls, public forms. Special emphasis on speeches related to the student's major vocational area. **Credits:** 3.00

COM 31500 - Speech Communication Of Technical Information

Credit Hours: 3.00. The organization and presentation of information of a practical technical nature. Emphasis is placed upon the study, preparation, and use of audiovisual materials in such presentations. **Credits:** 3.00

COM 31800 - Principles Of Persuasion

Credit Hours: 3.00. Persuasion and its effects, ranging from individual influences to societal impacts. Various perspectives and models of persuasion are examined, including classical and modern approaches. Both theoretical and pragmatic considerations are introduced.**Credits:** 3.00

COM 32000 - Small Group Communication

Credit Hours: 3.00. A study of group thinking and problem-solving methods; participation in, and evaluation of, committee, and informal discussion groups. Focus on the roles, networks, and messages employed by small group communicators. **Credits:** 3.00

COM 32400 - Introduction To Organizational Communication

Credit Hours: 3.00. An introduction to fundamental concepts and basic research related to communication behavior in organizational settings. Units cover message processing, leadership communication, communication climates, communication training, and communication audits. Students participate in an organizational simulation in some sections. **Credits:** 3.00

COM 32500 - Interviewing: Principles And Practice

Credit Hours: 3.00. Theory and practice of methods in selected interview settings: informational, employment, and persuasive. Emphasis on communication between two persons, questioning techniques, and the logical and psychological bases of interpersonal persuasion. **Credits:** 3.00

COM 32800 - Diversity At Work: A Rhetorical Approach

Credit Hours: 3.00. Introduces students to theories and experiences related to issues dealing with both diversity in the workplace and diversity at work to change or influence the world. **Credits:** 3.00

COM 33000 - Theories Of Mass Communication

Credit Hours: 3.00. An examination of mass communication theories and theorists. Readings and discussion of McLuhan, Lippman, De Fleur, Lazarsfeld, Schramm, Stephenson, and other significant contributors. **Credits:** 3.00

COM 33200 - Television Production

Credit Hours: 3.00. Basic principles of producing, writing, and directing for television. Treats program types and television criticism, and explores creative treatment of visual, artistic, and nonverbal elements of communication in television. Permission of department required.**Credits:** 3.00

COM 33600 - Advertising Media Strategy

Credit Hours: 3.00. Theory and practice of advertising as applied to advertising media strategy. Students build on a foundation of integrated marketing communication to develop digital advertising campaigns. **Credits:** 3.00

COM 33701 - Producing Digital Advertising

Credit Hours: 3.00. This course is designed as an advanced level production course. Through lectures, discussions, critiques, screenings, and various exercises, you will gain experience designing video advertisements. You will develop and refine critical viewing/listening abilities to effectively analyze video content for aesthetic elements and overall message. Additionally, you will apply production techniques pertaining to producing, directing, shooting and editing in the creation of projects for real clients. The coursework consists of three major video projects, and a series of assignments organized under the corporate role that would be performing those tasks.**Credits:** 3.00

COM 35100 - Mass Communication Ethics

Credit Hours: 3.00. A survey of various ethical approaches applied to situations confronting contemporary mass communicators, including misrepresentation in newsgathering, protection of sources, suppression of information, reporting of terror and violence, pressure from management and advertisers, and reporter bias. **Credits:** 3.00

COM 35200 - Mass Communication Law

Credit Hours: 3.00. Study of Anglo-American traditions and trends as well as current American conditions of the laws of libel, privacy, fair comment and criticism, privilege, property rights, and copyright as such factors affect the print journalist and the broadcaster. Emphasis is on existing state and federal regulations and precedents. **Credits:** 3.00

COM 35300 - Problems In Public Relations

Credit Hours: 3.00. Approaches to problems in public relations as they occur in industry, government, education, social agencies, and other institutions. **Credits:** 3.00

COM 35600 - Problems In Advertising

Credit Hours: 3.00. Approaches to problems in advertising as they involve the planning, creation, and evaluation of commercial messages. **Credits:** 3.00

COM 36000 - Forensics Practicum

Credit Hours: 1.00. Forensics is the study and practice of evidence-based argumentation. This course cultivates skills associated with researching and constructing arguments - and then applies these skills to contemporary societal, national, and global issues with an eye turned toward generating practicable solutions. Students will be required to move beyond passively consuming information to critically appraising information related to broadly general as well as highly specific and technical topics. The course also emphasizes the development of advanced argumentation and communication skills, as well as the application and adaptation of these skills to diverse audiences. Permission of instructor required. **Credits:** 1.00

COM 36001 - Mock Trial Practicum

Credit Hours: 1.00. This course prepares students to represent Purdue University in American Mock Trial Association competitions by focusing on legal reasoning, argumentation, and advocacy. Mock Trial students will become familiar with the United States' legal system and conduct a trial over a fictional civil or criminal case. Students develop and deliver opening statements, introduce and examine testimonial, physical, and demonstrative evidence, examine and cross examine witnesses, and develop and deliver closing statements. Permission of instructor required.**Credits:** 1.00

COM 36099 - Professional Practice Parallel Co-Op Summer II

Credit Hours: 0.00. Cooperative Education (Co-Op) is an academic program with oversight provided by assigned Faculty Coordinators who serve as the Instructor for participating students. Parallel Co-Op program participants are undergraduate students, who work part-time (more than 11 hours per week and less than 30 hours per week) in paid positions during the academic year terms (fall and spring semesters) for an employer with a local business or office. During the summer term, Parallel Co-Op students work in part-time or full-time positions at any location offered by the employer. A minimum of a one-year commitment is required for Parallel Co-Op students and employers. During the academic year, Parallel Co-Op students register for 6 to 11 credit hours of academic course load, and also for an appropriate 0-credit hour Parallel Co-Op course that carries half-time student status to recognize the academic impact of the experience. The combination of both academic courses and Parallel Co-Op course registrations provides students with full-time status. During the summer term, Parallel Co-Op students register for a zero-credit hour Parallel Co-Op Summer course that carries full-time student status. Permission of Instructor required. **Credits:** 0.00

COM 36100 - Multiplatform Journalism

Credit Hours: 3.00. This course is an introduction to video journalism, including critical examination of various styles of video journalism from news websites to local TV news to national/international television news programs. Students will produce video stories using video cameras and audio equipment to record interviews and natural sound, learn professional lighting techniques, find stories, interview for video, write scripts, review video journalism ethics, and related content.**Credits:** 3.00

COM 36199 - Professional Practice Parallel Co-Op Semester I

Credit Hours: 0.00. Cooperative Education (Co-Op) is an academic program with oversight provided by assigned Faculty Coordinators who serve as the Instructor for participating students. Parallel Co-Op program participants are undergraduate students, who work part-time (more than 11 hours per week and less than 30 hours per week) in paid positions during the academic year terms (fall and spring semesters) for an employer with a local business or office. During the summer term, Parallel Co-Op students work in part-time or full-time positions at any location offered by the employer. A minimum of a one-year commitment is required for Parallel Co-Op students and employers. During the academic year, Parallel Co-Op students register for 6 to 11 credit hours of academic course load, and also for an appropriate 0-credit hour Parallel Co-Op course that carries half-time student status to recognize the academic impact of the experience. The combination of both academic courses and Parallel Co-Op course registrations provides students with full-time status. During the summer term, Parallel Co-Op students register for a zero-credit hour Parallel Co-Op Summer course that carries full-time student status. Permission of Instructor required. **Credits:** 0.00

COM 36200 - Broadcast Performance

Credit Hours: 3.00. This course will immerse students in both the foundational concepts of broadcasting and nuanced performance techniques necessary to take the craft to the next level as on-camera/on-air presenters. Through hands-on, experiential learning, students will refine existing journalistic and creative skills (such as prior reporting, video production, hosting, anchoring, or online media experience) and also develop new talents and portfolio pieces.**Credits:** 3.00

COM 36299 - Professional Practice Parallel Co-Op Semester II

Credit Hours: 0.00. Cooperative Education (Co-Op) is an academic program with oversight provided by assigned Faculty Coordinators who serve as the Instructor for participating students. Parallel Co-Op program participants are undergraduate students, who work part-time (more than 11 hours per week and less than 30 hours per week) in paid positions during the academic year terms (fall and spring semesters) for an employer with a local business or office. During the summer term, Parallel Co-Op students work in part-time or full-time positions at any location offered by the employer. A minimum of a one-year commitment is required for Parallel Co-Op students and employers. During the academic year, Parallel Co-Op students register for 6 to 11 credit hours of academic course load, and also for an appropriate 0-credit hour Parallel Co-Op course that carries half-time student status to recognize the academic impact of the experience. The combination of both academic courses and Parallel Co-Op course registrations provides students with full-time status. During the summer term, Parallel Co-Op students register for a zero-credit hour Parallel Co-Op Summer course that carries full-time student status. Permission of Instructor required. **Credits:** 0.00

COM 36800 - Sociolinguistic Study Of African American English

Credit Hours: 3.00. A study of the history, structure, uses, and educational concerns of African American English in African American speech communities and the U.S. culture at large.**Credits:** 3.00

COM 37200 - Communication In Relationships

Credit Hours: 3.00. An examination of communication in personal relationships (including dating and marital relationships, friendships, and families) and professional relationships (including co-worker and supervisor-supervisee relationships and relationships in specific professions, such as doctor-patient and attorney-client). **Credits:** 3.00

COM 37400 - Social Interaction Skills: Assessment And Development

Credit Hours: 3.00. An examination of several major communication skills and procedures for their development. Focus is on skill measurement, methods of enhancement, assessment of training programs, and personal skill development. Skills examined include those for conversing, managing conflict, providing support, and influencing. **Credits:** 3.00

COM 37500 - Conflict And Negotiation

Credit Hours: 3.00. This course surveys theory and research focused on the role of communication in conflict and negotiation, and helps students develop skills needed to manage conflict effectively in their personal and professional relationships. **Credits:** 3.00

COM 37600 - Communication And Gender

Credit Hours: 3.00. Course is based on the assumption that studies of gender and communication are intertwined. Focus is on communication processes that create symbols of gender and how those processes recreate the meanings of gender in the lives of individuals and groups. **Credits:** 3.00

COM 37800 - Introduction To Health Communication

Credit Hours: 3.00. This course will serve as an introduction to the many ways that communication shapes health and health practices. Course content includes: 1) current healthcare structure in the United States; 2) communication in the healthcare organization; 3) provider-patient communication; 4) patient-support provider communication; 5) models of health behavior change and campaigns; and 6) crisis communication and health. **Credits:** 3.00

COM 38100 - Gender And Feminist Studies In Communication

Credit Hours: 3.00. This course examines the ways in which communication constructs and maintains our conceptions of gender. It explores different approaches to the study of gender and feminist issues in public, organizational, and mass communication. **Credits:** 3.00

COM 38399 - Professional Practice Cooperative Education III

Credit Hours: 0.00. Co-Op is an academic program with oversight provided by assigned Faculty Coordinators who serve as the Instructor for participating students. The program is coordinated by the Office of Professional Practice with cooperation of participating employers. Students submit a written summary report of their experience and evaluations of the company and their performance. Permission of instructor required. **Credits:** 0.00

COM 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in communication. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

COM 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in communication. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

COM 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in communication. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

COM 40700 - Introduction To New Media/Social Media Production

Credit Hours: 3.00. An exploration of how new technologies such as Twitter, Facebook, Pinterest, Soundslides, blogs, and audio and video are influencing the dissemination of information to mass audiences and correct practices such technologies. **Credits:** 3.00

COM 40800 - News Magazine Production

Credit Hours: 3.00. Students plan, write and produce a weekly video news magazine to be aired on Boiler TV.**Credits:** 3.00

COM 40900 - Video Journalism

Credit Hours: 3.00. Students plan, write and produce a weekly news magazine to be aired on Boiler TV.**Credits:** 3.00

COM 41100 - Communication And Social Networks

Credit Hours: 3.00. This course explores the growing area of networks. The class focuses on understanding how social structure influences our everyday life by examining the ways individuals, groups, and entities are tied together. Permission of instructor required. **Credits:** 3.00

COM 41200 - Theories Of Human Interaction

Credit Hours: 3.00. An exploration and critique of major theories of human interaction in a variety of contexts; consideration of language, nonverbal behavior, cognition, emotion, social perception, and social relations. **Credits:** 3.00

COM 41500 - Discussion Of Technical Problems

Credit Hours: 3.00. Principles of speech communication related to interpersonal and group discussions on technical topics and problems; practice in using these modes in situations typically encountered by technologists. **Credits:** 3.00

COM 41600 - United States Politics And The Media

Credit Hours: 3.00. This course examines the roles and influences of the mass media on American politics generally and with particular emphasis on election campaigns and the evolving political culture of the U.S. **Credits:** 3.00

COM 41900 - Judgment And Decision Making

Credit Hours: 3.00. This course is designed to foster an understanding, critique and analysis on issues related to judgment and decision processes. Permission of instructor required. **Credits:** 3.00

COM 42300 - Leadership, Communication And Organizations

Credit Hours: 3.00. This course explores leadership from a communication perspective. It examines topics such as leadership styles, leading change, influencing others, emotional intelligence, burnout, and engagement. Permission of instructor required. **Credits:** 3.00

COM 42700 - Careers, Communication Issues And Strategies

Credit Hours: 3.00. This course explores the nature of career from a variety of definitions and strategies for employability, objective or external and subjective or psychological success, entrepreneurship, and advancement in corporate and not-for-profit contexts. Permission of instructor required. **Credits:** 3.00

COM 43500 - Communication And Emerging Technologies

Credit Hours: 3.00. Both historical and contemporary perspectives of the reciprocal influence of new and changing technologies and the processes and practices of communication. The impact of print, telegraph, telephone, radio, and television will be surveyed, along with cable systems, direct broadcast satellites, and videotext. **Credits:** 3.00

COM 44400 - Introduction To Communication And Social Entrepreneurship

Credit Hours: 3.00. This class introduces students to the roles that communication and innovation play in social entrepreneurship. It explores activities of entrepreneurs, ethics and skill development at the individual and organizational levels, and communication functions in not-for-profit and social venture space.**Credits:** 3.00

COM 44700 - The Television Documentary

Credit Hours: 3.00. Study and application of principles of documentary television formats. Students will research an appropriate topic for documentary treatment and produce that program during the semester. Documentary formats examined include news, biographical, ethnographic, and documentary drama. **Credits:** 3.00

COM 44900 - Media Management

Credit Hours: 3.00. An introduction to management for mass media outlets. The course will explore management styles and techniques in a variety of media situations, including radio, television, and internet-based business models. Topics such as business structure, advertising and promotion, programming, and leadership style will be included in the discussion. This class is designed as both a philosophical and practical model. Students will discover the theories and principles behind the structure of media businesses, as well as put those ideas into practice in real world situations. Students in the course will be responsible for the programming and promotion of the Brian Lamb School of Communication's channel space on Boiler TV. A mini internship experience is introduced in the second half of the semester, giving the student an opportunity to sample what these opportunities are like. **Credits:** 3.00

COM 45300 - Reporting Of Science News

Credit Hours: 3.00. Study of, and practice in, the techniques of gathering and reporting news of scientific developments to the general public through the examination of samples of science news and regular reporting exercises. Attention given to professional demands made of science reporters. **Credits:** 3.00

COM 45600 - Advertising Writing

Credit Hours: 3.00. The theory and practice of copy writing in various advertising contexts. **Credits:** 3.00

COM 46099 - Professional Practice Parallel Co-Op Summer III

Credit Hours: 0.00. Cooperative Education (Co-Op) is an academic program with oversight provided by assigned Faculty Coordinators who serve as the Instructor for participating students. Parallel Co-Op program participants are undergraduate students, who work part-time (more than 11 hours per week and less than 30 hours per week) in paid positions during the academic year terms (fall and spring semesters) for an employer with a local business or office. During the summer term, Parallel Co-Op students work in part-time or full-time positions at any location offered by the employer. A minimum of a one-year

commitment is required for Parallel Co-Op students and employers. During the academic year, Parallel Co-Op students register for 6 to 11 credit hours of academic course load, and also for an appropriate 0-credit hour Parallel Co-Op course that carries half-time student status to recognize the academic impact of the experience. The combination of both academic courses and Parallel Co-Op course registrations provides students with full-time status. During the summer term, Parallel Co-Op students register for a zero-credit hour Parallel Co-Op Summer course that carries full-time student status. Permission of Instructor required. **Credits:** 0.00

COM 46399 - Professional Practice Parallel Co-Op Semester III

Credit Hours: 0.00. Cooperative Education (Co-Op) is an academic program with oversight provided by assigned Faculty Coordinators who serve as the Instructor for participating students. Parallel Co-Op program participants are undergraduate students, who work part-time (more than 11 hours per week and less than 30 hours per week) in paid positions during the academic year terms (fall and spring semesters) for an employer with a local business or office. During the summer term, Parallel Co-Op students work in part-time or full-time positions at any location offered by the employer. A minimum of a one-year commitment is required for Parallel Co-Op students and employers. During the academic year, Parallel Co-Op students register for 6 to 11 credit hours of academic course load, and also for an appropriate 0-credit hour Parallel Co-Op course that carries half-time student status to recognize the academic impact of the experience. The combination of both academic courses and Parallel Co-Op course registrations provides students with full-time status. During the summer term, Parallel Co-Op students register for a zero-credit hour Parallel Co-Op Summer course that carries full-time student status. Permission of Instructor required. **Credits:** 0.00

COM 46400 - American Political Communication

Credit Hours: 3.00. This course examines the content, processes, and effects of communication within the American political system. Designed for students to experience the breadth of the field of political communication, the course emphasizes relevant theories and practical skills. **Credits:** 3.00

COM 46499 - Professional Practice Parallel Co-Op Semester IV

Credit Hours: 0.00. Cooperative Education (Co-Op) is an academic program with oversight provided by assigned Faculty Coordinators who serve as the Instructor for participating students. Parallel Co-Op program participants are undergraduate students, who work part-time (more than 11 hours per week and less than 30 hours per week) in paid positions during the academic year terms (fall and spring semesters) for an employer with a local business or office. During the summer term, Parallel Co-Op students work in part-time or full-time positions at any location offered by the employer. A minimum of a one-year commitment is required for Parallel Co-Op students and employers. During the academic year, Parallel Co-Op students register for 6 to 11 credit hours of academic course load, and also for an appropriate 0-credit hour Parallel Co-Op course that carries half-time student status to recognize the academic impact of the experience. The combination of both academic courses and Parallel Co-Op course registrations provides students with full-time status. During the summer term, Parallel Co-Op students register for a zero-credit hour Parallel Co-Op Summer course that carries full-time student status. Permission of Instructor required. **Credits:** 0.00

COM 47800 - Health Communication Campaigns

Credit Hours: 3.00. This course is an introduction to the processes and theories that are used to design both informational and persuasive health communication campaigns. The course will also introduce students to proper evaluation procedures to determine a campaign's efficacy. Students will be able to contribute to their portfolios by applying theory and primary research in the construction of a health communication campaign plan for a client. **Credits:** 3.00

COM 47900 - Introduction To Risk Communication

Credit Hours: 3.00. This course introduces students to theories that show how people express, perceive, exchange, and deliberate information about risk as well as how this understanding can be used to improve risk communication practice. This course examines risk communication theory and practice from multiple perspectives including social, psychological, cultural, and communicative.**Credits:** 3.00

COM 48900 - Research Experience In Communication

Credit Hours: 1.00 to 3.00. This course grants credit to students who participate in structured research projects within the Brian Lamb School of Communication. Permission of instructor required. **Credits:** 1.00 to 3.00

COM 49000 - Internship In Communication

Credit Hours: 1.00 to 6.00. Experiential, supervised training in public relations, journalism, telecommunication, oral interpretation, speech education, organizational communication, or public communication. Usually given in junior or senior year. Usually gives two credits per internship experience. Permission of instructor required. **Credits:** 1.00 to 6.00

COM 49100 - Special Topics In Communication

Credit Hours: 1.00 to 3.00. Intensive study of selected topics, varying from semester to semester, from the literature or practice of communication. Course content will be drawn from areas not dealt with in the regular curriculum and may include such topics as photojournalism, economic reporting, and campaign communication. Permission of instructor required. **Credits:** 1.00 to 3.00

COM 49101 - Boiler Communication

Credit Hours: 1.00. This course provides a practical, hands-on approach to public relations by working in student-led teams to produce comprehensive, strategic communication campaigns for actual clients. The course also includes many opportunities for professional development and portfolio building. **Credits:** 1.00

COM 49500 - Special Topics In Public Relations And Rhetorical Advocacy

Credit Hours: 3.00. In-depth study of a particular area of public relations and rhetorical advocacy. Students read, discuss, and write about contemporary applications of public relations, advertising and rhetoric. Possible offerings include Integrated Marketing Communication, Persuasion and Social Protest, Communication Campaigns. **Credits:** 3.00

COM 49501 - Sports Media Relations

Credit Hours: 3.00. This course examines the role of public relations and mass media in sports communication. It provides an understanding of the operation of sports media and communication and how sports information departments perform their functions. Emphasis is on written communication from athletics communication perspective. **Credits:** 3.00

COM 49502 - Travel Writing

Credit Hours: 3.00. Travel writing is writing about places, persons, and things in other places-also writing about how to travel, when to travel, and advice on traveling-all with the reader in mind. It's about relaying your travel experiences to others so that they may emulate them or at the very least not make the same mistakes you did. And it's writing about things in your own back yard that are exotic to everyone else-a local farmer's market, historic site, restaurant, museum. In this class, you will explore the various ways travel writers can excite and assist readers. **Credits:** 3.00

COM 49503 - Public Relations For Social Change

Credit Hours: 3.00. The overarching goal of this course is for students to work cooperatively with a community partner to identify, define and address that organization's PR problems and opportunities from a long-term, in-house perspective, building on the work of previous students and incorporating social change theory from a relationship management perspective of PR. The applied work of this course will have the dual benefit of providing students the opportunity to gain contextualized, real-world experience at PR problem-solving and advancing the mission of a nonprofit organization that is important to the wellbeing of the Greater Lafayette community as a whole. **Credits:** 3.00

COM 49504 - Social Media For Social Good

Credit Hours: 3.00. Nonprofit organizations advance their missions through communication. This course is designed to introduce students to the use of social media by nonprofit organizations to create their brand and reach stakeholders. It will focus on best practices and critically assess local nonprofits return on social media investment.**Credits:** 3.00

COM 49505 - Sports Communication

Credit Hours: 3.00. This class will help students learn to think critically about sports communication, but it will also help students learn to do sports communication. Through the use of sports books and movies, guest speakers, field trips, and case studies, students will learn not only about sports communication as a field of study and a profession, but also how they can be more thoughtful consumers of sports communication in its various forms. **Credits:** 3.00

COM 49507 - Executive Communication

Credit Hours: 3.00. This course defines executive communication, offers a rationale for its importance, provides a catalog of deliverables (or tactics) involved in the practice, teaches students how to create those deliverables, and provides students with the tools to serve as strategic advisors to senior leaders. The ultimate goal of the course is to help students become more well-rounded and successful communication professionals.**Credits:** 3.00

COM 49600 - Special Topics In Corporate Communication

Credit Hours: 3.00. This course offers students the opportunity to explore in-depth, thorough readings, lectures and written assignments on current issue in corporate communication. Topics may include diversity in the workplace, organizational assessments, or spirituality in organizations. Permission of instructor required. **Credits:** 3.00

COM 49700 - Special Topics In Mass Communication

Credit Hours: 3.00. Offers students the opportunity to explore in-depth, thorough readings, lectures and written assignments, a current topic or trend in Media, Technology and Society. Possible offerings include Media and Social Change, Online Communities, and Technology and International Communication. **Credits:** 3.00

COM 49701 - Live Sports Broadcasting Summer

Credit Hours: 1.00. In this experiential Live Sports Broadcasting course in partnership with the Lafayette Aviators, students will have the opportunity to work in the studio at Loeb Stadium in Lafayette, operate cameras on the field, produce promotional material to be used before, during, and after games, and interview players for segments on The Purdue Channel. The class spans the home season of the Aviators. Students are expected to register for all 3 1-credit modules in a summer. Permission of instructor required.**Credits:** 1.00

COM 49702 - Video Games And Society

Credit Hours: 3.00. This course focuses on video games as a form of mass communication. Primarily, this focus entails understanding how video games communicate to mass audiences, using features distinctive to video games, and how that communication might impact game players (i.e., media psychology). There is a secondary focus on how game players communicate with each other. The course will primarily examine these issues from social scientific perspectives. Topics include the influence of society on game creation, the impact of games on players, gaming cultures, and game industries.**Credits:** 3.00

COM 49800 - Practicum In Human Relations

Credit Hours: 3.00. This course provides students within the Human Relations major an opportunity for an internship or directed research. **Credits:** 3.00

COM 50000 - Introduction To Graduate Studies In Communication

Credit Hours: 3.00. Introduces basic conventions of the principles and procedures of scholarly research, surveys research methods utilized in the communication discipline, applies research methods to various subjects, and offers an overview of degree requirements. Course restricted to graduate students only. **Credits:** 3.00

COM 50200 - Classroom Communication

Credit Hours: 3.00. An introduction to fundamental concepts and basic research related to communicative behavior in the classroom. The primary focus is on the study and application of principles of effective classroom communication through personal inquiry. Among topics discussed are components of classroom communication, systematic observation as a method of studying classroom communication, and applications of systematic observation in a variety of classroom communication settings. Department permission required. **Credits:** 3.00

COM 50300 - Cross Cultural Communication

Credit Hours: 3.00. In this course, we examine the scholarly history of intercultural and cross-cultural communication along with conceptual and empirical challenges in doing this type of inquiry. Several contexts will be studied from the point of view of forms of cultural wisdom and variation in practices. Larger questions of idenity, diversity, and intercultural competence will be explored, especially through filters of globalization and ethical issues in intercultural relations. Students will have regular reading assignments, short reaction papers, give oral presentations, and write a final research paper or proposal, depending on their stage in their programs.**Credits:** 3.00

COM 50700 - Introduction To Semiotics

Credit Hours: 3.00. (ANTH 51900, AUSL 58900, ENGL 57000, LC 57000) The study of languages, literatures, and other systems of human communication. Includes a wide range of phenomena, which can be brought together by means of a general theory of signs. The course deals with three fundamental areas: 1) verbal communication, 2) nonverbal communication (iconic systems, gestures, body language, etc.), and 3) communication through art forms. **Credits:** 3.00

COM 50800 - Nonverbal Communication In Human Interaction

Credit Hours: 3.00. An examination of theoretical writings and critical studies in selected areas of nonverbal communication, e.g., the environmental influences, space and territory relationships, physical appearance and dress, physical behavior, and vocal cues. One unit will deal specifically with measurement, recording, or transcription methods used in nonverbal study. **Credits:** 3.00

COM 51200 - Theories Of Interpersonal Communication

Credit Hours: 3.00. Review of contemporary theories, analysis of concepts, models, and pertinent research across the broad spectrum of interpersonal communication. **Credits:** 3.00

COM 51800 - Theories Of Persuasion

Credit Hours: 3.00. Review of contemporary theories, including analysis of concepts, models, and pertinent research across the broad spectrum of persuasive communication. **Credits:** 3.00

COM 52000 - Small Group Communication

Credit Hours: 3.00. Survey and critical evaluation of theoretical and empirical literature dealing with human communication within small group settings. **Credits:** 3.00

COM 52700 - Introduction To Cultural Studies In Communication

Credit Hours: 3.00. An examination of selected cultural studies perspectives on mass communication. Covers cultural studies philosophies, theories, and/or approaches to the study of cultural artifacts and practices that may include some of the following: postmodernism, deconstruction, feminism, and postcolonialism, and privileging context as a means of understanding culture. **Credits:** 3.00

COM 53100 - Special Topics In Mass Communication

Credit Hours: 3.00. Critical analysis and evaluation of current and continuing problems in both commercial and public mass communication. **Credits:** 3.00

COM 55800 - Historical Trends In Mass Communication Research

Credit Hours: 3.00. An examination of research on the process and effects of mass communication. Early studies on radio and film effects, propaganda, attitude formation and change, public opinion and voting, and the interpersonal dimensions of mass communication. **Credits:** 3.00

COM 55900 - Current Trends In Mass Communication Research

Credit Hours: 3.00. An examination of current research as it contributes to understanding the process and effects of mass communication. Topics covered include gatekeepers and information control, audience selection processes and uses of the media, persuasive effects of the media, media content and social learning, the effects of adult programming on children, and the effects of the media on the governmental process. **Credits:** 3.00

COM 56500 - Sociolinguistics

Credit Hours: 3.00. (ANTH 56500, AUSL 56500, ENGL 56500, LC 56500) An introduction to language in its social context, focusing on uses and users of language. Topics include social class, ethnic group, gender, language attitudes, and bilingualism. **Credits:** 3.00

COM 57400 - Organizational Communication

Credit Hours: 3.00. Survey of the theoretical and empirical literature dealing with human communication behavior as it occurs within the context of complex organizations. Among topics covered are superior-subordinate communication, communication

networks, message distortion, feedback processes, internal corporate mass media, managerial-communication climate, semantic and stylistic dimensions of messages, and communication in decision making. **Credits:** 3.00

COM 57600 - Health Communication

Credit Hours: 3.00. Survey of health communication theory and research. Examines issues such as patient-provider and everyday communication, broader community-societal discourse, and organizational and mass health communication. Prepares participants for subsequent more specialized seminars and enriched study in allied specialties. **Credits:** 3.00

COM 58200 - Descriptive/Experimental Research In Communication

Credit Hours: 3.00. Introduction to the fundamental tools of quantitative research in communication, including data analysis, statistical design and methods, basic measurement concepts, and designs for descriptive and experimental research. Individual and/or group research projects are planned, conducted, and reported. Permission of instructor required. **Credits:** 3.00

COM 58500 - Qualitative Methods In Communication Research

Credit Hours: 3.00. An introduction to qualitative research methods in communication studies. Provides students with an overview of several techniques for, and issues in, gathering, analyzing, writing-up, and using qualitative data. Department permission required. **Credits:** 3.00

COM 59000 - Directed Study Of Special Problems

Credit Hours: 1.00 to 3.00. Directed study of special problems. Permission of instructor required. **Credits:** 1.00 to 3.00

COM 59700 - Special Topics In Communication

Credit Hours: 3.00. Seminar of current topics of interest within the discipline of communication. **Credits:** 3.00

COM 60000 - Foundations Of Human Communication Inquiry I

Credit Hours: 3.00. Introduces doctoral students to major and emerging approaches to understanding human communication and provides them with the theoretical background and analytic skills needed to navigate the tensions among these approaches. Reviews the intellectual history of communication inquiry, overviews traditional and innovative questions about human communication, examines the ways in which these questions can be addressed from different perspectives, addresses some of the varied forms that knowledge about human communication can take, and explores how different research traditions go about making and warranting knowledge claims. **Credits:** 3.00

COM 60100 - Foundations Of Human Communication Inquiry II

Credit Hours: 3.00. Following COM 60000, this course continues to introduce doctoral students to major and emerging approaches to understanding human communication and provides theoretical background and analytic skills needed to navigate the tensions among these approaches. Reviews the intellectual history of communication inquiry, overviews traditional and innovative questions about human communication, examines the ways in which these questions can be addressed from different perspectives, addresses some of the varied forms that knowledge about human communication can take, and explores how different research traditions go about making and warranting knowledge claims. Prerequisite: COM 60000. **Credits:** 3.00

COM 60111 - Seminar In Strategic Communication

Credit Hours: 3.00. This graduate course will survey the theories and processes of strategic communication and its practice by business, government, politicians, and non-profits - in domestic and international arenas. The course will emphasize the application of theory to provide an in-depth understanding of planning, executing, and evaluating strategic communication plans. Prerequisite: Graduate student in communication. Permission of department required. **Credits:** 3.00

COM 60211 - Seminar In Global Strategic Communication

Credit Hours: 3.00. This course provides students with a global perspective in strategic communication and provides knowledge and understanding of how to address communication issues with international audiences. This class emphasizes such questions as how strategic communication plans can be successfully implemented in other countries and how plans can be measured and evaluated. Prerequisites: Graduate student in communication and COM 60111. Permission of department required. **Credits:** 3.00

COM 60311 - Seminar In Crisis Communication

Credit Hours: 3.00. This graduate course will focus on how to communicate in a time of crisis in order to manage the situation and disseminate key messages to various stakeholders. Prerequisite: Graduate student in Communication and COM 60111. Permission of department required. **Credits:** 3.00

COM 60411 - Seminar In Communication Research Methods

Credit Hours: 3.00. This graduate course serves as the methodological foundation of strategic communication. Students in this class will survey core research methods (qualitative and quantitative) in professional and applied settings. This class is fully online. Students will interact with faculty and other students throughout the week. Permission of department required. **Credits:** 3.00

COM 60511 - Strategic Communication And Professional Writing

Credit Hours: 3.00. This graduate course covers topics related to professional writing and strategic communication. Topics include grammar basics, audience considerations, credibility and ethics, and documentation style. In addition, writing will be discussed in a variety of contexts such as media, public relations, advertising, and business communication. Permission of department required. **Credits:** 3.00

COM 60611 - Seminar In Financial And Investor Relations

Credit Hours: 3.00. This course will provide students with a theoretical and practical overview of theory and practice in financial and investor relations. Student will learn about how the potential investors in public companies are and how to reach them. An emphasis will be placed on communicating with investors to facilitate informed investor decision-making. Prerequisite: COM 60111 Permission of department required. **Credits:** 3.00

COM 60711 - Strategic Communication And Fundraising Management

Credit Hours: 3.00. This graduate course serves as an introduction to the concepts, elements, and best practices of fundraising. Permission of department required. **Credits:** 3.00

COM 60811 - Leadership And Global Strategic Communication

Credit Hours: 3.00. Over the last decade, the field of strategic communication has grown rapidly. The work of strategic communication professionals requires coordinated responses between distinct organizational units that are often separated by time and space. These conditions necessitate effective leadership. Further complicating leadership in these contexts is the fact that the work of strategic communication has increasingly become global in nature. This course provides students with theoretical

background in leadership and global strategic communication, as well as the opportunity to apply what they learn to strategic communication cases and to their own professional experiences. It also encourages them to think proactively about leadership challenges in these contexts and to articulate theoretically-informed analyses and evaluations of leadership in action. Permission of department required. **Credits:** 3.00

COM 60911 - Strategic Public Relations

Credit Hours: 3.00. Strategic communication is composed, in part, of integrated marketing communication (IMC), advertising, and public relations. This course highlights public relations scholarship, which is one of the strengths of the Brian Lamb School of Communication. As such, it builds on the general strategic communication course by providing an in-depth understanding of public relations. Specifically, the class will cover public relations theories, ethics, concepts, principles, and applications. Permission of department required. **Credits:** 3.00

COM 61000 - Special Topics In Public Relations

Credit Hours: 3.00. Intensive study, varying from semester to semester, in public relations. Permission of instructor required. **Credits:** 3.00

COM 61011 - Strategic Communication And Ethics

Credit Hours: 3.00. This graduate course introduces the application of ethical principles and decision making. In this course, students will study both philosophical and practical ethical questions related to strategic communication. Permission of department required. **Credits:** 3.00

COM 61200 - Seminar: Special Topics In Interpersonal Communication

Credit Hours: 3.00. Intensive study of selected topics, varying from semester to semester, from the theoretical and research literature of interpersonal communication. Topics may include communication models, information theory, systems theory, general semantics, sociolinguistics, etc., as they relate to the study of interpersonal communication. Prerequisite: COM 51200. **Credits:** 3.00

COM 62100 - Seminar: Special Topics In Rhetorical Theory

Credit Hours: 3.00. Intensive study of selected topics, varying from semester to semester, from the literature of rhetorical theory. Prerequisite: COM 521 **Credits:** 3.00

COM 62111 - Seminar In Strategic Communication And Social Media

Credit Hours: 3.00. This course will provide an overview of social media and its relationship to strategic communication. Students will learn about the available forms of social media (e.g., Blogs, Social Networks, and Wikis) as well as their uses, strengths and weaknesses for building and managing relationship with stakeholders. Students will also gain exposure to methods for analyzing social media metrics as a framework for evaluating the effectiveness of social media strategies as tools for developing corporate, nonprofit, and governmental images and brands. Permission of department required. **Credits:** 3.00

COM 62411 - Focus Groups And Interviewing For Strategic Communication

Credit Hours: 3.00. This course provides students with an overview of qualitative research in public relations with a particular emphasis on focus group and interview methodologies. The course will consider practical applications of these protocols in strategic communication contexts. Prerequisite: COM 60411 Permission of department required. **Credits:** 3.00

COM 62511 - Survey Design, Analysis, And Reporting For Strategic Communication

Credit Hours: 3.00. This course provides students with an overview of quantitative research in public relations with a particular emphasis on survey design analysis. The course will cover the design and delivery of questionnaires, the use and interpretation of descriptive and inferential statistical methods, and reporting of quantitative results. The course will consider practical applications of these methods in professional strategic communication contexts. Prerequisite: COM 60411 Permission of department required. **Credits:** 3.00

COM 63200 - Seminar: Special Topics In Mass Communication

Credit Hours: 3.00. Intensive study of selected topics, varying from semester to semester, from the literature of mass communication. Topics may include institutional analysis, mass communication law, information diffusion, uses of mass communication, or other issues. Permission of instructor required. **Credits:** 3.00

COM 64011 - Seminar In Advertising

Credit Hours: 3.00. This course provides an overview of the strategic planning process for advertising including identifying the target audience, determining a positioning strategy and developing a communication media strategy. The course will provide information on theory and best practices that inform the planning and implementation process for successful advertising campaigns. **Credits:** 3.00

COM 64100 - Integrated Marketing Communication

Credit Hours: 3.00. Developing cohesive and integrated external and internal communication initiatives across traditional and social media channels is becoming increasingly important for strategic communication professionals. Traditionally, Public Relations, Marketing, and Advertising/Promotion have had separate functions; increasingly the role of strategic communication practitioners is to ensure the consistency of the brand story and message across all channels of communication. Prerequisites: Students must be admitted into the Online Masters of Science of Communication program. COM 60111. **Credits:** 3.00

COM 64200 - Persuasive Communication

Credit Hours: 3.00. This course focuses on the creation of persuasive messages in a variety of contexts from interpersonal to mass media. Specifically, students will review several of the prominent persuasion theories and models and examine the message, audience, and situational characteristics that influence the success of persuasive efforts. Understanding these theories and factors can assist students in the development of persuasive messages and persuasive strategies. Prerequisites: Students must be admitted into the Online Masters of Science of Communication program. COM 60111 **Credits:** 3.00

COM 64400 - Strategic Personal Branding

Credit Hours: 3.00. This graduate course will examine the theories and processes of personal brand development and self-marketing. The course will examine best practices, trends, and creative strategies used in contemporary personal branding. An emphasis will be placed on experiential learning, self-awareness, image and perceptual management, career development, self-promotion, brainstorming, and effective communication. **Credits:** 3.00

COM 64500 - Healthcare Communication

Credit Hours: 3.00. The healthcare environment is increasingly complex, and poses many challenges for communication professionals seeking to improve communication with key health industry stakeholders, including patients, providers, payers, government agencies, and others. This course provides an overview of a broad range of unique communication challenges associated with health and the healthcare industry. Topics include review and discussion of key issues such as, major health

communication theories, issues associated with patient-provider interaction, adoption and use of health information and communication technologies, the development and implementation of health campaigns and other behavior change initiatives, and marketing and public relations issues commonly faced by healthcare organizations. Prerequisites: Students must be admitted into the Online Masters of Science of Communication program. COM 60111 **Credits:** 3.00

COM 64600 - Strategic Corporate Branding

Credit Hours: 3.00. This graduate course will survey the theories and processes of business brand design, development, and implementation. The course will examine best practices, trends, and creative strategies used in contemporary business branding. An emphasis will be placed on experiential learning, case study analysis, and the application of relevant theory to provide an in-depth understanding of the development, planning, execution, and evaluation of business brands. **Credits:** 3.00

COM 65000 - Communication And Leadership

Credit Hours: 3.00. Communication is the essence of leadership, and this course aims to identify how communication can fuel productivity, drive consensus and push the organization to a leadership position within a market. At the same time, communication can sabotage one's success or be used as a weapon to silence voices and promote political agendas. This course aims to empower you to shape leadership throughout the organization and to know how to advise other leaders in their efforts to overcome communication challenges. Permission of department required. **Credits:** 3.00

COM 65100 - Organizational Culture And Internal Communication

Credit Hours: 3.00. The modern workplace had transformed well before a global pandemic magnified the paradigm shift already under way. In the United States, both consumers and the first five-generation workforce began to demand more from brand statements and value propositions. Those demands include genuine commitment to inclusion and diversity internally and corporate social responsibility externally. This course highlights the vital role professional communicators have in conveying brand and value statements that emanate from the organization's cultural core and carry forward to the consumer universe. **Credits:** 3.00

COM 65200 - Communication Education And Training

Credit Hours: 3.00. This course is designed to introduce fundamental concepts related to learning theory and learning design as applied to training and educational settings. The course will examine best practices and strategies with a focus on assessing and enhancing communication-related skills.**Credits:** 3.00

COM 65500 - Health Advocacy

Credit Hours: 3.00. This course considers how federal, state, and local policy influence health status and health improvement. Through this course students gain an understanding of the role of health communication campaigns in health advocacy efforts. To engage their understanding, students will apply an advocacy campaign model to address a relevant health issue. **Credits:** 3.00

COM 67400 - Seminar: Special Topics In Organizational Communication

Credit Hours: 3.00. Intensive study of selected topics, varying from semester to semester, from the theoretical and research literature of organizational (including business and industrial) communication; analysis of recurring communication problems in complex organizations; critique of research findings and methodologies. **Credits:** 3.00

COM 67600 - Seminar: Special Topics In Health Communication

Credit Hours: 3.00. Intensive study of selected topics, varying from semester to semester, from the theoretical and research literature on health communication. Prerequisite: COM 57600 **Credits:** 3.00

COM 68200 - Seminar: Special Topics In Quantitative Research

Credit Hours: 3.00. Intensive study, varying from semester to semester, of different aspects and applications of quantitative research in communication. Prerequisite: COM 58200 **Credits:** 3.00

COM 69500 - Curricular Practical Training

Credit Hours: 1.00 to 3.00. Internship providing practical field experience under professional supervision in selected situations related to the student's area of specialization. Good standing in the graduate program of the Department of Communication and an approved plan of study including the internship. Permission of instructor required. **Credits:** 1.00 to 3.00

COM 69800 - Research MA Or MS Thesis

Credit Hours: 1.00 to 18.00. Research MA Or MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

COM 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Comparative Literature

CMPL 23000 - Crossing Borders: Introduction To Comparative Literature

Credit Hours: 3.00. (LC 23000) Foundations for comparison of works in different languages, thematic (philosophical, sociological, psychological), and structural (genre, composition, use of linguistic devises); parallel interrelation of theme and structure in works of different literatures. The importance of literary norms and systems of genres. Examination of crosscurrents in different literatures during successive periods of development. **Credits:** 3.00

CMPL 23700 - Our Common Bond: Languages And Cultures In A Global Context

Credit Hours: 3.00. (LC 23700) Students learn what lies behind the concept of Liberal Arts: the capabilities, insights and skills of individuals who think critically and freely. It exposes students from across the university to the ideas, skill-set and inspiration that emanates from the liberal arts. They will be introduced to the discipline of Comparative Literature by examining the specific roles that languages and cultures play in the globalized world. The course also demonstrates how a Language and Cultures degree will put students at a greater advantage in career opportunities. **Credits:** 3.00

CMPL 26600 - World Literature: From The Beginnings To 1700 A D

Credit Hours: 3.00. (ENGL 26600) World literature in translation. A comparative and chronological survey of the masterpieces of Eastern and Western literature. **Credits:** 3.00

CMPL 26700 - World Literature: From 1700 A D To The Present

Credit Hours: 3.00. (ENGL 26700) World literature in translation. A comparative and chronological survey of the masterpieces of Eastern and Western literature. **Credits:** 3.00

CMPL 33000 - International Cinema

Credit Hours: 3.00. This course is designed to develop students' seeing, reading, speaking, writing, and critical thinking skills, and especially to improve visual competency, awareness of visual culture, and knowledge of selected international cinema. All films will be shown with English subtitles. **Credits:** 3.00

CMPL 49000 - Special Topics In Comparative Literature

Credit Hours: 3.00. Topics vary from section to section.**Credits:** 3.00

CMPL 59000 - Directed Reading In Comparative Literature

Credit Hours: 1.00 to 3.00. Directs the reading of students with special interests. Guides students in profitable reading in subjects of their own choice. Individual conferences. No class meetings. Permission of instructor required. **Credits:** 1.00 to 3.00

CMPL 63000 - Comparative Literature: Function And Methods

Credit Hours: 3.00. (LC 63000) An introduction to methods, problems, and the bibliographical tools pertaining to comparative study. **Credits:** 3.00

CMPL 65000 - Seminar In Comparative Literature

Credit Hours: 3.00. (ENGL 66500 and LC 63900) Exploration of a significant topic in comparative literature, e. g., the arts of translation, thematology, genre studies, literary movements, literary relations among countries. **Credits:** 3.00

CMPL 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Comparative Pathobiology

CPB 15000 - Clinical Pathology I-DL

Credit Hours: 2.00. This course is the first of three courses that provide basic instruction in the concepts of clinical pathology to the veterinary technician student. This course will place an emphasis on the terminology used in clinical pathology, as well as red blood cell production, function, and morphology. **Credits:** 2.00

CPB 15100 - Clinical Pathology II-DL

Credit Hours: 1.50. This course is the second of three courses that provide basic instruction in the concepts of clinical pathology to the veterinary technician student. This course will place an emphasis on white blood cell production, function, as well as white blood cell morphology characteristics and identification. **Credits:** 1.50

CPB 15200 - Clinical Pathology III-DL

Credit Hours: 1.00. This course is the third of three courses that provide basic instruction in the concepts of clinical pathology to the veterinary technician student. This course will place an emphasis on the basic concepts of clinical chemistry, urinalysis evaluation, as well as the fundamentals of cytological sample handling and evaluation. **Credits:** 1.00

CPB 22500 - Parasitology For Veterinary Technicians I - DL

Credit Hours: 1.00. This course is the first of two courses that provide basic instruction in the concepts of parasitology for the veterinary technician student. This course will place an emphasis on the basic information needed to accurately identify parasites commonly encountered in veterinary medicine. Emphasis will be placed on life cycles and the zoonotic aspects of the parasites. **Credits:** 1.00

CPB 22600 - Parasitology For Veterinary Technicians II - DL

Credit Hours: 1.00. This course is the second of two courses that provide basic instruction in the concepts of parasitology for the veterinary technician student. This course will place an emphasis on the basic information needed to accurately identify parasites commonly encountered in veterinary medicine. Emphasis will also be placed on life cycles and the zoonotic aspects. Students are expected to be able to make accurate identifications and to communicate effectively. **Credits:** 1.00

CPB 25500 - Clinical Pathology-VN

Credit Hours: 4.00. Basic instruction in clinical pathology, including theory and techniques of hematology, clinical chemistry, urinalysis, cytology, and specimen handling. **Credits:** 4.00

CPB 35100 - Microbiology-VN

Credit Hours: 2.00. Biology and laboratory identification of bacteria and fungi that cause infectious diseases in animals. Emphasis will be placed on the collection of specimens for culture, the isolation and identification of pathogenic organisms, and antibiotic susceptibility testing. Procedures and commercial systems available to veterinary practices will be utilized.**Credits:** 2.00

CPB 35200 - Parasitology-VN

Credit Hours: 2.00. Biology and life cycles of selected protozoan, helminth, and arthropod parasites of veterinary importance. Emphasis will be placed on laboratory procedures for the identification of common parasites of domestic and laboratory animals.**Credits:** 2.00

CPB 46400 - Clinical Toxicology-VN

Credit Hours: 2.00. The common toxicants and advanced topics on the drugs most commonly encountered in veterinary medicine. Emphasis is on mechanisms, indications, contraindications, and proper applications and handling of these drugs. Permission of department required.**Credits:** 2.00

CPB 48000 - Seminar In Animal Welfare And Human-Animal Interaction-VN

Credit Hours: 2.00. This course will be required for students involved in the interdisciplinary Animal Welfare and Societal Concerns program of study. Seminar in Animal Welfare and Human-Animal Interaction is for discussion of current topics in animal welfare and other areas involving the interaction of humans and animals. Outside speakers will present their perspectives in various areas. Journal articles will also be presented and discussed.**Credits:** 2.00

CPB 57600 - Biology And Management Of Laboratory Animals

Credit Hours: 2.00. A didactic course focusing on basic principles of the biology of laboratory animals and how they are managed in a vivarium. Covers regulatory aspects, anatomy, biological techniques, research uses, and management of mice, rats,

hamsters, guinea pigs, gerbils, other rodents, rabbits, dogs, carts, ferrets, and various species of primates, reptiles, and avians in experimental applications. Offered in alternate years. Permission of department required.**Credits:** 2.00

CPB 57800 - Animal Models Of Human Disease

Credit Hours: 2.00. A mixed didactic and discussion course focusing on animal models used in biomedical research. Didactic instruction on principles of model development and use will be coupled with student presentations of models currently used in various research disciplines or disease states. Advantages and limitations of research with various spontaneous and experimentally induced models of human disease, including genetically engineered models. Offered in alternate years. **Credits:** 2.00

CPB 57900 - Seminar In Comparative Medicine

Credit Hours: 2.00. A discussion course focusing on current issues of laboratory animal medicine. Review of current activities, health surveillance reports, etc. Selected cases are presented in detail, including clinical presentation, interpretation of diagnostic tests, and gross and microscopic pathology. In addition, this seminar includes discussions on animal resource management; surgery; animal experimentation; current journal reports; zoonoses; and clinical animal disease diagnosis, prevention, treatment, and control, and other species and topics not formally covered in other core courses. **Credits:** 2.00

CPB 58000 - Special Topics

Credit Hours: 1.00 to 4.00. Directed readings, discussions, and other intensive studies in specialized topics of the disciplines of the department. The topic of study will be selected and announced prior to the semester offered and will be indicated in the student's record. Permission of instructor required. **Credits:** 1.00 to 4.00

CPB 59000 - Special Topics In Animal Welfare And Human-Animal Interaction

Credit Hours: 1.00 to 4.00. Individual study and directed readings in specialized areas of interest of animal welfare or human-animal interaction either for advanced undergraduate or beginning graduate students. Permission of instructor required. **Credits:** 1.00 to 4.00

CPB 60000 - Special Problems In Pathology

Credit Hours: 0.00 to 4.00. Selected problems in veterinary pathology. The topic will be indicated in the student's record. Permission of instructor required. **Credits:** 0.00 to 4.00

CPB 60100 - Advanced Veterinary Clinical Pathology

Credit Hours: 0.00 to 8.00. Comparative hematology, clinical chemistry, diagnostic cytology, and surgical microscopic pathology in the diagnosis of diseases of animals, including laboratory application. Prerequisite: DVM degree. Permission of instructor required. **Credits:** 0.00 to 8.00

CPB 60200 - Advanced Veterinary Anatomic Pathology

Credit Hours: 0.00 to 8.00. Comparative gross and microscopic pathology in the diagnosis of diseases of animals. Prerequisite: DVM degree. Permission of instructor required. **Credits:** 0.00 to 8.00

CPB 60300 - Graduate Teaching Practicum

Credit Hours: 1.00. Graduate students assist in running the laboratory sessions in a sophomore DVM course. They also grade exams and may give one lecture in or make a scholarly contribution to the course. Permission of instructor required. **Credits:** 1.00

CPB 60400 - Neoplastic Diseases Of Animals

Credit Hours: 3.00. Histogenesis and structure of neoplasms of animals; consideration of clinical and pathological entities within groups of neoplasms. Prerequisite: CPB 55600. **Credits:** 3.00

CPB 60500 - Pathology Of Avian Diseases

Credit Hours: 2.00. Avian diseases presented from a gross and histopathological viewpoint. Pathogenesis and differential diagnosis of avian diseases discussed. Prerequisite: DVM degree. **Credits:** 2.00

CPB 61100 - Veterinary Pathology Literature Review Seminar

Credit Hours: 1.00. Understanding of principles of veterinary pathology is required. The class will provide the graduate students with in-depth knowledge in current pathology research and diagnostics. Permission of department required.**Credits:** 1.00

CPB 61400 - Topics In Advanced General Pathology

Credit Hours: 0.50 or 1.00. Discussion of current topics in the following areas of general pathology: cellular injury, fluid and hemodynamic alterations, inflammation, immunopathology, neoplasia, genetic and developmental disorders, pathogenesis of infectious diseases, and nutritional disorders. Class meets one hour in alternate weeks. Prerequisite: DVM degree. Permission of instructor required. **Credits:** 0.50 or 1.00

CPB 61600 - Molecular Diagnostics

Credit Hours: 2.00. The purpose of this course is to enable the student to have an understanding of the impact of molecular techniques in the clinical diagnostic laboratory, the range of techniques available, how they are effectively implemented, and how they are applied for diagnostic and research purposes. Permission of department required. Prerequisites: molecular biology or biochemistry course. Offered every even year.**Credits:** 2.00

CPB 61800 - Ethical Issues In Biomedical Research

Credit Hours: 2.00 or 3.00. Examination of moral reasoning as it applies to epidemiologic inquiry and the methods of biomedical research. Topics include obligations to human and animal research subjects, ethical considerations in research design, data interpretation and fraud, funding of research, and public policy. **Credits:** 2.00 or 3.00

CPB 61900 - Design, Conduct, And Analysis Of Clinical Trials

Credit Hours: 2.00. Reviews the various types of clinical trials that are used in medical research (e.g., therapeutic and preventive). The stages and activities in a "typical" trial are defined along with factors that influence study design. Key elements of data collection, organization, analysis, and interpretation and reporting of results are discussed and illustrated using published reports of clinical trials. Differences in the design and conduct of trials in human and veterinary medicine are considered, including the ethical concerns and costs. Prerequisite: Graduate-level coursework in Biostatistics. **Credits:** 2.00

CPB 62000 - Advanced Immunology

Credit Hours: 2.00. Teaches advanced concepts in basic immunology and applications to disease prevention and therapy. Emphasis is on recent developments and experimental approaches in this rapidly evolving discipline. Topics include antigen presentation, T-cell development, signal transduction in B and T lymphocytes, immunoglobulin structure, type I hypersensitivity (asthma), neuroendocrine regulation of the immune response, immune response in viral infections (influenza and HIV), and tumor immunology. Permission of instructor required. **Credits:** 2.00

CPB 62200 - Microbial Pathogenesis

Credit Hours: 2.00. Provides advanced study of the concepts of microbial pathogenesis and host-microbe interaction. The virulence factors and molecular mechanisms of infection used by bacteria, viruses, and protozoa to cause disease will be examined. Specific diseases will be studied as examples of how microbes affect animals as well as humans. Permission of instructor required. **Credits:** 2.00

CPB 62400 - Advanced Laboratory Animal Medicine

Credit Hours: 0.00 to 8.00. Experiential training and practice in laboratory animal medicine. Prerequisite: DVM degree. Restriction: Only CPB graduate students in Laboratory Animal Medicine may enroll in this course. **Credits:** 0.00 to 8.00

CPB 62500 - Clinical Biostatistics

Credit Hours: 2.00. Intended for veterinary medical and biological science graduate students, this course is designed to familiarize them with the appropriate usage (and reporting) of different statistical tests in biomedical research. Students are taught the basic theories underlying the different tests, the data assumptions underlying the application of those tests, and review/critique published scientific articles that employed these tests. Students have the opportunity to describe the appropriate statistical methods to be used in their proposed research and/or report the usage or appropriate statistical tests on their own data. **Credits:** 2.00

CPB 62600 - Design And Analysis Of Epidemiologic Studies

Credit Hours: 3.00. Focuses on epidemiologic study design and applications of statistical software to the analysis of data derived from health research. Includes an overview of epidemiologic study designs, frequency and association measures, generalized linear models and survival analysis. Hands-on computer laboratories are provided using data derived from field studies. Prerequisites: One graduate-level course in biostatistics. **Credits:** 3.00

CPB 63000 - Advanced Veterinary Avian Pathology

Credit Hours: 0.00 to 8.00. Comparative gross and microscopic pathology in diagnosis of avian diseases. Prerequisites: At least one Statistics course must be taken before or during the non-thesis MS/Residency Graduate Program. See list of courses. STAT courses: CPB 61900; CPB 62500; STAT 50300; STAT 51200; STAT 51400: STAT 52400. A DVM Degree is required to enroll in the non-thesis MS/Residency Grad Program. Permission of instructor required. **Credits:** 0.00 to 8.00

CPB 63100 - Avian Immunology

Credit Hours: 2.00. The avian immune system is significantly different than the mammalian immune system. This course compares and contrasts mammalian and avian immune systems. Prerequisites: At least one graduate or undergraduate course in biology or poultry science. Permission of instructor required. **Credits:** 2.00

CPB 63200 - Avian Medicine

Credit Hours: 2.00. This disease-based course is designed to introduce students to poultry medicine. It covers all the major diseases and conditions that affect poultry. Permission of instructor required. **Credits:** 2.00

CPB 63300 - Preventive Avian Medicine Practice

Credit Hours: 1.00. The course introduces students to issues/practice in commercial poultry production. Brief discussions will relate how these practices influence poultry health. Permission of instructor required. **Credits:** 1.00

CPB 63400 - Diseases Of Laboratory Animals

Credit Hours: 3.00. A didactic course focusing on basic understanding of the diseases of laboratory animal medicine, and concentrating on effects of the disease on research productivity, prevention programs, and pathogenesis. Etiology, pathogenesis, gross and microscopic pathology, diagnosis, control, and research complications of diseases of rats and mice, primates, rabbits, guinea pigs, hamsters, and ferrets; and health assessment programs. Permission of department required.**Credits:** 3.00

CPB 63500 - Advanced Veterinary Diagnostic Microbiology

Credit Hours: 0.00 to 8.00. Veterinary clinical and diagnostic microbiology training. Prerequisite: DVM degree or equivalent. Permission of instructor required. **Credits:** 0.00 to 8.00

CPB 63600 - Veterinary Microbiology Seminar

Credit Hours: 0.00 to 8.00. This class will provide graduate students with in-depth knowledge in current microbiology research and clinical diagnostics. Students will review current literature related to veterinary infectious disease with the intent of explaining its application to clinical and diagnostic microbiology. Permission of instructor required.**Credits:** 0.00 to 8.00

CPB 68000 - Special Topics

Credit Hours: 1.00 to 4.00. Directed readings, discussions, and other intensive studies in specialized topics of the disciplines of the department. The topic of study will be selected and announced prior to the semester offered and will be indicated in the student's record. Permission of instructor required. **Credits:** 1.00 to 4.00

CPB 69100 - Seminar In Veterinary Pathology

Credit Hours: 0.00 to 2.00. Discussions of selected current disease problems with emphasis on gross and microscopic tissue changes and pathogenesis. Required of all graduate students in veterinary pathology each semester in residence. **Credits:** 0.00 to 2.00

CPB 69400 - Special Topics In Immunology

Credit Hours: 1.00. Understanding of principles of immunology is required. Journal club style class geared to provide graduate students with in-depth knowledge in current immunology. Faculty will participate in class to facilitate the students' understanding and discussion. Students present one-two times depending on the number of participating students. They select a research paper, recently published in the area of immunology, assigned for the semester and have it approved by the course organizer. **Credits:** 1.00

CPB 69500 - Seminar In Epidemiology

Credit Hours: 1.00. Discussion of recent research in epidemiology, emphasizing study design, analysis, and public health significance. Discussion topics will be selected from the following areas: clinical epidemiology, infectious disease epidemiology, chronic disease epidemiology, and environmental epidemiology. Required of graduate students with a principal field of study in epidemiology. Prerequisite: Course work in Statistics and Epidemiology. **Credits:** 1.00

CPB 69700 - Research Seminar

Credit Hours: 0.00 or 1.00. Discussion of current concepts and research results in epidemiology, immunology, microbiology, parasitology, pathology, virology, host-parasite relationships, and other aspects of veterinary pathobiology. Each graduate student is expected to register each semester and to make one oral presentation per year. A grade of pass/not-pass and one credit will be awarded for the semester the presentation is given. Permission of instructor required. **Credits:** 0.00 or 1.00

CPB 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

CPB 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

CPB 81900 - Veterinary Toxicology

Credit Hours: 2.00. This course will provide an introduction to small and large animal toxicology. It will cover the most common toxicoses encountered in veterinary medicine with emphasis on recognizing clinical signs of toxicoses, discerning differential diagnoses for these cases, and assigning appropriate diagnostic tests. Prerequisites: Completion of first year in the DVM program. **Credits:** 2.00

CPB 83300 - Preventative Avian Medicine Practice

Credit Hours: 1.00. This course will cover practical veterinary management of commercial poultry. The first portion of the course will concentrate on types of commercial poultry and management of large flocks. In addition, the course will include environmental impact of commercial poultry farms, waste management, and animal welfare. Management of waste and animal welfare are crucial components of veterinary and agricultural workers. The students need to appreciate the intricacies of poultry production to be able to assess the welfare, environmental, and public health regulations pertaining to the poultry industry. Introduction to the role of the poultry veterinarian in non-traditional practice will also be covered. **Credits:** 1.00

CPB 84000 - Use And Care Of Laboratory Animals

Credit Hours: 1.00. Topics will include the history of animal use in research; ethical thought related to animal use in research; alternatives; government regulatory requirements; statistical considerations in designing animal studies; animal models; use of the National Agricultural Library Animal Welfare Information Center; biology, husbandry, techniques, and diseases of common laboratory animal species; hygiene and occupational health; biohazard control; perioperative care and aseptic surgical techniques; anesthesia; analgesia; and euthanasia. **Credits:** 1.00

CPB 84100 - Use And Care Of Laboratory Animals II

Credit Hours: 1.00. Priority will be given to students that have completed CPB 84000. This course teaches skills useful for the role of a laboratory animal veterinarian. Course is project-based and includes hands-on techniques in laboratory rodents. **Credits:** 1.00

CPB 85100 - General Pathology

Credit Hours: 3.00. An overview of the basic cellular reactions that develop in response to injurious agents. Focuses on the gross and microscopic alterations in tissues, events leading to the development of those alterations, and the consequences of those changes on the health of animals. Includes degenerative, necrotic, inflammatory, and neoplastic changes in various animal species. **Credits:** 3.00

CPB 85203 - Veterinary Parasitology

Credit Hours: 3.50. This course will provide an introduction to parasites of animal health importance. Specifically, this course covers the important helminth, protozoal and arthropod diseases of animals with emphasis placed on the pathogenesis, epidemiology, clinical features, diagnosis, control and zoonotic implications. This course will also cover the principles and practice of laboratory tests for detection of parasitic infections and identification of important parasites. **Credits:** 3.50

CPB 85204 - Veterinary Parasitology

Credit Hours: 3.00. Covers the important helminth, protozoal and arthropod diseases of animals. Emphasis is placed on the pathogenesis, epidemiology, clinical features, diagnosis, control, and zoonotic implications of protozoal and arthropod infections in this semester of the course. **Credits:** 3.00

CPB 85300 - Principles Of Veterinary Immunology

Credit Hours: 2.00. An overview of the fundamental concepts of immunology, with an emphasis on the immune system of domestic animals and comparative immunology. Focuses on the interactions between the host and microbial pathogens and on mechanisms that underlie hypersensitivity reactions, autoimmune diseases, and immune deficiencies. Discusses the principles of vaccination and serologic tests. **Credits:** 2.00

CPB 85400 - Principles Of Epidemiology

Credit Hours: 1.00. An introduction to the principles of epidemiology as it relates to evaluating and describing the health of human and animal populations. An emphasis is placed on the appropriate use by veterinarians of information derived from epidemiologic studies in making clinical decisions regarding the diagnosis, treatment, prognosis, and prevention of disease in individual patients. A goal is to demonstrate why epidemiology is considered by some as "a basic science for clinicians." **Credits:** 1.00

CPB 85401 - Epidemiology And Evidence-Based Veterinary Medicine

Credit Hours: 2.00. The fundamentals of descriptive and analytical epidemiology will be developed as they relate to problems in veterinary and comparative medicine. A primary goal of the course is to expose future health professionals to the information and thought processes that are essential for critically evaluating the medical literature and for making decisions regarding health care for individuals and populations. **Credits:** 2.00

CPB 85500 - Veterinary Hematology And Cytology

Credit Hours: 2.00. Provides an overview of veterinary hematology and cytology. Normal morphology and function of the cells of the hematopoietic system are reviewed. Laboratory analyses of the different cell types are discussed. The responses of the hematopoietic cells that can be seen during different disease processes are presented. Fundamentals of veterinary diagnostic cytology are introduced. **Credits:** 2.00

CPB 85602 - Veterinary Bacteriology And Mycology

Credit Hours: 4.00. The lecture portion provides an introduction to bacterial and fungal agents of animal diseases. The taxonomy, morphology, and physiology of the organisms are discussed. Pathogenic features of the infectious agents and host responses to infection will be emphasized. Epidemiology, diagnosis, and control of the various diseases will be presented. The laboratory portion of the course covers laboratory safety, sterilization and disinfection in addition to microbiological techniques, antimicrobial susceptibility testing and interpretation, and identification of cultured bacteria and dermatophytes. **Credits:** 4.00

CPB 85603 - Veterinary Bacteriology And Mycology

Credit Hours: 3.00. An overview of bacterial and fungal pathogens of veterinary species. Topics will include discriminating features of the organisms, the pathogenesis of diseases caused by these agents, diagnostics, management and therapeutics.**Credits:** 3.00

CPB 85700 - Veterinary Systemic Pathology

Credit Hours: 5.00. Provides coverage of system specific pathologic terminology and characteristic pathologic responses of the various body systems to injury. This is followed by presentation of representative examples of diseases of various etiologies, including, but not limited to, infectious and noninfectious diseases.**Credits:** 5.00

CPB 86000 - Veterinary Virology

Credit Hours: 3.00. Principles of medical virology and discussions of important viral diseases of animals. **Credits:** 3.00

CPB 86100 - Veterinary Clinical Chemistry

Credit Hours: 2.00. Laboratory techniques and interpretation of laboratory data as profiled by organ system are presented. Integration of data to explain pathophysiologic changes as an aid to diagnosis, prognosis and progression of disease is emphasized. **Credits:** 2.00

CPB 86200 - Clinical Epidemiology For Companion Animals

Credit Hours: 1.00. Fundamentals of experimental epidemiology and clinical decision-making are explored, particularly as they relate to the practice of companion animal medicine. Methods for disease detection and prevention are emphasized in catteries and kennels. The computer laboratories illustrate the software available for problem-solving in population medicine. **Credits:** 1.00

CPB 86300 - Epidemiology For Livestock Production

Credit Hours: 1.00. Study of the fundamental concepts for epidemiologic implications in livestock production, including design of epidemiologic studies in livestock populations, investigation of disease outbreaks, use of diagnostic tests, infectious disease control, and animal health economics. Rationale, strategies, and concepts of animal disease control are emphasized with examples. **Credits:** 1.00

CPB 86900 - Veterinary Public Health And Zoonoses

Credit Hours: 2.00. A survey of fundamental topics on diseases that are caused by viral, bacterial, rickettsial, and parasitic agents and are known to be transmissible from animals to humans, as well as those diseases that are common to humans and animals. Topics emphasize the epidemiology and methods for prevention and control of these diseases in animal and human populations. Food safety and foodborne diseases, with particular emphasis on foods of animal origin, are discussed. Risk assessment of occupational and environmental health conditions to which veterinarians are likely to be exposed in training or the workplace also is covered. **Credits:** 2.00

CPB 87000 - Diagnostic Veterinary Cytology

Credit Hours: 1.00. A combination of didactic and wet laboratory microscopic sessions are used to demonstrate applications of diagnostic cytology. Consists of weekly sessions with a brief lecture overview of the basic cytologic features of a particular organ system followed by microscopic review of collected cytology material from that particular organ system. The didactic and laboratory sessions are supplemented by Internet-based and digital-format archived images for student review. Typically offered Spring, Summer.**Credits:** 1.00

CPB 88300 - Public Health

Credit Hours: 3.00. This course is designed for senior veterinary students to fulfill their interests in public health and preventive veterinary medicine. There will be a classroom and field component, focusing on topics including epidemiology, food safety, infectious diseases, environmental health and health communications. Visits to various agencies will complement the course material by offering inside views of the day to day operations of the facilities as well as the career experiences of the employees working in them. Students will also gain field experience in actual or devised research projects that will include activities such as study design, questionnaire development, collecting epidemiologic data, date input, analysis, and interpretation. Students will be asked to design a study, produce an information brochure, and prepare a verbal presentation for elementary school children about topics relating to being safe with your pets. Total clinic hours 129.**Credits:** 3.00

CPB 88400 - Laboratory Animal Medicine

Credit Hours: 3.00. Students will participate in laboratory animal medicine practice which can include facility inspections, protocol review, preventative medicine, monitoring disease status, and diagnosis and treatment of spontaneous diseases in laboratory animals. Total clinic hours 129.**Credits:** 3.00

CPB 88501 - Necropsy I

Credit Hours: 1.00. This is one of three concurrent courses (CPB 88501, CPB 88502, CPB 88503) in which senior veterinary students will be enrolled. Students will actively participate in the diagnostic necropsy service within the ADDL. The student is expected to gain basic clinical experience and training in necropsy and diagnostic pathology as they contribute to and support the practice of veterinary medicine. Students are expected to actively assist faculty in performing necropsies, discuss pathophysiology of cases and submit reports of their observation. Total clinic hours 43. **Credits:** 1.00

CPB 88502 - Microbiology I

Credit Hours: 1.00. This is one of three concurrent courses (CPB 88501, CPB 88502, CPB 88503) in which senior veterinary students will be enrolled. This course is designed for senior veterinary students to gain additional training in diagnostic microbiology (bacteriology, mycology, virology and molecular diagnostics) in relation to clinical diseases. Students will actively participate in self study and discussion of selected diagnostic microbiology cases as well as hands-on logistically approached laboratory procedures for culture and isolation of microbial agents. The students are expected to be proficient and competent in veterinary diagnostic microbiology at the end of rotation. Total clinic hours 43.**Credits:** 1.00

CPB 88503 - Clinical Pathology I

Credit Hours: 1.00. This is one of three concurrent courses (CPB 88501, CPB 88502, CPB 88503) in which senior veterinary students will be enrolled. In addition to clinical pathology, students must be enrolled in microbiology and diagnostic pathology (necropsy). The main goal of this rotation is to insure that each participant is at a level of competency that every graduating senior should have attained. Through a combination of self study and small group periods in a classroom as well as on a multi-headed microscope, a set of core objectives will be explored. These objectives have been chosen as a representation of basic clinical pathology skills that students should have mastered to practice veterinary medicine competently. In addition, an approved

journal article or comparable piece of literature will be evaluated and summarized. An objective examination at the end of the rotation will test the student's knowledge of the objectives. Total clinic hours 43. **Credits:** 1.00

CPB 88600 - Diagnostic Pathology

Credit Hours: 3.00. Advanced training in diagnostic approaches to identification of the causes and pathogenesis of disease in mammals. Total clinic hours 129. **Credits:** 3.00

CPB 88700 - Avian Medicine

Credit Hours: 3.00. This course is designed for senior veterinary students to receive advanced training in avian disease diagnosis and health management in commercial poultry flocks. Critical poultry infectious and non-infectious diseases will be discussed. The student will visit production facilities for layers, broilers, turkeys, or ducks. Vaccination and medication programs for these species will be discussed. Necropsy experience will be gained from poultry, game bird, and pet bird accessions to the Animal Disease Diagnostic Laboratory (ADDL). Total clinic hours 129. **Credits:** 3.00

CPB 88800 - Microbiology II

Credit Hours: 3.00. This course is designed for senior veterinary students to gain advanced training in clinical microbiology in relation to clinical diseases. Microbial diseases of veterinary importance and zoonotic significance will be addressed. Students will actively pursue selected microbiology accessions to the Animal Disease Diagnostic Laboratory (ADDL) in depth by applying problem-based learning approach, using correct laboratory procedures, and searching related literature to reach microbiological diagnosis and conclude the cases. Written reports, oral presentations, case discussion will be highlighted in the rotation to enrich the learning experience and insure the proficiency and competency in veterinary clinical microbiology. Total clinic hours 129. **Credits:** 3.00

CPB 88900 - Clinical Pathology II

Credit Hours: 3.00. This advanced clinical pathology rotation is designed to take the core skills mastered in CPB 88503 and expand on them. Through daily interaction to the consulting office on clinical cases, students will learn to critically evaluate cytologic and hematologic specimens as well as laboratory data. Activities that the student will engage in include the resident's journal club, weekly clinical pathology rounds, large animal clinical pathology rounds and other small group sessions with residents and pathologists. The goal for the rotation is to begin building a broad base of experience to continue building on in the future. Total clinic hours 129. **Credits:** 3.00

Computer and Information Technology

CIT 20200 - Networking Fundamentals

Credit Hours: 3.00. This course will provide students with the fundamental skills necessary to design, implement, troubleshoot and manage a small to medium sized Local Area Network. Students will gain hands-on experiences in a lab environment, configuring a client server network, working with connectivity devices, troubleshooting hardware and software issues. Students will explore topics including network performance, network management and network security.**Credits:** 3.00

CIT 20300 - Information Security Fundamentals

Credit Hours: 3.00. This course provides students with an overview of the field of Information Security and Assurance. Students will explore current encryption, hardware, software and managerial controls needed to operate networks and computer systems in a safe and secure manner. In addition, students will participate in a semester project to re-enforce key concepts such as policy development and business contingency planning.**Credits:** 3.00

CIT 20700 - Data Communications

Credit Hours: 3.00. This course provides the foundation for the understanding of data communication systems and computer networks. Topics include information representation and transmission, medium types and configuration, telephony, error handling, TCP/IP and internetworking, and diagnostic techniques.**Credits:** 3.00

CIT 21200 - Web Site Design

Credit Hours: 3.00. This course is designed to give students an introduction to web site design and site creation. The course involves learning current standard XHTML fundamentals, CSS and design concepts. The proper design approach for constructing Web site and related techniques will also be covered.**Credits:** 3.00

CIT 21300 - Systems Analysis And Design

Credit Hours: 3.00. This course provides students with the concepts, processes, and tools of system analysis and systems design. Object-oriented methods and tools are utilized with a focus on developing web-based interfaces and prototypes.**Credits:** 3.00

CIT 21400 - Introduction To Data Management

Credit Hours: 3.00. Introduction to basic database development concepts. Extensive exploration of data manipulation using a relational DBMS and SQL. Students develop database applications using the most current database technologies.**Credits:** 3.00

CIT 21500 - Web Programming

Credit Hours: 3.00. This course will provide students with the knowledge and techniques of introductory web programming.**Credits:** 3.00

CIT 22000 - Quantitative Analysis II

Credit Hours: 3.00. A continued investigation into the problem solving tools and techniques that focus on both hardware systems and quantitative data analysis. The course is designed for CIT majors in their second full year of study.**Credits:** 3.00

CIT 24200 - Introduction To ASP.Net Programming

Credit Hours: 3.00. This course will provide students with the tools and techniques to build dynamic Web sites using the ASP.Net programming environment. Students gain hands-on experience building a database-driven Web site.**Credits:** 3.00

CIT 27000 - Java Programming I

Credit Hours: 3.00. This course is an introduction to the Java Programming language. Students will learn the syntax of the language, how to use objects, classes, and methods, and will perform programming exercises that illustrate how Java is used in stand alone applications and applets.**Credits:** 3.00

CIT 30400 - Database Programming

Credit Hours: 3.00. This course explores advanced database programming techniques for enterprise-wide databases and their implementation using programmatic extensions to Structured Query Language (SQL). Topics include advanced data manipulation, stored procedures, triggers, and query optimization.**Credits:** 3.00

CIT 30900 - Cybersecurity And Network Programming

Credit Hours: 3.00. Course teaches students skills necessary to develop programs and scripts to solve cybersecurity and networking problems such as automating manual tasks, parsing data, and data analysis. Students gain hands-on experience, combining the theory and practice of relevant tools, techniques, and programming technologies used in daily real-world cybersecurity and networking profession.**Credits:** 3.00

CIT 31300 - Commercial Web Site Development

Credit Hours: 3.00. This project-based course will have students develop a data driven web site to support business processes. Students will utilize both client and server side languages in developing the site.**Credits:** 3.00

CIT 32000 - Quantitative Analysis III

Credit Hours: 3.00. A continuation of statistical inference introduced in Quantitative Analysis II with emphasis on confidence intervals, hypothesis testing, analysis of variance, forecasting including linear regression and correlation, and quality control as they apply to information technology.**Credits:** 3.00

CIT 32700 - Wireless Communication

Credit Hours: 3.00. Students will learn about the growing range of wireless technologies and their applications. The course will explore the fundamentals of each wireless technology from basic signaling properties to current and future market uses. Students will have the opportunity to gain hands-on experience with various wireless technologies.**Credits:** 3.00

CIT 34400 - Database Security

Credit Hours: 3.00. This course will cover fundamentals of database security, data auditing, basic security models, and best practices. Topics may include security architecture, access control policies, auditing and monitoring. The course combines lectures with hands-on activities through lab sessions and an application oriented project using a database system such as Oracle or SQL Server.**Credits:** 3.00

CIT 35600 - Network Operating Systems Administration

Credit Hours: 3.00. Design and administration of network servers and workstations. Focus on basic network concepts such as user account administration, resource allocation, security issues and internet service management.**Credits:** 3.00

CIT 37300 - Visual Design For Software

Credit Hours: 3.00. Examination of best practices in software interface development for a variety of platforms. A study of the integration of visual elements into the systems analysis and design process, based on business and technical requirements. Topics include study of common design patterns, a review of prototyping tools, multi-modal design concepts, navigation strategies, and user acceptance testing.**Credits:** 3.00

CIT 37400 - Systems And Database Analysis

Credit Hours: 3.00. Intensive exploration of application and database analysis in a synergistic environment. Students engage in collaborative, project-based activities to learn about project management, requirements analysis, modeling, prototyping, employing problem solving, and team-building skills. Object-oriented and data modeling tools are used to apply class concepts.**Credits:** 3.00

CIT 38100 - Unix Programming And Administration

Credit Hours: 3.00. This course will teach students to effectively administer and develop applications in Linux/Unix. Emphasis will be on the ability to read, write, and debug shell script programs. An exploration of Windows scripting languages will also be covered.**Credits:** 3.00

CIT 40200 - Design And Implementation Of Local Area Networks

Credit Hours: 3.00. The design, implementation, and configuration of local area networks. Students install the necessary hardware and software to set up a LAN server with several clients. Students will explore topics including "inter-networking", network management, network performance, and security.**Credits:** 3.00

CIT 40600 - Advanced Network Security

Credit Hours: 3.00. This course provides students with the in-depth study and practice of advanced concepts in applied systems and networking security, including security policies, access controls, IP security, authentication mechanisms and intrusion detection and protection.**Credits:** 3.00

CIT 41500 - Advanced Network Administration

Credit Hours: 3.00. In this course, students will learn advanced concepts for installing, configuring and securing various types of network servers including enterprise, web and mail servers. The course also covers the documentation of network systems infrastructure and the testing of hardware and software network components.**Credits:** 3.00

CIT 41800 - Native Android Application Development

Credit Hours: 3.00. This advanced programming course gives students hands-on experience developing applications for Google mobile computing devices running the Android operating system. Students will build data-driven and location-aware applications using object-oriented software design patterns common to mobile application development. A variety of data storage and remote datasource-driven applications will be introduced.**Credits:** 3.00

CIT 42100 - Big Data Analytics

Credit Hours: 3.00. This course will cover both the fundamentals and concepts of data analytics. The focus is on emerging advanced data analytics techniques and their applications to practical problems for different disciplines, such as IT, health care, and economics. Machine learning algorithms and distributed computing environments will be explored. Students will apply these advanced techniques in labs and a project to resolve an applied problem and identify scientific findings by using public data sets. A project report is required at the end of the course.**Credits:** 3.00

CIT 43100 - Applied Secure Protocols

Credit Hours: 3.00. This course will emphasize the applied facets of cryptography for the information assurance and security professional. By the end of the course students will be able to apply important cryptographic principles and tools to allow networks to communicate securely.**Credits:** 3.00

CIT 44400 - Advanced Database Design

Credit Hours: 3.00. This course addresses enterprise data management and logical database design concepts with an emphasis on needs determination and data modeling skills from an organizational perspective. Students will create data models and apply

forward and reverse engineering techniques and will work through the full life cycle of the development of a software application. A project-based learning approach is used in this course.**Credits:** 3.00

CIT 45100 - IT Security Risk Assessment

Credit Hours: 3.00. Students will learn the basic tools of security risk assessment and risk management. Students will be able to identify and assess security risk, conduct information asset valuation, and apply risk control strategies. Other topics discussed will be: security policies, NIST Security Models, and training education and awareness. At the end of the course students will be able to assess vulnerabilities and document them according to published assessment standard.**Credits:** 3.00

CIT 47900 - Database Implementation And Administration

Credit Hours: 3.00. Extends knowledge of database concepts. Topics include physical database design, client/server implementation and database administration. Given a logical database design, students develop physical database structures and implement a database application. Students carry out database design, construction, administration, and programming activities using client/server technology.**Credits:** 3.00

CIT 48500 - The Living Lab

Credit Hours: 1.00 to 6.00. The Living Lab allows students to apply networking, security, database, website, and application development concepts and techniques learned from prior CIT courses to internal and/or external projects. The Living Lab emulates an industry IT department in which students work on one or more projects as part of an IT team. Permission of instructor required.**Credits:** 1.00 to 6.00

CIT 50700 - Measurement And Evaluation In Industry And Technology

Credit Hours: 3.00. This course is an introduction to measurement strategies and evaluation of data in industry and technology within the context of research design and implementation. Students will learn not only basic statistics in this course but will also learn about the research process by designing, conducting, and analyzing the data for a small empirical research project using real world data. The material in this course is directly relevant to student professional development. Data collection and interpretation are key day-to-day aspects of social and behavioral science, humanities, communication, economics, physical science, biological and medical science, technology, education, psychology, business, environmental science, education and government. In addition, the ability to use computers and other technologies around data has become a critical element in most professional decision-making processes.**Credits:** 3.00

CIT 51102 - Android Mobile Application Development

Credit Hours: 3.00. This advanced programming course teaches students to create data-driven, location-aware mobile applications for the Android platform. Students will learn common mobile app design patterns and will integrate cloud computing services into their applications. Prerequisite: Any programming course equivalent to 300-level programming; any relational database.**Credits:** 3.00

CIT 51600 - Database Security

Credit Hours: 3.00. This course provides a strong foundation in database security and auditing. It will cover topics on security, profiles, password policies, privileges and roles, Virtual Private Databases, and auditing. The course also covers advanced topics such as SQL injection, database management security issues such as securing the DBMS, enforcing access controls, and related issues. Permission of instructor required.**Credits:** 3.00

CIT 52600 - Applied Data Analytics

Credit Hours: 3.00. This course will cover both the fundamentals and concepts of the data analytics and the advanced data analytics techniques. The focus is on emerging advanced data analytics techniques and their applications to practical problems for different disciplines, such as IT, health care, and economics. Both advanced supervised learning and unsupervised learning algorithms will be explored along with data visualization techniques. Students will apply these advanced techniques in labs and a research project to resolve an applied research problem and identify scientific findings by using public data sets. A research project report is required at the end of the course and the quality of the research report is expected to align with the requirements of IEEE or ACM international conferences.**Credits:** 3.00

CIT 52800 - Information Security Risk Assessment

Credit Hours: 3.00. (CNIT 52800) Covers information security risk assessment, including the following topics: steps in performing information security risk assessment, threats to information security, technical, managerial, and operational vulnerabilities, methods for analyzing controls, methods for determining likelihood of and impact from an information security breach, and methods for determining risk. Emphasizes the development and utilization of security metrics in the risk assessment process.**Credits:** 3.00

CIT 53200 - Wireless Security And Technology

Credit Hours: 3.00. This course will provide in-depth coverage of wireless communications and security. Fundamentals and state of the art developments in the wireless security area will be covered, including advances in cellular, personal communications systems (PCS), wireless LANs, and fixed wireless networks. Significant details of wireless devices and corresponding security issues will be addressed. Emerging challenges and solutions in wireless vulnerabilities, attacks, and solutions at various layers of the protocol stack, spanning the stack from aspects of physical communication to application and service security issues, will also be covered.**Credits:** 3.00

CIT 58100 - Topics In Computer Information Technology

Credit Hours: 1.00 to 6.00. Advanced study of technical and professional topics relating to computer and information technology. Emphasis is on the cutting edge technologies and new developments relating to advanced information technologies. Permission of instructor required.**Credits:** 1.00 to 6.00

CNIT 300IN - Human-Computer Interaction

Credit Hours: 3.00. The analysis of human factors and the design of computer application interfaces. A survey of current best practices with an eye toward what future technologies will allow.**Credits:** 3.00

CNIT 10500 - Introduction To C Programming

Credit Hours: 3.00. This course is an introduction to computer programming using the "C" language. The emphasis is on structured programming principles, and understanding the basic concepts that apply to engineering problems. Among topics covered in this course are: problem solving using top down design, using flowcharts to explain the program logic, selection structure, repetition structure, bitwise operations, arrays, pointers, strings, passing arguments, and sequential files. **Credits:** 3.00

CNIT 10700 - Computers And Software Packages

Credit Hours: 1.00 to 4.00. Prerequisites vary with course content. Does not carry credit toward degree requirements in Computer Technology. Topics and skills associated with specific computer(s) and/or specific software package(s). Level of coverage varies according to audience. Various applications packages may be offered under this title. **Credits:** 1.00 to 4.00

CNIT 11100 - Computer Literacy

Credit Hours: 1.00. Introduction to computers and applications for students admitted to the Horizons program. **Credits:** 1.00

CNIT 13600 - Personal Computing Technology And Applications

Credit Hours: 3.00. This course provides an intermediate coverage of PC technology and problem solving. Topics include computer hardware, operations and ethics, and operating systems and environments. Students will gain hands-on skills with applications such as desktop and file management; word processing; spreadsheets; presentation graphics; electronic mail; personal information management; and internet browsing, searching, and publishing. **Credits:** 3.00

CNIT 14100 - Internet Foundations, Technologies, and Development

Credit Hours: 3.00. (CGT 14100) This course explores the history, architecture and development of the World Wide Web. Current tagging and scripting languages are covered in a tool independent environment. Topics also include authoring tools, design, graphic and multimedia formats, and commerce, implementation and security issues. PC literacy required. **Credits:** 3.00

CNIT 15500 - Introduction To Object-Oriented Programming

Credit Hours: 3.00. This course introduces fundamental software development concepts common to most programming languages. Topics include: problem solving and algorithm development, debugging, programming standards, variable, data types, operators, decisions, repetitive structures, modularity, array, user interface construction, software testing and debugging. A broad range of examples will be used throughout the course to show how each programming concept applies to real life problems. **Credits:** 3.00

CNIT 15501 - Introduction To Software Development Concepts

Credit Hours: 3.00. This course introduces fundamental software development concepts common to most programming languages. Topics include problem solving and algorithm development, debugging, programming standards, variables, data types, operators, decisions, repetitive structures, modularity, arrays, user interface construction, software testing and debugging. A broad range of examples will be used throughout the course to show how each programming concept applies to real life problems. **Credits:** 3.00

CNIT 16100 - Introduction To Programming And Data Management For Smart Manufacturing

Credit Hours: 3.00. This course introduces a programming language and provides an overview of coding, data analysis and data manipulation in a database. Topics include fundamentals of programming, introduction to data manipulation and analysis, and an introduction to relational databases and the Structured Query Language (SQL). **Credits:** 3.00

CNIT 17500 - Visual Programming

Credit Hours: 3.00. This course introduces event-driven application development and programming using a visual programming environment. Topics include problem solving and program design, control structures, objects and events, user interface construction, documentation, and program testing. Credit may be established in only one of: CPT 15500 or CPT 17500 or CPT 25000. PC literacy required.**Credits:** 3.00

CNIT 17600 - Information Technology Architectures

Credit Hours: 3.00. A conceptual and technological survey of information technology architectures inclusive of operating systems, network operating systems, distributed systems architectures, and distributed application architectures. Interoperability

between these architectural components is explored. Current technology and trends in each architectural element are reviewed. PC literacy required. **Credits:** 3.00

CNIT 18000 - Introduction To Systems Development

Credit Hours: 3.00. This course introduces information systems development. Topics include types of information systems, system development, database management systems, and problem solving. Students will read/create UML, ERD, and data flow diagrams to model information system objects, data, processes, and logic. Labs emphasize modeling and SQL/QBE querying to prepare students for later systems, programming, and database classes. Given user requirements students will design, construct, and test a personal computer information system. PC literacy required. **Credits:** 3.00

CNIT 18101 - Topics In Computer Information Technology I

Credit Hours: 3.00. This variable title course is used to pilot new course offerings. **Credits:** 3.00

CNIT 18200 - System And Organizational Security

Credit Hours: 3.00. This class focuses on the security of the design, procurement, testing, analysis and maintenance of components that are integrated into larger systems. Protecting organizations from cybersecurity threats and managing risk to support the successful accomplishment of the organization's mission is also covered.**Credits:** 3.00

CNIT 19900 - Topics In Computer And Information Technology

Credit Hours: 1.00 to 3.00. Hours and subject matter arranged by staff. Individual study under directed leadership of professor. Primarily for students with special aptitudes. Permission of instructor required. **Credits:** 1.00 to 3.00

CNIT 22700 - Introduction To Bioinformatics

Credit Hours: 2.00. Survey course in Bioinformatics for information technology specialists including topics such as: virtual bio-instrumentation, data reduction and mining algorithms and tools, data visualization, pattern matching, modeling and simulation, computational methods, and collaborative application environments. **Credits:** 2.00

CNIT 23500 - Management Information Systems And Collaboration Technology

Credit Hours: 3.00. This course introduces management information systems, project management topics and technologies, and collaboration technologies. PC literacy required. **Credits:** 3.00

CNIT 24000 - Data Communications And Networking

Credit Hours: 3.00. This course provides a comprehensive introduction to data communications and networks. Topics include communication standards and concepts, protocols, the Open Systems Interconnect (OSI) model, point-to-point communication, and local area networks. Business issues from both provider and user perspectives are discussed. Current technology and trends in each architectural element are reviewed.**Credits:** 3.00

CNIT 24200 - System Administration

Credit Hours: 3.00. This course provides a comprehensive introduction to system administration. Topics include authentication and authorization, directory services, system management and system security. Emphasis is placed on enterprise level systems. **Credits:** 3.00

CNIT 25500 - Programming For The Internet

Credit Hours: 3.00. This course introduces software development concepts common to modern object-oriented programming languages. Topics include: intermediate data types, decisions, repetitive structures; methods; arrays and collections; encapsulation; inheritance, and polymorphism; exception handling; data persistence; Database Management System (DBMS) connectivity; user interface construction; software testing and debugging; and working in teams. **Credits:** 3.00

CNIT 25501 - Object-Oriented Programming Introduction

Credit Hours: 3.00. This course introduces software development concepts common to modern object-oriented programming languages. Topics include: intermediate data types, decisions, repetitive structures; methods; arrays and collections; encapsulation, inheritance, and polymorphism; exception handling; data persistence; Database Management System (DBMS) connectivity; user interface construction; software testing and debugging; and working in teams.**Credits:** 3.00

CNIT 26700 - Introduction To C++ Language Programming

Credit Hours: 3.00. This course is an introduction to C++ language programming for persons with prior programming experience. Course topics include data types, control flow, operators and expressions, and an introduction to class construction including other object-oriented concepts and constructs. Applications are designed for business, manufacturing, or technology, depending on audience. **Credits:** 3.00

CNIT 27000 - Cybersecurity Fundamentals I

Credit Hours: 3.00. This course introduces cybersecurity fundamentals and concepts. Security models that provide a basis for overarching security solutions are introduced to provide a basis for discussion. Risks and vulnerabilities are examined along with technical controls that can be used to mitigate them. The role of security policy and the incident management framework are examined. Emphasis is placed on building a strong foundation for further study in the field.**Credits:** 3.00

CNIT 27100 - Cybersecurity Fundamentals II

Credit Hours: 3.00. Course will investigate additional foundational ideas in cybersecurity and serves as a survey course in the field. The course provides extended exposure to utilizing tools to secure/harden aspects of info systems such as mandatory access control, wireless security, hardware security, cloud security and others.**Credits:** 3.00

CNIT 27200 - Database Fundamentals

Credit Hours: 3.00. A study of relational database concepts. These concepts include data design, modeling, and normalization; the use of Structured Query Language (SQL) to define, manipulate, and test the database; programmatic access to a database and practical issues that database developers must handle.**Credits:** 3.00

CNIT 27600 - Systems Software And Networking

Credit Hours: 3.00. Introduction to a wide range of topics in the networking field. Topics include: systems and network administration support practices, desktop and server support, security, disaster recovery, ethics, change management, help desks, networks, network operating systems, and directory services. The students will gain hands-on experience in the laboratory with installing and configuring network operating systems and application software. **Credits:** 3.00

CNIT 28000 - Systems Analysis And Design Methods

Credit Hours: 3.00. Comprehensive introduction to information systems development. Topics include the systems analyst, the systems development life cycle, methodologies, development technology, systems planning, project management, systems analysis, systems design, systems implementation, and systems support. Introduction to tools and techniques for systems development.**Credits:** 3.00

CNIT 28101 - Topics In Computer Information Technology II

Credit Hours: 3.00. This variable title course is used to pilot new course offerings. **Credits:** 3.00

CNIT 28500 - Topics In Programming Languages

Credit Hours: 3.00. A programming course in one or more programming languages not covered in other CPT courses. Application of structured or event-driven program design, construction, debugging, testing, and documentation techniques. Topics, projects, and languages vary with course offering. **Credits:** 3.00

CNIT 29500 - Object-Oriented Programming

Credit Hours: 3.00. This course focuses on using object-oriented programming languages in the development of modern, business applications. Topics include object-oriented design, encapsulation, object interfaces, inheritance, aggregation, abstract classes, polymorphism, data structures, and exception handling. **Credits:** 3.00

CNIT 29900 - Topics In Computer And Information Technology

Credit Hours: 1.00 to 6.00. Hours and subject matter to be arranged by staff. Individual study under directed leadership of professor. Primarily for students with special aptitudes. Permission of instructor required. **Credits:** 1.00 to 6.00

CNIT 30500 - Information Technology

Credit Hours: 3.00. A survey of contemporary trends in information technology, including applications, languages, hardware, software, and communications. Integration of information and systems. Emphasis on database management and administration. **Credits:** 3.00

CNIT 30600 - Game Development I: Core Skills And Technologies

Credit Hours: 3.00. (CGT 24500) This course introduces students to the fundamental technologies and skill sets required to develop video games. Students will be taught agile development methodologies in a team-based environment. **Credits:** 3.00

CNIT 30800 - Game Development II: Design And Psychology

Credit Hours: 3.00. (CGT 25500) This course examines video game design, theory, and development from aesthetic, psychological, and technical perspectives. Students will gain experience with a commercial game development platform. Advanced game development techniques will be taught in this course. **Credits:** 3.00

CNIT 31500 - Systems Programming

Credit Hours: 3.00. This course introduces concepts of lower level systems programming in C/C++ on a UNIX/Linus operation system platform. Command level development, algorithms, data structures, iteration and recursion, algorithms and analysis will be covered.**Credits:** 3.00

CNIT 32000 - Policy, Regulation, And Globalization In Information Technology

Credit Hours: 3.00. This course provides students with opportunities to study how technology is intertwined with larger economic, social, cultural, and ethical dynamics in an era of intensified globalization. The course examines technology in a global environment. Students will explore concepts and issues related to law, policy, regulation, outsourcing, offshoring, globalization, global competitiveness, global communications, cultural differences and quality of life issues. Students will examine ethical situations that arise as a result of the impact of technology. In summary, the course is designed to help students understand what it means to identify as, and/or work with, technology in a global environment. **Credits:** 3.00

CNIT 32100 - Enterprise Collaboration

Credit Hours: 3.00. This course focuses on enterprise social media and global information technology. Topics include social media software applications such as communication, collaboration, multimedia and entertainment software, globalization, global information technology issues, cultural differences, understanding the role of culture and communicating across cultures. An emphasis will be placed on how companies are integrating enterprise social media applications and the impact of these technologies on the globalization of information technology. **Credits:** 3.00

CNIT 32200 - Research Methodology And Design

Credit Hours: 3.00. This course will discuss scientific research versus pseudoscience, experimental vs. quasi-experimental designs, different research controls and validity issues, and how study designs are used to answer research questions. Students will gain hands-on experience conducting observational and experimental research designs, and the process of writing a formal research paper.**Credits:** 3.00

CNIT 32300 - Basic Cyberforensics

Credit Hours: 3.00. This course introduces students to the fundamentals of cyberforensics and cyber-crime scene analysis. The various laws and regulations dealing with computer forensic analysis are discussed. Students are introduced to the emerging international standards for cyberforensic analysis, as well as a formal methodology for conducting computer forensic investigations.**Credits:** 3.00

CNIT 32500 - Object-Oriented Application Development

Credit Hours: 3.00. This course focuses on using object-oriented programming languages in the development of modern, business applications. Topics include object-oriented design, encapsulation, object interfaces, inheritance, aggregation, abstract classes, polymorphism, data structures, and exception handling.**Credits:** 3.00

CNIT 33100 - Game Development III: Environment Modeling For Games

Credit Hours: 3.00. (CGT 34500) This course teaches the techniques and principles needed to create realistic three-dimensional virtual environments in game engines. The course will examine the principles of physics that determine how light propagates through the world and is eventually perceived by a human eye. Global illumination techniques that approximate these principles are described, followed by an in-depth examination of how game engines then approximate these solutions in order to create virtual environments that can run at real-time frame rates. **Credits:** 3.00

CNIT 34000 - UNIX Administration

Credit Hours: 3.00. This course focuses on the tasks and issues involved in the administration of UNIX systems. Topics include installation, networking, software management, scripting, and user management. In the laboratory portion of the course, students implement and maintain UNIX systems. **Credits:** 3.00

CNIT 34010 - UNIX Fundamentals

Credit Hours: 1.00. This course focuses on the use and basic administration of UNIX systems. Topics include installation, networking, software management, user management, and security of UNIX systems. **Credits:** 1.00

CNIT 34200 - Advanced System And Network Administration

Credit Hours: 4.00. This course focuses on the tasks and issues involved in the installation of distributed computing systems. Topics include the administration of network operating systems and network system interoperability. In the laboratory portion of the course, students implement and maintain a comprehensive network service infrastructure. **Credits:** 4.00

CNIT 34210 - Storage Area Networking

Credit Hours: 2.00. This course introduces storage area network (SAN) technologies. Storage area networking concepts, architectures, protocols, and best practice implementation techniques are examined. Techniques for remotely booting systems over a SAN are covered. Students implement and maintain an industry standard SAN and network booting solutions.**Credits:** 2.00

CNIT 34220 - Network Administration

Credit Hours: 2.00 or 3.00. This course focuses on the tasks and issues involved in the installation and administration of distributed computing systems. Topics include the administration of network operating systems and network system interoperability. Students will implement and maintain a comprehensive network service infrastructure.**Credits:** 2.00 or 3.00

CNIT 34400 - Network Engineering Fundamentals

Credit Hours: 3.00. This course presents the foundations and intermediate levels of understanding required to effectively design, implement, and manage today's networked environments. Details of basic models; network addressing and operations; network protocol interactions; and enterprise-class hardware applications of both wired and wireless networks are provided. Students will gain experience with enterprise-class hardware through laboratory projects and assignments.**Credits:** 3.00

CNIT 34500 - Internetwork Design And Implementation

Credit Hours: 3.00 or 4.00. This is an advanced course in network architecture. Students learn to design and implement local and wide area networks capable of simultaneous transport of real-time traffic and multiprotocol data over packet-switched and circuit-switched networks. An emphasis is placed on the integration of diverse communications technologies, while considering the effects of engineering decisions on overall performance, from both business and technology perspectives.**Credits:** 3.00 or 4.00

CNIT 34600 - Wireless Networks

Credit Hours: 3.00 or 4.00. This course introduces wireless networking. Topics include fundamental wireless communication concepts, wireless local area networks (LANs), and cellular systems. Wireless specific protocol elements are addressed in typical application environments. Data communications in multiple wireless environments are emphasized. In the laboratory section, students implement wireless solutions and integrate them into wired LAN environments.**Credits:** 3.00 or 4.00

CNIT 35500 - Mobile Programming

Credit Hours: 3.00. This is an advanced programming course that teaches students the skills necessary to develop applications for mobile computing devices (e.g. Smartphones and tablet computers). Combining theory and practice, this course gives students

hands-on experience with the latest technologies, tools and techniques used to develop mobile software solutions for business and entertainment.**Credits:** 3.00

CNIT 36100 - Software Redesign Using COBOL

Credit Hours: 3.00. An introduction to COBOL programming with an emphasis on redesign of legacy COBOL applications to extend their useful lifetime in contemporary organizations. Topics include user interface redesign, structured design, object-oriented programming, and transition from conventional files to databases. Students learn to analyze existing programs to isolate legacy code problems, develop and test solutions, and integrate solutions into software libraries. **Credits:** 3.00

CNIT 37000 - Introduction To Cryptography

Credit Hours: 3.00. Cryptography is an essential component to protect information in cyber systems. This course introduces the inner workings of cryptographic primitives and how to correctly use them. Specifically, the course covers cryptographic algorithms, protocols and techniques. The algorithms illustrate the art of encryption and secure hashing. The cryptographic protocols will expose the students to the world of building trust in an untrusted environment. Cryptographic techniques used in key management and algorithm choice will be explored. **Credits:** 3.00

CNIT 37100 - Cyberlaw And Ethics

Credit Hours: 3.00. This course focuses on Cyberlaw, a legal framework of cyber activities and cyber operations subject to a diverse array of international, constitutional, U.S. federal, and state law and regulatory policies. Students will learn fundamental concepts designed to help ensure that the cyber operations in which they participate are consistent with the laws, regulations, and values of the society they serve. **Credits:** 3.00

CNIT 37200 - Database Programming

Credit Hours: 3.00. This course explores advanced database programming techniques for enterprise-wide databases and their implementation. It uses programmatic extensions to Structured Query Language (SQL) supported by today's enterprise-class Relational Database Management Systems (RDBMS). Topics include advanced data manipulation, storage considerations, data transformation techniques to enhance interoperability of data, stored procedure and trigger design and implementation, and query optimization. **Credits:** 3.00

CNIT 37600 - Information Storage And Management

Credit Hours: 3.00. This course provides a comprehensive introduction to information storage technology. It prepares students to make more informed decisions about data storage and also to learn advanced concepts, technologies, and products. Topics include the architectures, features, and benefits of intelligent storage systems; networked storage technologies such as FC-SAN, NAS, and IP-SAN; and long-term archiving solutions such as CAS. Other topics include business continuity, back-up and recovery, virtualization, security, and management. Students will gain hands-on experience with installing and configuring storage management technologies. **Credits:** 3.00

CNIT 38000 - Advanced Analysis And Design

Credit Hours: 3.00. This course is an advanced study of system analysis and design methods and techniques used by systems analysts to develop information systems. Object-oriented tools and the Unified Modeling Language (UML) will be used for describing object structure and behavior, and use cases will be used for modeling functional processes. Topics include rapid development concepts, application architecture and system design, transition from object-oriented analysis and models to components and services, graphical user interface design, web interface design, prototyping, and commercial software package integration. Emphasis is also placed on the use of an object-oriented CASE tool. This course surveys other important skills for the

systems analyst, such as fact-finding (requirements discovery), communications, project management, and cost-benefit analysis. **Credits:** 3.00

CNIT 38101 - Topics In Computer Information Technology III

Credit Hours: 3.00. This variable title course is used to pilot new course offerings. **Credits:** 3.00

CNIT 38301 - Packaged Application Software Solutions

Credit Hours: 3.00. This course introduces knowledge, skills, tools, and techniques used to select and implement packaged application software solutions, both small and large (including ERP). Topics will include the make-verses-buy decision, critical success factors for packages, economic analysis, requirements analysis, identifying vendors and products, request for proposals, analysis of vendor proposals, decision analysis, implementation service providers, contracting for software and service, implementation project planning, life-cycle architecture, software installation and configuration, business process redesign organizational change management, integration with legacy system, customization verses adaptation, data conversion, system and application testing, training and support, system cutover and post go-live considerations. The course will focus on best practices, and consequences of less than best practices. This course will benefit students with career aspirations as systems analysts, business analysts, consultants, data and database administrators, and IT managers. **Credits:** 3.00

CNIT 38501 - Advanced Systems Design And Integration

Credit Hours: 3.00. A continuation of CNIT 38000 with an emphasis on knowledge, skills, tools, and techniques that systems analysts and architects use to translate functional systems requirements into design specifications that can be subsequently implemented. Students will learn methods for developing specifications that fulfill desired quality properties such as performance, scalability, maintainability, security, privacy, and protection of corporate property, interoperability, and usability, to name a few. Special emphasis is placed on integrating new systems with older systems, as well as with business processes. This course takes a holistic view of design and integration that specifies a complete information technology or information systems solution from the perspectives of different stakeholders, and from different systemic viewpoints and perspectives. Increasingly, the result of design and integration is referred to as a solution's architecture. **Credits:** 3.00

CNIT 39000 - Supervised Practicum

Credit Hours: 1.00 to 3.00. An instructor-directed practicum designed to combine University study with work experience directly related to the student's plan of study. Designed to be scheduled during a regular semester. Credit awarded upon the completion of department-approved project. Maximum of three credit hours may be applied to the CPT bachelor degree. **Credits:** 1.00 to 3.00

CNIT 39200 - Enterprise Data Management

Credit Hours: 3.00. This course examines advanced design techniques and physical issues relating to enterprise-wide data management. Topics include advanced design concepts, enhanced modeling and constructs, objects and unstructured and semi-structured data in databases, data management in non-business contexts, implementation of an enterprise data architecture, and data quality and stewardship. **Credits:** 3.00

CNIT 39900 - Topics In Computer And Information Technology

Credit Hours: 1.00 to 4.00. Hours and subject matter to be arranged by staff. Primarily for students with special aptitudes. **Credits:** 1.00 to 4.00

CNIT 40500 - Software Development Methodologies

Credit Hours: 3.00. This course explores methodologies and practices commonly used in contemporary software development projects. Topics include programming standards, code ownership and accountability, source code management and version control, productivity and quality metrics, software testing, and software process maturity models. **Credits:** 3.00

CNIT 41500 - Advanced Coding Security

Credit Hours: 3.00. This course allows students to gain proficiency in secure coding principles. Security risks from common coding errors are examined. Techniques for integrating secure coding practices into the development process is detailed with an emphasis on ensuring that applications are designed and implemented with proper security requirements. **Credits:** 3.00

CNIT 41700 - Critical Infrastructure Security

Credit Hours: 3.00. In the socio-political context of nation state sponsored threat actors and cyber cold wars, critical infrastructure (such as water supply and power generation) is a strategic target for attackers. This course investigates the current threat landscape and vulnerabilities in critical infrastructure. Students then investigate system and network architectural solutions to the problem. Students build a model industrial system and will implement these protections in their model environment.**Credits:** 3.00

CNIT 42000 - Basic Cyber Forensics

Credit Hours: 3.00. This course introduces students to the fundamentals of cyber forensics and cyber-crime scene analysis. The various laws and regulations dealing with computer forensic analysis are discussed. Students are introduced to the emerging international standards for cyber forensic analysis, as well as a formal methodology for conducting computer forensic investigations. **Credits:** 3.00

CNIT 42100 - Mobile Forensics

Credit Hours: 3.00. This course will help students understand the issues, techniques, and vulnerabilities of small scale digital device forensics. Emphasis will be placed on the forensically sound acquisition, preservation, analysis and presentation of small scale digital devices as evidence. Specific investigations will cover devices such as Personal Digital Assistants (PDA's), Cell Phones, and Smart Phones.**Credits:** 3.00

CNIT 42200 - Cyber Criminology

Credit Hours: 3.00. This course examines both the traditional and contemporary forms of cybercrime, including hacking, insider threat, Internet child pornography, cyberbullying, hacktivism, and cyberterrorism. Students will learn how computers can be either the target (e.g., hacking) or the tool (e.g., child pornography) for committing cybercrimes. In addition, this course will apply a variety of sociological, psychological, and criminological theories to help explain, "Why do some people engage in cybercrimes when others do not?" Theories discussed include: social learning theory, space transition theory, routine activity theory, social cognitive theory, techniques of neutralization, and personality characteristics.**Credits:** 3.00

CNIT 42300 - Advanced Cyberforensics

Credit Hours: 3.00. This course covers specialized and advanced content in digital forensics discipline. The focus of the course is on advancing and expanding the knowledge of the students regarding digital forensics investigation process particularly on emerging and contemporary technologies. Application of best practices in cyberforensics are emphasized in this course.**Credits:** 3.00

CNIT 42500 - Advanced Mobile Programming

Credit Hours: 3.00. This programming course teaches students the skills necessary to develop complex applications for mobile computing devices (e.g. smartphones and tablet computers). This course gives students hands-on experience developing mobile applications that use advanced features found on the latest mobile computing devices.**Credits:** 3.00

CNIT 43500 - Advanced Network Services

Credit Hours: 3.00. This course covers the concepts and technologies required to deploy advanced network services such as telephony and television over modern data networks. The underlying network structure and enabling services will be detailed along with a comprehensive analysis of protocols and services required to deploy such services. **Credits:** 3.00

CNIT 44500 - Advanced Internetwork Routing And Switching

Credit Hours: 3.00. This course extends routing and switching knowledge with specific attention given to emerging trends. This course focuses on the concepts of traffic shaping, advanced exterior gateway routing protocols, label switching technologies, and quality of service. The necessary perspectives of integration of these topics into enterprise networks are addressed in both lecture and laboratory. **Credits:** 3.00

CNIT 44600 - Advanced Wireless Networks

Credit Hours: 3.00. This course is an advanced course in wireless networking. Building on knowledge gained from the introductory wireless local area network course, this course addresses wireless network design and implementation on a large scale. Topics include mesh networking, broadband wireless access, backhauling, WiMAX and cellular systems. The laboratory portion of the course includes implementing and simulating these technologies in an outdoor setting. **Credits:** 3.00

CNIT 45000 - Enterprise Application Development

Credit Hours: 3.00. This course explores advanced application development techniques in a large enterprise-wide setting. Topics include component development and reuse, distributed object technologies, multi-tier applications, data marshalling, transaction processing, concurrency problems and resolutions, load balancing and tuning, and application installation and deployment issues. **Credits:** 3.00

CNIT 45500 - Network Security

Credit Hours: 3.00. This course explores business, conceptual, and technological aspects of network security for voice and data networks. The course deals with the analysis, design, implementation, and management issues surrounding effective network security. Key concepts and technology include virus protection, firewalls, authentication, encryption, wireless security, security protocols, physical security, and network security architecture and policy development. **Credits:** 3.00

CNIT 45600 - Wireless Security And Management

Credit Hours: 3.00. This course is an advanced course concerning security and management issues as they apply to wireless networking. Students will gain knowledge on the problems and solutions the wireless industry face when implementing large scale networks. Issues addressed include encryption weaknesses, security methodology tradeoffs, large scale network management techniques and systems, and advanced wireless network architecture. The laboratory portion of the course enforces the learning outcomes with hands-on experiences in implementing secure, manageable complex wireless networks. **Credits:** 3.00

CNIT 45800 - Biomedical Informatics

Credit Hours: 3.00. This course explores the tools and objectives of research in the medical and life sciences industry relevant to the skills of information technology. The driving outcome of this course is for students to understand the domain demands

inherent to information systems in healthcare, bioinformatics and computational life sciences, with respect to their role in commercialism, therapeutic decision support and discovery support systems. Topics include information technology application in support of health care delivery, a brief overview of healthcare delivery, the history of healthcare informatics, an overview of the state of current systems and the professional opportunities in Health Informatics. In bioinformatics, introduce the concepts of genomics and proteomics, biotechnology, biological databases and file structures, common computational methods for exploiting biological databases, integrating computational methods within the life sciences industry, and a survey of successful computational life science applications. **Credits:** 3.00

CNIT 46000 - High Performance Computing Systems

Credit Hours: 3.00. This course provides an introduction to high performance, cluster, and grid computing from a systems perspective. The driving outcome for this course is for students to understand and apply high performance computing concepts, architectures, and software components to develop and operate a high performance computing environment. Topics include: high performance computer architectures, network architectures for High Performance Computing (HPC), commodity and open-source cluster architectures, and software systems. **Credits:** 3.00

CNIT 46100 - Parallel Data Systems

Credit Hours: 3.00. This course provides an introduction to the techniques and technologies used in high performance computing for developing, using and managing high performance data systems. Topics covered in this course will focus on aspects of the design, implementation, and use of high performance storage systems progressively from the hardware layer through the operating system up to the application level. Topics will include: commodity hardware and novel architectural storage components; the architecture and use of parallel file systems, including PVFS2 and Lustre; reliability and scheduling; virtualization and fault tolerant strategies for Petascale computing; system architectures for data intensive computing and workflows; parallel I/O systems; and grid and cloud computing architectures. The driving outcome for this course is for students to understand and apply advanced high performance computing concepts, architectures, and software components to develop and operate a high performance computing environment. **Credits:** 3.00

CNIT 46500 - Senior Software Development Project

Credit Hours: 3.00. This capstone course integrates the software development technologies and techniques taught in prior courses. Over the duration of the semester, students work as a team to develop an automated system of real value and quality. Class lectures explore project-related topics such as project planning and management, user and management expectations, system architecture and design, and quality management. **Credits:** 3.00

CNIT 47000 - Incident Response Management

Credit Hours: 3.00. This course will bridge business operations to IT support of the critical systems that support day-to-day operations. Techniques to detect anomalous behaviors through the configuration and monitoring of modern Intrusion Detection systems, analyzing and decoding network flows, system logs, and reports is covered along with appropriate remediation actions. Multiple approaches, theories, standards, and suggestions for incident response handling will be examined.**Credits:** 3.00

CNIT 47100 - Vulnerability Analysis And Testing

Credit Hours: 3.00. This course will focus on advanced security techniques often referred to as vulnerability analysis or network penetration testing (pen testing). Students will learn the methods, techniques, and tools to test the security of computer networks, infrastructure and applications. The activities will be based in an environment that allows testing and "hacking" that does not risk possible legal, ethical, and network availability issues.**Credits:** 3.00

CNIT 47200 - IT Data Analytics

Credit Hours: 3.00. Students learn decision strategies as well as Big Data and data analytics concepts using a variety of methods. Students will have "hands-on" opportunities using tools to assist in these efforts. Permission from instructor required. **Credits:** 3.00

CNIT 47500 - Electronic Commerce And Business Implementation

Credit Hours: 3.00. This course is an in-depth study of electronic commerce and electronic business implementation. The focus is on e-business topics and concepts including business models, electronic payment systems, infrastructure, implementation concerns, design criteria, solution of business problems through case studies, and related Web topics. Students will develop web-based applications that support e-business activities. **Credits:** 3.00

CNIT 47700 - Blockchain

Credit Hours: 3.00. This course focuses on blockchain technologies. As IT practitioners and cybersecurity professionals, knowing the inner workings of blockchain technology is necessary for career preparation and development. This course aims to demystify blockchain technology by looking into its fundamental aspects, such as data structure, network consensus, economic incentives, security and privacy, applications, and regulations.**Credits:** 3.00

CNIT 48000 - Managing Information Technology Projects

Credit Hours: 3.00. This course introduces the application of knowledge, skills, tools, and techniques that project managers use to plan, staff, estimate, and manage information technology projects. Special emphasis is placed on learning and applying the concepts of managing scope, risk, budget, time, expectations, quality, people, communications, procurement, and externally provided services. Students will apply project management technology and techniques to business problems.**Credits:** 3.00

CNIT 48101 - Topics In Computer Information Technology IV

Credit Hours: 3.00. This variable title course is used to pilot new course offerings. **Credits:** 3.00

CNIT 48200 - Six Sigma Data Quality For Continuous Improvement

Credit Hours: 3.00. A study of data quality for Six Sigma level of improvement, applying a Six Sigma DMAIC (Define, Measure, Analyze, Improve and Control) improvement methodology, utilizing information tools and techniques. The course addresses advanced topics in statistical based continuous improvement, data quality; and Big Data Analytics concepts, as pertains to systematic problems. An embedded certificate in SS is included in the body of knowledge. **Credits:** 3.00

CNIT 48300 - Applied Machine Learning

Credit Hours: 3.00. In the past decade, we have observed the expeditious evolution and tremendous applications of machine learning, such as unmanned vehicle, autonomous language translation, and smart healthcare. This course will introduce both the fundamental knowledge and design/application insights of machine learning techniques via a series of hands-on real-world examples. The overall aim is to provide the students with a good understanding of machine learning technologies, building machine learning models, and applying machine-learning technologies to address real-world problems. In this course, students will also have an opportunity to explore the cutting-edge machine learning technologies, such as deep learning, adversarial attacks, and meta learning, and develop their own machine learning-based solutions.**Credits:** 3.00

CNIT 48400 - Applications In Data Science

Credit Hours: 3.00. Students investigate practical applications of Data Science and evaluate their effectiveness in guiding decision making. Students will employ tools to assist in these efforts.**Credits:** 3.00

CNIT 48700 - Database Administration

Credit Hours: 3.00. This course explores tools and techniques for managing an organization's database technology. Topics include database architecture, database technology installation, database creation and maintenance, Database Management System (DBMS) operation and troubleshooting, and database performance tuning. In the laboratory, students engage in activities performed by a typical database administrator. **Credits:** 3.00

CNIT 48800 - Data Warehousing

Credit Hours: 3.00. The design and implementation of data warehouses (including data marts and operational data stores) are studied using current database technologies. Topics include data modeling for warehouses, data warehousing infrastructure and tool selection, data exploration, data synthesis and reduction, organizational metadata, data warehouse administration, and other contemporary issues. **Credits:** 3.00

CNIT 48900 - Advanced Topics In Database Technology

Credit Hours: 3.00. This course will provide students with a chance to explore contemporary issues in the database arena. These issues may be related to new or breakthrough concepts, technologies, and techniques. **Credits:** 3.00

CNIT 49000 - Senior Project

Credit Hours: 1.00 to 3.00. Team industrial experience for seniors who undertake a significant controlled project experience for an actual client and problem. Permission of instructor required. **Credits:** 1.00 to 3.00

CNIT 49900 - Topics In Computer And Information Technology

Credit Hours: 1.00 to 3.00. Hours and subject matter to be arranged by staff. Possible individual study under directed leadership of professor. Permission of instructor required. **Credits:** 1.00 to 3.00

CNIT 51000 - Data Literacy

Credit Hours: 3.00. This course examines concepts, models, and methods useful for applying data analytics in business environments. Focusing on hypothesis generation, the capturing, storage and expression of data, analysis for research and visualizations.**Credits:** 3.00

CNIT 51100 - Foundations In Homeland Security Studies

Credit Hours: 3.00. An interdisciplinary course addressing prevention, mitigation, preparation, response, and recovery from catastrophic events that threaten private and public sector resources and infrastructures. Course contents will include: characteristics of security; personal/corporate perspectives; identification of assets; assessing cost/benefits of protecting assets; risk assessment and risk management; crisis decision making; emergency management resources and response infrastructures; best practices in emergency management and risk and crisis communication; business continuity; and the importance of a collaborative response. Case studies include the 9-11 attacks and Hurricane Katrina. External experts will present and career opportunities will be discussed. Permission of instructor required. **Credits:** 3.00

CNIT 51200 - Managing Resources And Applications For Homeland Security

Credit Hours: 3.00. An interdisciplinary course providing examples and practice in applying and managing the resources, including technologies, used in the private and public sectors for homeland security programs. Course contents will include: terrorism; corporate security; biosecurity; health care preparedness; personal/community preparedness; risk transfer; and

information security and privacy. Additional content includes discussion of local, state, and federal preparedness programs issues in the public/private sectors that are designed to ensure survival during a continuum of emergency events, and continued practice in using collaborative application of team building skills. Permission of instructor required. **Credits:** 3.00

CNIT 51900 - Natural Language Technologies

Credit Hours: 3.00. This course serves as an introduction to natural language processing with the focus on current and emerging technologies and applications. The topics will review the state of the art of natural language processing, discuss their advantages and disadvantages for computational language processing, and look at some case studies. The assignments will range from pen and paper analysis to actual computational implementations. **Credits:** 3.00

CNIT 52300 - File System Forensics

Credit Hours: 3.00. The plethora of strategies to store information in different formats continues to expand. This course examines the various media and strategies of storing information and the processes of documenting the collection, imaging, and processing of forensic evidence. Topics include file formats, file systems, hardware, and software involved in forensic investigation. The overall pattern of forensic evidence in file systems will be examine along with the acquisition, analysis, and reporting of evidence artifacts found in file systems. **Credits:** 3.00

CNIT 52500 - Mobile And Embedded Device Forensics

Credit Hours: 3.00. Consumer technologies are rapidly moving forward with items integrating processing, storage, and transmission into their base functionality. The enterprise issues with the trend of "bring your own device" has rapidly expanded requirements on forensics investigators to address a plethora of mobile device types. Whether it is the automobile black box or a home thermostat, there are various elements of interesting evidence possible to be gained. The embedded and consumer device pantheon is developing as an important area of forensic science. This course explores techniques for conducting forensic analyses on a wide variety of mobile and embedded devices. **Credits:** 3.00

CNIT 53000 - Information Technology Business Analysis

Credit Hours: 3.00. This course introduces the application of knowledge, skills, tools, and techniques that business analysts use to solve business problems related to information technology projects. Special emphasis is placed on learning and applying the concepts of enterprise analysis, business analysis planning, stakeholder management, requirements management, and solution evaluation. Permission of department required. **Credits:** 3.00

CNIT 53100 - Information Technology Requirements Analysis And Modeling

Credit Hours: 3.00. This course introduces and develops the skills that business analysts will need to solve business problems and effectively model and analyze stakeholder requirements in order to define workable solutions and effective communicate customer needs. Permission of department required. **Credits:** 3.00

CNIT 53200 - IT Enterprise Analysis

Credit Hours: 3.00. This course introduces the application of knowledge, skills, tools, and techniques that enterprise level business analyst use to create accurate requirements statements, organization level needs analysis and accurate business cases which assist the project team in developing schedules and budgets as well as strategic management teams in selecting the right projects to execute. Special emphasis is placed on learning and applying the concepts of innovation driven management. Permission of Department required. **Credits:** 3.00

CNIT 53500 - Advanced Topics In IT Business Analysis

Credit Hours: 3.00. The course explores the topics and tools used by today's information system professionals to lead the requirements gathering, estimating, developing, and delivery efforts of custom software applications. Course emphasis focuses on agile methodologies. Emphasis is also placed on requirements gathering and estimating technics commonly used with agile teams. Permission of Department required. **Credits:** 3.00

CNIT 53600 - IT Policy, Law, And Ethics

Credit Hours: 3.00. This course examines the policy, legal, and ethical aspects of information technology. Issues covered include ethical decision making, policy development, professionalism, privacy, freedom of expression, intellectual property, liability, and social responsibility. Included will be the philosophical ethical theories that underpin ethical decision making in the context of executing IT based projects.**Credits:** 3.00

CNIT 53700 - Professional Research And Communication

Credit Hours: 1.00. This course explores aspects of research and communications that pertains to technology-based projects and professions as well as informed changes in business process. Specifically, the methods involved in objective driven research within and across technology and business domains, as well as the use of rationale for a concisely written summary of research methods and findings for a working professional.**Credits:** 1.00

CNIT 54100 - Cyberlearning Research And Development

Credit Hours: 3.00. This design-based research course explores and applies methodological and theoretical perspectives to the research, design, and evaluation of learning experiences and environments that integrate computational thinking or cyberlearning within a certain STEM discipline. Design-based research seeks to shape and even engineer learning environments and experiences "in the wild." Is a series of approaches with the intent of producing new theories, artifacts, and practices that account for and potentially impact learning and teaching in naturalistic settings.**Credits:** 3.00

CNIT 54200 - Design-Based Research Applications

Credit Hours: 3.00. The course provides an opportunity for students to study and apply design-based research to evaluate and improve learning environments. Specifically, the course focuses on using design-based research as a methodological approach to combine instructional design and research in a cyclical and interdependent manner. Students are expected to apply this approach with the goal of simultaneously solving practical problems and developing a sharable theory by connecting design features to valued outcomes. Students should have prior knowledge of educational research methods, have an educational project to work on or a dataset ready to be analyzed. (added last statement from proposed restrictions)**Credits:** 3.00

CNIT 54300 - Human-Computer Interaction Applied To Games And Education

Credit Hours: 3.00. This course will explore Human-Computer Interaction (HCI) as applied to both the field of education and games. Students will engage in reading in these three fields. Specifically, they will develop a foundational understanding of common approaches in studying HCI, as well as current broad intersections with education and gaming. The course will be heavily focused on a semester-long research project in which students will participate in HCI, games, and education research. Permission of instructor required.**Credits:** 3.00

CNIT 54600 - The Internet Of Things For Information Technology

Credit Hours: 3.00. This course will explore the emergence of technologies and vertical solutions in the Internet of Things (IoT) domain. The course explores the top-level problems that IoT promises to solve, the business drivers, the attributes of IoT-enabled enterprise and consumer markets, and how IoT is different from the contemporary Internet. The course will discuss and apply IoT components such as the "things", the data, the people, and the processes, as well as vertical markets. Emphasis will be placed on types of architecture, reference models, and standards (both open and proprietary), underlying technologies, commercial

products, issues (such as security), and research efforts in the Internet of Things. The lab component will focus on the complete IoT ecosystem (sensors, actuators, networks, etc.), but will specifically emphasize the functionality of IoT cloud platforms. Permission of instructor is required.**Credits:** 3.00

CNIT 55000 - Organizational Impact Of Information Technology

Credit Hours: 3.00. An enterprise view of the organizational impact of information technology as the most effective means for achieving "better, faster, cheaper operations" in today's highly competitive business environment. Examines how information technology has enabled new organizational forms and changes in business processes, products, markets, delivery systems, ways of working, and people management issues and challenges. Permission of instructor required. **Credits:** 3.00

CNIT 55100 - Information Technology Economics

Credit Hours: 3.00. Examines the economics of information systems and information technology as it relates to business performance. Topics include strategic information technology planning, alignment with business planning, value assessment, and performance measurement. Special emphasis is placed on issues relevant to strategic information technology infrastructure management, both for the information technology unit as well as the business as a whole. Permission of instructor required. **Credits:** 3.00

CNIT 55200 - Information Technology Project Management

Credit Hours: 3.00. Explores the necessary skills and knowledge to successfully initiate, plan, manage, control, and report on information technology projects. Special emphasis is placed on learning the PMBOK and its practices concerning integration management, scope management, time management, cost management, quality management, human resource management, communications management, risk management, and procurement management. Practical examples are used to demonstrate the concepts and techniques, plus hands-on experience is received by working on a case study. Permission of instructor required. **Credits:** 3.00

CNIT 55300 - Quality Management In Information Technology

Credit Hours: 3.00. This course explores quality and productivity models used to ensure quality in information technology systems development processes. Special emphasis is on learning and understanding process metrics and measurement, as well as initiatives such as Total Quality Management, Continuous Process Improvement, Six Sigma, and the Software Engineering Institute Capability Maturity Model. Permission of instructor required. **Credits:** 3.00

CNIT 55500 - Advanced Network Security

Credit Hours: 3.00. Advanced conceptual and technological aspects of network security for voice and data networks. Deals with the advanced analysis, design, implementation, and management issues surrounding effective network security. Technology research and presentation of results, as well as security technology implementation, are required course outcomes. Permission of department required. **Credits:** 3.00

CNIT 55501 - Social Engineering Mitigation In Information Technology

Credit Hours: 3.00. Human vulnerability is currently one of the biggest threats to cybersecurity. Social engineering is one of the primary tools used to take advantage of this vulnerability. In this course, students will learn about some techniques used in social engineering, the psychology harnessed to carry out social engineering attacks, and learn to identify possible avenues of attack and procedures to prevent and mitigate specific risks. Permission of instructor required. **Credits:** 3.00

CNIT 55600 - Basic Computer Forensics

Credit Hours: 3.00. Covers the fundamentals of the maturing discipline of computer forensics. The focus of the course is on gaining a broad understanding of the field of study and how technology and law interact to form this forensic science. Emerging standards and current and future issues related to the field are also explored. Examines law and public policy, the computer forensic methodology, report presentation, and expert witness testimony, as well as anti-forensic techniques that can be used to obfuscate evidence. Students are exposed to theory and practice with lab exercises, thought and term papers, and a practical, as well as written, final exam. **Credits:** 3.00

CNIT 55700 - Advanced Research Topics In Cyber Forensics

Credit Hours: 3.00. Provides students at the advanced degree level the opportunity to expand their knowledge of cyber forensics. Students are expected to have fundamental understanding of cyber forensics and digital forensic science. The emphasis is on directed learning and scholarly inquiry. Possible research topics range from law and public policy to software and/or hardware development. Permission of instructor required. **Credits:** 3.00

CNIT 55800 - Bioinformatics Computing And Systems Integration

Credit Hours: 3.00. This is a graduate-level course for students interested in the application of computational methods and information technology in the pharmaceutical, biotechnology, and life sciences arena. An overall understanding of information technology and systems is assumed, as well as an in-depth knowledge of one or more areas of information technology. Permission of instructor required. **Credits:** 3.00

CNIT 55900 - Data Warehousing

Credit Hours: 3.00. The design and implementation of data warehouses (including data marts and operational data stores) are studied using current database technologies. Topics include data modeling for warehouses, data warehousing infrastructure and tool selection, data exploration, data synthesis and reduction, organizational metadata, data warehouse administration, and other contemporary issues. Preference is given to students having graduate status in the College of Technology with a CIT concentration. Permission of instructor required. **Credits:** 3.00

CNIT 56000 - Advanced High Performance Computing Systems

Credit Hours: 3.00. This course is a graduate level course that covers advanced topics in high performance, cluster, and grid computing in detail from a systems perspective. Topics covered in this course will focus on aspects of the design, implementation, and use of high performance computing systems at each level of the system, including: commodity hardware and novel architectural components, such as graphics processing units; operating systems for HPC systems, including low-noise OS and light-weight kernels; system reliability and job scheduling; virtualization systems and fault tolerance for HPC; data intensive computing and workflows; parallel I/O systems; and grid and cloud computing architectures. Experience in Linux systems administration is a prerequisite for this course. **Credits:** 3.00

CNIT 56100 - Advanced Parallel Data Systems

Credit Hours: 3.00. This course is a graduate level course that covers advanced topics in high performance, cluster, and grid computing in detail from a systems perspective. Topics covered in this course will focus on aspects of the design, implementation, and use of high performance storage systems progressively from the hardware layer through the operating system up to the application level. Topics will include: commodity hardware and novel architectural storage components; the architecture and use of parallel file systems, including PVFS2 and Lustre; reliability and scheduling; virtualization and fault tolerant strategies for Petascale computing; system architectures for data intensive computing and workflows; parallel I/O systems; and grid and cloud computing architectures. Experience in Linux systems administration is a prerequisite for this course. **Credits:** 3.00

CNIT 56200 - Six Sigma Black Belt For Operations Excellence

Credit Hours: 3.00. A study of the Six Sigma quality and process improvement methodology, using the define, measure, analyze, improve, and control (DMAIC) process. This course addresses advanced topics in statistical quality; introduces quality management concepts as they pertain to the Six Sigma methodology; and provides an opportunity to earn a for Six Sigma Black Belt. Permission of instructor required. **Credits:** 3.00

CNIT 56300 - Software Design And Development For Robotics

Credit Hours: 3.00. The purpose of this graduate-level course is to provide students with hands-on experience in designing, implementing, programming, and debugging robotic software systems. The course begins with an introduction to fundamental concepts and skills in robotics, encompassing both hardware and software components. Students will gain proficiency in working with embedded processors such as Arduino and Raspberry Pi, and they will have the opportunity to construct their robots using a dedicated robotic development platform. Subsequently, students will explore programming tools such as Matlab and Simulink, along with robot simulators, to acquire a deep understanding of the principles and best practices in software design and development within the field of robotics. Additionally, students will actively engage in discussions and debates, gain insights from guest speakers within the robotics field, and collaborate on team projects. Through hands-on involvement in a project, students will gain valuable experience in addressing real, non-trivial challenges. This course equips students with the skills and knowledge needed to excel in the dynamic and rapidly evolving field of robotics, fostering a strong foundation in both theoretical concepts and practical application.**Credits:** 3.00

CNIT 56400 - Assistive Technology And Robotics

Credit Hours: 3.00. The purpose of this graduate-level course is to equip students with the practical skills required to engage in effective and impactful research within the realm of assistive technologies and assistive robotics. The course encompasses a comprehensive exploration of key topics and research areas in assistive robotics and related technology fields, including mobility, vision, hearing, speech, and cognitive aids. Throughout the course, students will acquire a strong foundation in the essential components of conducting research in these domains. This includes conducting needs assessments, conducting comprehensive literature reviews, implementing user testing and iterative solution development processes, evaluating solutions, and engaging in prototyping activities. Emphasizing a holistic approach to learning, students will actively participate in dynamic discussions and debates, engage in insightful site visits, interact with guest speakers, and collaborate on both team and individual projects. A pivotal aspect of the course involves the practical application of acquired knowledge in a research project. Students will have the opportunity to design, implement, and/or evaluate assistive technologies or robots tailored to address specific challenges faced by individuals with disabilities and the elderly. This hands-on experience will enable students to put theory into practice and contribute meaningfully to the advancement of assistive technology solutions.**Credits:** 3.00

CNIT 56500 - Information Security Management

Credit Hours: 3.00. Information Security Management explores the issues surrounding the alignment of business and information security. More precisely, once the context of information security is understood in terms of the business and the problems with the current state of Information Security Management are identified, the course pursues solutions to those problems in terms of people, policy, process, procedures, and technology. The product produced as a result of this pursuit is an Enterprise Security Architecture, mapping business needs to technology implementation. The enterprise security architecture produced is dynamic and maintainable, thereby assuring traceability and accountability. Permission of instructor required. **Credits:** 3.00

CNIT 57000 - IT Data Analytics

Credit Hours: 3.00. Students learn decision strategies as well as Big Data and data analytics concepts using statistical inference, regression, predictive analytics, and data mining. Students will have "hands-on" opportunities using tools such as R to assist in these efforts. The primary mission of this course is to provide students 1) an awareness of the primary approaches, techniques, and tools used for business/data analytics in industry, 2) opportunities to see their applications in a variety of areas, and 3) practical experience in applying them to challenges of interest to the students. Of primary emphases are the roles and responsibilities of Information Technology in enabling and supporting data analytics in organizations. Upon successful

completion of this course, students will be able to understand key business/data analytics concepts and apply analytics approaches, techniques, and tools for decision making purposes. Permission of instructor required. **Credits:** 3.00

CNIT 57100 - Responsible Data Science

Credit Hours: 3.00. This course examines advanced topics relating to algorithmic fairness, transparency, and interpretability of data-driven decision-making systems. Topics include the data science lifecycle, data quality, algorithmic bias, debugging and mitigating bias, and transparency of data and algorithms.**Credits:** 3.00

CNIT 57500 - Data Analysis

Credit Hours: 3.00. This course will teach students how data analysis can inform decision-making. Students will develop analytical skills and focus is placed on predictive analysis to evaluate business decision. Students will develop logical reasoning and communication skills related to quantitative outputs. This course will also develop the ability to collect large datasets, organize, and combine them using Tableau software. **Credits:** 3.00

CNIT 58000 - Advanced Topics In Information Technology Project Management

Credit Hours: 3.00. The course explores and applies the advanced concepts, skills, knowledge, techniques, and tools required to successfully initiate, plan, manage, execute, control, and report on information technology projects. Special emphasis is placed on applying the PM BOK in a real life business case study as well as researching and learning concepts, techniques, and processes experienced project and program managers employ to successfully plan and manage projects. This course enables the student to learn project management through the application of project approaches in a team based setting. Through the application of project methodologies, tools and templates, the student learns the project life-cycle approach as demonstrated through actual and simulated project situations. Permission of Department required.**Credits:** 3.00

CNIT 58100 - Workshop In Computer Technology

Credit Hours: 0.00 to 8.00. Advanced study of technical and professional topics. Emphasis is on new developments relating to technical, operational, and training aspects of industry and technology education. **Credits:** 0.00 to 8.00

CNIT 58200 - IT Project Estimating, Control And Scheduling

Credit Hours: 3.00. An exploration of the body of knowledge, skills, processes, methods, and techniques that IT project managers can use to create and manage time and cost estimates, as well as the creation of accurate schedules with dependencies. The course reviews research of best practices in schedule management and budget management. Students will apply these skills and techniques to business problems. Permission of Department required. **Credits:** 3.00

CNIT 58300 - IT Program And Portfolio Management

Credit Hours: 3.00. Program and Portfolio Management deliver benefits to organizations by enhancing current abilities or developing new capabilities for the organization to use. This CNIT Graduate course will provide a detailed understanding of Program and Portfolio Management and its relationship to Project management and will present concepts that promote efficient and effective management and communications among various groups. This course curriculum is consistent with the Project Management Body of Knowledge (PM BOK) and related Standards for Program and Portfolio Management published by the Project Management Institute. Permission of Department required. **Credits:** 3.00

CNIT 58500 - Organizational Change Management For IT Projects

Credit Hours: 3.00. An exploration of the body of knowledge, skills, processes, methods, and techniques that IT project managers can use to manage the "people" side of organizational change that results from IT projects that implement new technologies, systems, services, and products into the workplace. This is sometimes called stakeholder management. The course reviews research of best practices in change management and their impact on project metrics such as schedule, budget, scope, stakeholder satisfaction. Students also learn how to identify and document the organizational and people impacts of new information technology solutions, and then develop a formal project plan to manage the organizational change. Permission of Department required. **Credits:** 3.00

CNIT 58600 - IT Requirements Management

Credit Hours: 3.00. The course explores the approaches used by today's information system professionals to conduct and manage the requirements development process. Course emphasis focuses on contemporary techniques for requirements elicitation, requirements analysis, requirements specification, requirements validation and verification. Emphasis is also placed on identifying stakeholders through the use of formal stakeholder analysis techniques, the use of formal change control, requirements traceability and the use of requirements management tools. The course is designed based on the principles and competencies prescribed by the Project Management institute's PM BOK (Project Management Body of Knowledge) and Business Analyst Guide as well as the International Institute of Business Analysis's BABOK (Business Analysis Body of Knowledge). Permission of Department required. **Credits:** 3.00

CNIT 59000 - Special Problems In Computer Technology

Credit Hours: 1.00 to 6.00. Independent study of a special problem under the guidance of a member of the staff. Does not substitute for either M.S. thesis or M.S. project credit. Permission of instructor required. **Credits:** 1.00 to 6.00

CNIT 59800 - Directed MS Project

Credit Hours: 1.00 to 3.00. A formal investigation of a particular problem under the guidance of the advisory committee. Not applicable to a thesis option plan of study. Enrollment during at least two consecutive terms for a total of three credits is required. Permission of instructor required. **Credits:** 1.00 to 3.00

CNIT 60100 - Applied Statistics In Information Technology

Credit Hours: 3.00. This course will survey the field of applied statistics in information technology. Students will gain hands-on experience running statistical analyses on samples from a variety of populations. Students will learn the process of data cleaning, data transforming/coding, identifying the appropriate statistical analyses (descriptive and inferential), as well as writing and interpreting the results. Specifically, this course will survey the following statistical approaches: correlations, t-test, analysis of variance, analysis of co-variance, factorial ANOVA, simple regression, multiple regression, logistic regression, chi-square analysis, factor analysis, and nonparametric tests. In this course, students will be able to differentiate statistical analyses and identify appropriate statistical analyses depending on the research question and variables of interest. Permission of instructor required. **Credits:** 3.00

CNIT 61700 - Cyberphysical Security Seminar: Research Topics In Cyberphysical Security

Credit Hours: 3.00. This course meets the requirements of a research seminar for the CIT graduate program. Students focusing on homeland security and related research areas are encouraged to take this course to expand their knowledge of the field in general and in their specific research areas. The students will present their research to one another to gain knowledge of topics in the subject area. The student numbers will include PHSI student research assistants, interns, and students focused on homeland security research topics. The creation of this course will provide these students more structure for engagement, learning and research. Students taking the course will construct a research paper formatted for publication in a homeland security research

journal. This course will also promote the interdisciplinary nature of homeland security from information technology to public policy generation and agent-based computer modeling. Permission of Instructor required. **Credits:** 3.00

CNIT 62300 - Contemporary Computer Technology Problems

Credit Hours: 1.00 to 8.00. Theory and practice in the development of comprehensive solutions to problems in industrial, technical, and human resource development environments. Solutions based on emerging procedures will be emphasized. Permission of instructor required.**Credits:** 1.00 to 8.00

CNIT 62500 - Research Methods In Computing

Credit Hours: 3.00. The goal of this course is to provide you with the tools necessary to not only understand how to create your own research study on cyber-physical systems, but how to critically assess the different methodologies and components in various research designs used in applied information technology. In this course, you will learn about the landscape of research in information technology. You will learn to differentiate between different research methodologies used in IT, identify threats to validity, learn specific protocols for commonly used methods in IT, and synthesize empirical literature and theory in order to design a scientific research study. The end product of this course will be the ability to design and report on an IT-related research project. Permission of instructor required. Prerequisites: STAT 50100 or STAT 51100 or other statistics course; 6 credits of CNIT at the 500 level. **Credits:** 3.00

CNIT 64000 - Advanced Research Topics In Blockchain Technology

Credit Hours: 3.00. Blockchain is gaining momentum and of increasing interest to both academia and industry. The underlying distributed ledger technology was first introduced in the cryptocurrency Bitcoin by Satoshi Nakamoto and its adoption will dramatically reshape the landscape of IT infrastructure of a diverse range of sectors, such as manufacturing, finance, government, healthcare, and insurance, from centralized control to decentralized cooperation. Under the hood, cryptography, distributed consensus, economic incentives, and autonomous management/computation are consolidated to support Blockchain technology. In this research-focused course, we will explore a variety of active research areas in the evolving Blockchain technology, identify the challenges of the current development and attempt to answer open questions. Permission of instructor required.**Credits:** 3.00

CNIT 69100 - Natural Language In Information Assurance, Security, And Privacy

Credit Hours: 3.00. This course will serve as seminar in natural language applications with the emphasis in information assurance, security, and privacy. The topics will review the state of the art of general information assurance, security, and privacy with the focus on natural language text and information received from and implied in it. The course will focus in a wide range of papers describing various techniques and applications, with identifiable advantages and disadvantages. The assignments will range in class paper presentations to group projects and written reports. **Credits:** 3.00

CNIT 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

CNIT 69900 - Research PhD Dissertation

Credit Hours: 1.00 to 18.00. Dissertation-level research (for CIT PhD degree). Permission of instructor required.**Credits:** 1.00 to18.00

Computer Graphics Technology

CGT 132NN - Game Design Psychology: Theory And Prototyping

Credit Hours: 3.00. This course explores the application of cognitive psychology and theories of learning and motivation to the design and prototyping of games. Students learn how to create games that are fun to play, and evaluate and improve games that may not be, based on psychological concepts, theories, and findings.**Credits:** 3.00

CGT 10101 - Foundations Of Computer Graphics Technology

Credit Hours: 2.00. This course provides a foundational overview of computer graphics. The topics include the applications of computer graphics in today's world, basic technical elements of computer graphics, a review of current and future career opportunities in the field, and areas of potential research and study in computer graphics technology. **Credits:** 2.00

CGT 10501 - Introduction To Games

Credit Hours: 3.00. Students learn the history of computer game design. Students engage in learning activities that help them remember basic game design principles. These principles are then applied using simple exercises within game engine technology. **Credits:** 3.00

CGT 11000 - Technical Graphics Communications

Credit Hours: 3.00. This course is an introduction to the graphic language used to communicate design ideas using CAD. Topics include sketching, multiview drawings, auxiliary views, pictorial views, working drawings, dimensioning practices, and section views. **Credits:** 3.00

CGT 11100 - Designing For Visualization And Communication

Credit Hours: 3.00. An introductory design course for computer graphics majors. Students develop an understanding of the basic design elements and principles, composition, and typography through exercises and projects. The focus is on visual thinking, exploring the relationship between type and image, and developing multiple solutions to a given problem. **Credits:** 3.00

CGT 11200 - Sketching For Visualization And Communication

Credit Hours: 3.00. This course applies fundamental computer graphics concepts of visualization, communication, and creativity within a sketching metaphor. Exercises and projects in graphic theory, problem solving, and sketching skill development provide students with activities that focus on further development within the discipline. A variety of sketching techniques are used to gather critical information and transform data into effective communication instruments.**Credits:** 3.00

CGT 11505 - Scripting And Computational Thinking

Credit Hours: 3.00. This course introduces the students to computer programming, computational thinking, and the mathematics of graphics programming. The act of programming is viewed through the lenses of Decomposition, Pattern Matching, Abstraction and Algorithms and then applied to writing some simple games in current scripting languages. No prior programming experience is required. The principal objective of the course is to provide a working knowledge of programming fundamentals to game designers and artists as well as to prepare game programmers for more advanced game programming coursework. As computer programming is an applied discipline, this course uses an active learning approach that combines lecture time with extensive lab assignments.**Credits:** 3.00

CGT 11600 - Geometric Modeling For Visualization And Communication

Credit Hours: 3.00. A core introductory computer graphics course that provides entry-level experiences in geometric modeling. Students develop geometric analysis and modeling construction techniques and processes to produce accurate computer models for graphic visualization and communication.**Credits:** 3.00

CGT 11700 - Illustrating For Visualization And Communication

Credit Hours: 3.00. This foundation course stresses the use of pictorial illustration for visualization and communication. Various projection systems are introduced with discussion focusing on the appropriate use of view and system utilized to accentuate and provide clear communication. A variety of digital tools are used to construct, extract and render pictorial views using vector and raster tools.**Credits:** 3.00

CGT 11800 - Fundamentals Of Imaging Technology

Credit Hours: 3.00. This course provides a foundation for the development and use of raster and vector images for a variety of industries. Full-color images and illustrations are produced using computer technologies, with a focus on both technical and aesthetic aspects. Topics include color theory and perception, surface and lighting analysis, rendering techniques, and technical characteristics. **Credits:** 3.00

CGT 12300 - Animation Foundations

Credit Hours: 3.00. In this course, students are introduced to the core concepts and principles of animated motion. The course includes an overview of animation history and the evolution of animation technology. Principles of animation production are explored through practical exercises executed in a range of animation software types. These exercises will familiarize students with different approaches to creating animated motion, with a focus on keyframed digital animation. **Credits:** 3.00

CGT 14100 - Internet Foundations Technologies And Development

Credit Hours: 3.00. (CNIT 14100) The course explores the history, architecture, and development of the World Wide Web. Current tagging and scripting languages are covered in a tool-independent environment. Topics also include authoring tools, design, graphic and multimedia formats, and commerce, implementation, and security issues. PC literacy required.**Credits:** 3.00

CGT 14700 - Visual Effects Introduction

Credit Hours: 3.00. This course introduces students to the visual effects techniques using common methodologies and tools. Topics include procedural frameworks, 3D pipeline implementation, vector operations, and simulating physical phenomena for entertainment graphics. Special emphasis is placed on achieving aesthetically please entertainment-grade graphics using visual effects techniques. **Credits:** 3.00

CGT 17207 - User Experience Design Experience Studio I

Credit Hours: 3.00. This course allows students to practice as a UX designer in a company-like environment. Students learn about the roles they can pursue and build foundational collaboration and project management skills. Projects utilize a human-centered design approach to provide a rich user experience.**Credits:** 3.00

CGT 17208 - User Experience Design Studio I: Fundamentals

Credit Hours: 3.00. Introduction to the fundamental components of human-centered design, focusing on interactive computer systems. Students learn the basic tenets and methods of user-centered design, including usability and visual design principles, user research, and low-fidelity prototyping. The course is platform-independent and encourages students to experiment with new and emerging technologies.**Credits:** 3.00

CGT 20200 - Motion And Video I

Credit Hours: 3.00. The movement of graphics and incorporation of video is become ever prevalent within commercial production. No longer are these elements done solely by the Hollywood elite or used strictly within the film industry. Professionals are utilizing all kinds of tools in digital video, audio, graphic design and animation to create moving elements that tell a story and communicate concepts to solve communication problems. Students will learn basics in the production process, framing and movement, key framing, and design principles. Students will also learn basics in client relationship and business etiquette. Initial projects will focus on commercial creation and the utilization of typography as it relates to storytelling.**Credits:** 3.00

CGT 20400 - Introduction To Themed Attraction Design

Credit Hours: 3.00. An introduction to immersive attraction; including the consideration of operations, graphics, engineering, technology and design. Students will apply their knowledge in narration and graphic principles to concept projects in immersive spaces.**Credits:** 3.00

CGT 20500 - Portfolio Review

Credit Hours: 0.00. Portfolio review for students in Computer Graphics Technology. **Credits:** 0.00

CGT 21100 - Raster Imaging For Computer Graphics

Credit Hours: 3.00. Digital images are produced using a variety of computer technologies. Advanced color theory, surface rendering, and light control are emphasized in relation to technical illustration, hardware characteristics, and software capabilities. **Credits:** 3.00

CGT 21500 - Computer Graphics Programming I

Credit Hours: 3.00. This course focuses on programming fundamentals, logic, and problem solving necessary for advancement into upper level CGT courses. A cross-section of languages and technologies will be introduced and demonstrated.**Credits:** 3.00

CGT 21600 - Vector Imaging For Computer Graphics

Credit Hours: 3.00. Full-color vector illustrations for a variety of uses are produced using computer methods. Color theory, surface analysis, and rendering techniques are emphasized as they apply to vector-based illustrations. **Credits:** 3.00

CGT 21801 - Open Studio - Interactive Art And 3D Animation

Credit Hours: 3.00. This interdisciplinary course invites Purdue students to reflect on global culture, location and society, while simultaneously learning practical knowledge in programming, interactive visualization, locative media, 3D modeling and animation. The class integrates field trips, brainstorming sessions and technical training to create context-based interactive art. **Credits:** 3.00

CGT 22600 - Introduction To Constraint-Based Modeling

Credit Hours: 3.00. This course explores the techniques used in the construction and manipulation of constraint-based solid models and assemblies. Emphasizes extracting data from databases. Downstream applications of data and the impact on overall product design processes are explored. **Credits:** 3.00

CGT 24100 - Introduction To Computer Animation

Credit Hours: 3.00. This course introduces the knowledge base on which digital animation and spatial graphics technology are founded and developed. Emphasis will be placed on developing a working knowledge of the mechanics of 3D geometric formats, spline-based modeling with polygon mesh & NURBS, procedural mapping of raster images, simplified polygon modeling, rendering methods, hierarchical linking, and kinematic fundamentals. **Credits:** 3.00

CGT 24500 - Game Development I: Core Skills And Technologies

Credit Hours: 3.00. (CNIT 30600) This course introduces students to the fundamental technologies and skill sets required to develop video games. Students will be taught agile development methodologies in a team-based environment.**Credits:** 3.00

CGT 24600 - Compositing I

Credit Hours: 3.00. This course focuses on applying node-based video compositing techniques as applied to 3D visual effects and animation. Students explore the major areas of video compositing, including node-based workflows, integration with 3D animation and visual effects tools, image tracking, rotoscoping, and chroma keying. Special emphasis is placed on creating aesthetically pleasing video composites using production tools and techniques.**Credits:** 3.00

CGT 24700 - Visual Effects - Particles And Procedural Effects

Credit Hours: 3.00. This course focuses on simulating and rendering particles. Special emphasis is placed on volumes, sparks, dust, and smoke effects. Techniques for minimizing render times and meeting production requirements are explored. Emphasis is placed on the use of production tools and techniques to create aesthetically pleasing graphics.**Credits:** 3.00

CGT 24800 - Visual Effects - Pyrotechnics And Destruction Effects

Credit Hours: 3.00. This course focuses on the application of visual effects methodology to create effects based on destruction techniques and pyrotechnics. Students implement projects using methods for simulating destruction, fire, and smoke. Emphasis is placed on using production tools and techniques to produce realistic and aesthetically pleasing graphics. **Credits:** 3.00

CGT 25001 - Computer Graphics Professional Practices I

Credit Hours: 1.00. CGT 25001 is a course in the CGT professional practices sequence, with a focus on student professional development and communications in the field of computer graphics. Emphasis will be placed on industry engagement for the development and refinement of a student's professional resume and portfolio; and professional communications practices necessary for securing professional practical work experience. CGT 25001 will be taught in a seminar format with one meeting per week focused on guest speakers, status checks for portfolio and resume development, and professional networking. **Credits:** 1.00

CGT 25100 - Principles Of Creative Design

Credit Hours: 3.00. This course is an exploration of conceptualization and problem-solving using the integration of type and image as both visual and verbal communication. Topics such as systems of organization, visual hierarchy, creativity, typography, color, and navigation are introduced and explored. **Credits:** 3.00

CGT 25500 - Game Development II: Design And Psychology

Credit Hours: 3.00. (CNIT 30800) This course examines video game design, theory, and development from aesthetic, psychological, and technical perspectives. Students will gain experience with a commercial game development platform. Advanced game development techniques will be taught in this course.**Credits:** 3.00

CGT 25600 - Principles Of User Experience Design

Credit Hours: 3.00. This course introduces students to the process of user-centered design of computer systems humans interact with. Students learn how to draw upon principles of usability and user interface design rooted in human psychology and user research in order to conceptualize, prototype, and evaluate computer systems. Topics include processes such as user research, conceptual design, prototyping, and evaluation and concepts such as visual hierarchy, usability, information architecture, navigation, and more. The course is platform-independent and encourages students to experiment with new and emerging technologies. **Credits:** 3.00

CGT 26505 - Video Game Level, Mission, And World Design

Credit Hours: 3.00. This course teaches the techniques required to make game environments and levels from a game level design perspective. Students learn the process of designing play spaces through a structured process of paper design, blockout, and iteration. Architectural principles are discussed, in addition to case studies from published games. Environment art and lighting techniques are discussed and implemented, all with the goal of enhancing the interactivity of the given play space.**Credits:** 3.00

CGT 27000 - Introduction To Data Visualization

Credit Hours: 3.00. This course is designed for students with little or no background in Data Visualization. It provides an introductory examination of data visualization through lecture, readings and hands-on experience with current visualization tools. Students will obtain an overview of the various types of data, the fundamentals of the visualization process for information and scientific visualization, and examine detail visualizations workflows that aim to answer "when" (temporal data), "where" (geospatial data), "what" (topical data), and "with whom" (trees and networks) questions when visualizing data. After taking the course students will have both the theoretical foundation and practical skills needed to create insightful visualizations for a wide range of data types.**Credits:** 3.00

CGT 27001 - Topics In Data Visualization

Credit Hours: 1.00. This course provides students with first-hand knowledge about the field of data visualization and explore a collection of competencies that will help students think through, think about, and think with visual representation of data. Students will explore and examine current careers in data visualization and learn what skills they should work to refine in preparation for future internships and jobs. This course will provide insight into current data visualization literacy requirements in today's data driven world.**Credits:** 1.00

CGT 27108 - User Experience Design Studio II: Screen

Credit Hours: 3.00. Intermediate exploration of various approaches to human-centered design. Students learn intermediate research and design methods and create high-fidelity prototypes. The course is platform-independent and encourages students to experiment with new and emerging technologies.**Credits:** 3.00

CGT 27207 - User Experience Design Experience Studio II

Credit Hours: 3.00. This course allows students to practice as a UX designer in a company-like environment. Students continue to develop their abilities and contribute significantly to projects. Projects utilize a human-centered design approach to provide a rich user experience.**Credits:** 3.00

CGT 27208 - User Experience Design Studio III: Cross-Channel

Credit Hours: 3.00. Advanced exploration of cross-channel approaches to human-centered design such as service design that span digital and physical experiences. Students utilize principles of usability and user experience to create and evaluate physical

prototypes. The course is platform-independent and encourages students to experiment with new and emerging technologies.**Credits:** 3.00

CGT 27500 - Data Visualization II

Credit Hours: 3.00. This course provides a practical introduction to exploratory data analysis and data mining to better inform data visualization applications. The course introduces a practical approach for making sense out of data. Students are introduced to issues inherent to the data analysis process or data mining projects. The course covers: (1) how to *prepare* data prior to analysis, (2) how to *generate* summaries of the data, (3) how to *identify* non-trivial facts, patterns and relationships in the data and (4) how to *create* models from the data to better understand the data and make predictions. After data is analyzed students will use the data visualization process and techniques to *visually represent* the data. The course will also introduce the use of high-level programming languages for data analysis and data visualization. **Credits:** 3.00

CGT 28500 - Cross Cultural Game Development

Credit Hours: 3.00. This course presents current methods of design and development of digital games for extra-cultural audiences. Students are instructed using an experiential learning model in which multi-cultural student teams lead independent game development projects targeted at a non-native cultural audience. Topics include: dimensions of cultural, game engine scripting, art asset utilization, ethnographic data collection methods, cross-cultural team building, cultural observation, and project management. This course is taught in the US but is co-taught as a distance learning course with a foreign partner institution. Students who take 28500 may not also take 28510 (the study abroad version of the course). **Credits:** 3.00

CGT 29000 - Computer Graphics

Credit Hours: 1.00 to 3.00. Course topics will be determined by the CGT faculty. Hours and subject matter shall be arranged by the instructor and approved by the CGT curriculum committee. This course will not be used for independent study.**Credits:** 1.00 to 3.00

CGT 30505 - Portfolio II

Credit Hours: 0.00. Students present online portfolios, and the course instructors review and give feedback to help direct students' online presence in efforts to meet industry standards. **Credits:** 0.00

CGT 30800 - Prepress Production And Design

Credit Hours: 3.00. This course focuses on the process of designing, creating, and preparing documents for commercial printing. Students will develop proficiency with publishing software. Topics include page layout, font and image management, color, printing processes, papers, bindings and proofing methods. Projects emphasize designing single and multi-page documents for business and advertising such as identities, flyers, brochures, forms, catalogs, newsletters and booklets. **Credits:** 3.00

CGT 30900 - Internship In Computer Graphics Technology

Credit Hours: 2.00 or 3.00. Internship course in computer graphics technology. Practical experience totaling at least 240 hours in computer graphics technology. Permission of department required.**Credits:** 2.00 or 3.00

CGT 31000 - Drawing, Acting And Scripts For Animation

Credit Hours: 3.00. This course analyzes the symbiotic relationship between thinking and physical action, between emotion and its expression. Students will explore the visual storytelling process for film, animation, video games or multimedia. Students will learn the history of and gain needed drawing skills to create storyboards, animatics, along with the learning the importance to the

production process. Students will learn how animation scripts are developed as well as how visual stories are told through technical elements such as composition, lighting, framing and perspective. Students will explore how to tap into their creativity and create interesting original animations. **Credits:** 3.00

CGT 31300 - Digital Painting I For Computer Graphics

Credit Hours: 3.00. This course introduces students to digital painting techniques for graphical visualization and communication. Topics include industry standard practices and instruction in digital brush creation, digital mark making, value under painting, color palettes, and lighting and rendering to produce various computer graphics.**Credits:** 3.00

CGT 31400 - Advanced Motion Design

Credit Hours: 3.00. This course builds on the basic principles of motion design. Students will learn advanced techniques in visual storytelling, puppetry/rigging and integration of 3D elements into the design environment. Advanced design principles will also be discussed as sell as post-production techniques for animators with a focus on commercial production.**Credits:** 3.00

CGT 31500 - Computer Graphics Programming II

Credit Hours: 3.00. A continuation of the study of computer graphics programming concepts with an emphasis on interactive graphics and application development. Topics include polygon tessellation, vector imaging, interactive programming techniques, application development, and game development. **Credits:** 3.00

CGT 31700 - Planning And Communicating Themed Attraction Design

Credit Hours: 3.00. Building on students knowledge of narrative creation and design, students will learn about the fundamentals of operations, graphics, engineering, technology and design to create theme-based immersive attractions. This course will focus on design concepts, technical design, management and creation of immersive experiences.**Credits:** 3.00

CGT 32101 - Digital Illustration

Credit Hours: 3.00. This course applies fundamental computer graphics concepts of visualization, communication and creativity using a painting metaphor. Exercises and projects in graphic theory, problem solving and painting skill development provides students with projects that focus on further development within the digital illustration discipline. A variety of traditional digital drawing and painting techniques are used to transform concepts into communicative visual artifacts. **Credits:** 3.00

CGT 32500 - Animation For Games

Credit Hours: 3.00. In game industry, computer animation is the foundation giving life to human-like virtual characters. A thorough understanding of the motion capture and interactive computer animation is a requisite element of the game development process. This course introduces students to the fundamental techniques and skills required to develop animations for video games using a modern motion capture device and software packages. Students are taught using lectures and lab sessions. The focus of this course is primarily on the technical, artistic, and functional dimensions of animation for games, prioritizing the required technical skills. Production of user controller interactive virtual characters is required. **Credits:** 3.00

CGT 32600 - Graphics Standards For Product Definition

Credit Hours: 3.00. Introduction to product data exchange and interoperability standards, ANSI and NIST product documentation standards, product modeling standards, methodologies for technology selection, implementation, and evaluation. This course supports the product archival and communication processes in a PLM environment. **Credits:** 3.00

CGT 32800 - Business Of Themed Entertainment

Credit Hours: 3.00. This course provides an insider's look at the skills needed to succeed in themed entertainment industry as well as provide an overview of the experience economy. Students will get an insider understanding of the project process, working with outside vendors, team communication, common constraints and budgeting.**Credits:** 3.00

CGT 33300 - Modeling For Entertainment Graphics

Credit Hours: 3.00. This course offers students a chance to comprehensively explore Polygon Modeling, with consideration of how choices made in modeling can affect all other aspects of the animation pipeline. **Credits:** 3.00

CGT 33500 - Game Scripting

Credit Hours: 3.00. Students gain a deeper understanding into video game scripting. Utilizing a common project, students use scripted objects to customize and enhance a small existing game. While the projects are individualized for the student, they are trained to utilize best practices for team based, industry applications of their work. Permission of department required.**Credits:** 3.00

CGT 34000 - Digital Lighting And Rendering For Computer Animation

Credit Hours: 3.00. The development of a working knowledge of perspective display of three-dimensional models and the resulting effects of projected light sources on shade, shadow, color, texture, and atmospheric effects in architecture, product illustration, and animation. Emphasis will be placed on lighting design, analysis, and photorealistic simulation for commercial graphic applications. **Credits:** 3.00

CGT 34100 - Motion For Computer Animation

Credit Hours: 3.00. An applied course covering three-dimensional computer graphic animation for graphics specialists and professionals involved in the use of technical design, time and motion study, surface texture mapping, digital lighting, color, and the technology required to produce computer animations for commercial applications in manufacturing design, marketing, and training. **Credits:** 3.00

CGT 34500 - Game Development III: Environment Modeling For Games

Credit Hours: 3.00. (CNIT 33100) This course teaches the techniques and principles needed to create realistic three-dimensional virtual environments in game engines. The course will examine the principles of physics that determine how light propagates through the world and is eventually perceived by a human eye. Global illumination techniques that approximate these principles are described, followed by an in-depth examination of how game engines then approximate these solutions in order to create virtual environments that can run at real-time frame rates.**Credits:** 3.00

CGT 34505 - Environment Modeling For Games

Credit Hours: 3.00. This course teaches the techniques and principles needed to create realistic three-dimensional virtual environments rendered in game engines. This course will examine design, modeling, material creation and lighting of environments displayed in a real-time game engine environment. Amongst the topics that will be covered is: Direct input modeling, procedural modeling, digital sculpting, material authoring and real-time lighting using current 3D tools. **Credits:** 3.00

CGT 34600 - Digital Video And Audio

Credit Hours: 3.00. Covers the use of digital technologies for video and audio in multimedia, hypermedia, and animation products. Students examine the methods for creating, sampling, and storing digital video and digital audio and the constraints placed on these media assets when used for media-based products. Emphasis is placed upon the technology of digital video and audio, including formats, data rates, compressors, and the advantages and disadvantages of the different technologies. **Credits:** 3.00

CGT 34800 - Photorealistic Shaders

Credit Hours: 3.00. This course focuses on the creation and application of photorealistic custom shaders to visual effect problems. Students learn to tender common material photorealistically using common industry tools and techniques. Emphasis is placed on meeting specified aesthetic and photorealistic requirements within computationally constrained environments.**Credits:** 3.00

CGT 35300 - Principles Of Interactive And Dynamic Media

Credit Hours: 3.00. This course explores the development of interactive and dynamic media components for web and interactive media products. The course examines the design, creation and integration of 2D animation, 2D games, text, sound, video, programming, and databases for use in web and other interactive media.**Credits:** 3.00

CGT 35600 - Web Programming, Development And Data Integration

Credit Hours: 3.00. A course focusing on the development of dynamic content and applications to facilitate information distribution. The course stresses development strategies for managing the rapidly changing information of corporations and organizations for just-in-time distribution, using authoring programs to create interactive multimedia products that utilize database management systems, file systems, and XML to provide a method for visualizing and manipulating that data. Significant time is spent on intermediate to advanced programming and scripting. **Credits:** 3.00

CGT 36500 - Game Development Practicum

Credit Hours: 3.00. This course provides an opportunity for teams of game developers to focus on a project without distraction by competing course deliverables. Students propose a game project and spend the entire semester working only on that project. Course instructors will function as facilitators, producers, and supervisors, helping each student team scaffold their work such that all course goals are met.**Credits:** 3.00

CGT 36700 - Previsualization In Themed Entertainment

Credit Hours: 3.00. This course provides an overview of themed entertainment development from concept to previsualization and communication. Students will have the opportunity to take initial concepts for themed experiences and visualize them to communicate to multiple external audiences.
Credits: 3.00

CGT 37000 - Interactive Data Visualization

Credit Hours: 3.00. Data visualization is the art and science of putting quantitative numbers into pictorial or graphical format that are easy for users to understand, use, and take action upon the data. In this course, we will learn basic data visualization design principles, theories, data management skills, and fundamental web technologies to design and develop web based interactive date visualizations. The students will be able to design the proper visual representations of the data based on the data's characteristics, business needs, and prospective users. **Credits:** 3.00

CGT 37108 - User Experience Design Studio IV: Strategy

Credit Hours: 3.00. Advanced exploration of strategic human-centered design that aligns user experience with organizational strategy and business goals, using approaches such as agile, waterfall, and lean UX. Students utilize visual, information, and usability principles as well as various approaches and methods of human-centered design to create interactive digital prototypes. The course is platform-independent and encourages students to experiment with new and emerging technologies.**Credits:** 3.00

CGT 37207 - User Experience Design Experience Studio III

Credit Hours: 3.00. This course provides students with opportunities to explore opportunities in a company-like environment. Students are knowledgeable project members and beginning to transition into subject matter experts and managers. Projects utilize human-centered design principles to provide a rich user experience.**Credits:** 3.00

CGT 37208 - User Experience Design Studio V: Specialization

Credit Hours: 3.00. This course prepares students to lead complex and strategic design projects. Students become proficient in the most advanced approaches, methods and techniques of human-centered design. The course is platform-independent and encourages students to experiment with new and emerging technologies.**Credits:** 3.00

CGT 37500 - Game Audio

Credit Hours: 3.00. Students learn the basics of audio production as it relates to game development. Students edit and create audio effects using off-the-shelf tools and implement these sounds in a game engine. Microphones, digital audio workstations, and sound effect libraries are utilized in a framework that focuses on direct implementation into interactive media. **Credits:** 3.00

CGT 37700 - Scientific Visualization

Credit Hours: 3.00. This course is an introduction to the use of computer graphics to help user gain insight into scientific datasets. Applications from atmospheric science, medicine and physics will be explored. Topics will include the fundamental approaches to scalar-valued data (volume rendering, iso-surface extraction), vector-valued data (glyphs, streamlines), and tenors-valued data (ellipsoidal, quadric and super quadric glyphs). **Credits:** 3.00

CGT 38500 - Game Production

Credit Hours: 3.00. This course uses intensive project-based, student-led learning in game development to cultivate skills in quality assurance, leadership, communication, time management, contingency planning, technology integration, autonomy and accountability. Students act in an executive role with students in other project-oriented classes and in so doing cultivate supervisory production experience. Each student must engage with instructors and students to hone real-world hard and soft skills through situated experiences and student-led teaching opportunities. Student producers must develop a functioning development pipeline, meet regularly with their teams, and maintain industry-standard documentation and project management processes. Permission of Instructor required. **Credits:** 3.00

CGT 39000 - Computer Graphics

Credit Hours: 1.00 to 3.00. Course topics will be determined by the CGT faculty. Hours and subject matter will be arranged by the instructor and approved by the CGT curriculum committee.**Credits:** 1.00 to 3.00

CGT 40400 - Self Promotion For Computer Graphics

Credit Hours: 3.00. This course has been designed to introduce students to the professional practice of branding oneself as commonly used in industry. Students will learn how to critique their own work, and the work being done by peers in the industry.**Credits:** 3.00

CGT 40500 - Senior Portfolio Review

Credit Hours: 0.00. Portfolio review for seniors in Computer Graphics Technology.**Credits:** 0.00

CGT 40700 - Current And Future Trends In Themed Attraction Design

Credit Hours: 3.00. Students will learn about current trends in immersive attractions. Current technologies will be explored that can be used to enhance the narrative in a themed immersive space. Students will explore technologies, narrative techniques and integration of engineering.**Credits:** 3.00

CGT 41100 - Contemporary Problems In Applied Computer Graphics

Credit Hours: 3.00. Groups will identify, design, qualify, manage, create, and present a final project relative to existing or emerging issues within applied computer graphics. Activities and experiences will explore related topics such as project planning and management, user expectations, interpersonal communications skills, and quality management. The course concludes with faculty, peers, and practicing professionals evaluating oral, written, and media presentations of final projects. **Credits:** 3.00

CGT 41101 - Contemporary Problems In Applied Computer Graphics I

Credit Hours: 2.00. Groups will identify, design, qualify, and plan a final project relative to existing or emerging issues within applied computer graphics. This project will be done in conjunction with industry and faculty engagement. Activities and experiences will explore related topics such as project planning and management, user expectations, interpersonal communications skills, and quality management. This course is followed by CGT 41201 which includes the execution and evaluation of the capstone project planned in CGT 41101.**Credits:** 2.00

CGT 41201 - Contemporary Problems In Applied Computer Graphics II

Credit Hours: 2.00. CGT 41201 is the second course in the CGT applied computer graphics capstone sequence with a focus on execution and evaluation of the senior capstone project. Emphasis will be placed on industry engagement for the execution of the project plan that was developed in CGT 41101. Students will work in teams to execute the project plan; develop and execute a project evaluation plan, and make a professional final presentation to industry members, faculty, and peers. Students will execute a project refinement process based on feedback received and incorporate that into a final presentation and project report. CGT 41201 will be taught in a seminar format with one meeting per week focused on project status checks, evaluation plan development and execution, and project presentations. **Credits:** 2.00

CGT 41600 - Senior Design Project

Credit Hours: 3.00. This capstone course requires students to engage in a substantive endeavor directed at solving problems related to computer graphics. Activities include the creation and management of graphic systems and media assets per the requirements of the senior design proposal. Students are required to demonstrate professional attitudes and attributes in the timely completion and presentation of their project.**Credits:** 3.00

CGT 42300 - Product Data Management

Credit Hours: 3.00. This course provides an understanding of the types of data generated and used in the product lifecycle, the current tools and methodologies in the management of that data, and system analysis and implementation techniques for using PDM as the backbone supporting a company's product development and implementation activities. Interaction between various enterprise systems is also discussed. **Credits:** 3.00

CGT 42500 - Game Design

Credit Hours: 3.00. This course is about the discovery, summarization, application, analysis, and synthesis of novel game design techniques. Discovery and summarization are done through research and in-class presentations. These presentations are then used to create prototypes in the game engine of the student's choice. Students are expected to collect data on these prototypes. This data is then used to iterate on the prototypes throughout the semester. The course culminates in a polished prototype that is published on any valid public gaming platform or student portfolio. This is an advanced course that assumes the student has existing skills in game creation (particularly game scripting, game art, and game design). Permission of instructor required. **Credits:** 3.00

CGT 42600 - Industry Applications Of Simulation And Visualization

Credit Hours: 3.00. This course focuses on developing mathematically accurate physical-visual simulations of mechanisms, systems, and assemblies. Topics include physical system analysis; coordinate systems; inverse kinematics; linear, rotational, and reciprocating motion. Simulations will be created using modeling technology, programmed scripting, and diverse software. **Credits:** 3.00

CGT 43500 - Virtual Reality And 3D User Interfaces

Credit Hours: 3.00. The purpose of this course is twofold: (a) to provide students with a deep understanding of the fundamentals of virtual reality environments and 3D user interfaces and (b) to offer students practical experience with consumer-grade virtual reality systems. Students will explore the challenges of developing and analyzing virtual reality systems and 3D user interfaces that are effective and comfortable, motivated by design goals and constrained by the real world. We will also explore the relationship of virtual reality to entertainment, medical, and manufacturing domains.**Credits:** 3.00

CGT 44200 - Production For Computer Animation

Credit Hours: 3.00. An applied course covering advanced spline modeling techniques, lighting techniques, applied shading, motion dynamics and controllers, particle systems, application customization programming, and pre-production development and planning. Study of emerging advancements in computer animation and spatial graphic technologies will be included. **Credits:** 3.00

CGT 44400 - The History And Technique Of Visual Effects In Film

Credit Hours: 3.00. This lecture-based course presents the history and technique of special or visual effects in film from the 19th Century (George Me'lie's) to the current digital age of visual effects. Emphasis is placed on the use of effects in fantasy, science fiction, and horror genres. These effects can range from the recreation of historical venues, to fictional characters and to worlds not yet seen. This course serves not only to address this facet of the history of film and cinema, but also the techniques and technology of visual effects including practical effects, miniatures, stop-motion, makeup, mechanical effects, optical effects, motion control, and the digital realm.**Credits:** 3.00

CGT 44500 - Game Development IV: Procedural Asset Creation For Games

Credit Hours: 3.00. This course teaches a procedural approach to game development ranging from geometric modeling techniques, crowd simulation, particle systems, fluid simulation and flame simulation. The course will examine procedural nondestructive workflows that can be translated into real-time assets for game development. Students will learn how to set up nodal and parameter based graphs that carry the ability to be interactively updated and changed, thus having the flexibility expected in an industry pipeline.**Credits:** 3.00

CGT 44600 - Post-Production And Special Effects For Computer Animation

Credit Hours: 3.00. A variety of commercial applications of technical animation and spatial graphics are analyzed and produced, with special emphasis upon client development, design, organization, scripting, storyboarding, technical production, management, and evaluation. **Credits:** 3.00

CGT 45000 - Professional Practices

Credit Hours: 3.00. This course prepares students for professional employment in Computer Graphics related professions. Topics include ethical and legal issues, contracts, copyright, and freelancing as well as portfolio planning, design, preparation, and presentation. **Credits:** 3.00

CGT 45001 - Computer Graphics Professional Practices II

Credit Hours: 1.00. Preparation for professional employment in computer graphics professions. Topics covered include professional and technical writing, correspondence, corporate and freelance employment considerations; portfolio planning; and interviewing. Students will arrange interviews and portfolio reviews. **Credits:** 1.00

CGT 45600 - Advanced Web Programming, Development And Data Integration

Credit Hours: 3.00. This course presents the advanced technologies available for use on the World Wide Web and within corporate intranet environments. Emphasis and discussion is focused on the advantages and disadvantages of these technologies as well as on implementation to create unique solutions for business and industry. Strategies for planning, development, and implementation will be discussed and demonstrated. Significant time is spent on advanced programming and scripting as well as manipulation and visualization of data from various sources, including robust database management systems. Students are required to plan, design and implement a major project. **Credits:** 3.00

CGT 47000 - Data Visualization Studio

Credit Hours: 3.00. This course will teach students design and develop interactive data visualization systems to communicate and analyze complicated datasets. Students will learn interaction and visual design principles, draw from human perception and cognition theories, and focus on hands-on practice of developing interactive data visualization systems that enable users to see, understand, and analyze complex data and relations. At the end of the class, students will apply the design principles and use proper technologies to create a comprehensive interactive visualization system for data analysis.**Credits:** 3.00

CGT 47407 - UXD Experience Studio VI Management

Credit Hours: 3.00. This is an advanced-level course where students are project managers in a company-like environment within the Purdue Experience Studios. Students learn about management expectations within a UX design company as they work with multi-level teams on corporate-sponsored projects. Projects utilize a human-centered design approach with an emphasis on designing for the user experience. Students learn how to manage team leadership, including training project owners by planning, organizing, and running training and mentoring workshops. Permission of instructor required.**Credits:** 3.00

CGT 48500 - Honors Game Production

Credit Hours: 3.00. This course provides an opportunity for students to acquire real-world experience working as a game studio producer for one or more student Career Project (capstone) teams. Students may enroll in this course via invitation only. As this is an Honors course, students are expected to bear greater individual responsibility and produce very high quality results. Students should be capable of working with a high degree of autonomy and be prepared to adapt to open-ended problems and deliverables expectations that may shift according to project needs. Student producers will coordinate development efforts and logistics between Career Project teams (CGT 365) and the various Outsourcer courses that the Career Project teams depend upon. Students must function as leaders and accept responsibility for their team's results. This course fulfills the requirement for work experience as defined by the CGT department. Permission of instructor required. **Credits:** 3.00

CGT 49000 - Computer Graphics

Credit Hours: 1.00 to 3.00. Senior-level course topics will be determined by the CGT faculty. Hours and subject matter shall be arranged by the instructor and approved by the CGT curriculum committee. This course will not be used for independent study.**Credits:** 1.00 to 3.00

CGT 49100 - Special Topics In Computer Graphics

Credit Hours: 1.00 to 6.00. A variable title, variable content course pertaining to problems and research in graphical methods and representation. Permission of instructor required.**Credits:** 1.00 to 6.00

CGT 49800 - Undergraduate Research In Computer Graphics Technology

Credit Hours: 1.00 to 3.00. Students will conduct research in the area of computer graphics technology with a primary investigator. The primary focus of the course is to contribute to ongoing research, while learning current research techniques. Contributing to research design, analyzing data, determining courses of action, developing critical thinking, and presenting results are emphasized. Requires prior approval of, and arrangement with, a faculty research advisor. Permission of instructor required. **Credits:** 1.00 to 3.00

CGT 49900 - Selected Tropics in Computer Graphics

Credit Hours: 1.00 to 3.00. Hours and subject matter to be arranged by staff.**Credits:** 1.00 to 3.00

CGT 50100 - Seminar In Computer Graphics Technology

Credit Hours: 0.00 to 3.00. A variable topics course that addresses contemporary problems and issues related to M.S. students in Computer Graphics Technology. Permission of instructor required. **Credits:** 0.00 to 3.00

CGT 51100 - The Development Of Graphics In Technology

Credit Hours: 3.00. An introduction to the historical development of visual science in western civilization and its effect on computer graphics techniques and practices. Topics include the historical, contemporary, and future developments in computer graphics. Emphasizes the study of visual science and the significance of computer graphics as a communications medium. **Credits:** 3.00

CGT 51200 - Foundational Readings Of User Experience Design

Credit Hours: 3.00. This course provides an overview of the field of human-computer interaction (HCI) and user experience (UX) design. Students will explore the main themes, paradigms, and theories of HCI and UX from its inception to the present. The course takes a broad, chronological approach, examining the history and evolution of HCI and UX, including its major intellectual shifts, successes and failures, and its dynamic relationship to other fields. Students will read seminal works from leading researchers. This course is intended to provide a solid foundation for further research. No specific technical or programming experience is required. **Credits:** 3.00

CGT 51300 - Interactive Multimedia Development And Research

Credit Hours: 3.00. A survey of the interactive multimedia development process, knowledge base, and applications in business and industry. Particular attention is paid to research issues surrounding theoretical, technological, and interactive techniques, and validating those approaches through applied research. Emphasis is placed on the interdisciplinary nature of the development of new media tools. **Credits:** 3.00

CGT 51500 - Virtual Environments

Credit Hours: 3.00. This course provides deep exposure to the most prominent and important research within the fields of virtual reality, games, and any application area where virtual environments are constructed or inhabited. Students will study experiential, cultural, and phenomenological aspects of habitation within virtual environments as well as become familiar with technical aspects involved in virtual environment creation. Students will generate original research data and analysis, prepare a publishable manuscript, and build their own virtual worlds as applicable. **Credits:** 3.00

CGT 51600 - Collaborative Virtual And Augmented Environments

Credit Hours: 3.00. A study of the field of collaborative virtual and augmented environments in shared, multi-user, same-site and multi-site immersive environments. Students will gain knowledge in the following research areas: multi-user interaction, collaborative virtual and augmented environments, and latest software and hardware tools. In this collaborative environment, students not only interact within the same virtual environment but collaborate between physically different environments through distributed environments. Knowledge of 3D computer graphics fundamentals, openGL, and C/C++, or consent of instructor. **Credits:** 3.00

CGT 51800 - Augmented Reality

Credit Hours: 3.00. Augmented Reality, a form of presenting virtual information within a perspective of the real world. This course instructs students in the foundations, practice and use of AR (Augmented Reality) as well as the technology required to produce an AR visualization. The concepts covered in this class include: physical tracking systems, computer vision, image processing techniques, 3D virtual environment visualization and calibration, display systems for AR and usage of AR in multimedia & tech culture. Some experience in Unity 3D preferred. **Credits:** 3.00

CGT 51900 - Projects In Graphics

Credit Hours: 3.00. This course instructs students in current methods of conducting research on computer graphics and the content development process. Topics covered in the course include biofeedback, user experience, measurement and analysis, development pipelines, publication strategies and methodologies. LaTeX document preparation, simulation, and qualitative approaches to conducting research in the field of computer graphics. **Credits:** 3.00

CGT 52000 - Computer Graphics Programming

Credit Hours: 3.00. This course provides a working knowledge of computer graphics programming using OpenGL and C++. OpenGL is the platform independent industrial standard APL and the leading edge technology for computer graphics application design. It has been used in the gaming industry, as well as in research and for scientific visualizations. The course focuses on creating real-time and interactive applications and is structured into several blocks; OpenGL introduction, modeling, texturing, transformations, lighting, and interactive application design. Students will develop various applications through the course focusing different aspects of computer graphics programming. **Credits:** 3.00

CGT 52100 - Advanced Real-Time Computer Graphics

Credit Hours: 3.00. This course focuses on a working knowledge of real-time rendering and shaders using GPI. Students will learn how to program advanced computer graphics techniques and how to benefit from the existing graphics hardware in an efficient way. The main focus is on programming modern graphical processing units (GPUs) using the GLSL, CG and OpenGL. Students will learn what the data-flow programming model is, and how to write vertex, geometry, tessellation, and fragment shaders. Another output is using texturing and lighting on the low level of the GPU and the next step is to provide animations using vertex shaders. Advanced texturing techniques such as bump mapping or environment mapping will be explained. Permission of instructor required. **Credits:** 3.00

CGT 52200 - UX Design Graduate Studio I: Fundamentals

Credit Hours: 3.00. This course is an introduction to the fundamental components of human-centered design, focusing on interactive computing systems. Students learn basic tenets and methods of user-centered design, including usability and visual design principles, user research, low-fidelity prototyping, and high-fidelity prototyping. The course is platform-independent and encourages students to experiment with new and emerging technologies.**Credits:** 3.00

CGT 52300 - Intelligent Virtual Agents

Credit Hours: 3.00. Intelligent Virtual Agents (IVAs) are interactive virtual characters that exhibit human-like qualities, including communicating using natural human modalities such as facial expressions, speech, and gesture. They are capable of real-time perception, cognition, emotion, and action that allow them to participate in dynamic social environments. This course introduces students to the interdisciplinary research on the design, application, and evaluation of IVAs. Students will be taught theory, methodologies, and algorithms, which they will then apply to individual projects. These individual projects will provide students with a common base for authoring IVAs for various application domains, including virtual assistants, pedagogical agents, human-agent task/problem co-solving, human-agent collaboration, and more. Prior background in virtual reality or technical animation is assumed, as the course will provide students the opportunity to further develop these competencies through hands-on assignments within a commercial game engine. The focus of this course is primarily on the computational and functional dimensions of IVAs; however, design and creativity are also important aspects of all projects. This course uses an active learning approach that involves lab assignments, presentations, independent research, and group ideation and collaboration.**Credits:** 3.00

CGT 52500 - Virtual Reality

Credit Hours: 3.00. This course introduces students to the hardware, software, and cognitive underpinnings necessary for creating cutting-edge virtual reality (VR) applications with a strong emphasis on immersive and interactive experiences, allowing students to explore and innovate within the realm of VR. Students will engage with various topics throughout the course, including computer graphics, human-computer interaction, applied perception, optics, and display technologies. Practical experience with consumer-grade virtual reality systems will empower students to design, develop, and analyze VR applications that are effective and comfortable for the user. This course aims to explore the vast potential of VR beyond traditional applications, highlighting its impact on entertainment, healthcare, education, and various other industrial domains. Through a combination of lectures, hands-on projects, and assignments, students will tackle the challenges of VR development, guided by design principles and real-world constraints. By the end of this course, students will be equipped with both knowledge and practical skills needed to design and develop VR experiences that push the boundaries of immersion and interactivity.**Credits:** 3.00

CGT 53200 - UX Design Graduate Studio II: Cross-Channel

Credit Hours: 3.00. This course is an advanced exploration of cross-channel approaches to human-centered design, such as service design, that span digital and physical experiences. Students utilize principles of usability and user experience to create and evaluate physical prototypes. The course is platform-independent and encourages students to experiment with new and emerging technologies. **Credits:** 3.00

CGT 53700 - Applied Artificial Intelligence For Computer Graphics

Credit Hours: 3.00. This graduate-level survey course offers a comprehensive exploration of how AI technologies are revolutionizing computer graphics and applications, including animation, augmented reality (AR), virtual reality (VR), digital media, and interaction techniques. With a focus on both the theoretical foundations and practical applications of AI, the curriculum delves into machine learning, deep learning, neural networks, and their specific uses in creating visual content and interactive digital media applications. Students will engage in hands-on projects, ranging from individual experiments to collaborative efforts, designed to demonstrate AI's transformative potential in enhancing both the visual and interactive dimensions of computational media. By the end of this course, students will not only understand the current landscape of AI in

computational media but also possess the technical, analytical, and creative skills needed to contribute meaningfully to this rapidly evolving field.**Credits:** 3.00

CGT 54000 - Current Topics In 3D Animation

Credit Hours: 3.00. This course addresses recent research and development in 3D animation. Permission of instructor required. **Credits:** 3.00

CGT 54300 - Experimental Animation

Credit Hours: 3.00. This course introduces key theoretical and applied concepts of experimental animation. Evolving technology consistently provides new opportunities for experimental practices in animation production. In this course, students will engage with experimental creative practices including abductive reasoning, abstraction, generative animation, motion graphics, simulations, glitch and mixed digital media. These experimental animations are suitable for a wide range of outputs including experimental short film, installation, projection mapping and a range of online platforms.**Credits:** 3.00

CGT 54400 - Animation History, Technology And Technique

Credit Hours: 3.00. This course traces the history of animation by reviewing the evolution of animation technology and the nexus between these technologies, production practices and crafts and the resulting styles, movements and genres of animation. The course reviews major technological developments of the 20th century that have impacted commercial animation production, as well as lesser known independent studios and artists, fringe technologies and sub genres. The course culminates with a consideration of current animation technology and the limits and opportunities it creates. **Credits:** 3.00

CGT 54500 - Game Development I

Credit Hours: 3.00. In both research and industry game engines are the foundation for nearly all graphics-intensive interactive applications. A thorough understanding of how game engines work is therefore a requisite element of the game development process and lever for research in most domains involving interactive simulations and games. As game engine development, research, and application is a large and complex topic, the course is split into two semesters of study. The two courses are structured similarly but cover different aspects of development on and within game engines. This course introduces students to the fundamental technologies and skills required to develop video games using a modern game engine. Students are taught using a student-led, active-learning pedagogy in which students co-develop and present lectures, demonstrations, and assignments for their peers, with facilitation by the course instructor. The focus of this course is primarily on the technical, functional, and theoretical dimensions of game development, prioritizing technical soundness over design and creativity (which are covered more explicitly in a separate course). As research in this field continues to rapidly iterate, the latest findings are incorporated into each new offering of the course, refreshing its content as the technology evolves in its implementation and theoretical underpinnings. Production of original research focused upon an aspect of game development or game engine design is required. **Credits:** 3.00

CGT 55400 - Configuration Management In The Digital Enterprise

Credit Hours: 3.00. This course will cover Configuration Management (CM) in the context of the digital enterprise and Product Lifecycle Management (PLM). Configuration Management applies processes, resources and controls to establish and maintain consistency between product configuration information and the product. Configuration information includes product requirements and changes to the product. This course provides preparation for IpX CM2 Certification at the Application Specialist level. **Credits:** 3.00

CGT 55500 - Game Development II

Credit Hours: 3.00. This course introduces students to the advanced concepts, technologies, skills that enable the creation of sophisticated video games, simulations, and game systems. Students are taught using student-led, active-learning pedagogy in

which students co-develop and present lectures, demonstrations, and assignments for their peers, with the facilitation of the course instructor. A thorough understanding of how game engines work is therefore a requisite element of the game development process and lever for research in most domains involving interactive simulations and games. As game engine development, research, and application is a large and complex topic, the course material is distributed across two semesters. In addition to the continuation of technical topics this course also emphasizes the experiential, conceptual, and aesthetic dimensions of game development, prioritizing implementation completeness with creative, aesthetically-pleasing implementations that are informed by current research. As research in this field continues to rapidly iterate, the latest findings are incorporated into each new offering of the course, refreshing its content as the technology evolves in its implementation and theoretical underpinnings. Production of original research focused upon an aspect of game development or game engine design is required. Permission of instructor required. **Credits:** 3.00

CGT 56200 - Cognition And Human-Computer Interaction

Credit Hours: 3.00. This course provides an overview of the role of human cognition in the use of interactive digital technologies. Students will learn fundamental theories and concepts of cognitive science that are relevant to interactive technology. The course takes a broad chronological approach, examining the history and development of cognitive theories and models in the field of human computer-interaction (HCI). Students will read seminal works from leading researchers in cognitive science and HCI. The course covers older well-established theories and models as well as newer speculative ones. Students will develop a sound understanding of the origins, development, and future directions of cognition research in HCI. Topics covered include: classical cognition; the cognitive revolution; mediated cognition; activity theory; situated action; embodied cognition; distributed, external, and extended cognition; enactive cognition; thinking and epistemic coping; make-believe and imagination; scaffolding and cognitive offloading; internal and external representations. Students are encouraged to make appropriate connections to their own research areas. No specific technical or programming experiences is required. **Credits:** 3.00

CGT 57000 - Information Visualization

Credit Hours: 3.00. This course provides a systematic, comprehensive framework to study principles, design choices, and development toolkits on information visualization design and development. It focuses on creating innovative and intuitive visualization solutions to provide users with peripheral awareness of meaningful information from a complex data set. Employing a user-centric approach, this course studies and analyzes visualization design and development from data, tasks, and visualization and interactions. The students will learn perception theories on visualization and use visual elements such as space and color to encode data, compare, evaluate, choose among different visualization forms and interaction methods. Through a project-based learning approach, students will conduct case studies on various visualization designs, analyze the user, data, tasks, and design choices in the visualizations, and finally design and develop information visualization solutions as course projects. Students should have finished their undergraduate study in domains that are closely related to one or more of the following: business analysis, statistics, knowledge management, computer science, software engineering, interaction design, human-centered computing, scientific visualization or information visualization. Permission of department required. **Credits:** 3.00

CGT 57200 - Special Topics In Human-Centered Design And Development

Credit Hours: 3.00. This course offers students the opportunity to explore current topics in human-centered design and development of systems with graphical user interfaces in-depth through readings, discussions, design projects and design critiques. Topics vary by semester. Possible offerings include Critical Design, Design for Behavior Change, Participatory Design, Design for Social Good, Service Design, Social Interaction Design. **Credits:** 3.00

CGT 57207 - UX Design Graduate Experience Studio

Credit Hours: 3.00. This course immerses students in a company-like environment where they work on semester-long design projects that are sponsored by industry partners. Students learn about the various roles within a UX environment as they build collaboration and project management skills. Projects utilize a human-centered design approach with an emphasis on designing for the user experience. Students will engage in substantial research and evaluation activities, informed by seminal literature in

the field, along with their design work. Students are expected to take responsibility for project deliverables and mentor junior students. Permission of department required.**Credits:** 3.00

CGT 57500 - Data Visualization Tools And Applications

Credit Hours: 3.00. This course provides hands-on experience in data visualization tools and applications. The course is designed for students with little or no background in Data Visualization. It introduces students to design principles for creating meaningful displays of quantitative and qualitative data to facilitate insight and decision-making. The goal is to introduce visualization as a tool, explore and identify which visualization tools are better suited to visualize different types of data, and understand the role visualization plays in understanding what the data represent. This course gives students an in-depth view of the various branches of visualization and the visualization tools in each area. After taking the course students will be able to evaluate data visualization tools and determine which tool to use for different types of data. This course is targeted towards students interested in using visualization in their own work and future academic courses. **Credits:** 3.00

CGT 58100 - Workshop In Computer Graphics Technology

Credit Hours: 0.00 to 8.00. Advanced study of technical and professional topics. Emphasis is on new developments relating to technical, operational, and training aspects of industry and technology education. **Credits:** 0.00 to 8.00

CGT 59000 - Special Problems In Computer Graphics Technology

Credit Hours: 1.00 to 6.00. Independent study of a special problem under the guidance of a member of the staff. Does not substitute for either M.S. thesis or M.S. project credit. Permission of instructor required. **Credits:** 1.00 to 6.00

CGT 59700 - Directed MS Capstone

Credit Hours: 3.00 to 6.00. An original investigation of a particular problem under the guidance of the instructor(s). The resulting product is a substantial project report with an evaluation or research component. Not applicable to a thesis option plan of study. Enrollment for a total of six credits is required. Permission of department required. **Credits:** 3.00 to 6.00

CGT 59800 - Directed MS Project

Credit Hours: 1.00 to 3.00. A formal investigation of a particular problem under the guidance of the advisory committee. Not applicable to a thesis option plan of study. Enrollment during at least two consecutive terms for a total of three credits is required. Permission of instructor required. **Credits:** 1.00 to 3.00

CGT 61000 - Visual Intelligence And Perception

Credit Hours: 3.00. This course focuses on the fundamentals of perception and cognition relative to vision and its implications to the field of computer graphics technology and the creation of graphics. Students will examine the foundations of human perception of form, shape, color, and motion, developing an understanding of why and how humans perceive visual information. Permission of instructor required. **Credits:** 3.00

CGT 62000 - Graphics Processing Unit Computing

Credit Hours: 3.00. This course provides a working knowledge of general-purpose graphics processing unit computing (GPGPU) using CUDA, OpenCL, and C++. OpenCL and CUDA are the platform independent industrial standard API and leading edge technology for GPGPU. The course focuses on utilizing, GPU for advanced tasks of scientific computing on parallelization of creating real-time and interactive applications and is structured into several blocks; parallel programming and synchronization

tasks, GPU architecture, CUDA programming model, the OpenCL programming model. Permission of instructor required. **Credits:** 3.00

CGT 62100 - Compute Shader Programming

Credit Hours: 3.00. Compute shaders allow graphics programmers to leverage the parallel processing power of the GPU for tasks besides rendering. Kinematics and other simulations, collision detection and image processing are common applications. In this class we will use several different shading languages to implement a variety of algorithms in both stand-alone applications and in game engines. Pre-Requisite: CGT 52000 (Concurrent Pre-Requisite) or CGT 52100 (Concurrent Pre-Requisite) or instructor permission.**Credits:** 3.00

CGT 63700 - Creative AI: Machine Learning For Creativity And Design

Credit Hours: 3.00. This graduate seminar offers an in-depth exploration into the creative and innovative intersections of artificial intelligence (AI) and machine learning with arts and design. As we witness a surge of breakthroughs in AI, this course aims to uncover the creative potential of new interaction techniques and art forms within these technological advances. Students will delve into how machine learning reshapes disciplines such as computational design, media arts, music, gaming, human-computer interaction, virtual reality, and graphics. The seminar has a dual focus: firstly, surveying the landscape of contemporary creative applications of deep learning across various fields; and secondly, empowering students to conceive and execute their own creative projects that leverage AI technologies. Coursework will be organized around the development of creative AI projects, to be completed either individually or collaboratively in small groups. Prerequisite: CGT 53700 or by permission of instructor.**Credits:** 3.00

CGT 64500 - Games Research

Credit Hours: 3.00. This course instructs students in current methods of conducting research on digital games, ludology, and the game development process. The most current or impactful research in the field is presented, analyzed, and extrapolated upon. The course surveys a wide variety of specific topics that shift as new research findings are published. Previous topics have included: biofeedback, user experience evaluation in games, gameplay measurement and analysis, development pipelines, mathematical modeling of game design, publication strategies and methodologies, scientific document preparation, and simulation. Quantitative and qualitative approaches to conducting research in the field of digital and traditional games. Production of original research focused upon an aspect of games, ludology, game development, or simulation is required. **Credits:** 3.00

CGT 67000 - Applications In Visual Analytics

Credit Hours: 3.00. Visual Analytics (VA) provides a fast way for people to make sense of large number of data, and has applications in many sectors. This course will introduce Visual Analytics through foundational theories and a broad range of techniques and tools, focusing on using visualization methods to reason and solve complex problems in a wide variety of applications. Visual analytics is the science of analytical reasoning facilitated by interactive visual interfaces that synthesize human and computational ability to attack large complex problems. It is concerned with analytical reasoning, interaction, data transformations, data visualization, analytic reporting, and technology transition. While the different visual analytics applications share common theories and strategies, each of them has its unique data composition, visual representations, and analytical needs and strategies. Through survey and study a broad range of visual analytics applications, students will be able to apply visual analytics on their own applications, analyze and break down a complex analytical problem into proper components and steps, evaluate different visual analytic techniques and strategies, and finally design and develop an effective visual analytics solution toward the problem. **Credits:** 3.00

CGT 68100 - Workshop In Computer Graphics Technology

Credit Hours: 0.00 to 6.00. This variable topics course focuses on advanced study of technical and professional research topics, primarily for doctoral students. Permission of instructor required. **Credits:** 0.00 to 6.00

CGT 69000 - Research Projects In Computer Graphics Technology

Credit Hours: 1.00 to 6.00. This course provides a means of independent study of a special problem under the guidance of a graduate faculty member who holds a terminal degree. It is assumed that projects in this course are research projects independent of one's doctoral research. Although not required, it is likely that a major result of the course will be a conference or journal publication. This course does not substitute for dissertation research credit on the plan of study. Permission of instructor required. **Credits:** 1.00 to 6.00

CGT 69400 - CGT Graduate Seminar

Credit Hours: 0.00. The CGT Graduate Seminar is designed to provide opportunities for students to experience the breadth and depth of academic inquiry, raising their awareness of key challenges and opportunities for graduate research within the field of the department. Through participation in a series of interactive sessions and presentations, students will gain valuable insights into the diverse research areas within the department, discover potential research avenues, and become aware of critical issues in the fields.**Credits:** 0.00

CGT 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Computer Sciences

AIS 20000 - Introduction To Data Science

Credit Hours: 3.00. This course introduces data science and programming in the R statistical computing environment. Students learn relevant concepts from statistics, mathematics, and computer science. Topics include data manipulation, analysis, modeling, and visualization. Students gain experience analyzing real-world datasets from science, government, and industry.**Credits:** 3.00

AIS 30000 - Collaborative Human-AI Systems

Credit Hours: 3.00. This course introduces human-AI interaction design for systems that solve problems neither humans nor artificial intelligence could solve alone. Topics include interpretability, transparency, trust, and AI ethics. Student projects focus on developing applications where AI provides cognitive and perceptual augmentation to humans.**Credits:** 3.00

CS 514 - Numerical Analysis

Credit Hours: 3.00. (MA 51400) AIternative methods for solving nonlinear equations; linear difference equations, applications to solution of polynomial equations; differentiation and integration formulas; numerical solution of ordinary differential equations; roundoff error bounds. Typically offered Fall.**Credits:** 3.00

CS 571 - Artificial Intelligence

Credit Hours: 3.00. Artificial Intelligence (AI) systems are increasingly being deployed in many real-world tasks. This course provides an introduction to the fundamental principles and applications of AI. The course covers classic material including search-based methods, probabilistic reasoning, game playing, decision making, exact and approximate inference, causal learning, and reinforcement learning as well as selected advanced topics. The focus of the course is on foundational methods and current techniques for building AI systems that exhibit 'intelligent' behavior and can 'learn' from experience. The course assumes students are familiar with basic concepts in analysis, linear algebra, optimization, discrete mathematics, elementary probability, statistics,

data structures, and algorithms. Students are expected to have good programming and software development skills and have a working knowledge of Python and Java.**Credits:** 3.00

CS 573 - Data Mining

Credit Hours: 3.00. (CSCI 57300) Data Mining has emerged at the confluence of artificial intelligence, statistics, and databases as a technique for automatically discovering summary knowledge in large datasets. This course introduces students to the process and main techniques in data mining, including classification, clustering, and pattern mining approaches. Data mining systems and applications are also covered, along with selected topics in current research. Offered in alternate years. Typically offered Fall.**Credits:** 3.00

CS 578 - Statistical Machine Learning

Credit Hours: 3.00. This introductory course will cover many concepts, models, and algorithms in machine learning. Topics include classical supervised learning (e.g., regression and classification), unsupervised learning (e.g., principle component analysis and K-means), and recent development in the machine learning field such as variational Bayes, expectation propagation, and Gaussian processes. While this course will give students the basic ideas and intuition behind modern machine learning methods, the underlying theme in the course is probabilistic inference. Typically offered Fall.**Credits:** 3.00

CS 590 - Topics In Computer Sciences

Credit Hours: 1.00 to 5.00. Directed study for students who wish to undertake individual reading and study on approved topics. Permission of instructor required. Typically offered Fall Spring.**Credits:** 1.00 to 5.00

CS 592 - Computer Science Seminar

Credit Hours: 3.00. A seminar course for in-depth exploration of a specific topic. Topics vary. Classes consist of both instructor and student presentations. Students read, present and discuss research papers, and may complete and present a research project in the area. For each offering, inclusion on a plan of study is determined by the CS Graduate Study Committee. If approved, may be included on a CS MS or PhD plan of study according to relevant ruleset. Typically offered Fall Spring.**Credits:** 3.00

CS 10100 - Digital Literacy

Credit Hours: 3.00. Survey of the digital world, computers as multi-purpose machines, digital information, definition of programming, computers everywhere (the Internet of things), computers that perform simultaneous computations, how apps work, data storage and searching, databases, digital audio, graphics, video, computer networks and the Internet, the World Wide Web and Internet sharing services, network and Internet performance, real-time services, artificial intelligence, cloud computing, security, and privacy. CS students may take course for elective credit only. Typically offered Spring.**Credits:** 3.00

CS 15900 - C Programming

Credit Hours: 3.00. Fundamental principles, concepts, and methods of programming in C, with emphasis on applications in the physical sciences and engineering. Basic problem solving and programming techniques; fundamental algorithms and data structures; and use of programming logic in solving engineering problems. Students are expected to complete assignments in a collaborative learning environment. Credit cannot be obtained for both CS 15900 and any of CS 15600, CS 15800 and CS 18000. **Credits:** 3.00

CS 17600 - Data Engineering In Python

Credit Hours: 3.00. The course introduces students to programming fundamentals in Python, including loops, functions and different data types, and provides an introduction to data engineering including working with common data formats and learning the basics of data wrangling. Students will format, extract, clean, filter, transform, search, combine, summarize, aggregate, and visualize a diverse range of data sets. Python libraries including Matplotlib and Pandas are used.**Credits:** 3.00

CS 17700 - Programming With Multimedia Objects

Credit Hours: 4.00. Introduction to computers and programming: number representations, primitive data types and operations, basic control structures, programming applets and applications using graphical user interfaces, programming for detecting events and performing actions, processing multimedia objects such as images and sounds. Throughout the course, examples are drawn from a variety of fields in the natural sciences. Not open to CS majors with a grade of C or better in CS 18000. Not open to non-CS majors with a grade of C or better in any course in computer programming. **Credits:** 4.00

CS 18000 - Problem Solving And Object-Oriented Programming

Credit Hours: 4.00. Problem solving and algorithms, implementation of algorithms in a high level programming language, conditionals, the iterative approach and debugging, collections of data, searching and sorting, solving problems by decomposition, the object-oriented approach, subclasses of existing classes, handling exceptions that occur when the program is running, graphical user interfaces (GUIs), data stored in files, abstract data types, a glimpse at topics from other CS courses. Intended primarily for students majoring in computer sciences. Credit cannot be obtained for both CS 18000 and any of 15600, 15800 and 15900. Not open to students with credit in CS 24000. **Credits:** 4.00

CS 18200 - Foundations Of Computer Science

Credit Hours: 3.00. Logic and proofs; sets, functions, relations, sequences and summations; number representations; counting; fundamentals of the analysis of algorithms; graphs and trees; proof techniques; recursion; Boolean logic; finite state machines; pushdown automata; computability and undecidability.**Credits:** 3.00

CS 18300 - Professional Practice I

Credit Hours: 0.00. Professional Practice. Permission of instructor required. **Credits:** 0.00

CS 18400 - Professional Practice II

Credit Hours: 0.00. Professional Practice. Permission of instructor required. **Credits:** 0.00

CS 19000 - Topics In Computer Sciences

Credit Hours: 1.00 to 5.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 5.00

CS 19100 - Freshman Resources Seminar

Credit Hours: 1.00. This course is intended to integrate freshman majors in computer sciences into the department, help them adjust to university life, and assist them in developing academic and intellectual survival skills. Weekly recitation sections enable the students to work in teams. Strongly recommended for freshmen. The credit may be used only toward free electives. **Credits:** 1.00

CS 19300 - Tools

Credit Hours: 1.00. This course is designed to introduce new Computer Science students to various programming tools which will aid them in their Computer Science classes, personal projects, and software development job experiences. **Credits:** 1.00

CS 19700 - Freshman Honors Seminar

Credit Hours: 1.00. A seminar dealing with the history, context, and future of computer science. Open only to students in the Computer Sciences Honors Program. The credit may be used only toward free electives. **Credits:** 1.00

CS 21100 - Competitive Programming I

Credit Hours: 2.00. CP1 teaches applied algorithmic ideas and problem solving techniques to solve programming interview and competitive programming questions including usage of basic data structures such as [array, set, map, stack, queue, deque, priority queue], the four main algorithm paradigms: [complete search, greedy, divide and conquer, dynamic programming], other algorithmic ideas including [binary search the answer/bisection, meet-in-the-middle, prefix sum and difference arrays, two pointers, sliding window], and basic graph algorithms covering [strongly/connected components, floodfill, topological sort, shortest paths].**Credits:** 2.00

CS 23500 - Introduction To Organizational Computing

Credit Hours: 3.00. People and organizations, decision-making, information systems, telecommunications, desktop systems, integration tools, collaboration and groupware, multimedia, authoring multimedia documents, emerging technologies. May not be taken for credit by Computer Science majors. **Credits:** 3.00

CS 24000 - Programming In C

Credit Hours: 3.00. The UNIX environment, C development cycle, data representation, operators, program structure, recursion, macros, C preprocessor, pointers and addresses, dynamic memory allocation, structures, unions, typedef, bit-fields, pointer/structure applications, UNIX file abstraction, file access, low-level I/O, concurrency. **Credits:** 3.00

CS 24200 - Introduction To Data Science

Credit Hours: 3.00. (STAT 24200) This course provides a broad introduction to the field of data science. The course focuses on using computational methods and statistical techniques to analyze massive amounts of data and to extract knowledge. It provides an overview of foundational computational and statistical tools for data acquisition and cleaning, data management and big data systems. The course surveys the complete data science process from data to knowledge and gives students hands-on experience with tools and methods. Basic knowledge of Python required. Computer Science majors cannot count this course as a degree requirement but can take it for credit as a free elective if taken before CS 37300, 34800, 47100, 47300, 44800.**Credits:** 3.00

CS 24300 - Artificial Intelligence Basics

Credit Hours: 3.00. This course provides an introduction to foundational areas of artificial intelligence and current techniques for building intelligent systems. As an entry-level course for Artificial Intelligence, the primary goals of this course are: Teach fundamental building blocks of an intelligent system, namely, knowledge representation; learning; model validation, diagnosis, and visualization; reasoning and decision-making; probabilities and uncertainty in AI. Provide students with first-hand experiences in building a working machine learning and an automated reasoning system. Provide an overview of current state-of-the-art technologies in multiple domains of artificial intelligence. Broaden the students' horizon and spark their interests via learning about exciting applications of artificial intelligence in many aspects of human society.**Credits:** 3.00

CS 25000 - Computer Architecture

Credit Hours: 4.00. Digital logic: transistors, gates, and combinatorial circuits; clocks; registers and register banks; arithmetic-logic units; data representation: big-endian and little-endian integers; ones and twos complement arithmetic; signed and unsigned values; Von-Neumann architecture and bottleneck; instruction sets; RISC and CISC designs; instruction pipelines and stalls; rearranging code; memory and address spaces; physical and virtual memory; interleaving; page tables; memory caches; bus architecture; polling and interrupts; DMA; device programming; assembly language; optimizations; parallelism; data pipelining. **Credits:** 4.00

CS 25100 - Data Structures And Algorithms

Credit Hours: 3.00. Running time analysis of algorithms and their implementations, one-dimensional data structures, trees, heaps, additional sorting algorithms, binary search trees, hash tables, graphs, directed graphs, weighted graph algorithms, additional topics. **Credits:** 3.00

CS 25200 - Systems Programming

Credit Hours: 4.00. Low-level programming; review of addresses, pointers, memory layout, and data representation; text, data, and bss segments; debugging and hex dumps; concurrent execution with threads and processes; address spaces; file names; descriptors and file pointers; inheritance; system calls and library functions; standard I/O and string libraries; simplified socket programming; building tools to help programmers; make and make files; shell scripts and quoting; Unix tools including sed, echo, test, and find; scripting languages such as awk; version control; object and executable files (.o and a.out); symbol tables; pointers to functions; hierarchical directories; and DNS hierarchy; programming embedded systems.**Credits:** 4.00

CS 25300 - Data Structures And Algorithms For DS/AI

Credit Hours: 3.00. This course gives a broad introduction to the most important data structures and algorithms in computer science. The emphasis is on data structures and their use in algorithms relevant for data science and AI and their applications. The course focuses on developing and comparing efficient implementations, assessing suitability of data structures for massive data sets, and understanding effective use, modifications, and extensions. This course will not fulfill CS 25100 requirement for any Computer Science major or minor.**Credits:** 3.00

CS 28400 - Professional Practice III

Credit Hours: 0.00. Professional Practice. Permission of instruction required. **Credits:** 0.00

CS 28401 - Professional Practice Part-Time

Credit Hours: 0.00. Professional Practice Part-Time. The instructor determines the adequacy of the student's preparation for the work assignment proposed by the prospective employer for the student. Permission of Instructor required. **Credits:** 0.00

CS 29000 - Topics In Computer Sciences

Credit Hours: 1.00 to 5.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 5.00

CS 29100 - Sophomore Development Seminar

Credit Hours: 1.00. Presentations by corporate partners about careers in computer science. Presentations by faculty about careers in academia and research. Students learn about upper-division courses, tour research laboratories, and attend job fairs. **Credits:** 1.00

CS 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in computer science. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CS 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in computer science. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CS 30700 - Software Engineering I

Credit Hours: 3.00. An introduction to the methods and tools of software engineering; software life cycle; specification and design of software, software testing, cost and effort estimation; laboratory exercises with design, testing, and other tools.**Credits:** 3.00

CS 31100 - Competitive Programming II

Credit Hours: 2.00. CP2 teaches experienced programmers additional techniques to solve interview and competitive programming problems and builds on material learned in CP1. This includes specific algorithmic techniques such as [shortest paths, topological sort, MST, union find, range queries], advanced algorithms surrounding trees and DAGs, advanced problem types in [dynamic programming, backtracking/simulation, mathematics, string processing], and more. It can be viewed as a programming complement to CS 38100, with some overlap in content.**Credits:** 2.00

CS 31400 - Numerical Methods

Credit Hours: 3.00. Iterative methods for solving nonlinear equations; direct and iterative methods for solving linear systems; approximations of functions, derivatives, and integrals; error analysis. **Credits:** 3.00

CS 33400 - Fundamentals Of Computer Graphics

Credit Hours: 3.00. Fundamental principles and techniques of computer graphics. The course covers the basics of going from a scene representation to a raster image using OpenGL. Specific topics include coordinate manipulations, perspective, basics of illumination and shading, color models, texture maps, clipping and basic raster algorithms, fundamentals of scene constructions. CS 31400 is recommended. **Credits:** 3.00

CS 34800 - Information Systems

Credit Hours: 3.00. File organization and index structures; object-oriented database languages; the relational database model with introductions to SQL and DBMS; hierarchical models and network models with introductions to HDDL, HDML, and DBTG Codasyl; data mining; data warehousing; database connectivity; distributed databases; the client/server paradigm; middleware, including ODBC, JDBC, CORBA, and MOM.**Credits:** 3.00

CS 35100 - Cloud Computing

Credit Hours: 3.00. Introduction to cloud computing. Cloud data center infrastructure, public and private clouds, servers and virtualized servers, data center networks and virtualized networks, virtualized disk, file, and object storage, the concept of scale-out, algorithms and programming systems used in the design and implementation of cloud-native software, especially using containers and orchestration systems, microservices, serverless designs, controller-based designs, edge and fog computing, security in a cloud environment, programming models.**Credits:** 3.00

CS 35200 - Compilers: Principles And Practice

Credit Hours: 3.00. Should not be taken concurrently with CS 35400. The theory and practice of programming language translation, compilation, and run-time systems, organized around a significant programming project to build a compiler for a simple but nontrivial programming language. Modules, interfaces, tools. Data structures for tree languages. Lexical analysis, syntax analysis, abstract syntax. Symbol tables, semantic analysis. Translation, intermediate code, basic blocks, traces. Instruction selection, CISC and RISC machines. Liveness analysis, graph coloring register allocation. Supplemental material drawn from garbage collection, object-oriented languages, higher-order languages, dataflow analysis, optimization, polymorphism, scheduling and pipelining, memory hierarchies. **Credits:** 3.00

CS 35300 - Principles Of Concurrency And Parallelism

Credit Hours: 3.00. Important concepts, models, algorithms, abstractions, and implementation aspects of concurrent and parallel programs. Topics include: techniques used to describe concurrent programs (e.g., threads, events, co-routines, continuations), abstractions for shared-memory and message-passing programs, relaxed memory models, livelock and deadlock detection, lock-free algorithms, data races and atomicity, scheduling techniques, process calculi, and software transactions. **Credits:** 3.00

CS 35400 - Operating Systems

Credit Hours: 3.00. Should not be taken concurrently with CS 35200. Introduction to operating systems. Computer system and operating system architectures, processes, inter-process communication, inter-process synchronization, mutual exclusion, deadlocks, memory hierarchy, virtual memory, CPU scheduling, file systems, I/O device management, security. **Credits:** 3.00

CS 35500 - Introduction To Cryptography

Credit Hours: 3.00. An introduction to cryptography basics: Classic historical ciphers including Caesar, Vigenere, and Vernam ciphers; modern ciphers including DES, AES, Pohlig-Hellman, and RSA; signatures and digests; key exchange; simple protocols; block and stream ciphers; network-centric protocols.**Credits:** 3.00

CS 36000 - Software Engineering

Credit Hours: 3.00. The course presents the common forms of the software life cycle, which are used throughout the commercial, industrial, institutional, and even governmental communities when a single development effort is appropriate. We will discuss the nature of software and software projects, software development models, software design, software process maturity, project planning, management, and communication. We will study methods for analysis, design, testing, and implementation of various software systems. **Credits:** 3.00

CS 36100 - Great Issues In Computer Science

Credit Hours: 3.00. This course provides an overview of current and essential professional and ethical issues in computing and their impact on society. Topics specialize in the impact of computing, including algorithmic bias, motives behind design decisions, data ethics, privacy and security, and legal issues. The goal of this course is to equip students with the framework and context necessary to think critically about the impact of computing. Discussions and readings will include current events.**Credits:** 3.00

CS 37300 - Data Mining And Machine Learning

Credit Hours: 3.00. This course will introduce students to the field of data mining and machine learning, which sits at the interface between statistics and computer science. Data mining and machine learning focuses on developing algorithms to automatically discover patterns and learn models of large datasets. This course introduces students to the process and main

techniques in data mining and machine learning, including exploratory data analysis, predictive modeling, descriptive modeling, and evaluation.**Credits:** 3.00

CS 38001 - C++ Programming

Credit Hours: 1.00. This course builds on the CS 24000 (Programming In C) course to teach C++ extensions. This 5-week one-credit course teaches C++ programming and helps students improve their understanding of object-oriented programming. It also teaches how to use an Integrated Development Environment (IDE) when programming in C++. **Credits:** 1.00

CS 38002 - Advanced Java Programming

Credit Hours: 1.00. This course builds on the Java course CS 18000 (Problem Solving And Object Oriented Programming) to teach advanced topics in Java. This 5-week one-credit course will teach advanced topics such as Network Programming in Java, JDBC, JNI, and J2EE to write web applications in Java. You will also improve your understanding of Object Oriented Programming. **Credits:** 1.00

CS 38003 - Python Programming

Credit Hours: 1.00. This course teaches the Python programming language assuming that students have already taken a course in computer programming. This 5-week one-credit course teaches the Python language, the most common modules used in Python, as well as how to write Python web applications. **Credits:** 1.00

CS 38100 - Introduction To The Analysis Of Algorithms

Credit Hours: 3.00. Techniques for analyzing the time and space requirements of algorithms. Application of these techniques to sorting, searching, pattern-matching, graph problems, and other selected problems. Brief introduction to the intractable (NP-hard) problems.**Credits:** 3.00

CS 38600 - Professional Practice IV

Credit Hours: 0.00. Professional Practice. Permission of instructor required. **Credits:** 0.00

CS 39000 - Topics In Computer Sciences

Credit Hours: 1.00 to 5.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 5.00

CS 39100 - Junior Resources Seminar

Credit Hours: 1.00. This seminar course engages a number of outside speakers who typically present information on the role of research in computer science, how the research components of computer science relate to each other, approaches to software development in industry, different types of application development paradigms, technological trends, and societal, ethical, and legal issues. The credit may be used only toward free electives. **Credits:** 1.00

CS 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in computer science. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CS 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in computer science. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CS 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in computer science. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

CS 39700 - Honors Seminar

Credit Hours: 0.00. A seminar for all sophomores, juniors, and seniors in the Computer Sciences Honors Program. Meets eight times each semester under the supervision of the Honors coordinator. The meetings focus on honors research projects, helping students to identify appropriate projects and form groups, and providing a forum for juniors and seniors to report on their projects as required in the honors program. **Credits:** 0.00

CS 40700 - Software Engineering Senior Project

Credit Hours: 3.00. A capstone course combining all the concepts students have learned in the Software Engineering Track: software and software engineering, working as a team leader and as a team member, Agile Software Development, Scrum Software Development, Version Control, basing software development on reusable technology, developing requirements (User Stories and Use Cases), modelling with classes, design patterns, focusing on users, modelling interactions and behavior, architecting and designing software, testing and inspecting, managing the software development process. This is a project course. Students are organized into 4-6 student teams. Each team completes a full-semester software engineering project. Each team creates a Project Charter, Product Backlog, Design, and for 3 Sprints -- Planning Document, Demo, Retrospective Document. The final demo is a formal presentation. **Credits:** 3.00

CS 40800 - Software Testing

Credit Hours: 3.00. Preliminaries: errors and testing; software quality, requirements, behavior, and correctness; testing, debugging, verification; control flow graphs, dominators; types of testing; Test selection: from requirements, finite state models, and combinatorial designs; regression testing and test minimization; Test adequacy assessment: control and data flow; mutation based; testing tools.**Credits:** 3.00

CS 41100 - Competitive Programming III

Credit Hours: 2.00. CP3 teaches experienced programmers additional techniques to solve competitive programming problems and builds on material learned in CP1 and CP2. This includes algorithmic techniques in topics such as [network flow, computational geometry, graph matching, NP-hard problems]. Primarily, CP3 prepares students to compete in programming contests, which means most class time is focused on simulating contest environments and teaching teamwork and communication alongside problem practice.**Credits:** 2.00

CS 42200 - Computer Networks

Credit Hours: 3.00. Undergraduate-level introduction to computer networks and data communication. Low-level details of media, signals, and bits: time division and frequency division multiplexing; encoding; modulation; bandwidth, throughput, and noise. Packet transmission: Local Area Network (Ethernet, FDDI) and Wide Area Network technologies (ATM); wireless

networks; network interconnection with repeaters, bridges, and switches; DSU/CSU; xDSL and cable modems. Internetworking: router-based architecture; IP addressing; address binding with ARP; datagram encapsulation and fragmentation; UDP and TCP, retransmission; protocol ports; ICMP and error handling. Network applications: client/server concept; port demultiplexing; program interface to protocols (API); use by clients and servers; domain name system; TELNET; Web technologies including HTTP, CGI, Java; RPC and middleware; network management. **Credits:** 3.00

CS 42600 - Computer Security

Credit Hours: 3.00. A survey of the fundamentals of information security. Risks and vulnerabilities, policy formation, controls and protection methods, database security, encryption, authentication technologies, host-based and network-based security issues, personnel and physical security issues, issues of law and privacy. **Credits:** 3.00

CS 43400 - Advanced Computer Graphics

Credit Hours: 3.00. Advanced concepts and techniques of computer graphics. The course covers, in complete detail, going from a scene representation to a raster image without using OpenGL or other graphics packages. The course develops a complete graphics implementation in which the students implement every aspect of the graphics pipeline. This involves a substantial software project in C/C++. **Credits:** 3.00

CS 43900 - Introduction To Data Visualization

Credit Hours: 3.00. The course offers an introduction to the fundamentals principles, design strategies, and techniques needed to visually communicate, explore, and analyze data. The course focuses primarily on the visual representation of inherently non-spatial data (e.g., tables and spreadsheets, graphs and networks, trees, text, and time series), but also considers the visualization of maps and of data in geospatial context.**Credits:** 3.00

CS 44000 - Large Scale Data Analytics

Credit Hours: 3.00. This course provides an integrated view of the key concepts of modern algorithmic data analytics. It focuses on teaching principles and methods needed to analyze large datasets in order to extract novel, transformative insights for the underlying application. The course emphasizes the duality between formulating questions that can be answered by statistical data analysis tools (the statistical perspective) and the algorithmic challenge of actually extracting such answers using available parallel and distributed computational resources from massive datasets. The topics cover three areas: (1) algorithmic concepts necessary for big data analytics, (2) big data systems, including data management and programming, and (3) advanced analytic methods to address characteristics of real-world big data problems.**Credits:** 3.00

CS 44100 - Data Science Capstone

Credit Hours: 3.00. The Capstone course aims at providing students with an opportunity to integrate their accumulated knowledge and technical and social skills in order to identify and solve realistic or real-world data science problem, with an emphasis on the application domain. Capstone projects are often sponsored by corporate partners or by academic or non-academic research groups. The Capstone course serves as preparation for students entering into the profession of Data Science. Students will conduct a team-based project through the entire data science pipeline, by following the six phases of the CRISP-DM (Cross-Industry Standard Process for Data Mining) methodology. Students get experience in working as teams, participating in project planning, writing reports, and giving presentations.**Credits:** 3.00

CS 44800 - Introduction To Relational Database Systems

Credit Hours: 3.00. An in-depth examination of relational database systems including theory and concepts as well as practical issues in relational databases. Modern database technologies such as object-relational and Web-based access to relational

databases. Conceptual design and entity relationship modeling, relational algebra and calculus, data definition and manipulation languages using SQL, schema and view management, query processing and optimization, transaction management, security, privacy, integrity management.**Credits:** 3.00

CS 45600 - Programming Languages

Credit Hours: 3.00. Concepts for structuring data, computation, and whole programs. Object-oriented languages, functional languages, logic- and rule-based languages. Data types, type checking, exception handling, concurrent processes, synchronization, modularity, encapsulation, interfaces, separate compilation, inheritance, polymorphism, dynamic binding, subtyping, overloading, beta-reduction, unification. **Credits:** 3.00

CS 45800 - Introduction To Robotics

Credit Hours: 3.00. Any intelligent robot system interacting with our environment needs to have perception, planning, and control methods in its cognition process. The perception module outlines the robot's procedures to gather and interpret sensory observations into world models. The underlying planning and control modules use those world models to plan robot behaviors and their interaction with our natural environments. Therefore, this course will cover the fundamental topics in robot perception, planning, and control to design general-purpose robot cognition algorithms. Overall, this course is divided into four modules: Robot perception: This covers fundamental techniques needed for robot localization and mapping from raw 3D sensory data. Robot planning: This module will discuss robot behavior planning techniques such as A*, RRT*, and trajectory optimization. Robot Control: This introduces basic control techniques such as PID controller to execute the robot's planned behaviors in the real world. Robot Learning: This part will briefly introduce machine learning techniques for robot decision-making and control.**Credits:** 3.00

CS 47100 - Introduction To Artificial Intelligence

Credit Hours: 3.00. Students are expected to spend at least three hours per week gaining experience with artificial intelligence systems and developing software. Basic problem-solving strategies, heuristic search, problem reduction and AND/OR graphs, knowledge representation, expert systems, generating explanations, uncertainty reasoning, game playing, planning, machine learning, computer vision, and programming systems such as Lisp or Prolog.**Credits:** 3.00

CS 47300 - Web Information Search And Management

Credit Hours: 3.00. This course teaches important concepts and knowledge of information retrieval for managing unstructured data such as text data on Web or in emails. At the same time, students will be exposed to a large number of important applications. Students in the course will get hands on experience from homework and a course project. The first part of the course focuses on general concepts/techniques such as stemming, indexing, vector space model, and feedback procedure. The second part of the course shows how to apply the set of techniques on different applications such as Web search, text categorization, and information recommendation.**Credits:** 3.00

CS 47500 - Human-Computer Interaction

Credit Hours: 3.00. The goal of this course is to teach students how to design useful and usable interactive systems that address important needs of people. Students will experience the entire user-centered design life cycle, from need finding to usability evaluation. Topics covered in the course include user-centered design principles, usability heuristics, need-finding methods such as semi-structured interviews and contextual inquiry, quick prototyping techniques, usability evaluation methods such as hallway testing and human-subjects user study, and theories about user interaction and decision making. As we are entering a new era of AI, the course will also include a brief introduction on how to apply the HCI principles and techniques to AI-powered systems. This course is project-based. Students will form project teams among themselves to work on a semester-long project and apply the user-centered design principles, theories, and techniques that they have learned in class to build a useful and usable

interactive system such as a mobile application. This course is also highly interactive, including a series of design studios and in-class activities that require active participation, communication, and discussion with other students.**Credits:** 3.00

CS 47800 - Introduction To Bioinformatics

Credit Hours: 3.00. (BIOL 47800) Bioinformatics is broadly defined as the study of molecular biological information, targeting particularly the enormous volume of DNA sequence and functional complexity embedded in entire genomes. Topics will include understanding the evolutionary organization of genes (genomics), the structure and function of gene products (proteomics), and the dynamics of gene expression in biological processes (transcriptomics). Inherently, bioinformatics is interdisciplinary, melding various applications of computational science with biology. This jointly taught course introduces analytical methods from biology, statistics and computer science that are necessary for bioinformatics investigations. The course is intended for junior and senior undergraduates from various science backgrounds. Our objective is to develop the skills of both tool users and tool designers in this important new field of research. **Credits:** 3.00

CS 48300 - Introduction To The Theory Of Computation

Credit Hours: 3.00. Turing machines and the Church-Turing thesis; decidability; halting problem; reducibility; undecidable problems; decidability of logical theories; Kolmogorov complexity; time classes; P, NP, NP-complete; space classes; Savitch's theorem, PSPACE-completeness, NL-completeness; hierarchy theorems; approximation theorems; probabilistic algorithms; applications of complexity to parallel computation and cryptography. Typically offered Fall Spring.**Credits:** 3.00

CS 48700 - Professional Practice V

Credit Hours: 0.00. Professional Practice. Permission of instructor required. **Credits:** 0.00

CS 48900 - Embedded Systems

Credit Hours: 3.00. Software for embedded systems; programming with extreme constraints on memory, storage, and processing power; programming models, including synchronous, asynchronous, and concurrent; programming systems that run forever; use of Finite State Machines (FSMs); review of embedded hardware and available boards; asynchronous and synchronous serial connections (e.g., RS232 and SPI); General Purpose I/O (GPIO) pins; relays, servos, and other peripherals; design for low power; battery characteristics; systems that communicate over computer networks and the Internet; current industry practices; design of embedded projects; working in teams. CS 35200 (Compilers) and CS 35400 (Operating Systems) are recommended, but not required. Typically offered Fall Spring.**Credits:** 3.00

CS 49000 - Topics In Computer Sciences For Undergraduates

Credit Hours: 1.00 to 5.00. Supervised reading and reports in various fields. Permission of instructor required. **Credits:** 1.00 to 5.00

CS 49700 - Honors Research Project

Credit Hours: 3.00. One semester of the project may be counted as one of the seven computer science courses at or above the 300 level required for the bachelor's degree. One more semester, if approved by the honors coordinator, can be used as a free elective. A group research project directed by Computer Sciences faculty members. Each group must submit a technical report describing its work and the results obtained. **Credits:** 3.00

CS 50010 - Foundational Principles Of Information Security

Credit Hours: 3.00. This course covers foundational principles relevant to information security including data structures, algorithm design, computational complexity, probability theory, number theory, and basics of cryptography. This course is restricted to CS graduate students. This course is required for students in the Master of Science in Computer Science Concentration in Information Security for Professionals Program. The course may not be used on the Plan of Study for any CS graduate students other than those in the Concentration in Information Security for Professionals program. Programming experience and computer science knowledge equivalent to that of a minor in CS. Incoming students are expected to have programming skills in at least one procedural programming languages, e.g., C,C++,Java, or Python. Typically offered Summer.**Credits:** 3.00

CS 50011 - Introduction To Systems For Information Security

Credit Hours: 3.00. The course covers computer systems principles relevant to information security and it serves as a prerequisite for the later courses in the MS in IS program. The material includes features in the C/C++ programming languages for understanding security-critical software vulnerabilities, basic knowledge in computer architecture and assembly languages, knowledge of the compiling process, operating systems, networking, databases, and web applications relevant to information security. This course is restricted to CS graduate students. This course is required for students in the Master of Science in Computer Science Concentration in Information Security for Professionals Program. The course may not be used on the Plan of Study for any CS graduate students other than those in the Concentration in Information Security for Processionals program. Programming experience and computer science knowledge equivalent to that of a minor in CS. Incoming students are expected to have programming skills in at least one procedural programming languages, e.g., C,C++,Java, or Python. Typically offered Fall Summer.**Credits:** 3.00

CS 50023 - Data Engineering I

Credit Hours: 1.00. The course introduces students to the fundamentals of Data Engineering with a focus on tools and computational techniques to gather, construct, manipulate, summarize, and visualize data sets as a means to extract knowledge from the underlying data. Python and Python libraries are used. Completion of the course will allow learners to perform basic data analysis on data sets. Experience in Python Programming and Linear Algebra is required. The course also prepares learners for additional instruction in the courses Data Engineering II and Foundations of Decision Making. Typically offered Fall Spring Summer.**Credits:** 1.00

CS 50024 - Data Engineering II

Credit Hours: 1.00. This course introduces students to the fundamentals of database management systems (DBMS) from a user's perspective. The principles of modeling an enterprise using Entity-Relationship diagrams and transforming the model into a relational or NoSQL database are illustrated through a range of examples. The SQL language is used to create, query, aggregate, and update a relational database. NOSQL databases and the related data models (column, graph, and document-based) are introduced. Experience in Python Programming is required. Typically offered Fall Spring Summer.**Credits:** 1.00

CS 50025 - Foundations Of Decision Making

Credit Hours: 1.00. This course provides an overview of data science methods used for data-driven discovery, extraction of knowledge, and informed decision making. The course covers fundamental computational methods and statistical techniques used to correctly reason about uncertainty, conduct hypothesis tests, infer causal relationships, and apply and evaluate predictive models. The course highlights how sampling biases can impact fairness in decision making. Throughout, students get hands-on experience on how to make correct and explainable inferences from data. Experience in Python Progamming, Probability, Statistics and Linear Algebra is required. Typically offered Fall Spring Summer.**Credits:** 1.00

CS 50100 - Computing For Science And Engineering

Credit Hours: 3.00. Credit in this course may not be used toward a graduate degree in Computer Sciences. Computational concepts, tools, and skills for computational science and engineering scripting for numerical computing, scripting for file processing, high performance computing, and software development. Project may be required. Typically offered Fall.**Credits:** 3.00

CS 50200 - Compiling And Programming Systems

Credit Hours: 3.00. Basic principles of compilers and compiler design; control of translation, loading, and execution; symbolic coding systems; lexical and syntactic analysis, design and operation of assemblers and macroprocessors; design of interpretive systems. Students are expected to complete a large programming project as part of the course. Typically offered Fall.**Credits:** 3.00

CS 50300 - Operating Systems

Credit Hours: 3.00. Basic principles of operating systems: addressing modes, indexing, relative addressing, indirect addressing, stack maintenance; implementation of multitask systems; control and coordination of tasks, deadlocks, synchronization, mutual exclusion; storage management, segmentation, paging, virtual memory; protection, sharing, access control; file systems; resource management; evaluation and prediction of performance. Students are expected to spend at least three hours per week gaining hands-on experience in using and modifying a small operating system. Typically offered Fall Spring.**Credits:** 3.00

CS 50500 - Distributed Systems

Credit Hours: 3.00. Foundations for building reliable distributed systems, including failure and system models, and basic communication and agreement problems; crash failures, recovery, partition, Byzantine failures; asynchronous systems, failure detectors, communication channels, wireless and sensor networks; software clocks, causality, and cuts. Examples of problems include reliable broadcast consensus, leader election, group communication, and replication. Permission of department required. Typically offered Spring.**Credits:** 3.00

CS 51000 - Software Engineering

Credit Hours: 3.00. Software life cycles, requirements engineering, software design, design of distributed systems, verification and validation, software architecture, process metrics and models, and research methods in software engineering. Typically offered Spring.**Credits:** 3.00

CS 51500 - Numerical Linear Algebra

Credit Hours: 3.00. Direct and iterative solvers of dense and sparse linear systems of equations, numerical schemes for handling symmetric algebraic eigenvalue problems, and the singular-value decomposition and its applications in linear least squares problems. Typically offered Spring.**Credits:** 3.00

CS 51501 - Parallelism In Numerical Linear Algebra

Credit Hours: 3.00. This course examines both theoretical and practical aspects of numerical algorithm design and implementation on parallel computing platforms. In particular, it provides an understanding of the tradeoff between arithmetic complexity and management of hierarchical memory structures, roundoff characteristics if different from the sequential schemes, and performance evaluation and enhancement. Applications are derived from a variety of computational science and engineering areas.**Credits:** 3.00

CS 51520 - Operating Systems

Credit Hours: 3.00. This course is about the concepts and principles of modern operation systems. It includes: design and implementation of multi-process systems; process synchronization, mutual exclusion; CPU scheduling, deadlock, memory management, segmentation, paging, virtual memory; storage management, file system management, protection and security, evaluation and prediction of performance. Reading the latest paper about operation systems and presentations are required. Every student should participate in debates based on the case studies of Linux System and Windows 7. Prerequisites: CS 30200. Permission of department required.**Credits:** 3.00

CS 52000 - Computational Methods In Optimization

Credit Hours: 3.00. A treatment of numerical algorithms and software for optimization problems with a secondary emphasis on linear and nonlinear systems of equations: unconstrained and constrained optimization; line search methods; trust region methods; Quasi-Newton methods; linear programming; calculating derivatives; quadratic programming; global optimization, including simulated annealing. Typically offered Spring.**Credits:** 3.00

CS 52300 - Social, Economic, And Legal Aspects Of Security

Credit Hours: 3.00. This course focuses on social, legal, and economic aspects of information security and privacy, also including ethics, policies, and human behavioral issues. The course covers the interactions between non-technological aspects of information security as well as relevant technological aspects. It focuses on how non-technological facets can inform and guide technological choices, and how technological choices can enhance or detract from the broader organizational and societal goals. Typically offered Fall Spring.**Credits:** 3.00

CS 52500 - Parallel Computing

Credit Hours: 3.00. Parallel computing for science and engineering applications: parallel programming and performance evaluation, parallel libraries and problem-solving environments, models of parallel computing and run-time support systems, and selected applications. Typically offered Spring.**Credits:** 3.00

CS 52540 - Data Mining, Machine Learning And Statistical Analysis

Credit Hours: 3.00. This course combines computer science algorithms and statistics analysis for data mining and machine learning. The course introduces rule-based decision tree systems, statistical learning, supervised and unsupervised learning, and multi-layer Neural Networks deep learning. Students will do modeling with C5, Neural Networks and R, and implement multiple algorithms in the programming languages C and Python.**Credits:** 3.00

CS 52600 - Information Security

Credit Hours: 3.00. (CSCI 52600) Basic notions of confidentiality, integrity, availability; authentication models; protection models; security kernels; secure programming; audit; intrusion detection and response; operational security issues; physical security issues; personnel security; policy formation and enforcement; access controls; information flow; legal and social issues; identification and authentication in local and distributed systems; classification and trust modeling; and risk assessment. Typically offered Fall.**Credits:** 3.00

CS 52700 - Software Security

Credit Hours: 3.00. This course focuses on software security fundamentals, secure coding guidelines and principles, and advanced software security concepts. Students will learn to assess and understand threats, learn how to design and implement secure software systems, and get hands-on experience with common security pitfalls. Restricted to CS MS and CS PHD students. Significant programming experience and skills are required to complete the labs and projects. Typically offered Spring.**Credits:** 3.00

CS 52800 - Network Security

Credit Hours: 3.00. The course focuses on the principles and foundations of building secure network systems and on security and privacy challenges in existing and emerging networks. The course compares and analyzes network architectures and network protocols from the physical layer to the access control, network, transport and application layer from an adversarial standpoint to understand how to build more secure protocols that can withstand attacks. Restricted to CS MS and CS PHD students. Significant programming experience and skills are required to complete the projects. Typically offered Spring.**Credits:** 3.00

CS 52900 - Security Analytics

Credit Hours: 3.00. This course focuses on applied data mining, machine learning, data analytics techniques, and their application and relevance in information security. The course covers basic concepts of data mining and machine learning, computation platforms in support of big data analytics including Map-Reduce and Spark, machine learning algorithms such as classification trees, logistic regression, naive Bayes, k Nearest Neighbors, Support Vector Machines, Artificial Neural Networks (including Feed Forward, Convolutional, and Recurrence), the application of these algorithms to security tasks such as Spam/Phishing detection, malware detection, intrusion detection, and situational awareness. The future and potential role of applying machine learning techniques in information and data security is explored.**Credits:** 3.00

CS 53000 - Introduction To Scientific Visualization

Credit Hours: 3.00. Teaches the fundamentals of scientific visualization and prepares students to apply these techniques in fields such as astronomy, biology, chemistry, engineering, and physics. Emphasis is on the representation of scalar, vector, and tensor fields; data sampling and resampling; and reconstruction using multivariate finite elements (surfaces, volumes, and surfaces on surfaces). Typically offered Fall.**Credits:** 3.00

CS 53100 - Computational Geometry

Credit Hours: 3.00. Computational geometry studies how to compute with and reason about geometric objects. The subject is playing an increasingly important role in computer graphics, game software, geometric modeling, geographic information systems, and many other applications. Course topics include convex hull, segment manipulations, triangulations, range searching, Voronoi diagrams, window queries, Delaunay triangulation, and duality. Some key algorithms are implemented. Questions of floating-point accuracy and robust algorithm design are considered throughout the course. Typically offered Fall Spring.**Credits:** 3.00

CS 53200 - Geometric Modeling Algorithms

Credit Hours: 3.00. The geometric modeling course will first introduce computational and mathematical concepts needed for 3D shapes, such as points, vectors, linear combinations, metrics, continuity, differentiability, and transformations. Then, it will describe mathematical descriptions of shapes and their implementations, starting from curves to free-form and subdivision surfaces, meshes and their simplifications, volumetric structures such as meshes, and constructive solid geometry. It will also provide knowledge of the fundamentals of procedural modeling (fractals, L-systems, terrain, and vegetation modeling). This course will also discuss modern AI-oriented methods for 3D shape generation. **Credits:** 3.00

CS 53500 - Interactive Computer Graphics

Credit Hours: 3.00. The principles of computer graphics and interactive graphical methods for problem solving. Emphasis placed on both development and use of graphical tools for various display devices. Several classes of graphics hardware considered in detail. Topics include pen plotting, storage tubes, refresh, dynamic techniques, three dimensions, color, modeling of geometry, and hidden surface removal. Part of the laboratory involves use of an interactive minicomputer graphics system. Knowledge of programming required. Typically offered Fall.**Credits:** 3.00

CS 53600 - Data Communication And Computer Networks

Credit Hours: 3.00. Data communications: communication hardware technologies including local area and longhaul network hardware, circuit and packet switching, interfaces between computer and network hardware, and performance issues. Network architecture: protocol software and conceptual layering, reliable delivery over an unreliable channel, transport protocols, virtual circuits, datagrams, internetworking as a fundamental design concept, the client-server paradigm, naming and name binding, name servers, addressing and address resolution, routing and routing algorithms, congestion and flow control techniques, network file systems, distribution of computation, and DARPA internet protocols (TCP/IP) as examples of protocol organization. Typically offered Fall.**Credits:** 3.00

CS 54100 - Database Systems

Credit Hours: 3.00. Fundamentals for the logical design of database systems. The entity-relationship model, semantic model, relational model, hierarchical model, network model. Implementations of the models. Design theory for relational databases. Design of query languages and the use of semantics for query optimization. Design and verification of integrity assertions, and security. Introduction to intelligent query processing and database machines. Typically offered Fall.**Credits:** 3.00

CS 54200 - Distributed Database Systems

Credit Hours: 3.00. Fundamental issues in distributed database systems that are motivated by the computer networking and distribution of processors and databases. The theory, design, specification, implementation, and performance of distributed database systems. Typically offered Spring.**Credits:** 3.00

CS 54300 - Introduction To Simulation And Modeling Of Computer Systems

Credit Hours: 3.00. Simulation: discrete event simulation, process oriented simulation, generating random numbers, simulation languages, simulation examples of complex systems. Nondeterministic models: random variables, Poisson process, moment generating functions, statistical inference and data analysis. Modeling: elementary queuing models, networks of queues, applications to performance evaluation of computer systems. Typically offered Fall.**Credits:** 3.00

CS 54701 - Information Retrieval

Credit Hours: 3.00. Basic principles and practical algorithms used for information retrieval and text mining: statistical characteristics of text, several important retrieval models, text categorization, recommendation system, clustering, federated text search, link analysis, etc. Typically offered Fall Spring.**Credits:** 3.00

CS 55100 - Cloud Computing Fundamentals

Credit Hours: 3.00. A comprehensive course that investigates all aspects of cloud computing, including: cloud data centers and infrastructure (equipment for processing, storage, communication, and special-purpose facilities); the use of virtualized servers (virtual machines and containers), virtualized storage (Storage Area Networks, Network Attached Storage, object storage), and virtual networks; automation; orchestration systems, such as Kubernetes; programming paradigms used to construct cloud-native software, such as MapReduce, microservices, controllerbased computing, and serverless computing; edge computing; security and privacy in cloud systems; software models. The course emphasizes researching new ways to use cloud computing and research into new ways to design and build cloud systems. The course includes a project. Students should have completed coursework in or have equivalent familiarity with operating systems and computer networks. **Credits:** 3.00

CS 55500 - Cryptography

Credit Hours: 3.00. (CSCI 55500) Concepts and principles of cryptography and data security. Cryptography (secret codes): principles of secrecy systems; classical cryptographic systems, including Vigenere and Vernam ciphers; the Data Encryption Standard (DES); public-key encryption; privacy-enhanced email; digital signatures. Proprietary software protection; information theory and number theory; complexity bounds on encryption; key escrow; traffic analysis; attacks against encryption; basic legal issues; e-commerce; and the role of protocols. Typically offered Spring.**Credits:** 3.00

CS 55600 - Data Security And Privacy

Credit Hours: 3.00. Data security and privacy is an important part of information security. This course provides an introduction to the fundamental principles and techniques for data security and privacy. The course covers fundamental theories of access control, discretionary access control, mandatory access control, and role-based access control, database access control approaches including grant revoke, virtual private databases and labelled databases, database encryption. On privacy, it covers data anonymization, re-identification attacks, definition, primitives, and applications of differential privacy.**Credits:** 3.00

CS 55800 - Introduction To Robot Learning

Credit Hours: 3.00. Intelligent robot systems are in high demand in many real-world tasks, leading to growing interest in designing scalable robot algorithms for automation. From improving healthcare systems to enhancing the manufacturing capacity of various industrial sectors, the role of Robotics has been acknowledged worldwide. They are now also being considered as necessary tools to build large-scale assistive technologies such as smart vehicles and delivery drones to improve people's quality of life. This course covers topics in robot motion planning, estimation, learning, and control to design algorithms for robots to safely interact with their environments and perform various challenging tasks under constraints. The first part of this course focuses on classical techniques such as search, sampling-based planning, PID control, Model Predictive Control (MPC), and Bayesian Kalman filters. The second part covers modern imitation learning and deep reinforcement learning techniques and their application to planning and decision-making in robotics. The course assumes students are familiar with basic concepts in linear algebra, optimization, elementary probability, statistics, data structures, and algorithms. Students are expected to have good programming and software development skills and have a working knowledge of Python.**Credits:** 3.00

CS 56000 - Reasoning About Programs

Credit Hours: 3.00. The course focuses on the logical foundations and algorithmic techniques used to ensure program correctness. With an emphasis on automated program verification and synthesis, the course covers classical concepts and techniques such as Hoare logic, abstract interpretation, abstraction-refinement and bounded model checking. The course also exposes students to approaches for program synthesis, a new frontier for program reasoning, such as inductive synthesis, synthesis using version space algebras, constraint-based synthesis and synthesis based on machine-learning techniques. The courses emphasizes both theoretical foundations as well as hands-on experience with verification/synthesis tools and SAT/SMT solvers. Students are expected to have completed undergraduate coursework in Foundations of Computer Science (CS 18200) or equivalent, Systems Programming (CS 25200) or equivalent, and Introduction to the Analysis of Algorithms (CS 38100) or equivalent. Mathematical maturity is expected. Typically offered Fall.**Credits:** 3.00

CS 56500 - Programming Languages

Credit Hours: 3.00. An exploration of modern or unconventional concepts of programming languages, their semantics, and their implementations; abstract data types; axiomatic semantics using Hoare's logic and Dijkstra's predicate transformers; denotational semantics; functional, object-oriented, and logic programming; concurrency and Owicki-Gries theory. Example languages include ML, Ada, Oberon, LISP, PROLOG, and CSP. Typically offered Spring.**Credits:** 3.00

CS 56900 - Introduction To Robotic Systems

Credit Hours: 3.00. (ECE 56900) The topics to be covered include: basic components of robotic systems; selection of coordinate frames; homogeneous transformations; solutions to kinematic equations; velocity and force/torque relations; manipulator

dynamics in Lagrange's formulation; digital simulation of manipulator motion; motion planning; obstacle avoidance; controller design using the computed torque method; and classical controllers for manipulators. **Credits:** 3.00

CS 57700 - Natural Language Processing

Credit Hours: 3.00. This course will cover the key concepts and methods used in modern Natural Language Processing (NLP). Throughout the course several core NLP tasks, such as sentiment analysis, information extraction, syntactic and semantic analysis, will be discussed. The course will emphasize machine-learning and data-driven algorithms and techniques, and will compare several different approaches to these problems in terms of their performance, supervision effort and computational complexity. Prerequisites: A background in linear algebra, calculus, statistics and probability, and completion of CS 57800 or equivalent are highly recommended. Strong programming skills in any modem language (Python, Java, C++) are required. Typically offered Fall Spring.**Credits:** 3.00

CS 57800 - Statistical Machine Learning

Credit Hours: 3.00. This introductory course will cover many concepts, models, and algorithms in machine learning. Topics include classical supervised learning (e.g., regression and classification), unsupervised learning (e.g., principle component analysis and K-means), and recent development in the machine learning field such as variational Bayes, expectation propagation, and Gaussian processes. While this course will give students the basic ideas and intuition behind modern machine learning methods, the underlying theme in the course is probabilistic inference.**Credits:** 3.00

CS 57900 - Bioinformatics Algorithms

Credit Hours: 3.00. Review of Genomes, DNA, RNA, proteins, proteomes. Biological Sequences: dynamic programming; pairwise global, local, and semi-global alignments of genes and proteins; constant, affine, and general gap penalties; RNA alignments; BLOSUM and PAM scoring matrices. Multiple alignment of proteins: approximation algorithms; iterative and progressive alignment methods. Database search for sequences: BLAST and variants. Phylogenetic Trees: distance-based methods, ultrametric and additive distance functions; parsimony, and maximum likelihood methods. Whole Genome Alignment: suffix trees and suffix arrays. Systems Biology: Module discovery in biological networks, spectral algorithms for graph clustering. Network alignment: quadratic programming formulations and graph matching. Genetic Variation: haplotype inference, the perfect phylogeny problem and chordal graphs. Additional topics such as next-generation sequencing, analysis of multidimensional data from flow cytometry, and gene expression data, if time permits. Typically offered Fall.**Credits:** 3.00

CS 58000 - Algorithm Design, Analysis, And Implementation

Credit Hours: 3.00. Basic techniques for designing and analyzing algorithms: dynamic programming, divide and conquer, balancing. Upper and lower bounds on time and space costs, worst case and expected cost measures. A selection of applications such as disjoint set union/find, graph algorithms, search trees, pattern matching. The polynomial complexity classes P, NP, and co-NP; intractable problems. Typically offered Fall Spring.**Credits:** 3.00

CS 58400 - Theory Of Computation And Computational Complexity

Credit Hours: 3.00. The theory of general purpose programming systems. Recursive and partial-recursive functions; recursive and recursively enumerable sets. The Church-Turing thesis. The recursion theorem, Rogers' translation theorem, Rice's undecidability theorem. The general theory of computational complexity: there are no general solutions to natural optimization problems. Complexity for specific models of computation: the polynomial complexity classes P, NP, and PSPACE; NP-hard and PSPACE-hard problems, inherently exponential problems. Typically offered Spring.**Credits:** 3.00

CS 58500 - Theoretical Computer Science Toolkit

Credit Hours: 3.00. This course covers fundamental techniques and a range of mathematical tools that underlie today's research in theoretical computer science. The course material is essential for research in theoretical computer science as well as machine learning theory. The course is targeted at students who plan to pursue research in these areas. Topics will be chosen from four core areas: Convex Analysis and Optimization, Spectral Methods, Concentration Inequalities, and Discrete Fourier Analysis. Depending on student and instructor interest, additional topics will be chosen and may include applied analysis, coding theory, probabilistic proofs, and more advanced topics in discrete Fourier analysis. Students will read papers in theoretical computer science and machine learning theory using, exploring and extending the covered techniques and tools. Students are expected to be proficient in probability theory, have the maturity to follow and carry out basic analysis proofs, and have completed courses in calculus, linear algebra, discrete mathematics, and analysis of algorithms. More specifically, the course expects mastery of the material covered in Calculus III, Linear Algebra, Probability, Foundations of CS, and Analysis of Algorithms.**Credits:** 3.00

CS 58700 - Foundations Of Deep Learning

Credit Hours: 3.00. This course provides an integrated view of the key concepts of deep learning (representation learning) methods. This course focuses on teaching principles and methods needed to design and deploy novel deep learning models, emphasizing the relationship between traditional statistical models, causality, invariant theory, and the algorithmic challenges of designing and deploying deep learning models in real-world applications. This course has both a theoretical and coding component. The course assumes familiarity with coding in the language used for state-of-the-art deep learning libraries, linear algebra, probability theory, and statistical machine learning.**Credits:** 3.00

CS 58800 - Randomized Algorithms

Credit Hours: 3.00. The area of randomized algorithms has grown from being a tool in computational number theory to finding widespread application in algorithms in all areas of computer science. Two practical benefits of randomization are its simplicity and speed. Deep and important computational complexity connections have been developed, from bridging the gap between discrete and continuous optimization, bypassing deterministic barriers in online settings, summarizing massive data in polylogarithmic space, probabilistically checkable proofs, privacy enhancing techniques, modeling the web and other large networks, and sparsifying and compressing complicated combinatorial structures such as graphs. Randomization is an essential key ingredient in the algorithmic breakthroughs today and in the future. This course presents the basic concepts in the design and analysis of randomized algorithms and shows how to apply them to algorithms for a wide range of problems. The course covers a broad range of problems benefitting from randomized computation including data structures, graph algorithms, online algorithms, geometric algorithms, streaming algorithms, derandomization techniques, and tools for probabilistic analysis of algorithms. Typically offered Fall.**Credits:** 3.00

CS 59000 - Topics In Computer Sciences

Credit Hours: 1.00 to 5.00. Directed study for students who wish to undertake individual reading and study on approved topics. Permission of instructor required.**Credits:** 1.00 to 5.00

CS 59100 - Seminar

Credit Hours: 1.00. A weekly seminar presented by faculty and invited speakers, normally in a specific area. Typically offered Fall Spring.**Credits:** 1.00

CS 59300 - New Topics In CS

Credit Hours: 3.00. A variable title course for topics not currently covered in the CS graduate curriculum. Each offering follows a traditional course structure with textbook(s), assignments, exams, and week-by-week content synopsis described in a syllabus. A CS 59300 offering does not imply that a course is intended to become, or will become, a regular course in the CS graduate curriculum. May be included on a CS MS or PhD plan of study according to the relevant ruleset.**Credits:** 3.00

CS 59799 - Graduate Professional Practice

Credit Hours: 0.00. Internship experience to complement the student's academic coursework and help prepare the student for employment in computer science. The student must present a letter from the proposed employer describing to a reasonable extent the work to be undertaken and find a member of the Computer Science Graduate Faculty to be the instructor. The student must have completed at least one semester as a computer science graduate student at Purdue, West Lafayette. May not be taken in successive semesters. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 0.00

CS 61500 - Numerical Methods For Partial Differential Equations I

Credit Hours: 3.00. (MA 61500) Finite element method for elliptic partial differential equations; weak formulation; finite-dimensional approximations; error bounds; algorithmic issues; solving sparse linear systems; finite element method for parabolic partial differential equations; backward difference and Crank-Nicolson time-stepping; introduction to finite difference methods for elliptic, parabolic, and hyperbolic equations; stability, consistency, and convergence; discrete maximum principles. Prerequisite: CS 51400, MA 52300. Typically offered Spring.**Credits:** 3.00

CS 62600 - Advanced Information Assurance

Credit Hours: 3.00. Advanced topics in information assurance, including selections from the following: penetration testing, formal verification of systems, formal models of information flow and protection, distributed system authentication, protocol design and attack, computer viruses and malware, intrusion and anomaly detection models, multi-level security, active defenses, investigation and forensics, network firewalls, anonymity and identity, e-commerce support, and database security models and mechanisms. Offered every third semester. Prerequisite: CS 52600, CS 55500. Typically offered Fall Spring.**Credits:** 3.00

CS 63500 - Capturing And Rendering Real-World Scenes

Credit Hours: 3.00. Advanced techniques for automated modeling and visualization of complex environments, such as rooms, buildings, urban scenes, and landscapes. Topics covered are at the confluence of computer graphics, computer vision and engineering, and include: capture technologies, acquisition device calibration, view registration, panoramic images, 3D reconstruction from images, view morphing, 3D image warping, lightfield modeling and rendering, visual hulls, point-based modeling and rendering, view dependent texture mapping, and application development issues and examples. Prerequisite: CS 58000, CS 53500 or a solid foundation in computer graphics, programming proficiency in C or C++ and basic linear algebra. Typically offered Spring.**Credits:** 3.00

CS 63600 - Internetworking

Credit Hours: 3.00. Principles of Internetwork architecture and communication protocols underlying interoperable systems. Topics include universal interconnection, Internet addressing and routing, address binding, control of Internet congestion and flow, examples of Internet protocol suites (TCP/IP and XNS), round trip time estimation, naming and name resolution, Internet applications programs, and the ISO/OSI model. Prerequisite: CS 50300. Typically offered Fall.**Credits:** 3.00

CS 63800 - Multimedia Networking And Operating Systems

Credit Hours: 3.00. For graduate students in computer sciences who have a background in networking and operating systems and are interested in research in networked multimedia systems. The course consists of a selection of networking and operating system topics for realizing high performance, predictable, scalable, flexible, and secure multimedia systems. Topics may vary to reflect timely research issues and the current interests of the instructor(s). Students are expected to complete a term project. Presentations also may be required. Undergraduate background in computer science required. Prerequisite: CS 53600 or CS 50300. Typically offered Fall Spring.**Credits:** 3.00

CS 64100 - Multimedia Database Systems

Credit Hours: 3.00. Prepares students for research in multimedia database systems. Students are exposed to a variety of emerging innovative techniques to store, manipulate, communicate, visualize, and reason with multimedia systems. Prerequisite: CS 54100 or CS 54200. Typically offered Fall Spring.**Credits:** 3.00

CS 65500 - Advanced Cryptology

Credit Hours: 3.00. Advanced topics in cryptography and cryptanalysis, including selections from the following: Steganographic methods, Cryptanalytic techniques, including differential cryptanalysis, and chosen plaintext attacks. Message digest algorithm construction. Digital cash. Quantum cryptography. N-key systems. Minimal and zero-knowledge systems. Protocol design and failure. Verification of algorithms. Key generation and management. Traffic analysis. VPN construction and operation. Politics, espionage, and law enforcement concerns. Offered every third semester. Prerequisite: CS 52600, CS 55500. Typically offered Fall Spring.**Credits:** 3.00

CS 66200 - Pattern Recognition And Decision-Making Processes

Credit Hours: 3.00. (ECE 66200) Introduction to the basic concepts and various approaches of pattern recognition and decision-making processes. Topics include various classifier designs, evaluation of classifiability, learning machines, feature extraction, and modeling. Prerequisite: ECE 30200. Typically offered Fall.**Credits:** 3.00

CS 69000 - Seminar On Topics In Computer Sciences

Credit Hours: 0.00 to 5.00. Topics vary. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 0.00 to 5.00

CS 69010 - Seminar On Topics In Computer Science

Credit Hours: 0.00 to 5.00. Topics vary. Permission of instructor required. **Credits:** 0.00 to 5.00

CS 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. The student is expected to follow safe research practices, to follow ethical research practices, to maintain communication with the instructor, to formulate a set of reasonable semester research progress milestones with instructor, optionally in writing. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 18.00

CS 69810 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. The student is expected to follow safe research practices, to follow ethical research practices, to maintain communication with the instructor, to formulate a set of reasonable semester research progress milestones with instructor, optionally in writing. Permission of instructor required.**Credits:** 1.00 to18.00

CS 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. The student is expected to follow safe research practices, to follow ethical research practices, to maintain communication with the instructor, to formulate a set of reasonable semester research progress milestones with instructor, optionally in writing. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 18.00

CSCI 23000 - Computing I

Credit Hours: 4.00. The context of computing in history and society, information representation in digital computers, introduction to programming in a modern high-level language, introduction to algorithms and data structures, their implementation as programs.**Credits:** 4.00

CSCI 24000 - Computing II

Credit Hours: 4.00. Continues the introduction of programming begun in CSCI 23000, with a particular focus on the ideas of data abstraction and object oriented programming. Topics include programming paradigms, principles of language design, object-oriented programming, programming and debugging tools, documentation, recursion, linked data structures, and an introduction to language translation.**Credits:** 4.00

CSCI 24100 - Introduction To Web Design

Credit Hours: 3.00. Introduction to writing content for the Internet and World Wide Web. Emphasis on servers, hand-coded HTML, Cascading Style Sheets and extending HTML with other Web technologies.**Credits:** 3.00

CSCI 31100 - Advanced Database Programming, Oracle

Credit Hours: 3.00. Focus on the concepts and skills required for database programming and client server development. Concepts will apply to any modern distributed database management system. Emphasis on developing Oracle SQLPlus scripts, PL/SQL server side programming, and Oracle database architecture. Students with programming experience in ODBC compliant languages will be able to practice connecting such languages to an Oracle database. Lecture and laboratory.**Credits:** 3.00

CSCI 34000 - Discrete Computational Structures

Credit Hours: 3.00. Theory and application of discrete mathematics structures and their relationship to computer science. Topics include mathematical logic, sets, relations, functions, permutations, combinatorics, graphs, Boolean algebra, digital logic, recurrence relations, and finite-state automata.**Credits:** 3.00

CSCI 36200 - Data Structures

Credit Hours: 3.00. A study of the design and analysis of data structures and algorithms. Abstract data types: arrays, stacks, queues, lists, trees, graphs, etc. Algorithms: sorting, searching, hashing. File structures: organization and access methods.**Credits:** 3.00

CSCI 40300 - Introduction To Operating Systems

Credit Hours: 3.00. Operating system concepts; history, evolution and philosophy of operating systems. Concurrent processes, process coordination and synchronization, CPU scheduling, deadlocks, memory management, virtual memory, secondary storage and file management, device management, security and protection, networking, distributed and real-time systems.**Credits:** 3.00

CSCI 41400 - Numerical Methods

Credit Hours: 3.00. Error analysis, solution of nonlinear equations, direct and iterative methods for solving linear systems, approximation of functions, numerical differentiation and integration, numerical solution of ordinary differential equations. Not open to students with credit in CSCI 512.**Credits:** 3.00

CSCI 44300 - Database Systems

Credit Hours: 3.00. Relational database systems: architecture, theory, and application. Relational data structure, integrity rules, mathematical description, data manipulation. Standard SQL and its data manipulation language, engineering aspects of database design in industry, introduction to non-relational database systems.**Credits:** 3.00

CSCI 45000 - Principles Of Software Engineering

Credit Hours: 3.00. Tools and techniques used in software development. Lifecycle concepts applied to program specification, development, and maintenance. Topics include overall design principles in software development; the use of structured programming techniques in writing large programs; formal methods of program verification; techniques and software tools for program testing, maintenance, and documentation.**Credits:** 3.00

CSCI 48400 - Theory Of Computation

Credit Hours: 3.00. Introduction to formal languages and automata theory; finite automata, regular expressions, regular languages, context-free languages and pushdown automata, context sensitive languages, Turing machines, undecidability, P and NP. Design and analysis techniques for divide-and-conquer algorithms, greedy algorithms, dynamic programing, amortized analysis.**Credits:** 3.00

CSCI 49000 - Topics In Computer Sciences For Undergraduates

Credit Hours: 1.00 to 5.00. Supervised reading and reports in various fields.**Credits:** 1.00 to 5.00

CSCI 49500 - Explorations In Applied Computing

Credit Hours: 1.00 to 6.00. Explorations in Applied Computing is an undergraduate capstone experience. Students will work in teams, advised by faculty and external liaisons, to solve real-world computing problems. This hands-on experience will cultivate technical expertise, utilization of analytical thinking, quantitative reasoning, project management skills, and communication skills.**Credits:** 1.00 to 6.00

CSCI 49600 - Computer Science Internship Capstone

Credit Hours: 3.00. A professional experience providing students the opportunity to incorporate material learned in CSCI coursework in a supervised internship position. The approved internship position will cultivate technical expertise, utilization of analytical thinking, quantitative reasoning, project management skills, and communication skills.**Credits:** 3.00

INFO I3000 - Human-Computer Interaction

Credit Hours: 3.00. The analysis of human factors and the design of computer application interfaces. A survey of current best practices with an eye toward what future technologies will allow.**Credits:** 3.00

Construction Engineering and Management

CEM 18000 - Construction Engineering Pre-Professional Development

Credit Hours: 1.00. Online course consisting of 8 sessions and 1 module (10 hour OSHA training) is intended to be completed before the student's first work session (internship) in order to prepare the student in the form of oral and written communication that will assist them in being successful in their experiential learning opportunities within industry. This course will also

introduce the students to the construction industry relative to office and field requirements and introduce the student to professional skills that will be needed for their experiential learning opportunities including but not limited to: verbiage and acronyms, tools, software platforms, and general business etiquette and ethics.**Credits:** 1.00

CEM 19100 - Construction Internship I

Credit Hours: 0.00. First of three work periods required for students in the construction engineering and management program. The off-campus location for each work period is designated by the construction organization that sponsors the construction internship. Student intern receives compensation from the sponsor during each work period. A typical first internship period emphasizes the field-based activities of the sponsor. Recommended, but not required, to be preceded by CE 22000. Available to CEM students only. **Credits:** 0.00

CEM 20100 - Life Cycle Engineering And Management Of Constructed Facilities

Credit Hours: 3.00. This course introduces concepts relating to the engineering and construction of facilities throughout their life cycle. Topics that will be explored include the nature of the construction industry, construction contracts, legal and management organization of construction companies, basics of the design and construction process, as well as an introduction to the role of estimating and project scheduling. Cost, time, safety and quality concepts of construction management relationships will also be discussed. Prerequisite: First Year Engineering Curriculum must be completed. **Credits:** 3.00

CEM 28000 - Construction Engineering Professional Development I

Credit Hours: 1.00. This course will prepare the student for professional practice in construction engineering including information on careers and issues in construction industries; History and Culture of the U.S. Construction Industry; Engineering Ethics and Preparation for Leadership. Information and assistance is also provided related to minors and selections associated with the plan of study; student's organizations; opportunities for construction research and community outreach at Purdue. Guest speakers with be utilized to enhance the experience. The guest speakers include industry partners as well as faculty and staff. There will be an emphasis on written and oral communication. **Credits:** 1.00

CEM 29100 - Construction Internship II

Credit Hours: 0.00. Second of three internship periods and a continuation of that described for CEM 19100. Typically, experience emphasizes the office-based activities of the sponsor. **Credits:** 0.00

CEM 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in Construction Engineering and Management. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required.**Credits:** 0.00

CEM 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in Construction Engineering and Management. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required.**Credits:** 0.00

CEM 29700 - Experimental Course

Credit Hours: 1.00 to 6.00. This course is required to assist in the development and testing of new courses for either residential or online delivery. Initially, there may be more residential courses than online due to faculty availability and/or workload. **Credits:** 1.00 to 6.00

CEM 30100 - Project Control And Life Cycle Execution Of Constructed Facilities

Credit Hours: 3.00. This course continues an introduction to construction management and engineering concepts for future engineers, contractors and owner representatives involved at different stages in the life-cycle of constructed facilities. Specifically, this course focuses on the principles, tools, and procedures used in the construction industry for project selection and financing, advanced planning and scheduling techniques, resource management, and project monitoring. **Credits:** 3.00

CEM 30200 - Practical Applications For Construction Engineering

Credit Hours: 3.00. This course teaches practical applications of the theories, tools and skills taught in CEM 20100 and CEM 30100. Construction processes will be studied through hands on exercises working with actual contract plans and specifications and computerized project scheduling of the sample project that is the focus of the class. Topics that will be explored are Contract Format, Understanding Contract Specifications. Permission of department required. **Credits:** 3.00

CEM 32100 - Construction Engineering Materials Lab

Credit Hours: 1.00. The nature and performance of materials under load stress. Important engineering materials for evaluation of physical and mechanical properties include ferrous and nonferrous metals, plastics, bituminous materials, Portland cement, aggregates, concrete, timber, and particulate systems. **Credits:** 1.00

CEM 32400 - Human Resource Management In Construction

Credit Hours: 3.00. Introduce a broad set of fundamental topics regarding management of people in engineering and construction organizations in the U.S. Subjects include labor-management relations (laws, regulations and practices affecting construction workers and organizations); worker motivation, productivity, and training; roles and practices of managers; construction safety; management of quality. **Credits:** 3.00

CEM 35100 - Foundations Of Architectural Design

Credit Hours: 3.00. Contemporary humans spend most of our time directly engaging with architecture; it is the context in which we live our lives. This course introduces the demands ('tasks') and methods ('tools') inherent to the practice of architectural design. In other words, the problems architects address through design and the ways in which they do so. These two sets of topics are presented in tandem through historical and contemporary examples, along with selected case-studies and readings. Success in the course will provide a foundation for richly experiencing, critically assessing, and productively engaging the development of our built environment. **Credits:** 3.00

CEM 38000 - Construction Engineering Professional Development II

Credit Hours: 1.00. This course will build upon the topics discussed in CEM 28000 to further prepare students for their work in the construction industry. A focus of this class will be on presentation skills. By utilizing the first or last hour of CEM 42500 - Construction Practice Project, the students of CEM 38000 will have the opportunity to present and also participate as an audience and active participant in CEM 42500 Construction Practice Project. The presentations of CEM 38000 will consist of their required Summer Internship Reports, which are a compilation of the work they have completed and skills they have learned in their first two internships (CEM 19100 and CEM 29100). **Credits:** 1.00

CEM 39100 - Construction Internship III

Credit Hours: 0.00. Third, and last, of required internships. It typically emphasizes the project management activities of the sponsor. Actual assignments to a student may vary from sponsor to sponsor. **Credits:** 0.00

CEM 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in Construction Engineering and Management. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required.**Credits:** 0.00

CEM 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in Construction Engineering and Management. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required.**Credits:** 0.00

CEM 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in Construction Engineering and Management. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required.**Credits:** 0.00

CEM 39700 - Experimental Course

Credit Hours: 1.00 to 6.00. This course is required to assist in the development and testing of new courses for either residential or online delivery. Initially, there may be more residential courses than online due to faculty availability and/or workload. **Credits:** 1.00 to 6.00

CEM 40100 - Critical Thinking In Construction Engineering

Credit Hours: 3.00. This course introduces the concepts of critical thinking and why acting in our 'comfort zone' can result in discomfort. Students will explore a number of simulated and actual problems that challenge understanding of the situation and require additional investigation or analysis. Problems will cover the entire building life-cycle from development of a project plan, through design, project risk analysis for bidding, controlling the project, project recovery, and project handover. Guest speakers will present examples of projects where critical thinking was applied to resolve project issues or avoid a significant error. **Credits:** 3.00

CEM 42501 - Construction Engineering Capstone I

Credit Hours: 2.00. The capstone senior design course for construction engineering and management majors. Working in teams in a realistic engineering practice environment, students use an actual construction project to accomplish open-ended project planning and systems design. Course covers construction project strategy, cost estimating and bidding, constructability analysis, project scheduling, contract conditions, project organization, site analysis and development, safety and quality management, and information systems design. Comprehensive written submittals and oral presentations require integration of knowledge gained in previous courses and in construction internships. **Credits:** 2.00

CEM 42502 - Construction Engineering Capstone II

Credit Hours: 2.00. The capstone senior design course for construction engineering and management majors. Working in teams in a realistic engineering practice environment, students use an actual construction project to accomplish open-ended project planning and systems design. Course covers construction project strategy, cost estimating and bidding, constructability analysis,

project scheduling, contract conditions, project organization, site analysis and development, safety and quality management, and information systems design. Comprehensive written submittals and oral presentations require integration of knowledge gained in previous courses and in construction internships. **Credits:** 2.00

CEM 43100 - Introduction To Facility Engineering And Management

Credit Hours: 3.00. This course introduces students to the field of facility engineering and management, the operation of constructed facilities to ensure efficient operation, meet stakeholder needs, and preserve the facility for its intended life. The course is a technical elective for Construction Engineering and Management students who are familiar with the delivery of capital construction projects and provides an owner/operator perspective of capital construction and ongoing operations. The course focuses on the different capital construction types (buildings, roads, bridges, tunnels, water treatment facilities, and industrial facilities). Guest speakers will be used to present the challenges specific to individual facility types. Methods and tools to develop the needed management and annual operational plans for facilities will be used. Case studies will be used to demonstrate the application of methods and tools. **Credits:** 3.00

CEM 45100 - Integrative Building Design

Credit Hours: 3.00. This course introduces the architectural and constructive challenges of comprehensive, integrated building design. In lectures, the range of constituent systems (active and passive) that combine to produce contemporary buildings will be presented with particular attention to the specific parameters and metrics that drive their functionality and performance. The central project is an extended exercise in design modeling: applying iterative refinements to introduce additional layers of systemic complexity and to respond to specific analytical measures of building performance. Success in this course will support the ability to productively contribute to building and construction projects from a variety of specific roles. **Credits:** 3.00

CEM 45500 - Temporary Structures In Construction

Credit Hours: 3.00. This course will cover the design and construction of various temporary structures and systems used in building and transportation construction. The course describes not only design issues of temporary structures such as formwork, falsework, bracing, earth retention systems, scaffolding, cofferdams, and so forth by providing lectures and design examples, but it also covers business aspects associated with the design and construction of temporary structures in the real world such as business practice, legal aspects, and design philosophy. **Credits:** 3.00

CEM 45600 - Design-Build Project Delivery Method For Engineers

Credit Hours: 3.00. This course presents traditional project delivery methods and contrasts them with design-build project delivery. The course focuses on the principles, tools, and procedures used in the design-build project delivery method. It provides students with sufficient education to become certified (following additional examination) by the Design Build Institute of America as an Associate Member and dependent on employment experience, a full Member. Traditional project delivery methods, Design-Bid-Build, Construction Manager as Agent, 'Fast Track', and other 'rip and read' methods are losing popularity to project delivery methods that take a more collaborative approach. Collaboration requires a different way of thinking about a capital construction project and working with others in project delivery. Constructors must move from a transactional, arms-length relationship where the project is viewed as a low-price commodity to a full-suite delivery of services resulting in a high-value product. This requires collaboration with the Owner and other members of the project delivery process, something that has been missing from traditional project delivery methods. Active student participation is required. Student participation will be facilitated through assigned presentations, in-class projects, field trips to local projects, and guest lectures. Students who complete the course and achieve DBIA's minimum requirements (Fundamentals of Project Delivery, Principles of Design-Building Project Delivery, Post Award, and Contracts & Risk Management) will be eligible for recognition by DBIA. **Credits:** 3.00

CEM 45700 - Inland Navigation Engineering

Credit Hours: 3.00. This course teaches detailed elements of Inland Navigation Structures, primarily in the United States. Students will become familiar with how waterways are conceived, planned, designed and constructed. Engineering Design Manuals for Locks and Dams will be reviewed. A primary focus will be on a new Corps of Engineers Lock and Dam currently under construction. The students will thoroughly review the Plans and Specifications as well as Construction Photos and Videos taken during construction. Various marine construction equipment and techniques will be presented. **Credits:** 3.00

CEM 48500 - Legal Aspects Of Construction Engineering

Credit Hours: 3.00. This course will cover legal principles and landmark cases relevant to civil and construction engineering. Specific subjects covered include contracts, torts, agency, professional liability, labor laws, insurance, expert testimony, arbitration, patents and copyrights, sureties and ethics. **Credits:** 3.00

CEM 49700 - Construction Engineering Projects

Credit Hours: 0.00 to 4.00. Topics vary. Permission of department required. **Credits:** 0.00 to 4.00

CEM 50100 - Leadership And Advanced Project Management

Credit Hours: 3.00. This course will focus on the first ten years of the student's professional career. It will introduce concepts relating to development of the leader-manager, advanced project management techniques that will assist the student towards success in the construction industry, and developing a business plan on starting a small engineering or construction company. Guest speakers provide learning from entrepreneurs who got their start utilizing the systems taught in the course. **Credits:** 3.00

CEM 53100 - Facilities Engineering And Management

Credit Hours: 3.00. This course provides the student with an understanding of the issues related to facilities management for owner organizations. The course is oriented toward upper class and graduate students familiar with the delivery of capital construction projects and provides an owner's perspective of capital construction and ongoing operation. The course will focus on the total life-cycle cost of a capital construction project beginning with planning, business rationale, economic analysis, and programmatic specifications. The owner's perspective on annual operating costs will be examined including calculation of daily, weekly, monthly, and annual operating costs. The implications of stewardship and customer service will be reviewed and analyzed including the implications on total life-cycle costs. The human resources implications of operating a facility will be reviewed including determination of staffing requirements to meet various levels of service as well as tools and techniques to determine and manage contracted services. Numerous case studies will be described and discussed which will demonstrate the importance of careful planning and budgeting of annual and periodic maintenance. Issues of sustainability, regulations, and other legal factors will be discussed and examined. **Credits:** 3.00

CEM 53200 - Infrastructure Planning

Credit Hours: 3.00. This course provides the student with an in depth understanding of the issues related to infrastructure planning, engineering, and economics. The focus will be on the prioritization, stewardship, management and decision-making roles within the engineering division of a large public works agency. Various infrastructure planning concepts will be reviewed and discussed. Numerous case studies will be described and discussed, which will demonstrate that in order to plan and implement a successful public works project, many controversial issues must be faced and difficult problems must be solved. Decision-making at agency and other levels of government will be discussed with respect to reports prepared by planners covering engineering feasibility, environmental and social impact assessments, and financial and economic analyses. Evolving modern planning issues will be introduced and discussed, including sustainability; environmental economics; environmental justice; uncertainty and risk-benefit analysis; partnerships with private entities versus total privatization; and the optimum staff-mix utilization in-house versus outsourcing. **Credits:** 3.00

CEM 53300 - Infrastructure Analytics

Credit Hours: 3.00. This course investigates the data sources and numerical tools required to assess the status of constructed facilities and to make informed decisions from the data. The course is oriented toward upper class and graduate students familiar with the delivery of capital construction projects (buildings, roads, bridges, earthworks, utilities, rail/transit, ports, and canals) and includes numerical analysis techniques. The course will focus on data sources, either direct or indirect, and analysis methods to identify the current condition or project future conditions of built infrastructure. Course format will be highly interactive with discussion about recent infrastructure projects in both instructor, guest speaker, and student-led discussions. Issues of sustainability, regulations, and other factors will be discussed and examined. **Credits:** 3.00

CEM 58500 - Temporary Structures

Credit Hours: 1.00. This class will provide construction and design professionals the skills to understand construction loads and their combinations, wind loads and their impacts, timber design, bracing and guying design, designing vertical forming systems, and shoring analysis for vertical construction.**Credits:** 1.00

CEM 58600 - Development Of Underground Space

Credit Hours: 3.00. This course has been designed to support students with civil engineering and construction engineering and management background. New underground construction projects are planned all over the world, and the course equips students to contribute to these exciting developments. This course includes an overview of the application for tunneling and underground space as well as construction methods. The course will cover various sizes of underground opening from small diameters built by micro-tunneling to common tunnels used in civil and mining applications to large caverns, often found in different end uses such as storage or hydropower construction.**Credits:** 3.00

CEM 58700 - Underground Infrastructure Asset Management

Credit Hours: 3.00. Most of the U.S. water and wastewater conveyance infrastructure was installed during the first half of the 20th century and is coming to an end of its useful life. "Out of sight, out of mind" describes the awareness and significance that has been placed on these underground lifeline systems which support societies' quality of life, public health, economic development and living standard. Historically, management of these systems has been described as "crises management." They only get attention when there is a failure. It has been determined that a reactive management approach is not sustainable. The Environmental Protection Agency (EPA) has been instrumental in assisting utilities transition from reactive management practices to proactive practices. This approach involves the principles and practices of Asset Management (AM). AM is a comprehensive approach which involves every aspect of the organization to develop and implement best business practices to address: (a) the current state of the assets, (b) levels of service, (c) critical assets, (d) life-cycle costing, and (e) funding. This course prepares students to utilize sound engineering judgment and principles for managing the construction, repair, rehabilitation, and maintenance of buried infrastructure systems including pipes, tunnels, chambers, etc.**Credits:** 3.00

CEM 59700 - Experimental Masters Course

Credit Hours: 1.00 to 3.00. This course will allow CEM to develop and test new courses for graduate level delivery. Possible courses include: Robotics in Construction; Tunneling; Process Plant Construction; Waterway Engineering; Construction Visualization; Remote Monitoring and Inspection; Cost/Benefits of Planning Details; Heavy Construction Innovation; Site Pollutant Reduction & Control; Statistical Methods in Construction; Infrastructure Decay Mechanisms; Time Buffers and Task Durations; BIM Tools and Applications; Sustainable Construction Methods; Construction Operations & Productivity; Construction Accounting; and Construction Leadership.**Credits:** 1.00 to 3.00

Construction Management

CM 10000 - Introduction To Construction Management

Credit Hours: 3.00. This course is a survey of the construction industry. Topics include the overall construction process, career opportunities in the construction industry, an introduction to construction materials as well as management and technology tools used in the industry. There will be an emphasis on construction specific vocabulary. **Credits:** 3.00

CM 11000 - Construction OSHA Ten-Hour Certification

Credit Hours: 1.00. This course provides safety training following the OSHA (Occupational Safety and Health Administration) requirements for entry level workers of the construction industry. Upon successful completion of this course students will obtain their OSHA 10-hour card. **Credits:** 1.00

CM 15000 - Construction Management Fundamentals

Credit Hours: 6.00. An introductory course dealing with construction materials and methods, contracts, and layout of basic commercial, residential, heavy/civil, and industrial projects. Students will acquire fundamental skills in quantity estimating, construction plan reading, project layout, and project documentation through hands-on laboratory experiences. **Credits:** 6.00

CM 16000 - Surveying

Credit Hours: 3.00. Fundamental concepts and practical applications related to measurement of vertical and horizontal distances and angles using the tape, level, and total station. Computations of grades, traverses, areas, and curves. Basic concepts and applied use of topography, contours, and topographical maps.**Credits:** 3.00

CM 16400 - Graphics For Civil Engineering And Construction

Credit Hours: 2.00. An introductory course in the area of computer graphics documentation for civil engineering- and construction-related professions. Experiences focus on accepted industry graphic standards and their technical visual applications. The course emphasizes creation and distribution of graphics to enable communication. **Credits:** 2.00

CM 20000 - Intermediate Pre-Construction Management

Credit Hours: 9.00. A project course covering intermediate level commercial, residential, heavy/civil, and industrial construction projects. Students will expand their understanding of construction company management, design, cost, project controls, and safety. In addition, students will explore the areas of concentration within the construction management program. **Credits:** 9.00

CM 20001 - Intermediate Pre-Construction Management

Credit Hours: 6.00. A project course covering intermediate level commercial, residential, heavy/civil, and industrial construction projects. Students will expand their understanding of construction company management, design, cost, project controls, and safety.**Credits:** 6.00

CM 20002 - Intermediate Pre-Construction Management

Credit Hours: 4.00. A project course covering intermediate level commercial, residential, heavy/civil, and industrial construction projects. Students will expand their understanding of construction company management, design, cost, project controls, and safety.**Credits:** 4.00

CM 21000 - Construction Management Portfolio I

Credit Hours: 0.50. Creation of a portfolio demonstrating developing and emerging levels of competence within the construction management discipline. Students will meet individually and in small groups with faculty mentors to review and critique progress. **Credits:** 0.50

CM 21500 - Mechanical Construction

Credit Hours: 3.00. Principles of code, design, methods, and materials are applied to plumbing, heating, ventilation, and air conditioning systems for buildings. The comprehension of mechanical construction plans and specifications is emphasized through exercises in mechanical estimating.**Credits:** 3.00

CM 21601 - Electrical Construction

Credit Hours: 2.00. Principles of code and basic concepts in electrical theory, materials, methods, design and estimating are applied to electrical systems for buildings. Comprehension of electrical construction plans and specifications as well as installation exercises are emphasized through lab experiences.**Credits:** 2.00

CM 23301 - Mechanical, Electrical And Piping Systems In The Built Environment

Credit Hours: 3.00. An introductory course dealing with construction materials and methods related to building systems, focusing on mechanical, electrical, and piping (MEP) systems. Students will acquire fundamental skills in MEP construction plan reading, quantity estimating, basic systems' design and construction execution through lectures, laboratories and integrated project team exercises. **Credits:** 3.00

CM 25000 - Intermediate Construction Management

Credit Hours: 9.00. A project course covering intermediate level commercial, residential, heavy/civil, and industrial construction projects. Students will expand their understanding of construction materials and methods, layout, documentation, site planning, site supervision, cost control, and MEP systems. **Credits:** 9.00

CM 26000 - Introduction To Modeling For BIM

Credit Hours: 3.00. This is an introduction to the materials and processes used when generating 3D modeled solutions to construction problems using traditional and emerging construction documentation standards. Construction documents are created based on current Architectural, Engineering and Construction (AEC) standards with a focus on residential settings - introduction sketching into 2D documentation that will progress into 3D modeling. **Credits:** 3.00

CM 26200 - Introduction To Construction Graphics

Credit Hours: 3.00. Study of graphic solutions to problems conditioned by traditional and emerging construction document standards. Construction document creation is based on current architectural engineering and construction (AEC) standards with a focus on residential settings. Introductory 2D documentation will progress into 3D modeling techniques. **Credits:** 3.00

CM 27000 - Statics

Credit Hours: 3.00. Forces acting on bodies at rest, including coplanar, concurrent, and non-concurring systems; equivalent force systems and distributed forces. Use of free body diagrams and equations of equilibrium in solving problems for array of determinate structural systems: trusses, pin frames, arches, cables, retaining walls, and beams. Load tracing to examine the overall structural conditions with regards to lateral and gravity loads.**Credits:** 3.00

CM 30000 - Advanced Pre-Construction Management

Credit Hours: 9.00. A project course covering advanced level commercial, residential, heavy/civil, and industrial construction projects. Students will further develop their understanding of construction company management, design, cost, project controls, and safety. In addition, students will pursue their desired area of concentration within the construction management program.**Credits:** 9.00

CM 30001 - Advanced Pre-Construction Management

Credit Hours: 6.00. A project course covering advanced level commercial, residential, heavy/civil, and industrial construction projects. Students will further develop their understanding of construction company management, design, cost, project controls, and safety.**Credits:** 6.00

CM 30002 - Advanced Pre-Construction Management

Credit Hours: 4.00. A project course covering advanced level commercial, residential, heavy/civil, and industrial construction projects. Students will further develop their understanding of construction company management, design, cost, project controls, and safety.**Credits:** 4.00

CM 30101 - Introduction To Construction Company Financial Management

Credit Hours: 2.00. An introduction to methods for recognizing revenue for long-term construction contracts and each method's impact on financial statements. Includes introduction to analysis of financial statements and their use in developing company budgets, projecting cash needs, pricing construction projects, and forecasting the impact of business decisions on construction company profit.**Credits:** 2.00

CM 31000 - Equipment And Field Operations

Credit Hours: 3.00. Study of heavy equipment used in construction operations with an emphasis on equipment selection, application, cost, productivity, safety, and economics.**Credits:** 3.00

CM 33000 - Design And Construction I

Credit Hours: 6.00. A course which introduces students to projects and the design information of the built environment as communication tools representing space and proportion. Through a blend of lectures and studio work, students obtain working knowledge of the traditions, documents and standards utilized in the planning for a built structure. Students will also experience how design decisions and programing are influenced by a multitude of outside influences.**Credits:** 6.00

CM 33100 - Design And Construction II

Credit Hours: 6.00. A course where students exert criticism and evaluation of existing design through a blend of lectures and studio work. Students will be exposed to typical impediments to the design of the built environment as they demonstrate integrative decision making in creating an aesthetic and functional design program that meet the needs of society in a resource efficient and sustainable manner. Students will regularly critique the work of others and have their work critiqued as they seek to shape and implement informed design decisions.**Credits:** 6.00

CM 33200 - Architectural Design, Construction Techniques And Society

Credit Hours: 3.00. A course in which students will be exposed to the evolution of architecture and building techniques that influenced the western built environment. Emphasis will be given to the use of appropriate vocabulary and also how social and cultural factors have influenced the design of the built environment throughout the centuries. The course will survey topics from XVII century to recent times. **Credits:** 3.00

CM 35000 - Advanced Construction Management

Credit Hours: 9.00. A project course covering advanced level commercial, residential, heavy/civil, and industrial construction projects. Students will further develop their understanding of construction materials and methods, layout, documentation, site planning, site supervision, cost control, and MEP systems. **Credits:** 9.00

CM 36000 - Applications Of Construction Documentation I

Credit Hours: 3.00. Standards applied to the creation and distribution of documentation within the construction enterprise. Construction documents are created as products of a computer model. Residential modeling is followed by an introduction to light commercial documentation. Topics include a study of blueprint reading and 5D building information modeling (BIM) estimation of material extracted from a model.**Credits:** 3.00

CM 36200 - Construction Competition

Credit Hours: 2.00. This is a multi-disciplinary course where students from several majors work together as a team, developing a proposal for a construction of development project, which is presented at a student competition. Topics include a variety of project types, including land development, design/build, residential, commercial and heavy highway. Permission of instructor required. **Credits:** 2.00

CM 36400 - Jobsite Management

Credit Hours: 3.00. Examination of construction project management on the jobsite. Topics include, submittals, record keeping, jobsite layout, meetings, negotiations, dispute resolution, labor relations, safety, subcontracting, quality, cost control, waste management, changes, claims, progress payments, and project closeout.**Credits:** 3.00

CM 36500 - BIM For Project Managers And Field Supervision

Credit Hours: 2.00. One of the most important components of the construction industry is to visualize the project during its design, construction and over entire life cycle of structure, enabling invested parties to change/adjust the project. A construction project manager' job description is a person who can plan and oversee a construction project from initiation to close with the help of software, technology, resources and a reasonable budget. BIM has delivered a significant impact all aspects and types of AEC projects in terms of economic as well as technical viability. BIM plays a vital role in the management of the project. A project manager can leverage the capability of BIM to deliver a successful construction project and BIM reduces the burden on the project manager of manually calculating and managing tasks. It seems clear that for a construction project to be successful today, project managers would do well to adopt BIM technology. This course is the start that seeks to better understand & address student needs as a on job-site project manager utilizing advanced technologies coupled with Building Information Modeling to produce a form of Building Information Management. It will be given across the multiple disciplines/curricula in anticipation of integrating said new technologies extracted from BIM. Permission of instructor required.**Credits:** 2.00

CM 37000 - Heavy Civil Construction Management

Credit Hours: 3.00. This course will focus on the construction of roads, bridges, and other major transportation-related infrastructure. Topics include construction of concrete pavements, asphalt pavements, deep foundations, and underground utilities. Management of traffic, road construction safety, quality and master planning will also be covered. **Credits:** 3.00

CM 37100 - Industrial Construction Management

Credit Hours: 3.00. This course will focus on the design and construction of industrial systems and processes including Infrastructure for energy, chemical, and water/wastewater systems. Topics studied include piping, welding, heavy lift cranes, and high voltage systems. **Credits:** 3.00

CM 37200 - Planning, Design, And Construction Process For The Healthcare Built Environment

Credit Hours: 3.00. This course will focus on the construction of healthcare facilities including hospitals, clinics, nursing homes and laboratories. The course will emphasize the interrelationship of planning, design, and construction. **Credits:** 3.00

CM 37300 - Healthcare Construction Management - Systems, Occupied Space Work, And Related Industries

Credit Hours: 3.00. This course will focus on the construction of healthcare facilities and include topics related to infectious materials control, disruption avoidance, rapid technology changes, emergency routes, and advanced mechanical and electrical systems. **Credits:** 3.00

CM 37400 - Mechanical And Electrical Construction Management I

Credit Hours: 3.00. This course will focus on the process of analyzing the elements of mechanical, electrical, and plumbing (MEP) construction inherent in producing a MEP construction estimate. Topics include using work product documentation to present and shape the proposal, establishing a conceptual framework of the estimating process, examining commercial/industrial methods and materials, symbol identification, equipment application, and studying the estimating process sequence from project overview to final pricing. **Credits:** 3.00

CM 37500 - Mechanical And Electrical Construction Management II

Credit Hours: 3.00. This course will focus on an in-depth investigation of the elements of mechanical, electrical, and plumbing (MEP) construction on real-world projects. The student will be involved in investigating the equipment and components for the MEP systems and selecting the optimum project delivery method. Estimating will include topics such as solar arrays, EV charging, electrical vehicle charging station projects, smart grids, and energy conservative strategies and equipment. Cost saving strategies will also be examined for MEP system installations utilizing Building Information Modeling (BIM), pre-fabrication, and value engineering. **Credits:** 3.00

CM 37600 - Residential Construction Management-Green Construction And Sustainability

Credit Hours: 3.00. A study of the best building practices in residential construction, based upon the National Green Building Standard and other national green/sustainable building practices. **Credits:** 3.00

CM 37700 - Residential Construction Management Design-Build

Credit Hours: 3.00. A study of the design-build project delivery system for residential construction, including home design fundamentals, construction methods, disability code requirements, building code requirements, and aging-in-place design coupled with best practices of universal design. **Credits:** 3.00

CM 38000 - Soils And Foundations

Credit Hours: 3.00. Study of soils and foundations in the construction projects. Topics include, fundamental soil engineering theories, properties of soils, soil classification, compaction, permeability, stress, shear strength, consolidation, and bearing capacity.**Credits:** 3.00

CM 39000 - Construction Work Experience I

Credit Hours: 1.00. This course shall be taken when approximately half of a student's required 800 hours of work experience within the construction industry are completed. Students will be required to share their experiences with faculty and other construction management students. Permission of department required. **Credits:** 1.00

CM 40000 - Construction Capstone I

Credit Hours: 6.00. A project course covering specialized construction projects related to a student's area of concentration within the construction management program. Students will synthesize their previous knowledge of pre-construction management into a capstone project.**Credits:** 6.00

CM 41000 - Construction Management Portfolio II

Credit Hours: 0.50. Creation of a portfolio demonstrating emerging and proficient levels of competence within the construction management discipline. Students will meet individually and in small groups with faculty mentors to review and critique progress. **Credits:** 0.50

CM 42100 - Construction Management And Technologies For Disaster Recovery

Credit Hours: 3.00. Introductory topics in disaster recovery management: causes of disasters and dimensions of their effects; protocols, equipment, and techniques of disaster restoration and reconstruction; and project and business management practices and imperatives of disaster recovery contractors. **Credits:** 3.00

CM 42200 - Structural Demolition For Construction Managers

Credit Hours: 3.00. Introductory topics in demolition and reconstruction management: situations requiring structural demolition and its effect; protocols, equipment, and techniques of structural demolition; and project and business management practices and imperatives of structural demolition contractors. **Credits:** 3.00

CM 43300 - Risk Management And Legal Issues In Design And Construction Integration

Credit Hours: 2.00. An advanced course dealing with risk management and legal issues as they pertain to the interaction of designers, contractors, and owners. Students will learn to identify and mitigate potential risks that may affect the multiple stakeholders and the business organizations they represent during design and construction activity. The course will also deal with trust and teamwork issues within collaborative processes in the built environment.**Credits:** 2.00

CM 45000 - Construction Capstone II

Credit Hours: 6.00. A project course covering specialized construction projects related to a student's area of concentration within the construction management program. Students will synthesize their previous knowledge of construction management into a capstone project. **Credits:** 6.00

CM 45001 - Construction Capstone II

Credit Hours: 3.00. A project course covering specialized construction projects related to a student's area of concentration within the construction management program. Students will synthesize their previous knowledge of construction management into a capstone project.**Credits:** 3.00

CM 45701 - Construction Safety

Credit Hours: 3.00. This course will examine the impact of safety on the construction industry, including in-depth discussions on the application of the Occupational Safety & Health Administration (OSHA) Safety and Health Standards for the construction industry. The emphasis of this course is to provide training for job sited supervisory personnel. This course will also fulfill the requirements for the OSHA 30-Hour Card.**Credits:** 3.00

CM 46000 - Building Information Modeling For Commercial Construction

Credit Hours: 3.00. The study of commercial jobsite planning and coordination. Trade coordination, visualization, and communication are emphasized. Activities include collision detection reports, construction animations, and professional presentations.**Credits:** 3.00

CM 46200 - Applications Of Construction Documentation II

Credit Hours: 3.00. Creating, archiving, integrating, qualifying and utilizing computer-generated, three-dimensional architectural models in a light commercial construction enterprise. Topics include components of MEP, fire protection, blueprint reading and 4D BIM scheduling. Credit cannot be obtained for both CM 36000 and CM 46200.**Credits:** 3.00

CM 47500 - Construction Costs

Credit Hours: 2.00. A study of construction costs, including analysis of field records, job cost accounting, job cost control, and determination of unit prices.**Credits:** 2.00

CM 48100 - Emerging Topics In Construction

Credit Hours: 3.00. Study of emerging topics related to construction and construction related fields.**Credits:** 3.00

CM 49000 - Construction Work Experience II

Credit Hours: 1.00. This course completes a student's required 800 hours of work experience within the construction industry. Students will be required to share their experiences with faculty and other construction management students. Permission of department required. **Credits:** 1.00

CM 49900 - Special Topics In Construction

Credit Hours: 0.00 to 4.00. Variable title, variable credit course (Independent Study). Hours, subject matter, and credit to be arranged by staff. Permission of Instructor required. **Credits:** 0.00 to 4.00

CM 50500 - Construction Finance And Company Management

Credit Hours: 3.00. This course provides students with knowledge and research training to construction finance and company management.**Credits:** 3.00

CM 50800 - Human Factors In Construction And Transportation

Credit Hours: 3.00. This course provides students with knowledge and research training to identify and solve design problems and safety issues of human factors specifically in construction and transportation. **Credits:** 3.00

CM 51000 - Topics In Environmentally Sustainable Construction, Design And Development

Credit Hours: 3.00. This course explores environmental sustainability in all its forms, starting with the historical and theoretical basis and continuing through an understanding of sustainable building construction, design, development, and renewable energy strategies/management tools and how these can be applied in practice. **Credits:** 3.00

CM 51100 - Energy Conserving Building Retrofit

Credit Hours: 3.00. This course introduces energy related reconstruction of buildings with an emphasis on light commercial buildings. Retrofit topics include: Basic thermodynamics, Energy conserving technologies, Impact of site characteristics, Indoor air quality, Water conservation measures, Measuring and benchmarking energy performance, Cost/Benefit Analysis, Financing energy improvements, as well as Building operation and management to reduce energy and water use. **Credits:** 3.00

CM 51800 - Building Information Modeling And Sustainability

Credit Hours: 3.00. This course explores environmental sustainability in all its forms, starting with the historical and theoretical basis and continuing through an understanding of sustainable building construction, design, development, and renewable energy strategies/management tools. In this course students explore Building Information modeling technology to assess and compare the design impact on the environment.**Credits:** 3.00

CM 52000 - Preconstruction Project Management

Credit Hours: 3.00. Management and control of projects from authorization to start of construction. Project success factors, conceptual and parametric estimating, design planning and management constructability review techniques and value engineering methods. Real estate transactions. Land zoning, platting, development and pro forma calculations. **Credits:** 3.00

CM 52500 - Managing Construction Quality And Production

Credit Hours: 3.00. Advanced techniques for assessing the success of construction project management including schedule cost, safety and quality measurements. Impacts of pre planning, human factors, and communication systems on quality and productivity. Statistical methods for analysis of construction operations. **Credits:** 3.00

CM 52600 - Value Engineering - Functional Analysis Of Systems And Techniques

Credit Hours: 3.00. This course applies value engineering principles and life cycle costs to the built environment with particular focus on the effect of the decisions made in the design, construction, operation and maintenance of the built environment on the quality and cost.**Credits:** 3.00

CM 53000 - Construction Operations And Strategic Management

Credit Hours: 3.00. Principles of construction company business management for U.S. companies. Executive-level construction functions including strategic planning, organizational structure, and ownership structure including succession planning. **Credits:** 3.00

CM 53500 - Construction Accounting And Financial Management

Credit Hours: 3.00. Accounting techniques, financial methods, and financial management for construction firm management. Analysis techniques for contemporary construction company accounting and finance practice with an emphasis on cash flow analysis and cash management. **Credits:** 3.00

CM 53600 - Highway Construction And Quality Control

Credit Hours: 3.00. This course provides students with knowledge of methods, materials, equipment, and procedures in construction of highways. Students will acquire the concepts and applications of quality control and quality assurance in construction of highways. Students will learn to design appropriate work zones to improve efficiency and safety of highway construction. This course will provide graduate students with a much-needed venue to gain the theory, technology, and practice of highway construction, rehabilitation, maintenance, and quality control.**Credits:** 3.00

CM 53800 - Roadway Infrastructure Management

Credit Hours: 3.00. This course provides students with theories and practices of managing roadways to achieve maximum benefit in the system and network level with limited available funds and resources. Students will learn the concepts of roadway performance measures in terms of physical conditions, service levels, and safety. As a graduate level course, this course will introduce basic methods to find optimal solutions for real-world problems and provide graduate students analytical and mathematical tools for effectively conducting research related to problem formulation, optimal decision-making, and maximizing benefits/effectiveness and minimizing costs. **Credits:** 3.00

CM 54000 - Law For Construction Managers

Credit Hours: 3.00. A study of the legal system and its impact on the construction process. The focus is on the legal obligations, rights and remedies pertaining to the construction company. Topics include bidding, contracts, and construction changes. **Credits:** 3.00

CM 54500 - Construction Management Training And Development

Credit Hours: 3.00. Identification, training and development of future company leaders. Mentorship as a required, managerial activity, effective delegation of responsibility, and empowerment of subordinates to take initiative. **Credits:** 3.00

CM 54700 - Collaborative Project Delivery Models And Practices

Credit Hours: 3.00. A project-focused course covering advanced topics on collaborative project delivery models such as Integrated Project Delivery (IPD), Design-Build (DB), and Partnering. Collaborative project delivery methodologies aim to integrate project teams, stakeholders, systems, business structures, and practices to facilitate collaboration at all levels within a project and to produce the most optimal project outcomes. Students will develop and expand their interdisciplinary collaborative team working skills, communication, and understanding of essential elements underlying collaborative project delivery models. **Credits:** 3.00

CM 54900 - Advanced Topics In Mechanical And Electrical Construction

Credit Hours: 3.00. A project-focused course covering advanced topics on mechanical and electrical construction installation practices and processes. This course teaches the student how to plan, organize, and execute mechanical and electrical construction operations. Students will develop and expand their knowledge about mechanical and electrical work sequencing, coordination, commissioning, and relationship to facility operations and management.**Credits:** 3.00

CM 55000 - Risk Management In Construction

Credit Hours: 3.00. Analysis of the depth and breadth of risk in construction. Defining key terms and concepts used in various risk management arenas - legal statutes, precedent and case studies relevant to construction risk management, insurance, and surety bonding. Subjects include: contracts, torts, insurance, surety, safety laws, quality, and risk management models. Analysis of case studies to utilize risk management tools and identify issues and possible approaches. Project risk control including management of foreseeable hazards as well as unforeseen conditions. **Credits:** 3.00

CM 55500 - Construction Leadership And Marketing

Credit Hours: 3.00. Analysis of organizational leadership at the executive level. The goals of this course are to introduce and stimulate thought and discussion of leadership theories, characteristics and behaviors of successful leaders, contextual factors affecting leader effectiveness, dynamics of leader-follower relationships, communication, decision-making and contemporary challenges confronting organizational leaders as well as marketing theory, marketing vs. business development, the marketing process, and an introduction to a construction marketing dashboard. **Credits:** 3.00

CM 56000 - Academic Writing Seminar I

Credit Hours: 1.00. Analysis of the requirements of research reports. Emphasis on research methods and concepts, identifying major issues, academic literature reviews, data collection and presentation methods, and selecting a research topic. **Credits:** 1.00

CM 56500 - Academic Writing Seminar II

Credit Hours: 1.00. Provides a higher level understanding of scholarly writing as it is applied to the individual student's research. Students also learn to present his or her technical work to an audience in a clear, easily understandable form. **Credits:** 1.00

CM 57000 - Analysis Of Research In Construction

Credit Hours: 4.00. Analysis of research and evaluation of research reports. Emphasis on understanding the application of business research procedures including fundamental statistical methods in the solution of a construction industry relevant problem. **Credits:** 4.00

CM 58100 - Workshop In Building Construction Management Technology

Credit Hours: 0.00 to 8.00. Advanced study of technical and professional topics. Emphasis is on new developments relating to technical, operational, and training aspects of industry and technology education.**Credits:** 0.00 to 8.00

CM 59000 - Special Problems In Building Construction Management Technology

Credit Hours: 1.00 to 6.00. Independent study of a special problem under the guidance of a member of the staff. Does not substitute for either M.S. thesis or M.S. project credit. Permission of instructor required**Credits:** 1.00 to 6.00

CM 59800 - Directed MS Project

Credit Hours: 1.00 to 3.00. A formal investigation of a particular problem under the guidance of the advisory committee. Not applicable to a thesis option plan of study. Enrollment during at least two consecutive terms for a total of three credits is required. Permission of instructor required.**Credits:** 1.00 to 3.00

CM 61000 - Urban Built Environment

Credit Hours: 3.00. This provides students with advanced theories and applications of analyzing multiple performance indicators in urban built environments. Students will learn the concepts of energy, environment, human comfort, and mobility performance in urban built environments. This course will offer an overview of various analysis techniques using Geographic Information System, Building Energy Modeling and Simulation, and Spatial Analytics using a programming language. Graduate students will learn problem-solving skills through project-based learning, and how to apply the skills to effectively conduct research related to urban built environment planning, design, and development. Prerequisite: CM 51000. **Credits:** 3.00

CM 62500 - Smart Infrastructure System

Credit Hours: 3.00. Applying advanced cutting-edge technologies to the civil and construction industry to address traditional infrastructure problems is becoming more popular. One of the very hot areas is developing smart infrastructure. How to make our civil infrastructures smarter and more resilient plays a vital role for our society. The first half of this course will cover the fundamental knowledge of some cutting-edge technologies and smart infrastructure including sensing, signal processing, data collection and transmission, and closed-loop control. The second half of this course will focus on smart infrastructure applications including smart bridges, smart grid, smart building and smart railways. This advanced-level course will provide advanced knowledge of cutting-edge technologies to develop smart infrastructure systems. Through this course, student will polish their research skills in different aspects including: conducting literature review, developing their own research idea, implementing their ideas, presenting their work and publishing their results. In addition, at the end of this course, students will be able to implement various types of systems, create smart infrastructure systems and check their performance. Prerequisite: CM 58100.**Credits:** 3.00

CM 63500 - Advanced Facilities Management

Credit Hours: 3.00. This course provides advanced facilities management (FM) practices in the life cycle of the built environment, including core competencies, compliance and standards, operations & maintenance, risk management, sustainability, health & safety, real estate and financial management, human resources management, and workplace and utility management. In addition, FM practices include emergency preparedness, business continuity, leadership, contracts, capital and maintenance planning, outsourcing, procurement, space planning, occupant comfort and productivity, and energy management. The role of the facilities manager in hard (space and infrastructure) and soft services (grounds, custodial, waste management, pest control, parking, workspace management, catering) will be analyzed with case studies emphasizing the need for their integration in the design and construction process. The students will be able to interpret and analyze critical management principles in the operations phase of the built environment by identifying the fundamentals of facilities management theory and practice. Prerequisite: CM 52600.**Credits:** 3.00

CM 63600 - Future-Proof Construction And Infrastructure

Credit Hours: 3.00. The course provides advanced tools and methods to optimize the maintainability, resilience, flexibility and responsiveness of infrastructure and construction so to ensure that these provide an adequate level of service under uncertain future conditions. This includes methods to rigorously quantify the level of service, model the uncertainty over variable parameters, identify maintainable, resilience flexible and responsive design solutions, run simulations to estimate their impact (i.e., costs of interventions and risk on the service) and identify the optimal balance with the costs of construction. Prerequisite: CM 51000.**Credits:** 3.00

CM 63700 - Computer Vision Application For Smart Infrastructure Management

Credit Hours: 3.00. This graduate-level course is for students who major in Construction Management Technology, Construction Engineering and Management, Civil Engineering, and other related majors in the architecture, engineering, and construction domain. Computer vision (CV) technology can play a critical role in constructing and managing built environments (infrastructure systems and facilities). It promises to become even more critical in the next few decades as technologies are more efficient and effective for infrastructure inspection and maintenance. The CV technologies include the principles and utilization of object detection, action recognition, and 3D reconstruction technologies. This course will offer the students the advanced knowledge and ability to come up with a solution for infrastructure and facility management challenges by evaluating current

computer vision technologies. After this course, the students can evaluate appropriate computer vision algorithms and develop frameworks for various infrastructure management problems by creating their own training data sets and models.**Credits:** 3.00

CM 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required.**Credits:** 1.00 to 18.00

CMGT 12000 - Materials And Methods

Credit Hours: 3.00. Introduction to common construction terminology, materials, methodologies, building codes, structural fundamentals, and contract documents related to buildings, industrial facilities, and infrastructure. Field trips to production / fabrication facilities for each type of material (wood, steel, concrete, and masonry).**Credits:** 3.00

CMGT 15000 - Surveying

Credit Hours: 3.00. Fundamental concepts and practical applications related to measurement of vertical and horizontal distances and angles using the tape, level, and total station. Computations of grades, traverses, areas, and curves. Basic concepts and applied use of topography, contours, and topographical maps.**Credits:** 3.00

CMGT 21000 - Quantity Take-Off

Credit Hours: 3.00. Study of methods to estimate material quantities for construction projects. Topics include, interpreting construction drawings, fundamental construction technology, quantity take-offs. Excel and take-off software are used.**Credits:** 3.00

CMGT 25000 - Mechanical And Electrical Systems

Credit Hours: 3.00. Methods for design, construction and inspection of mechanical and electrical systems for buildings. Emphasis on heating and cooling loads, equipment selection, duct and pipe sizing, codes, safety installation, inspection, commissioning, and estimating. Responsibilities of the general contractor for HVAC (heating, ventilating, and air-conditioning), electrical and plumbing work.**Credits:** 3.00

CMGT 26000 - Statics

Credit Hours: 3.00. Forces acting on bodies at rest, including coplanar, concurrent, and non-concurring systems; equivalent force systems and distributed forces. Use of free body diagrams and equations of equilibrium in solving problems for array of determinate structural systems: trusses, pin frames, arches, cables, retaining walls, and beams. Load tracing to examine the overall structural conditions with regards to lateral and gravity loads.**Credits:** 3.00

CMGT 31000 - Cost Estimating

Credit Hours: 3.00. Study of methods to estimate quantities and costs for material, labor and equipment; establishing direct overhead and markups including indirect overhead and profit for a construction project; software applications for estimating; conceptual estimating procedures; and subcontractor qualifications and scope of work.**Credits:** 3.00

CMGT 32000 - Scheduling And Project Control

Credit Hours: 3.00. A study of the planning and control of construction schedules. Topics include Gantt charts, critical path method (CPM) network scheduling, and monitoring and controlling the schedule. Lab work includes the application of MS Project for creating, presenting, revising, updating and controlling construction schedules.**Credits:** 3.00

CMGT 33000 - Contract Administration And Specifications

Credit Hours: 3.00. Study of the contractual organization and administration of a construction project. Topics include, analysis of delivery systems, working with contracts, general and special conditions of the contract, specifications, project communication, payment applications, change orders and close out. Project management software is used.**Credits:** 3.00

CMGT 35000 - Materials Testing

Credit Hours: 2.00. Laboratory and field testing of structural materials to determine their mechanical properties and behavior under load. Materials included are steel, aluminum, concrete, wood, and asphalt.**Credits:** 2.00

CMGT 36000 - Strength Of Materials

Credit Hours: 3.00. Stress-strain relationships of construction materials. Consideration of strength issues related to major classes of engineering materials including steel, concrete, and wood. Composite analysis; shear forces and bending moments in beams. Introduction to analysis and design of steel and wood beams and columns, beam deflections.**Credits:** 3.00

CMGT 38000 - Infrastructure Planning, Engineering, And Economics

Credit Hours: 3.00. Introduction to the planning and analysis of infrastructure projects. The focus will be on the prioritization, stewardship, management and decision-making roles within the division of a large public works agency. This course will cover municipal infrastructure system, infrastructure alternatives, financial and economic analyses, environmental and social impact assessment, uncertainty and risk-benefit analysis, sustainability, and public-private partnerships including numerous case studies.**Credits:** 3.00

CMGT 39000 - Construction Experience III

Credit Hours: 1.00. Supervised pre-professional learning experience that allows students to apply their skills and knowledge in a professional setting. This experience is designed to enhance the student's preparedness for an intended career in the construction profession. A minimum of 400 work-hours is required.**Credits:** 1.00

CMGT 41000 - Equipment And Field Operations

Credit Hours: 3.00. Study of heavy equipment used in construction operations with an emphasis on equipment selection, application, cost, productivity, safety, and economics.**Credits:** 3.00

CMGT 42000 - Safety And Inspection

Credit Hours: 3.00. Study of safety regulations, practices, policies, and procedures required for construction projects. Topics include, accident investigation, record keeping, OSHA reporting requirements, inspections, and hazards. Included is an OSHA safety card.**Credits:** 3.00

CMGT 43000 - Jobsite Management

Credit Hours: 3.00. Examination of construction project management on the jobsite. Topics include, submittals, record keeping, jobsite layout, meetings, negotiations, dispute resolution, labor relations, safety, subcontracting, quality, cost control, waste management, changes, claims, progress payments, and project closeout.**Credits:** 3.00

CMGT 44000 - Project Management Capstone

Credit Hours: 3.00. Students apply the knowledge and skills, acquired during their construction management program of study, to simulate the construction management process on an actual construction project. Includes role playing and a formal oral presentation.**Credits:** 3.00

CMGT 45000 - Structural Systems And Analysis

Credit Hours: 3.00. Analysis of the structural characteristics of common construction materials, including: wood, steel, concrete, masonry, and light gauge metal in order to integrate structural elements into complete structural systems in the construction of modern buildings and structures to withstand gravity, wind, earthquake, and other environmental forces.**Credits:** 3.00

CMGT 46000 - Soils And Foundations

Credit Hours: 3.00. Study of soils and foundations in the construction projects. Topics include, fundamental soil engineering theories, properties of soils, soil classification, compaction, permeability, stress, shear strength, consolidation, and bearing capacity.**Credits:** 3.00

Consumer Science

CSCI 31700 - Computation For Scientific Applications

Credit Hours: 3.00. Prerequisite: N207 or equivalent. This course gives a survey and overview of popular computational software used in multiple scientific domains to support data processing and scientific research. This class focuses on teaching how to use software to efficiently process data in terms of modeling, simulating, visualizing and data-mining. Fundamental concepts related to scientific computing are introduced briefly.**Credits:** 3.00

CSCI 36100 - Fundamentals Of Software Project Management

Credit Hours: 3.00. Tools and techniques used to manage software projects to successful completion. Problem solving focus to learn specification development and management, program success metrics, UML modeling techniques, code design and review principles, testing procedures, usability measures, release and revision processes, and project archival.**Credits:** 3.00

CSR 10000 - Introduction To CSR

Credit Hours: 1.00. A workshop to familiarize students with the CSR department, department majors, advising resources, and major requirements. Special emphasis on basic freshman survival skills. **Credits:** 1.00

CSR 10300 - Introduction To Personal Finance

Credit Hours: 3.00. This course will provide knowledge and skills for young adults to be active, informed, and rational managers of their financial life. The course will particularly address the following 4 areas of personal finance. Managing money: Why it's useful to plan ones financial affairs, budgeting, being an informed manager of ones money and consumer of financial products. Financing large items using savings and credit: Know how credit works, how to use it wisely, and how to avoid over indebtedness. Learn savings strategies to maximize the growth of your money. Using financial markets: What are the different

ways to invest, and how to make them work for you and your objectives (such as retirement). Managing risk: How to use financial tools (such as insurance) to protect yourself against risk. The course will emphasize age-relevant knowledge and practical advice, with the objective to help students make better financial decisions and adopt better financial behaviors for the long term. Typically offered Fall Spring.**Credits:** 3.00

CSR 12800 - Introduction To Apparel Design

Credit Hours: 3.00. This course introduces the fundamentals of the Apparel industry, design, and assembly through lectures, discussions, readings and application in an Apparel laboratory. The student will learn the proper operation of industrial garment production equipment. Further, the course will introduce the manufacturing standards of apparel assembly through garment construction, principles of fit and fiber, and fabric performance. Typically offered Fall.**Credits:** 3.00

CSR 20000 - Professional Development In Consumer Science

Credit Hours: 1.00. Professional Development in Consumer Sciences & Retailing is a required course that will provide the necessary techniques to manage job search skills and career development for both current and future professional needs. The covered topics will expose students to on-campus resources, opportunities to gain key networking skills, and establish their professional identity to better prepare students for the current job market. **Credits:** 1.00

CSR 20100 - Introduction To Professional Sales

Credit Hours: 3.00. Introduction to sales process, business to business communication strategies, and expectations of a sales professional.**Credits:** 3.00

CSR 20900 - Introduction To Retail Management

Credit Hours: 3.00. Retail career paths, management training, merchandise control, organization and service structure, and a comparison of store types. **Credits:** 3.00

CSR 21500 - Textile Industry

Credit Hours: 3.00. Fundamentals of the textile industry addressing the lifecycle of textile products beginning with the source and properties of textile fibers to the steps in the production of textile products and their impact on product performance and consumer satisfaction. Generate an awareness of the global textile industry as it relates to the impact on the environmental and social communities. Emphasis on retail, apparel, and interior design applications. **Credits:** 3.00

CSR 22000 - Apparel Design I

Credit Hours: 3.00. Introductory course that deals with the evolution of apparel design through the principles of flat pattern design, three-dimensional draping, and computer-aided design (CAD for pattern design). Fundamentals for apparel design. Students create designs for a basic, sleeveless, collarless top. **Credits:** 3.00

CSR 22100 - Apparel Design II

Credit Hours: 3.00. Continued development of apparel design from concept to finished product through the application of flat pattern design, draping, and computer-aided design. Building on the introductory course to create apparel wear design that includes sleeves, collars, blouses/shirts, dresses, pants, and skirts. Introduction to pattern grading manually and through CAD, and marker for apparel production. **Credits:** 3.00

CSR 22200 - CAD For Apparel Pattern Design

Credit Hours: 3.00. Study of computer-aided-design for apparel pattern making, pattern grading, and marker making for the manufacture of apparel and other sewn products. Operation of CAD system from Gerber Technology AccuMark PDS & GMS, and PDM (Product Data Management) are incorporated in this course. **Credits:** 3.00

CSR 25500 - Apparel Showcase

Credit Hours: 2.00. Production of annual apparel showcase of apparel original designs and artwork of Apparel Design majors. All students in the Apparel Design major work on teams to produce the annual event. **Credits:** 2.00

CSR 28200 - Customer Relations Management

Credit Hours: 3.00. A course that provides insight into the structure and working of customer relations management and its role in business and government agency. Analysis of how consumer needs, complaints, and education are handled. Customer relations' management in the real world and techniques used in managing customer relations toward the goal of maximizing customer satisfaction. This course has a real-world focus and is more applied than the usual introductory course. **Credits:** 3.00

CSR 30000 - Field Experience In Retail Management

Credit Hours: 1.00. Approved in-service training, a total of 140 hours; development of activities plan; and report of activities. Recommended for semesters 3,4,5, or 6. Advance approval of director and employer and attendance at pre- and post-organizational meeting is required. Permission of instructor required. **Credits:** 1.00

CSR 30700 - Field Experience In Selling And Sales Management

Credit Hours: 1.00. Approved in-service training and supervised work experience in selling and sales management. Total of 140 hours required with in-depth report and analysis of activities. Permission of department required. **Credits:** 1.00

CSR 30900 - Leadership Strategies

Credit Hours: 3.00. Provides knowledge of humanistic processes that contribute to development of effective leadership. **Credits:** 3.00

CSR 31000 - Buying Of Merchandise

Credit Hours: 3.00. Principles of volume buying applicable to department, chain, specialty, and independent stores.**Credits:** 3.00

CSR 31500 - Relationship Selling

Credit Hours: 3.00. This course focuses on long-term relationship selling. The course is organized around a seven-step selling process which has proven to be effective. The course adds to this process some principles of marketing and business strategy. The elements are necessary for the success of professional salesperson both in successful prospecting and making strategic choices as to how to allocate their time within the territory. Important to the learning process is actually practice of principles. Students will do various exercises of principles such as prospecting and negotiation. At the end of the semester, students will hone the skills learned through the semester with a series of role plays designed to put them in position of both seller and buyer.**Credits:** 3.00

CSR 32200 - Field Experience In Apparel Design And Technology

Credit Hours: 1.00 to 3.00. Approved in-service in the apparel industry and any related sewn product company and/or theatrical production. This field experience is intended to provide the opportunity for a student to apply skills and expertise gained through

the study in apparel design courses. Required report of daily responsibilities plus a final report. Minimum of 140 hours of work per credit hour; Required 2 credits minimum. Advanced approval of director and employer; and attendance at organization meeting. Permission of department required. **Credits:** 1.00 to 3.00

CSR 32300 - Visual Merchandising

Credit Hours: 3.00. Creative experimentation, production, and analysis of promotional formats for merchandising of product in a retail setting. Study of the elements and principles of design and their application for promotion of retail merchandise and/or services. **Credits:** 3.00

CSR 32800 - Apparel Art And Design

Credit Hours: 3.00. Exploration and experimentation of creative rendering of apparel design through the use of various media. Opportunity for the students to develop their own unique style of illustrating fashion. **Credits:** 3.00

CSR 33100 - Consumer Behavior

Credit Hours: 3.00. An interdisciplinary survey of consumer behavior theory focused on psychological, sociological, and cultural influences on consumer choice and use of products and services. Credit will not be given for both CSR 33100. **Credits:** 3.00

CSR 33200 - Cross-Cultural Marketing And International Retailing

Credit Hours: 3.00. Examination of marketing/retail practices used to target domestic and global consumer market segments. Development of successful retail and marketing strategies is stressed. **Credits:** 3.00

CSR 34100 - Luxury Brand Management

Credit Hours: 3.00. Students examine the innovation and creativity that foster the development of luxury brands in the current business environment. A key facet of this course is the opportunity to develop unique brand strategies that generate social, aesthetic, quality, and emotional value for luxury consumers. Students learn the ways brands tailor services, products, and experiences to achieve these goals.**Credits:** 3.00

CSR 34200 - Personal Finance

Credit Hours: 3.00. The class covers a comprehensive discussion of investments, consumer credit, insurance and retirement issues. The goal is to show how these components are interconnected in order to create a complete picture of financial health of an individual. CTL:IPO 1811 Personal Finance **Credits:** 3.00

CSR 34400 - Fundamentals Of Negotiations

Credit Hours: 3.00. This course is designed to be relevant to the broad spectrum of bargaining "problems" that are traditionally faced by the manager, sales personnel and financial advisors. The course explores the processes of bargaining and negotiation as social and managerial activities. Special emphasis will be given to the areas of interpersonal and interpersonal and intergroup conflict, in addition to the interpersonal influence techniques and the tactics and strategies involved with improved bargaining and negotiation. The major purpose of the course is for each student to gain insight into his or her own negotiating style and to become a more effective negotiator, as well as a more astute observer of social process. The course will involve extensive use of cases, role-plays, and related participative activities, enhanced by rigorous self-review and introspection. **Credits:** 3.00

CSR 35500 - Apparel Showcase

Credit Hours: 1.00. Planning of annual apparel showcase of apparel original designs and artwork of Apparel Design majors. All juniors and seniors in the Apparel Design major work with co-leaders to plan the annual event. This course will be an avenue to work with special projects as requested by outside interest groups. **Credits:** 1.00

CSR 35700 - Retail Technology: Merchandise Planning And Allocation

Credit Hours: 3.00. The application of software technology in retail merchandising, planning and allocation systems. Builds on basic knowledge of buying functions utilizing industry software, to develop skills needed in higher-order planning and allocation of merchandise. Students apply knowledge and skills through simulations with real-world data.**Credits:** 3.00

CSR 38600 - Risk Management

Credit Hours: 3.00. The course includes principles of insurance, analysis and evaluation of risk exposures, legal aspects of insurance, insurance needs and analysis, policy selection, and insurance company selection and due diligence. Types of insurance that are studied include: property and casualty, health, life, long-term care, disability and general business liability. **Credits:** 3.00

CSR 39000 - Undergraduate Special Problems

Credit Hours: 1.00 to 6.00. Individual participation, supervised reading, laboratory or field experiments, or research in special areas of the field. Permission of instructor required. **Credits:** 1.00 to 6.00

CSR 39100 - Undergraduate Structured Problems

Credit Hours: 1.00 to 3.00. Group participation in an organized class, a structured workshop, or research problem in a particular area of the field. Permission of instructor required. **Credits:** 1.00 to 3.00

CSR 39500 - Special Projects

Credit Hours: 1.00 to 6.00. Individual participation in supervised undergraduate project. Open to qualified upperclassmen. Permission of department required. **Credits:** 1.00 to 6.00

CSR 39700 - Directed Honors Research

Credit Hours: 1.00 to 3.00. Directed independent honors research for CFS Honors Program students. Students must select a faculty advisor for the course. Permission of instructor required. **Credits:** 1.00 to 3.00

CSR 39800 - International Special Topics

Credit Hours: 1.00 to 6.00. Course taken during an International experience that is recognized by the University. Permission of department required. **Credits:** 1.00 to 6.00

CSR 39900 - Undergraduate Special Topics In CSR

Credit Hours: 1.00 to 6.00. Various topics that may change from semester to semester are presented by CSR faculty. Permission of department required. **Credits:** 1.00 to 6.00

CSR 40300 - Retail Management Internship

Credit Hours: 3.00. A supervised full-time internship in retail and related industries. This experience will enable students to further develop their professional interests and skills. Prior field experience and completion of application and pre-approval of internship by internship director and attendance at pre- and post-organization meetings is required. Permission of department required. **Credits:** 3.00

CSR 40600 - E-Retailing

Credit Hours: 3.00. To provide understanding of the technological and retail infrastructure that underlines doing retailing over the internet. Build an understanding of business strategies over the net. To identify management issues and consumer issues in e-retailing. **Credits:** 3.00

CSR 41500 - Sales Force Management

Credit Hours: 3.00. An introduction to sales force management. An examination of the sales force management process, including principles of recruiting and selecting, training, compensation, motivation, supervision, and evaluation. Planning skills, including sales force deployment and the role of the sales force in sales forecasting, are also covered. **Credits:** 3.00

CSR 41600 - Retail Supply Chain Management

Credit Hours: 3.00. Supply chain management is a set of approaches utilized to efficiently integrate all parties of the supply chain to fulfill a request from a customer. Companies like Amazon, Zara, Walmart, Toyota, Dell, and Procter & Gamble are proof that excellence in supply chain management is a must to achieve industry leadership. With increasing competition around the globe, supply chain management is both a challenge and an opportunity for companies. The main goal of this course is to introduce you to the key concepts and techniques that will allow you to analyze, manage and improve supply chain processes for different industries. The course is a combination of lectures, case studies, in-class exercises, and games with the goal of defining key tradeoffs that managers need to understand and evaluate to successfully manage complex supply chains. Quantitative tools designed to evaluate these tradeoffs will be studied and used extensively throughout the course. Topics that will be covered in this course include: Managing inventory, forecasting in supply chains, the optimal design of the supply chain, transportation and distribution, bullwhip effects and dealing with uncertainty, sourcing and supply contracts.**Credits:** 3.00

CSR 41800 - Selling And Sales Management Capstone

Credit Hours: 3.00. A capstone course in advanced professional selling taught in a seminar format and designed to prepare students for the transition from student to professional. Students are introduced to practitioner-focused issues involved in long-term, major B2B account sales and an emphasis is placed on professional presentation skills. Students will complete a senior group research project and a major account sales project. Professional dress code from business-casual to full-business attire required based on the scheduled day-to-day activity. **Credits:** 3.00

CSR 42100 - Apparel Design III

Credit Hours: 3.00. Creation of apparel product line or collection from concept to consumer. Application of principles of apparel design from rendering, technical sketches, pattern design, pattern grading, marker making, and construction of several apparel garments from the line or collection. **Credits:** 3.00

CSR 42300 - Apparel Portfolio/Professional Development

Credit Hours: 3.00. Exploration of employment-seeking skills including cover letters and resume writing, networking, job-seeking organization and interview practice. Creation and development of various forms of computer-generated art for the portfolio including fashion illustration, textile design, storyboards, and line brochures as well as stationary and business card design. **Credits:** 3.00

CSR 48000 - Financial Counseling And Planning Internship

Credit Hours: 1.00. Supervised internship in the financial services industry. The experience will enable students to develop their professional interest and skills. Attendance at a pre-planning meeting required. Permission of department required. **Credits:** 1.00

CSR 48100 - Ethics And Behaviors In Financial Planning

Credit Hours: 3.00. As research in behavioral finance makes increasingly clear, understanding the psychology of financial behaviors is a critical skill for financial planners. Simultaneously, understanding ethical challenges to financial planners' own behaviors, and complying with new and ever more complex regulations, is a key requirement of successful and relevant financial planning and advice-giving. The course will enable students to be better financial planners by reviewing rules of behaviors for financial planners, improving students' capacity to provide fiduciary advice, and enhance their ability to integrate psychological insights into customers' financial behavior throughout the financial planning process. **Credits:** 3.00

CSR 48400 - Consumer Investment And Savings Decisions

Credit Hours: 3.00. A survey of consumer investment alternatives, with emphasis on financial assets. **Credits:** 3.00

CSR 48500 - Case Studies In Financial Planning

Credit Hours: 3.00. Financial planning principles and practice. Course utilizes a case study approach toward financial planning for upper- and middle-income households. Business calculator required. **Credits:** 3.00

CSR 48600 - Retirement Planning And Employee Benefits

Credit Hours: 3.00. Analysis of employee benefit plans, retirement needs analysis, and types of retirement plans including employer-sponsored plans and participant-directed plans. **Credits:** 3.00

CSR 49000 - Independent Study

Credit Hours: 1.00 to 4.00. Independent study. Permission of instructor required. **Credits:** 1.00 to 4.00

CSR 49700 - Honors Research Project

Credit Hours: 1.00 to 4.00. The completion of the independent honors research project for CFS Honors Program students. Must have an approved Honors Project Proposal. Permission of instructor required. **Credits:** 1.00 to 4.00

CSR 50300 - Transitional Health Disparities: Research, Practice, And Policy

Credit Hours: 3.00. This course will provide an overview of quantitative and qualitative research methods, measurement models, and research skills relevant to translational health science and the transfer/translation of knowledge from the research setting to applied practice settings. Course material will place special emphasis on research skills for developing health disparities translational researchers and strategies for being culturally competent, and career-minded in the mediation, cultivation, and development of translational research skills, and the implementation of evidence-based practices. Emphasis is placed on service needs of marginalized populations. Typically offered Fall. **Credits:** 3.00

CSR 58100 - Social Marketing And Social Change

Credit Hours: 3.00. Healthy lifestyle impacts people's quality of life at the individual and population level. Social marketing, as a process, applies marketing principles and techniques to benefit the target audience and the society through its approach for developing programs to promote healthy living. This course aims to equip learners the knowledge, skills, and technologies of social marketing to develop strategies for reaching out to target clients and effectively collaborate with the clients in addressing their behavior of health concern given their unique culture and social environment. Prerequisites: Prior learning of marketing and/or health related subject matters is preferred. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

CSR 59000 - Special Problems In Consumer Sciences And Retailing

Credit Hours: 1.00 to 4.00. Credit variable. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 4.00

CSR 60000 - Introduction To Research In Consumer Sciences And Retailing

Credit Hours: 3.00. Introduction to research development, evaluation and analysis in the consumer sciences and retail management. Emphasis on preliminary stages of the research process including critical reading, preparation of literature reviews, scholarship standards, and preliminary proposals for research. Required of all graduate students entering CSR. Typically offered Fall.**Credits:** 3.00

CSR 60300 - Advanced Writing For Consumer And Public Health

Credit Hours: 3.00. This course is designed to focus on one of the most essential professional and academic skills: writing. This course will provide resources and support for students to achieve goals in composing public health research-based manuscripts for publication and presentation, skillfully crafting grant applications for internal and external funding, and exploring publishing beyond academic journals. Typically offered Spring.**Credits:** 3.00

CSR 62300 - Design And Analysis Of Public Health Interventions

Credit Hours: 3.00. (HK 67500) Professional competencies in design, implementation, evaluation and diffusion of health interventions in community settings. Program planning paradigms, determinants of health behavior, and behavior change strategies serve as a basis for analyzing health interventions. Typically offered Fall Spring Summer.**Credits:** 3.00

CSR 63100 - Consumer Behavior Theories

Credit Hours: 3.00. An examination of research methods, principles, and theories of social science as they apply to the study of consumer behavior and marketing sciences. Prerequisite: STAT 50100, STAT 50200, or PSY 60000, PSY 60100. Typically offered Fall Spring.**Credits:** 3.00

CSR 68100 - Consumption Theories

Credit Hours: 3.00. Analysis of theories of consumption with emphasis on their relation to current practices and to the history of economic thought. Permission of instructor required. Typically offered Summer Spring.**Credits:** 3.00

CSR 68200 - Analytical Tools For Consumer Economists

Credit Hours: 3.00. Economic and analytical skills needed to interpret and conduct research in family and consumer economics. Focuses on consumer theory and includes theory of the firm, price theory, and welfare economics. Prerequisite: ECON 25100, ECON 25200, and 3 credit hours at the lower division undergraduate level in Economics. Enrolled in Selling & Sales Mgmt, Retail Management, Apparel Design & Tech or Financial Counsel & Planning.**Credits:** 3.00

CSR 69000 - Independent Study In Consumer Sciences And Retailing

Credit Hours: 1.00 to 6.00. Topic and credit to be arranged. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 6.00

CSR 69700 - Final Non-Thesis Paper

Credit Hours: 1.00 to 3.00. The curriculum of consumer behavior and family and consumer economics has evolved in the past decades with the changing market trend to currently encompassing specializations for meeting the diverse and integrated needs of individual consumers, their families, and communities. The non-thesis option is called to respond to the increasing market demand for professionals who are able to solve practical issues in the field in addition to mere epistemological pursuits. This proposed new course is designed for the students from this option to organize their learnings in the option in a way that provides propositions and strategies for addressing their topics of interest. Hence, this course should be taken during the last semester of the student's Master's program. The students will work with their major advisors for the topic and design of the study. Prerequisites: The students should take this course during the last semester of their non-thesis master's program. It is preferably taken after the students have completed the recommended core courses. Permission of Instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 3.00

CSR 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 18.00

CSR 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 18.00

Critical Disability Studies

CDIS 23900 - Introduction To Disability Studies

Credit Hours: 3.00. Introduces students to the principles of and debates within disability studies. Topics explored include ideas of normalcy; the social model of disability; history of eugenics and its current manifestations; relations between disability and other identity categories; issues of social and physical access; cultural representations of disabled people. **Credits:** 3.00

CDIS 29000 - Special Topics In Critical Disability Studies

Credit Hours: 3.00. Various topics in critical disability studies, changing from semester to semester as presented by different instructors.**Credits:** 3.00

Dance

DANC 10100 - Modern Dance Technique I

Credit Hours: 2.00. An introduction to the techniques and principles of modern dance. Typically offered Fall Spring.**Credits:** 2.00

DANC 10200 - Ballet I

Credit Hours: 2.00. An introduction to the techniques and principles of classical ballet. Typically offered Fall Spring.**Credits:** 2.00

DANC 10300 - Jazz Dance I

Credit Hours: 2.00. An introduction to the principles of jazz dance techniques: alignment, isolations, rhythmic patterns, and basic locomotion. Typically offered Fall Spring.**Credits:** 2.00

DANC 20100 - Modern Dance Technique II

Credit Hours: 2.00. A continuation and refinement of the modern dance techniques and principles addressed in DANC 10100. Typically offered Fall Spring.**Credits:** 2.00

DANC 20200 - Ballet II

Credit Hours: 2.00. A continuation of the principles and techniques of classical ballet addressed in DANC 10200. **Credits:** 2.00

DANC 20300 - Jazz Dance II

Credit Hours: 2.00. A continuation and refinement of the jazz dance concepts and movement vocabulary addressed in DANC 10300. **Credits:** 2.00

DANC 23000 - Biomechanics Of Dance, Movement and Strength

Credit Hours: 2.00. This course will provide conceptual and experiential understanding of biomechanical approaches to dance technique. Through studio, lecture, movement exercises and assignments, the students will learn to perform all types of dance and movement with ease, strength and economy of motion. Typically offered Fall Spring.**Credits:** 2.00

DANC 24000 - Dance Composition

Credit Hours: 3.00. An introduction to the theory and practice of the principles and utilization of choreographic tools; movement exploration, manipulation of basic dance elements, development of movement themes, and application of compositional dance forms. Typically offered Fall Spring.**Credits:** 3.00

DANC 24500 - Practicum In Dance Performance And Production

Credit Hours: 1.00 to 2.00. Open through audition. The study and practice of dance rehearsal, performance and basic concert production techniques, culminating in a main-stage dance concert. Permission of instructor required.**Credits:** 1.00 to 2.00

DANC 26000 - Dance Improvisation

Credit Hours: 3.00. In this course students explore a variety of techniques for creating movement. While physically researching concepts from a broad spectrum of improvisational artists, students expand their boundaries and definitions of dance, art and creativity. Important concepts include choice making, moving from internal motivations, and ensemble collaboration. All backgrounds in dance and movement are welcome, and will benefit from this course.**Credits:** 3.00

DANC 26100 - Contact Improvisation

Credit Hours: 3.00. This course is both a physical practice and philosophical exploration of the techniques and underlying premise of this contemporary partner dance form. CI training involves a practice of movement improvisation while developing the body's ability to attend to the effects of gravity, muscle tone, and anatomical structures on dancing solo and in partnership. While increasing their body awareness, respect, sensitivity and connection, students learn about collaborative community creativity, which can be applied in other settings including design, performance, and social activism. DANC 26000 is a good preparation for this course, but not required. Course may be repeated for credit. **Credits:** 3.00

DANC 30000 - Performance Production

Credit Hours: 3.00. This course teaches many aspects of producing a performance, from backstage to onstage. Students will learn the technical aspects of creating a professional performance by both observing performance production and developing an actual performance, which this semester is the Xperimental 2024 Concert. Students may participate in the production in a variety of active roles; however, they will be exposed to all aspects through observation, participation, and discussion. Production roles include: director and assistant director, choreographer, performer, lighting design and staging, sound design and technical support, and stage crew (stage manager, house manager, ticket manager, setup and strike support). Occasional class sessions cover skills to enhance your knowledge of some areas of production such as sound design, and lighting technology. For many students who are at the university level, the art of performance is defined almost totally by the act of being on stage performing, in studios or on stages. This course is designed to invite students to learn about all the activities that are done behind the scenes in order for live performances to be presented to an audience. We will discuss what is involved in both large institutional performance spaces, and compare this to our university performance. Then we will discuss what this scenario looks like for performance professionals after college. This course will greatly enhance students' ability to produce their own events in the future, and develop greater appreciation for the collaborative nature of live performance as art form. **Credits:** 3.00

DANC 30100 - Modern Dance Techniques III

Credit Hours: 2.00. A continuation and refinement of the modern dance techniques and principles addressed in DANC 20100 . Emphasis placed on expressive qualities of movement. Typically offered Fall Spring.**Credits:** 2.00

DANC 34500 - Choreography

Credit Hours: 3.00. This course focuses on methods and practices of choreographing contemporary dance works. It teaches the choreographic process: how to create original movement and expand and build both solo and group dance works. Basic compositional elements of exploring and manipulating movement and structuring choreographed material are utilized. The development of production elements are taught to support choreographic intent. Highly recommended before enrolling in this course: DANC 24500 and DANC 30100. Typically offered Fall Spring.**Credits:** 3.00

DANC 34600 - Intermediate Choreography

Credit Hours: 1.00 or 2.00. A study of selected principles underlying the design of group performance in modern dance. Permission of instructor required. Typically offered Fall Spring.**Credits:** 1.00 or 2.00

DANC 35000 - Dance For The Camera

Credit Hours: 3.00. An introduction to technical and aesthetic techniques to create screendance or dance film, with an emphasis on camera use, editing techniques, development and production of choreographic projects designed specifically for film format.**Credits:** 3.00

DANC 35100 - Intermedia Dance Technology

Credit Hours: 3.00. An introduction to dance and intermedia within the choreographic process. Integration of movement and various forms of technology which might involve digital images, film, animation, programming, sensors, sound, lighting and/or robotics.**Credits:** 3.00

DANC 36800 - Dance Sound Design

Credit Hours: 1.00. The study and application of sound design for dance, with emphasis on creation of sound scores for Modern Dance concerts. Instructor permission required. Typically offered Fall Spring.**Credits:** 1.00

DANC 37800 - Survey Of Concert Dance History

Credit Hours: 3.00. This course is a broad a survey of concert dance history predominately in the 20th and 21st century in Western cultures. The direct relationship and influence of the culture, training, choreographic, and performative records of dance practices, to socio-political ideologies of gender, race, sexuality, and national identities will be the area of investigation. Students will read, watch, research and actively participate in discussion regarding important dance figures, movements, eras, and their social and cultural reverberations. Dance's relationship to other art practices throughout history will also be a subject of lecture and discussion. Typically offered Fall Spring.**Credits:** 3.00

DANC 37900 - The Art Of Protest: An Examination Of The Role Of Arts, Artists, Activism, & Social Transformation

Credit Hours: 3.00. Throughout history, art has been used to advocate for political movements and provoke social action and transformation. This course examines the role of the arts and the artist and their relationship to activism throughout history and beyond. We will investigate how art has been used as a tool to transform cultural perspectives, alter policies, and promote social change. We will explore a range of artists whose methodologies, materials and approach challenge the cultural norms. From printmakers to musicians, to choreographers, to performance artists, students will engage and evaluate the act of art-making as a tactic of resistance and the responses to those acts. We will investigate readings that argue for and against the need for artists to make work that politically challenge their society. Once a foundation of knowledge has been laid, we will turn to the creative process through an investigation of materials and practices -performance, mixed media, and photography. Students will research, watch, discuss, create, and perform their own projects that promote social transformation. **Credits:** 3.00

DANC 49000 - Special Problems In Dance

Credit Hours: 1.00 to 3.00. Individual readings, topics, or projects in dance. Permission of instructor required. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

Earth Atmospheric and Planetary Sciences

EAPS 1000N - Earth And Our Environment

Credit Hours: 3.00. An introduction to geology through discussion of geological topics that show the influence of geology on modern society. Topics include mineral and energy resources, water resources, geologic hazards and problems, geology and health, and land use.**Credits:** 3.00

EAPS 1110N - How The Earth Works

Credit Hours: 3.00. Introduction to processes within and at the surface of the earth. Description, classification, and origin of minerals and rocks. The rock cycle. Internal processes: volcanism, earthquakes, crustal deformation, mountain building, plate tectonics. External processes: weathering, mass wasting, streams, glaciers, ground water, deserts, coasts. With laboratory GEOL G1200, equivalent to IU GEOL GEOL G1030, IU GEOL GEOL G1110, and PU GEOS 11100.**Credits:** 3.00

EAPS 10000 - Planet Earth

Credit Hours: 3.00. An introduction to the Geosciences-Earth science, oceanography, atmospheric science and astronomy. The course emphasizes topics (earthquakes, volcanoes, ocean pollution, climate change, severe weather, etc.) that are of general interest and relevance, and the interconnections between various Earth processes. Typically offered Fall Spring. CTL:IPS 1730 Earth Science**Credits:** 3.00

EAPS 10400 - Oceanography

Credit Hours: 3.00. Origin of the oceans and marine life. Seafloor spreading and marine geology; currents, waves, and tides; marine organisms and ecology; beaches and nearshore life. Man's use and abuse of the sea, including contemporary problems and future opportunities. The role of oceans in climate and evolution of the biosphere. Typically offered Fall Spring Summer.**Credits:** 3.00

EAPS 10500 - The Planets

Credit Hours: 3.00. This course is designed for science and non-science majors alike to learn about the origin and characteristics of the bodies in our Solar System, including planets, moons, asteroids, comets, exoplanets beyond, and the search for extraterrestrial life. We'll discuss how solar systems form and die, the origin of the terrestrial versus giant planets and their orbits, the evolution of planetary surfaces due to asteroid impacts and volcanism, the development of atmospheres, the formation of planetary rings, the origin of moons, the hazards of space travel, and why Pluto IS a planet.**Credits:** 3.00

EAPS 10600 - Geosciences In The Cinema

Credit Hours: 3.00. This course is designed for science and non-science majors alike to learn about natural hazards based on the depictions of such hazards in movies. Topics include earthquakes, tsunamis, volcanoes, tornadoes, hurricanes, climate change, asteroid impacts, space exploration, and wildfires. The course focuses on the accuracy of the depiction of natural hazards in the movies, the underlying processes that control their formation and the dangers they represent, how they influence society, and how students can prepare for them and keep themselves safe. **Credits:** 3.00

EAPS 10900 - The Dynamic Earth

Credit Hours: 3.00. This course covers the formation and development of the solid earth, atmosphere, hydrosphere, and biosphere. The course studies the whole earth as a system of many interacting parts and focuses on the changes within and between these parts. This course is intended for all majors in earth and atmospheric sciences. Typically offered Fall.**Credits:** 3.00

EAPS 11100 - Physical Geology

Credit Hours: 3.00. Geologic processes and the development of land forms. Laboratory covers the study of minerals and rocks, the interpretations of topographic and geologic maps, and field investigations. Typically offered Summer Fall Spring. CTL: Physical Geology**Credits:** 3.00

EAPS 11200 - Earth Through Time

Credit Hours: 3.00. The history of the planet Earth from its beginnings to the present. This course will explore the causes and effects of processes that have changed the Earth's surface and subsurface through time, the impacts of these changes on the evolution of life, and how scientist interpret Earth history from the geologic record. The laboratory will provide hands-on experience in interpreting various geologic and fossil records. This course may be taken on its own, or as a year-long lab series with EAPS 11100. EAPS 11100 and EAPS 11200 will fulfill the two course sequence laboratory experience outside the major department. Typically offered Spring.**Credits:** 3.00

EAPS 11600 - Earthquakes And Volcanoes

Credit Hours: 3.00. A survey class on earthquakes and volcanoes. Topics include earthquake hazards and forecasting, the use of seismic waves to investigate the earth's interior, volcanoes and tectonics, volcanic hazards, and the influence of volcanoes on climate. Examples of recent and historic earthquakes and volcanic eruptions are presented. Typically offered Spring.**Credits:** 3.00

EAPS 11700 - Introduction To Atmospheric Science

Credit Hours: 3.00. The weather/climate system. Solar variability and Milankovitch Theory. Atmospheric scales of motion. Chemistry of greenhouse gases and aerosols. Fundamental laws of meteorological dynamics and radiation. Weather systems, air masses and fronts. Severe storms, hurricanes and tornadoes. (Required for atmospheric sciences majors.). Typically offered Spring.**Credits:** 3.00

EAPS 11800 - Introduction To Earth Sciences

Credit Hours: 3.00. Introduction to a range of topics in Earth Science, including: Origin and geological history of Earth, including geological records of climate and evolution; Earth materials (minerals and rocks); Chemical and physical composition and structure of the Earth; Rock weathering, erosion, and sedimentary processes; Geological timescale; Geologic structures including their map and field expression; Tectonic processes; The hydrological cycle with emphasis on groundwater and physical and chemical oceanography; Energy and mineral resources; Astrobiology. (Required for Geology and Geophysics and Earth and Space Science Teaching majors.) Typically offered Spring.**Credits:** 3.00

EAPS 12000 - Introduction To Geography

Credit Hours: 3.00. Introduction to the major themes of modern geography, designed to enhance your spatial thinking skills, geographic literacy, and to help you understand the relevance of geographic concepts and how they relate to our changing world. This course will expand your awareness of global issues and provide you with tools to understand how the world around you changes at local, regional, and global scales.**Credits:** 3.00

EAPS 12500 - Environmental Science And Conservation

Credit Hours: 3.00. (AGRY 12500, FNR 12500, NRES 12500) Introduction to environmental science and conservation includes topics in ecological principles, conservation and natural resource management, human impacts on the environment, toxic waste disposal, climate change, energy, air and water pollution, environmental geology and geologic hazards. Typically offered Fall Spring.**Credits:** 3.00

EAPS 12900 - Earth System Dynamics

Credit Hours: 3.00. Provides foundational knowledge and critical thinking skills to discuss the Earth's changing climate and environment and their impacts. Introduces how the components of the Earth system - atmosphere, hydrosphere, lithosphere, and biota -- interact with each other in response to various forcings. Course is designed to enhance learners' geospatial-temporal thinking skills and geoscience literacy, as well as analyze some of the 'what if' scenarios using a 'systems approach'. Typically offered Fall Spring Summer.**Credits:** 3.00

EAPS 13700 - Freshman Seminar In Earth, Atmospheric, And Planetary Sciences

Credit Hours: 1.00. Seminar presented by guests in different fields of the Earth and Atmospheric Sciences to expose students to the range of topics included in the department and in possible career paths. Typically offered Fall Spring.**Credits:** 1.00

EAPS 13800 - Thunderstorms And Tornadoes

Credit Hours: 3.00. Not open to juniors and seniors majoring in atmospheric science. An elementary treatment of the physical structure of the atmosphere and the dynamical conditions that lead to the development of convective clouds, thunderstorms, and severe weather (including tornadoes, hail, wind, rain, lightning, and flash floods). This course will also focus on storm climatology, the socioeconomic impact of severe weather, as well as prediction, detection, warnings, and safety procedures. Analysis of severe weather events will include tornado movies and case studies of ground/aerial surveys of storm damage. Typically offered Fall.**Credits:** 3.00

EAPS 19100 - Introductory Topics In Earth And Atmospheric Science

Credit Hours: 1.00 to 3.00. Introductory special topics in earth and atmospheric sciences. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 3.00

EAPS 20000 - Water World: Processes And Challenges In Global Hydrology

Credit Hours: 3.00. Introduction to the Hydrological Sciences designed for undergraduate students. Course uses an Earth-systems approach to emphasize the interconnections and feedback between the hydrosphere, geosphere, biosphere, and atmosphere. Course topics will include: global water-balance, techniques for measuring components of the water-balance, hydrological uncertainties, groundwater, surface-water, vadose zone, forest and watershed hydrology, global change hydrology, human and climate impacts on water resource, and water on the worlds. Typically offered Fall Spring Summer.**Credits:** 3.00

EAPS 20500 - Fundamentals Of Planetary Science

Credit Hours: 3.00. This course provides a quantitative understanding of the fundamental principles that govern the behavior of planetary systems, including their atmospheres, surfaces, interiors, and orbital dynamics. This course is intended to be a quantitative follow-on to EAPS 10500, and aims to provide students with hands-on experience with physics-based problem solving, scientific programming, and developing research projects. Lecture periods will include lectures as well as group work on problems, and lab periods will focus on programming projects in Python. By the end of the course, students will have a strong foundation in the principles and techniques of planetary science and be well-prepared to engage in upper-year courses and conduct planetary science research. It is recommended that students have completed EAPS 10500 The Planets, PHYS 17200 Modern Mechanics or equivalent, and have some previous programming experience (preferably in Python).**Credits:** 3.00

EAPS 22100 - Survey Of Atmospheric Science

Credit Hours: 3.00. (NRES 23000) An introductory course for both science and nonscience students. A general study of the atmosphere, basic meteorological principles, and weather systems. Relationships of the changing atmosphere to climate ozone depletion, and other contemporary issues. Typically offered Summer Fall Spring.**Credits:** 3.00

EAPS 22500 - Science Of The Atmosphere

Credit Hours: 3.00. This course provides a quantitative introduction to how to use the laws of physics to understand the behavior of the Earth's atmosphere. Emphasizes key processes that govern the climate system and the weather phenomena that arise within it. Topics covered may include the Earth's energy balance, heat transfer, the greenhouse effect, atmospheric convection, precipitation, the general circulation, the Coriolis effect, atmospheric chemistry, weather systems, weather forecasting, and climate change. **Credits:** 3.00

EAPS 22700 - Introduction To Atmospheric Observation And Measurements

Credit Hours: 3.00. Survey of principal techniques, tool, and instruments used in atmospheric science research. Students work on research projects designed in coordination with EAPS faculty. Topics are complimentary to those covered in EAPS 22500 and may include either observational analysis, numerical modeling, or both. Topics to be covered include hypothesis formulation, literature search, training on the necessary instruments and numerical modeling tools, experiment design and execution, statistical analysis, student-designed experiment revision, scientific writing, and presentation of findings to the class and interested EAPS faculty.**Credits:** 3.00

EAPS 23000 - Laboratory In Atmospheric Science

Credit Hours: 2.00. A laboratory course that introduces the fundamentals of atmospheric science through quantitative exercises. The theoretical exercises include the vertical structure of the atmosphere, the Earth's energy budget, atmospheric moisture, saturation and stability, clouds and precipitation and atmospheric motion. Data and map analysis exercises include mid-latitude cyclones, thunderstorms and tornadoes, hurricanes and controls of climate. Prior or current course work in introductory atmospheric science is required. This course may not be taken for credit by students in the atmospheric science option of the Department of Earth and Atmospheric Sciences.**Credits:** 2.00

EAPS 23001 - Laboratory In Atmospheric Science: Introduction To Weather And Climate Datasets

Credit Hours: 2.00. This course is a Python-based introduction to the array of weather and climate datasets freely available on the internet in an online computational laboratory setting. The course will emphasize the importance of having data be freely available and "FAIR" (Findable, Accessible, Interoperable, Reusable) from the point of view of the philosophy of science, from a data science perspective, and from a practical "how to do it" perspective.**Credits:** 2.00

EAPS 24300 - Mineralogy

Credit Hours: 4.00. Elements of crystallography, physical and chemical properties of rock-forming minerals, and minerals of economic importance. Origin and occurrence of minerals. Prior course work in dynamic earth or physical geology is required.**Credits:** 4.00

EAPS 24400 - Earth Materials II

Credit Hours: 4.00. The study of common igneous, sedimentary, and metamorphic rocks. The origin and occurrence of rocks, weathering, and alteration processes. Prior course work in earth materials or mineralogy is required. Typically offered Spring.**Credits:** 4.00

EAPS 30100 - Oil!

Credit Hours: 3.00. Petroleum is a common thread that interweaves Geoscience with the Political-Economic history of the 20th century. Its dominance in current society has major repercussions on our current and future society and environment. The unequal distribution of petroleum and natural gas, coupled with innovative geologists and engineers, has set the stage for the modern geo-political world. This course is a unique survey into the multitude of aspects of petroleum -- from its formation to "resource wars". Typically offered Fall.**Credits:** 3.00

EAPS 30900 - Computer-Aided Analysis For Geosciences

Credit Hours: 3.00. Application of computer analysis techniques including error analysis, line and surface fitting, spatial and temporal correlations, contouring, interpolation, and map projections. These methods are discussed in terms of specific geologic applications. All exercises and examples are developed using commercial mathematical software package. A three-hour-per-

week computer laboratory tutorial provides hands-on experience with the techniques discussed in class. Prior course work in computer programming is required.**Credits:** 3.00

EAPS 31000 - Introductory Statistics For Geosciences

Credit Hours: 3.00. Introductory course in statistics and quantitative reasoning for students in geosciences. Topics covered include probability distributions of discrete and continuous random variables, simulation, confidence intervals and hypothesis tests for one and two samples, inference for regression and correlation. Typically offered Fall Spring.**Credits:** 3.00

EAPS 31201 - Earth Systems Science For Elementary Teachers

Credit Hours: 3.00. An Earth Systems Science perspective draws upon the wealth of Earth systems science research in both content and pedagogy. This approach has served as a guiding framework for how students learn, engage in, and develop deep understandings of the interconnections among Earth's many different systems of geosphere, hydrosphere, atmosphere, and biosphere and the important role that human civilization plays in affecting Earth's other systems. This course takes an Earth Systems Science approach - an emerging transdisciplinary endeavor - to build students' understanding of the structure and functioning of the Earth as a complex, adaptive system.**Credits:** 3.00

EAPS 31500 - Biogeochemistry

Credit Hours: 3.00. The course examines the main element cycles of Earth: carbon, oxygen/hydrogen, nitrogen, sulfur, phosphorous, and trace metals, and how they are interconnected from terrestrial, aquatic/ocean, and atmospheric perspectives. General chemistry concepts such as equilibrium, free energy, electrochemistry are used to understand the energetics of the cycles. Connection between the cycles and environmental problems, such as climate change and air pollution will be emphasized. Typically offered Fall or Spring.**Credits:** 3.00

EAPS 31900 - Exploring Earth Through Time

Credit Hours: 3.00. The course will explore the history of the Earth from its beginning 4.5 billion years ago to the present. Our understanding and insight into the history of the Earth has greatly expanded during the last several decades. Emphasis will be placed on the relationships of tectonic processes that shaped the surface of the Earth and the evolution of the Earth's biosphere. The course will also examine how the role of evolution of life has played in the history of the atmosphere and oceans. Typically offered Spring.**Credits:** 3.00

EAPS 32500 - Aviation Meteorology

Credit Hours: 3.00. This course is designed for students who have an interest in topics in meteorology applied to aviation operations with emphasis on meteorological hazards for instrument flight. Topics covered include obtaining and evaluating weather data, review of synoptic meteorology, map analysis, the ICAO standard atmosphere, pressure and altimetry, atmospheric thermodynamics, moisture and stability, low-IFR operations, aircraft icing, turbulence, thunderstorms and associated hazards, and interpretation and use of radar and satellite imagery. Prior course work in introductory atmospheric science and pre-calculus is required. Typically offered Spring.**Credits:** 3.00

EAPS 32700 - Climate, Science And Society

Credit Hours: 3.00. This course will examine the broad problems of climate change by examining the relationship between science, politics, and society by using climate change as a lens through which to examine larger issues. Students will be encouraged to identify similar themes in their own experiences as emerging scientists, engineers and global leaders. Adequate preparation to write essays and perform basic arithmetic calculations needed. Prior knowledge of climate change science is not necessary. Typically offered Fall Spring.**Credits:** 3.00

EAPS 34400 - Igneous And Metamorphic Petrology

Credit Hours: 4.00. This course provides an overview of igneous and metamorphic petrology including, but not limited to, the following topics: experimental petrology and phase diagrams, melting of the Earth's interior, understanding the relationship between mineralogy, chemical composition, and physical conditions, relating magmatism and metamorphism to different tectonic environments, and exploring the similarities, and differences, between magmatism on Earth and other planetary bodies. The lectures and labs emphasize developing a basic understanding of petrology and petrologic processes, rather than the simple memorization of terms, definition, and facts.**Credits:** 4.00

EAPS 35200 - Structural Geology

Credit Hours: 3.00. This course deals with the nature and evolution of structures in rock deformed naturally by flow and fracture, as deduced from experimental, theoretical and field studies. Specific topics include: structures in three dimensions using descriptive geometry and stereonets, field measurements of rock geometry, tensors, strain and stress, the theory of brittle and plastic rock behavior, theory and field observation of folds and faults, structural analysis of an outcrop, the structure and mechanics of mountain belts. Students will be expected to show competency with using a general set skills, techniques, and tools commonly used by professional geoscientists. Typically offered Spring.**Credits:** 3.00

EAPS 35300 - Earth And Planetary Surface Processes

Credit Hours: 3.00. Introduction to a variety of topics in sediment transport and deposition, emphasizing linkages between active processes, landscape evolution, and the rock record. Comparisons will be made between surface processes occurring on Earth and other planetary bodies in the Solar System. Topics include: introductory fluid mechanics; sediment transport by water, ice, and wind, and the development of fluvial bed forms, glacial landscapes, and sand dunes; groundwater geochemistry and the development of karst and caves; impact cratering; comparative planetology. Each major topic is accompanied by field projects that emphasize local geologic history. **Credits:** 3.00

EAPS 35400 - Earth And Planetary Geophysics

Credit Hours: 3.00. This course will explore geophysical processes from the scales of individual stresses that deform rocks, to plate motions, to planetary-scale interiors and phenomena. Emphasis will be focused on sources of stress and how this stress is manifested, heat transfer, and fluid processes. Seismic waves, gravity data, planetary shape, and what information they provide about the interior of solid planets will be discussed. The course material will be applied to Earth, other rocky worlds like the Moon and Mars, and icy moons like Europa and Enceladus. This course is an introduction to geophysical processes and serves as a stepping-stone to upper level geophysics courses such as EAPS 35200, EAPS 45000, and EAPS 55700.**Credits:** 3.00

EAPS 36000 - Great Issues In Climate Change And Society

Credit Hours: 3.00. This course develops basic skills and knowledge critical to analyze issues of energy use, climate change, and sustainability that incorporate both societal and scientific perspectives. The goal of this course is not to arrive at particular consensus solutions to the problems associated with these issues but instead to foster an informed (through information literacy) debate that will ultimately be waged as solutions are sought. Working in teams the students work throughout the semester to complete a capstone teamwork project and a group presentation. Counts for Great Issues course in College of Science.**Credits:** 3.00

EAPS 36400 - Natural Hazards: Science And Society

Credit Hours: 3.00. This course will investigate the role of data and science in policy and decision-making as it relates to natural hazard resiliency. The scientific fundamentals of specific hazards will be introduced along with an explanation of how available data, various policies, programs, and real-time decisions can impact a community's response and recovery from disasters. Guest speakers describe their role in specific disasters, and in framing the policies and decisions made in the aftermath of the natural

hazards. This course counts as a Great Issues course in the College of Science for Juniors and Seniors. Typically offered Spring.**Credits:** 3.00

EAPS 36700 - Survey Of Planetary Atmospheres

Credit Hours: 3.00. This course is intended to serve as an introduction to the diversity of planetary atmospheres in our solar system and beyond for those without an atmospheric science background. Topics to be covered in this class include: The basic structure and properties of an atmosphere, how planetary atmospheres form / are eroded, the balance of radiation and its effect on atmospheric motions, the presence and formation of hazes, clouds, and aerosols, fundamental atmospheric compositions and chemistry, the connections between planetary interiors, surfaces, and atmospheres, and how we measure and interpret observations of exoplanet atmospheres. To achieve this, we will learn about Earth's atmosphere and us our terrestrial template to compare, contrast, and explore the atmospheres of other astronomical bodies.**Credits:** 3.00

EAPS 37500 - Great Issues - Fossil Fuels, Energy And Society

Credit Hours: 3.00. Prosperity of the 20th century was based on abundant and cheap energy; during the 21st century we will be faced with difficult challenges. Our society will face higher energy prices, decline of petroleum based fuels supplies, increased environmental effects of fossil fuels usage, and the challenge of solving the technological problems of developing alternative fuels. This course will review the structure, economics, and geopolitical issues faced by fossil fuel industries and the mitigation strategies that will be needed to change to low fossil fuel use society based on low polluting renewable energy sources. Counts for Great Issues course in College of Science for Juniors and Seniors. Typically offered Fall Spring.**Credits:** 3.00

EAPS 38500 - Principles Of Engineering Geology

Credit Hours: 3.00. Application of geology to evaluation of design and construction problems relating to dams, highways, tunnels, and reservoirs; review of construction material sources and their utilization. A field investigation is required. Prior course work in mineralogy, petrology or geology for engineers is required. Typically offered Spring.**Credits:** 3.00

EAPS 39000 - Geologic Field Methods

Credit Hours: 3.00. Introduction to geologic mapping principles on quadrangle (7 1/2 min., 15 min., 1:250,000 scales) maps. Application of aerial photography, GPS, and GIS techniques. Emphasis on construction of cross sections, measurement of stratigraphic sections, and preparation of geologic reports. Several weekend field exercises will be required. Typically offered Spring.**Credits:** 3.00

EAPS 39100 - Topics In Earth And Atmospheric Sciences

Credit Hours: 1.00 to 4.00. Intermediate special topics in the earth and atmospheric sciences. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 4.00

EAPS 39500 - Astrobiology

Credit Hours: 3.00. Course explores current ideas on how life originated on Earth and may have originated elsewhere in the universe. Lectures will cover zones of habitability in stellar systems, planetary surface and atmosphere evolution and the environment of the early Earth. Topics include how life on Earth functions and its earliest evolution, SETI, planetary quarantine, panspermia, mass extinctions and the potential for life elsewhere in our own solar system. Typically offered Fall.**Credits:** 3.00

EAPS 40000 - Planetary Sciences Senior Capstone

Credit Hours: 3.00. In this course, students will use the knowledge they have gained as part of their education at Purdue to develop a comprehensive science-driven planetary exploration strategy. First, students will review the history of planetary exploration. Next, students will understand the current landscape for planetary exploration including missions and instruments which will soon fly. Throughout the course, student-led research and presentation exercises will build to the development of a mission concept for planetary exploration.**Credits:** 3.00

EAPS 41900 - Internship In Environmental Geosciences

Credit Hours: 1.00 to 6.00. This course provides students with an opportunity to gain practical work experience in environmental geoscience. The student works with a faculty advisor to set up an internship consisting of the equivalent of at least six weeks of full-time employment with a government agency, business, or consulting company. Internships typically involve field, laboratory, and office work. A portion of the internship may be part-time work during a regular semester, but at least three consecutive weeks must be full-time work. One credit hour per week of unpaid internship. Six week internship. Prior course work in upper level EAPS courses is required. Permission of department required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 6.00

EAPS 42000 - Global Change Modeling

Credit Hours: 3.00. Understanding, monitoring, and modeling global environmental change. Each session examines the response of the interrelated earth systems to different geological, ecological, atmospheric, oceanic, or societal impacts. Topics include global warming, major biogeochemical cycles, atmospheric ozone, coevolution of life and climate, asteroid impacts, and ecological disruptions. The laboratory uses object-oriented modeling software and current NASA satellite data. No prior knowledge of computer programming is required. Typically offered Spring.**Credits:** 3.00

EAPS 42100 - Atmospheric Thermodynamics

Credit Hours: 3.00. (AGRY 43100) Structure and composition of the atmosphere. Thermodynamics of dry and moist air, including adiabatic and pseudo-adiabatic processes, hydrostatic stability, and air mass determination. Prior course work in introductory atmospheric science, second semester physics or thermodynamics is required. Typically offered Fall.**Credits:** 3.00

EAPS 42200 - Atmospheric Dynamics I

Credit Hours: 3.00. (AGRY 43200) A study of the general system of equations governing mass and momentum changes in the atmosphere; special horizontal wind representations, thermal wind relationships; circulation, vorticity, divergence, and vertical motion. Prior course work in atmospheric thermodynamics and differential equations is required. Typically offered Spring.**Credits:** 3.00

EAPS 42300 - Atmospheric Dynamics II

Credit Hours: 3.00. (AGRY 43300) An extension of EAPS 42200, with emphasis on perturbation theory and hydrodynamics stability, air mass and frontal theory, barotropic and baroclinic models, wave cyclone theory, and numerical weather prediction. Typically offered Fall.**Credits:** 3.00

EAPS 42501 - Physics Of Climate

Credit Hours: 3.00. To understand climate we describe and synthesize physical processes in the atmosphere and their coupling to the ocean, ice, and land. We quantitatively explore climatology with an equal balance of physical principles and scrutiny of available modern data. Topics include: visualization of atmospheric/land surface/oceanographic climatological data sets; theories of climate dynamics; and climate change. Beginning with radiative balance and simple energy balance models, the course progresses toward understanding the effects of radiative-convective forcing and rotation on the fluid envelopes. Analysis of data

in an interactive computer-enabled environment is an important part of the course. By the end of this course, the student should know how the Earth System behaves at large scales and grasp the physical understandings of why.**Credits:** 3.00

EAPS 43100 - Synoptic Laboratory I

Credit Hours: 1.00. (AGRY 44100) Analysis of vertical distributions of temperature and moisture with applications to adiabatic and pseudo-adiabatic processes, hydrostatic stability, and air mass determination. Prior course work in atmospheric thermodynamics is required. Typically offered Fall.**Credits:** 1.00

EAPS 43200 - Synoptic Laboratory II

Credit Hours: 1.00. Analysis of horizontal distributions of pressure, temperature, wind, vorticity, and vertical motions. Applications to synoptic-scale wave propagation. Prior course work in atmospheric thermodynamics and synoptic lab I is required. Typically offered Spring.**Credits:** 1.00

EAPS 43300 - Synoptic Lab III

Credit Hours: 1.00. (AGRY 44300) Diagnoses of midtropospheric wave propagation and growth. Analysis of surface pressure fields and fronts and their relationships to upper air features. Extensive use is made of teletype and facsimile weather information. Prior course work in atmospheric dynamics and synoptic lab II is required. Typically offered Fall.**Credits:** 1.00

EAPS 43400 - Weather Analysis And Forecasting

Credit Hours: 3.00. (AGRY 44400) In-depth study of contemporary weather analysis and forecasting techniques and problems. Extensive use is made of teletype and facsimile data and numerical weather prediction guidance provided by the National Meteorological Center. Typically offered Spring.**Credits:** 3.00

EAPS 44500 - Spacecraft Design

Credit Hours: 3.00. Senior students perform a team-based spacecraft design, requiring application of the education and skills developed in the planetary sciences curriculum. Components include analysis methods for preliminary design, development of an initial spacecraft and mission concept, and development of a complete numerical model of the mission, culminating in oral and written reports by the teams. Typically offered Fall, Spring.**Credits:** 3.00

EAPS 44600 - Geochemistry

Credit Hours: 3.00. This course provides an overview of the processes controlling the distribution of elements within the solid Earth as well as the hydrosphere and atmosphere.**Credits:** 3.00

EAPS 45000 - Physics And Chemistry Of Solid Earth

Credit Hours: 4.00. Physics of the earth's interior, including seismic velocity and density structure, seismic wave propagation, and gravitational and magnetic fields. Thermal history of the earth. Chemical and mineralogical composition of the earth, radioactivity, isotopes, and geochronology. Magma generation, crustal evolution, and tectonic models. Prior course work in chemistry, physics, calculus, earth materials, and plate tectonics is required. Typically offered Fall Spring.**Credits:** 4.00

EAPS 47400 - Sedimentary Geology

Credit Hours: 4.00. Systematic study of continental and marine depositional environments. Interpretation of sedimentary facies, structures, and microfacies. Principles and applications of stratigraphy, including applications of paleontology, field relations, paleomagnetism, well logs, seismic reflections, and chemistry. Field investigations may be required. Prior course work in earth materials, mineralogy and petrology is required.**Credits:** 4.00

EAPS 47500 - Geology And Geophysics Field Camp - Wasatch-Uinta Field Camp

Credit Hours: 6.00. The Wasatch-Uinta Field Camp is a six-week capstone course designed to prepare students for successful careers in the geosciences. This course emphasizes scientific methodology and traditional techniques that provide a strong foundation for the broad range of modern technologies used by today's industry, academic, government and private workforces. Students learn to develop research strategies, collect field observations and measurements, compile detailed rock descriptions, measure stratigraphic sections, and construct geologic maps and cross sections. Field exercises are located in geologically ideal locations in the Wasatch and Uinta mountains of Utah, the San Rafael Swell of southeastern Utah, Grand Teton National Park in Wyoming, and the Carlin-type gold deposits of Nevada. The Wasatch-Uinta Field Camp was established in 1967 by the University of Minnesota. The camp is operated by a consortium that currently includes Purdue University, the University of Minnesota-Duluth, University of Wisconsin-Madison, the University of Nebraska, and the University of Illinois.**Credits:** 6.00

EAPS 49000 - Field Geology In Rocky Mountains

Credit Hours: 6.00. Field studies in sedimentary, igneous, and metamorphic terrains. Studies may involve geologic mapping, stratigraphic section measuring, structural analysis and interpretation, geomorphic interpretation, and interpretation of geologic history. Field excursions include visits to several classical geologic localities in the Colorado Plateau, Great Basin, and Rocky Mountains with discussions and interpretations of features observed. Transportation fee plus room and board at field station required. Rigorous field work requires physical conditioning. Six-week session, including field excursion. Prior course work in earth materials, surface processes, and plate tectonics is required. Permission of instructor required.**Credits:** 6.00

EAPS 49700 - Earth And Atmospheric Sciences Undergraduate Readings And Research

Credit Hours: 1.00 to 6.00. Supervised reading and/or research in various fields. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 6.00

EAPS 50300 - Mars Seminar

Credit Hours: 3.00. This seminar course will introduce students to the origin and evolution of Mars through reading classic papers on the geology, atmosphere, and Interior of Mars, as well as in-class lectures, discussions, and a final paper.**Credits:** 3.00

EAPS 50400 - Geologic Dating Methods

Credit Hours: 3.00. This course covers general theory and applications of geochronology and thermochronology to questions in Earth and planetary science.**Credits:** 3.00

EAPS 50600 - Cosmochemistry And Geochemistry

Credit Hours: 3.00. The course focuses on the chemical processes involved in the formation and evolution of our solar system and our planet. The course includes discussion of nucleosynthesis and chemical abundances, the origin and composition of various planetary objects and their constituent materials, and the distribution and cycling of elements within and between different Earth systems, including the solid Earth, atmosphere, and oceans.**Credits:** 3.00

EAPS 50700 - Introduction To Analysis And Computing With Geoscience Data

Credit Hours: 3.00. Course teaches computing techniques including error analysis, line and surface fitting, interpolation, map projections, geospatial and temporal correlations, signal processing, and visualization with discussions on specific and practical geoscience applications. Lectures with computer exercises and team project reporting using open-source computer software. Cannot get credit for both EAPS 50900 and EAPS 50700.**Credits:** 3.00

EAPS 50701 - Geospatial Data Analytics

Credit Hours: 3.00. The course will introduce fundamental theories, analytical methods and programming skills that are needed to work with geospatial data. Students will learn the theories, methods, and techniques to visualize, analyze and model various geospatial data through hands-on computer programming practice based on various open-source geospatial libraries. To be specific, the course will use R and its related packages as the basic tool for implementation. The goal is to enable the learners to develop their own geospatial analytical applications. **Credits:** 3.00

EAPS 50801 - Geographic Information Systems

Credit Hours: 3.00. This course covers a range of fundamentals in geographic information science and technology. Students will learn the use of current popular geographic information system (GIS) tools to handle various geographic data. Through working on real-world geospatial problems, students shall gain extensive and hands-on experience in geographic data manipulation, visualization, and analysis. Course assignments are focused on both GIS theoretical basics and practical skills for students to achieve expected proficiency. The course will work with geospatial data in geography, topography, environmental science, hydrology, transportation, and geosocial science. It is targeted to students with interest in civil and environmental engineering, agriculture, geography, earth science, natural resources, smart cities or other related subjects. **Credits:** 3.00

EAPS 50900 - Data Analysis Techniques In Earth And Atmospheric Sciences

Credit Hours: 3.00. Application of statistical techniques to analyze and interpret data containing substantial information about the dynamics of our planet Earth. Emphasis on fundamentals with elements of atmospheric/climate time series analysis and weather and climate extremes (necessary for understanding current research) interwoven with computer-intensive bootstrap methods (which work for complex data sets typical in geosciences). Offered Spring.**Credits:** 3.00

EAPS 51000 - Climate Time Series Analysis

Credit Hours: 3.00. This course in time series analysis combines traditionally taught basics with topics of central importance in current weather and climate research, including long memory, extremes, nonlinear time series, chaos and complexity. Typically offered Fall Spring.**Credits:** 3.00

EAPS 51201 - Planetary Origins

Credit Hours: 3.00. The goal of this course is to introduce students to our current understanding of how planetary systems form and evolve. We will focus on the physical theories describing how the structures of planetary systems develop and how planets, moons, and other heavenly bodies form. We will also consider the relationship between these theories and observations (astronomical, geophysical, cosmochemical) of the Solar System and extrasolar planetary systems. This will include some discussion how the Solar System fits into our understanding of the veritable menagerie of planetary systems. **Credits:** 3.00

EAPS 51400 - Glacial And Quaternary Geology

Credit Hours: 3.00. Formation, dynamics, and regimen of glaciers. Erosional and depositional processes and landforms developed by alpine and continental glaciation. Glaciation of North America during the Ice Age, with emphasis on stratigraphy, soils, climates, biology, and physical changes resulting from glacial processes and environments. Application of glacial studies to agronomy, life sciences, climatology, oceanographic studies, and engineering problems. A one-day field investigation is required. Typically offered Spring.**Credits:** 3.00

EAPS 51500 - Geodata Science

Credit Hours: 3.00. Course covers a range of topics with applications of mathematical, statistical, numerical, and distributed parallel computing methods for modeling and understanding complex and large spatio-temporal geoscience datasets in the formats common to in-situ observations, asynoptic remote sensing data, volumetric gridded analysis, etc. Typically offered Fall Spring.**Credits:** 3.00

EAPS 51800 - Soil Biogeochemistry

Credit Hours: 3.00. This course will provide an introduction to the physical and microbial processes governing the cycling of photosynthetically-produced organic matter on land and in streams and rivers. Organic geochemical transformations in the soil and litter will be highlighted along with methods of characterization of the organic constituents. Biogeochemical concepts of stabilization and destabilization of soil organic matter and stress response of terrestrial ecosystems will be reinforced through manipulation of actual data sets.**Credits:** 3.00

EAPS 52000 - Theory Of Climate

Credit Hours: 3.00. A general introduction to the theory of climate at an intermediate level. A brief survey of physical climatology and paleoclimates. Theoretical development of climate models. Theories of climatic stability and climatic change.**Credits:** 3.00

EAPS 52100 - Atmospheric Chemistry

Credit Hours: 3.00. An introduction to the chemistry of the earth's atmosphere. Covers evolution of the earth's atmosphere, its physical and chemical structure, its natural chemical composition and oxidative properties, and human impacts, including increasing tropospheric ozone, decreasing stratospheric ozone, climate change, and acidic deposition. Typically offered Fall.**Credits:** 3.00

EAPS 52300 - Radar Meteorology

Credit Hours: 3.00. Origin and evolution of radar. Modern weather radar systems and their component parts. Propagation of microwave energy in the atmosphere. Rayleigh and Mie scattering theory, with application to scattering by precipitation. Utilization of radar systems in forecasting quantitative analyses and cloud physics research. Recent refinement and future potential. Prior coursework in synoptic meteorology labs and atmospheric physics is required. Typically offered Fall Spring.**Credits:** 3.00

EAPS 52400 - Laboratory Analysis

Credit Hours: 3.00. This course focuses on becoming familiar with various laboratory techniques used in the analysis of earth and planetary materials and understanding what questions data products from these techniques can answer. This course will include discussion of the instruments and how they operate, as well as provide hands-on experience working in the lab and processing data. **Credits:** 3.00

EAPS 52500 - Boundary Layer Meteorology

Credit Hours: 3.00. (AGRY 53500) A study of the physical nature of the lowest layers of the atmosphere. The energy balance concept and the turbulent transfer of heat, momentum, and water vapor are discussed in detail. Some specific microclimates are studied in this context. Typically offered Fall.**Credits:** 3.00

EAPS 52600 - Introductory Geofluid Dynamics

Credit Hours: 3.00. Provides a fluid dynamics background for graduate students interested in atmospheric sciences, oceanography, mantle convection, hydrology, turbulence, or pollution. Topics covered include: basic assumptions and deviations of Navier Stokes equations, conservation laws, vorticity, divergence, waves, and applications in atmosphere, ocean, and geophysics. Typically offered Spring Summer.**Credits:** 3.00

EAPS 52700 - Principles Of Terrestrial Ecosystem Ecology

Credit Hours: 3.00. The objective of this course is to build a conceptual model of terrestrial ecosystems and to provide students with the state-of-the-art mechanisms by which terrestrial ecosystems work. Topics include ecosystem concept, Earth's climate system, geology and soils, terrestrial water and energy balance, terrestrial production processes, terrestrial decomposition, terrestrial plant nutrient use and cycling, biogeochemical pathways, and ecosystem temporal and spatial dynamics. Permission of instructor required. Typically offered Spring.**Credits:** 3.00

EAPS 52900 - Modeling Ecosystems And Biogeochemical Cycles

Credit Hours: 3.00. Process-based models are powerful tools for studying ecosystem dynamics and geochemical cycles in Earth System Sciences. In this course, we will explore how various components of ecosystems can be modeled following principles of biology, physics, and chemistry. We will also examine techniques for using modeling to study: 1) responses of the structure and functioning of ecosystems to changing climate, atmospheric composition, environmental conditions, and human activities; and 2) exchanges of major greenhouse gases (e.g., CO2, CH4, and N2O) between the atmosphere and the biosphere. During the course, we will go through the whole cycle of system modeling approach including model conceptualization, formulation, parameterization, sensitivity and uncertainty analysis, verification, and application. Typically offered Fall.**Credits:** 3.00

EAPS 53000 - Extreme Weather And Climate: Science And Risk

Credit Hours: 3.00. Trains students in the analysis of risk due to meteorological hazards, including climate change. Focus on integrating the basics of probability theory, including calculation of hazard return periods and exceedance curves, with the fundamental physics of meteorological hazards. Hazards may include hurricanes, tornadoes, and floods. Typically offered Fall Spring Summer.**Credits:** 3.00

EAPS 53200 - Atmospheric Physics I

Credit Hours: 3.00. Cloud and precipitation physics and basic atmospheric radiative transfer. Introduction to computer-aided problem solving.**Credits:** 3.00

EAPS 53300 - Atmospheric Physics II

Credit Hours: 3.00. A continuation of EAPS 53200, covering the following selected advanced topics in atmospheric physics: gaseous absorption, Mie scattering, the equation of transfer, and radiative transfer in cloudy and hazy atmospheres. The application of radiative transfer in active and passive remote sensing. Advanced topics in atmospheric thermodynamics, such as heterogeneous systems, kinetic theory of gases, and planetary atmospheres. Basic ozone photochemistry applied to stratospheric and tropospheric pollution. Typically offered Fall.**Credits:** 3.00

EAPS 53400 - Tropical Meteorology

Credit Hours: 3.00. This course tackles the observed structure of the Earth's tropical atmosphere and the core theories that explain this structure and its variability. Topics include the 3D annual and seasonal mean state, the energy budget, the Hadley cell, monsoons, the Walker cell, equatorial waves, ENSO, convective aggregation, easterly waves, and tropical cyclones. **Credits:** 3.00

EAPS 53500 - Atmospheric Observations And Measurements

Credit Hours: 3.00. A course that introduces students to direct and remotely sensed observations of the atmosphere. Directly measured quantities discussed include temperature, pressure, moisture, wind, solar radiation, chemical properties of the atmosphere, etc. Remote sensing of cloud, precipitation, and air motion by weather radars, satellites, profilers, lidars, and other emerging technologies is reviewed. Students will gain experience in observation techniques and data interpretation, and will learn uncertainty and error assessment. Prior course work in atmospheric science and statistics is required. Typically offered Fall.**Credits:** 3.00

EAPS 53600 - Introduction To General Circulation

Credit Hours: 3.00. This course provides an overview of the general circulation of the atmosphere and oceans. Topics include: global energy balance, hydrological cycle, atmospheric general circulation and climate, ocean general circulation and climate, history and evolution of Earth's climate, climate sensitivity and feedback mechanisms, global climate models, natural climate change and anthropogenic climate change. Typically offered Fall Spring.**Credits:** 3.00

EAPS 53900 - Mesoscale Meteorology

Credit Hours: 3.00. Review of the theories applied in mesoscale meteorology, including semi-geostrophic systems and frontogenesis, symmetric instability, rainbands and inertia-gravity waves, sea-breeze, terrain effects, mountain waves, lee-vortices and cyclogenesis, convection, convective instability, low-level jets, drylines, and squall lines. Prior course work in synoptic labs and vector calculus is required. Typically offered Fall Spring.**Credits:** 3.00

EAPS 54000 - Introduction To Geodesy

Credit Hours: 3.00. Course offers an introduction and overview of theory, techniques, data sources, and applications of geodesy. Provides understanding of how various geodetic techniques work and how they can be used to investigate a number of geological, atmospheric, and related problems. Evaluation of the robustness and quality of data as well as assessment of models and conclusions derived from geodetic methods. Typically offered Fall Spring.**Credits:** 3.00

EAPS 54100 - Geodetic Data And Applications

Credit Hours: 3.00. This course will provide students with hands-on experience in the selection, processing, and analysis of geodetic data sets, particularly InSAR and GPS. Students will learn how to select data, evaluate its strengths and weaknesses, process and analyze the data, and apply it to the investigation of geological problems. Typically offered Fall Spring.**Credits:** 3.00

EAPS 54200 - Economic Geology: Petroleum

Credit Hours: 3.00. Fundamental principles of the origin, migration, accumulation, exploration, and development of petroleum. Study of reservoir fluids, reservoir mechanics, and primary and secondary production techniques. Methods of prospect and leasehold evaluation and economic appraisal. Offered in alternate years. Typically offered Fall Spring.**Credits:** 3.00

EAPS 55000 - Advanced Geophysical Field Studies.

Credit Hours: 1.00 to 3.00. Individual geophysical field investigations including organizing, conducting and reducing, and interpreting data under the guidance of a staff member. Permission of instructor required. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

EAPS 55501 - Numerical Modeling Of Planetary Orbits

Credit Hours: 3.00. The goal of the course is twofold. First, you will develop quantitative skills to understand the orbital motions of planets and minor bodies in planetary systems, both in our solar system and in exosolar systems. Second, you will develop practical skills and techniques for using computers to solve scientific problems. We will begin with classical analyses of the two-body and N-body problems. We will then learn about modern, powerful, analytical and numerical techniques. We will then see how these techniques are applied to solving real problems in understanding the origin and evolution of planetary systems. These problems will include understanding planet formation, planet migration, resonance dynamics and resonance capture, tidal evolution of planets and natural satellites, and the collisional evolution of small body populations. Permission from instructor required. **Credits:** 3.00

EAPS 55600 - Planetary Surface Processes

Credit Hours: 3.00. The application of petrology and structural geology to other planets. Topics include: theories of star and solar system formation, orbital dynamics and Kepler's laws, petrology and geochemistry of meteorites, age dating techniques, structure and composition of the terrestrial, giant, and icy planets, planetary surfaces, planetary atmospheres, and theories of the formation of the moon. Offered in alternate years. Prior course work in earth materials is required.**Credits:** 3.00

EAPS 55700 - Introduction To Seismology

Credit Hours: 3.00. Theory of propagation to seismic waves in elastic media. Solution of wave equations for compressional, shear, and surface waves. Analysis of travel-times, amplitudes, and attenuation of seismic waves in terms of ray and wave theory. Principles of the seismograph. Structure of the earth as determined by seismological studies. Investigation of the causes, effects, distribution, and characteristics of earthquakes. Earthquake prediction. Typically offered Fall.**Credits:** 3.00

EAPS 55900 - Topics In Seismology

Credit Hours: 1.00 to 3.00. This course covers current topics in seismology. Recent topics have included seismic structure of the crust and mantle, seismic anisotropy, and earthquake sources. Professor Nowack. Permission of instructor required. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

EAPS 56700 - Planetary Atmospheres

Credit Hours: 3.00. This course is intended to for upper-level undergraduates and graduate students and will provide an in-depth look into the to the diversity of planetary atmospheres in our solar system and beyond. Topics to be covered in this class include: The processes by which atmospheres are constructed and eroded over plants lifetime, radiative balance, general circulation, the formation of hazes, clouds, and aerosols, atmospheric compositions and chemistry, the link between planetary interiors, surfaces, and atmospheres, how we measure and interpret observations of exoplanet atmospheres, and much more. To achieve this, we will briefly introduce the properties and components of an atmosphere, visit the planetary atmospheres in our solar system to learn more, and finally explore exoplanetary atmospheres. **Credits:** 3.00

EAPS 57300 - Basin Analysis

Credit Hours: 3.00. Advanced study of tectonic evolution and stratigraphic history of sedimentary basins. Topics include formative mechanisms of different sedimentary basins; tectonic, eustatic, and climatic controls on basin stratigraphy; relationship of depositional systems to basin types; subsidence and thermal histories; and application of basin analysis to petroleum reservoir and ground water aquifer assessment. Required field trips. Offered in alternate years. Prior course work in sedimentology and stratigraphy is required. Typically offered Fall.**Credits:** 3.00

EAPS 57700 - Remote Sensing Of The Planets

Credit Hours: 3.00. Introduction to key planetary and Earth science satellite remote sensing datasets, including visible and thermal imagery, visible through mid-infrared spectroscopy, radar, gamma ray and neutron spectroscopy, and laser altimetry.

Students will receive hands-on-experience with data acquisition, image processing in IDL, spectral analysis in ENVI and Davinci, crater counting, and geologic mapping in GIS programs. Includes 1-2 full-day field trips. Junior, Senior, or Graduate status required. Recommended minimum background for undergraduates: Introductory knowledge of Earth or planetary surface processes and basic programming skills. Typically offered Fall Spring.**Credits:** 3.00

EAPS 58000 - Geodynamics

Credit Hours: 3.00. This course will provide students with a first order understanding of geophysical processes by developing analytical solutions to a variety of geophysical and planetary thermo-mechanical problems. Topics will include stress and strain, rheology, elasticity and flexure, faulting, and conductive heat transfer, and fluid mechanics. We will develop governing analytical equations based on first order principles, such as the conservation of mass, energy, and momentum, and solve these equations for a number of boundary conditions. Typically offered Fall, Spring.**Credits:** 3.00

EAPS 58300 - Geology Of Landfills

Credit Hours: 3.00. This course consists of the application of the geological sciences to the siting, exploration and site evaluation for solid waste disposal landfills, plus the evaluation of existing landfill facilities as they pertain to soils, bedrock, stratigraphy, landforms, geologic processes, and hydrogeology. Included are soil and rock exploration, laboratory testing, installation of ground water monitoring devices, and evaluation of contaminant transport. Both attenuation and confinement landfill systems are considered. Geological aspects of solid waste disposal regulations are reviewed and compared to those for hazardous waste disposal. Classroom discussions include evaluation of specific landfill examples and a semester project on a landfill evaluation. A one-day field investigation is required. Typically offered Fall.**Credits:** 3.00

EAPS 58400 - Hydrogeology

Credit Hours: 3.00. Investigates the qualitative and quantitative aspects of ground water location, occurrence, movement, evaluation, and development, and the influence of man upon this resource. Geologic and engineering aspects of ground water systems are discussed. Classroom teaching is complemented by problem sets and field trips. Typically offered Fall.**Credits:** 3.00

EAPS 58801 - Impact Cratering

Credit Hours: 3.00. Impact cratering is arguably the most pervasive geologic process in the solar system. In this course, we will study the physical process of impact cratering and its place in planetary science. The course will take a process-oriented approach to understanding impact cratering with firm foundations in geologic observation and impact experiments. To explore the extreme process of impact cratering, we will use continuum/rock mechanics, thermodynamics, numerical modeling, experiments, and observations. Principal topics will include the formation of craters from contact of the projectile to final crater morphology; shock metamorphism; impact ejecta and products; cratered terrains; impacts and planetary evolution; and impact hazards. **Credits:** 3.00

EAPS 59000 - Field Geology North America

Credit Hours: 2.00. Advanced study of tectonic evolution and stratigraphic history of specific geologic provinces. Particular emphasis on the relationship between tectonics, basin development, and sedimentation. Field component deals with application of field techniques used in basin analysis and structural studies. A 10-day field trip is required. Permission of instructor required. Typically offered Spring.**Credits:** 2.00

EAPS 59100 - Advanced Topics In Earth And Atmospheric Sciences

Credit Hours: 0.00 to 18.00. Specialized study offered on an individual basis or through specially arranged courses. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 0.00 to 18.00

EAPS 60000 - Writing Successful Science Proposals

Credit Hours: 3.00. This course is designed to teach graduate students the skills necessary to successfully garner extramural graduate, postdoctoral, and project funding. Topics will include identification of funding sources and development of research objectives and strategies. Emphasis will be on writing concise fellowships and full NSF-type research proposals. Class meetings will be interactive with an emphasis on peer review. Each student will complete a quality research proposal based upon their own research. Any graduate student with a nascent idea for a science or engineering project is encouraged to enroll. We have found that this course works especially well to help newer MS or PhD graduate students develop a research project, improve communication with their advisor, and organize their research priorities regardless of whether they use this course to submit a proposal. Typically offered Fall Spring.**Credits:** 3.00

EAPS 60200 - New Graduate Student Seminar

Credit Hours: 3.00. This course will provide students with the tools to succeed as a graduate student in the Department of Earth, Atmospheric, and Planetary Sciences, which include good communication with their advisors, graduate fellowship proposal writing, giving good talks and posters, giving and receiving critical reviews, an understanding of regulations and graduate timelines, formulating a plan of study, and resources available to help graduate students succeed. Permission of instructor required. **Credits:** 3.00

EAPS 62000 - Aerosols, Clouds And Climate

Credit Hours: 3.00. An exploration of the complex relationships between aerosols, clouds and climate, including the so-called "direct effect" of aerosol on the radiation balance and their numerous influences upon relevant cloud properties called "indirect effects", the impact of different cloud types upon incoming solar radiation and outgoing longwave radiation, the effects of anthropogenic aerosol and climate change on precipitation efficiency, and the representation of aerosol, clouds and cloud processes in climate models. Typically offered in alternating years Fall Spring.**Credits:** 3.00

EAPS 65000 - Advanced Topics In Geophysics

Credit Hours: 3.00. Specialized topics in geophysics such as heat flow, rock magnetism, and marine geophysics; varied depending on interest. Permission of instructor required. Typically offered Fall Spring.**Credits:** 3.00

EAPS 65200 - Folding Of Rocks

Credit Hours: 3.00. Theory and application of finite strain to the study of folded rocks, with numerous illustrations from literature. Presentation of modern theories of folding and density instability of single- and multi-layered rocks, with special emphasis on basic folding mechanisms. Treatment of linear viscous and power-law fluids. Second- and third-order analysis of causes of basic fold forms, such as concentric, chevron and kink folds, and mullion structure. Causes of drag folds and reverse drag folds. Offered in alternate years. Typically offered Fall.**Credits:** 3.00

EAPS 65300 - Fracturing Of Rocks

Credit Hours: 3.00. Description and analysis of joints and faults from the point of view of field geology and fracture mechanics. Three basic modes of fracture and their analogs in the Earth's crust. Also examined are structures, such as folds, pressure solution surfaces, basins, and mountain ranges associated with faults. Offered in alternate years. Prerequisite: differential equations. Typically offered Spring.**Credits:** 3.00

EAPS 65700 - Geophysical Inverse Theory

Credit Hours: 3.00. Investigates problems of determining physical parameters of the earth from remote observations of wave and potential fields. The theoretical topics include spectral and singular value decompositions, maximum likelihood and stochastic inversion, Backus and Gilbert theory, Green's function and linear operators, and the physics of layered media. Geophysical applications include seismic tomography, deconvolution, gravity and magnetics, earthquake sources, geodetics, and remote sensing. Offered in alternate years. Prior course work in advanced differential equations, physics, and chemistry of the earth is required. Typically offered Spring.**Credits:** 3.00

EAPS 68000 - Contaminant Hydrogeology

Credit Hours: 3.00. Covers the basic theory and applications of problem-solving exercises in hydrogeology, fluid mechanics, and chemistry of contaminated sites; flow and transport equations and models; investigational methods; remediation methods; case studies; and pertinent environmental laws. Prior course work in chemistry, computer programming, differential equations, and hydrogeology is required. Typically offered Spring.**Credits:** 3.00

EAPS 69100 - Colloquium In Earth, Atmospheric, And Planetary Sciences

Credit Hours: 1.00. This course is intended to expose students to the wide range of topics studied throughout the Department of Earth, Atmospheric, and Planetary Sciences, allows for interactions with outside experts and networking, and provides the opportunity for students to synthesize high level topics that may not be directly related to their scientific endeavors.**Credits:** 1.00

EAPS 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 18.00

EAPS 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 18.00

Economics

ECON 270EN - Introduction To Statistical Theory In Economics And Business

Credit Hours: 3.00. Describing populations and samples; introduction to inference, including confidence intervals and hypothesis testing; correlation and simple and multiple regression; Chi-square, non-parametric, test of independence. Uses a popular statistical package for demonstrating and solving statistical problems.**Credits:** 3.00

ECON 510 - Applied Game Theory

Credit Hours: 2.00. Game theory is a powerful tool that facilitates a decision making process of individuals. Games are characterized usually by two or more players where any player's action has an impact on other player's payoff. Players are decision making units, e.g. individuals, firms, workers, managers, countries etc. Game theory analyzes situations in which people (or other animals) interact by breaking these situations down into basic descriptions of the set of players, the strategies available to these players, and the payoffs that the players receive for different combinations of strategy choices. Permission of department required.**Credits:** 2.00

ECON 573 - Financial Econometrics

Credit Hours: 2.00. This course offers an introduction of basic principles of econometric analysis that will help students understand finance theories and their empirical applications. It will also equip students with appropriate statistical techniques for doing applied financial research. The statistical techniques are particularly well suited for analyzing financial time-series data. Permission of department required. Typically offered Spring**Credits:** 2.00

ECON 574 - Microeconometrics

Credit Hours: 2.00. This is a graduate-level course in microeconometrics. This course is primarily related to the specification and estimation of various models commonly encountered in microeconomic applications. The course will first briefly cover the theory of maximum likelihood estimation (MLE), and apply MLE in some introductory settings. These methods will then be applied to various latent-variable economic models including binary choice models (the logit, probit, and other alternatives), censored regression models (e.g., the tobit) and models for count data. Permission of department required. Typically offered Fall.**Credits:** 2.00

ECON 590 - Problems In Economics

Credit Hours: 1.00 to 4.00. Open only to a limited number of seniors and graduate students. Arrange with instructor before enrolling. Supervised reading and reports in various subjects. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 4.00

ECON 2510N - Introduction To Microeconomics

Credit Hours: 3.00. An analysis of evolution of market structure using the analytical concepts of supply and demand, opportunity cost, and marginal analysis. Applications include a variety of concurrent microeconomic issues.**Credits:** 3.00

ECON 2520N - Introduction To Macroeconomics

Credit Hours: 3.00. An introduction to macroeconomics which studies the economy as a whole; the level of output, prices and employment, how they are measured and how they can be changed; money and banking; international trade; and economic growth.**Credits:** 3.00

ECON 16500 - The Marketplace Of Economic Ideas Honors

Credit Hours: 3.00. Every day, every one of us makes choices and engages in social interactions, including exchange. We do this within a context of institutions - formal rules and informal norms that shape our incentives. The outcomes that emerge, and the value we create in the process, depends on those institutions and incentives. Economics is a broad and diverse body of ideas that helps us understand those everyday choices and the kinds of outcomes they generate. We will explore these economic ideas and the ways that institutions affect outcomes, from informal social norms all the way to big questions of social organization such as the contrast between capitalism and socialism. Our main method of exploring economic ideas will be communicating those ideas - through writing, video, and other multimedia approaches; we will build and deepen our understanding of economic ideas in society by explaining them, applying them, and sharing them with others. Course readings will include work by some of the most eloquent and effective economics communicators over the past 250 years up to today. Typically offered Fall.**Credits:** 3.00

ECON 21000 - Principles Of Economics

Credit Hours: 3.00. This course presents the principles upon which the social science of economics is based. Specifically, it examines how individuals, firms, and the government interact through markets. It also examines several important macroeconomic issues including unemployment, inflation, international trade, and economic growth. Students are expected to be able to apply these economic principles to analyze current events, work decisions, and personal choices. Typically offered Fall Spring Summer.CTL:ISH 1040 Introduction To Economics**Credits:** 3.00

ECON 21900 - Economics For Future Elementary Teachers

Credit Hours: 3.00. A principles of economics course designed for future elementary and social studies teachers. The purpose of this course is to: 1) introduce the future teacher to basic economic concepts required by the Indiana Academic Standards for Social Studies, K-6, 2) learn methods for teaching these concepts in the K-6 curriculum, and 3) develop a catalog of curriculum materials appropriate for teaching economics in grades K-6. No credit for management students. Typically offered Fall Spring.**Credits:** 3.00

ECON 21910 - Economics For Future Secondary Teachers

Credit Hours: 3.00. Upon completion of this course students will be able to analyze economic events in order to make more intelligent choices as consumers, workers, and voting citizens; identify and understand the basic concepts and principles of economics in order to meet standards at the secondary school level; identify supplemental materials and programs from variety of sources used in your teaching major, minor or as supplements in your classrooms; and review and organize lessons that teach economic concepts. No credit for management students. The course content is principles-level economics and is designed for social studies education students who are beginning their sequence of required economics courses. The course is designed to be taken before upper-division economic content courses. Typically offered Fall Spring.**Credits:** 3.00

ECON 25100 - Microeconomics

Credit Hours: 3.00. Microeconomics studies the choices individuals make and the incentives that influence those choices. Emphasis is on the incentives that determine market prices and resource allocation. The role of public policy in influencing incentives and efficiency is also addressed. Typically offered Fall Spring Summer. CTL:ISH 1042 Microeconomics**Credits:** 3.00

ECON 25200 - Macroeconomics

Credit Hours: 3.00. This course examines how the US economy functions and provides an overview of important macroeconomic issues including: unemployment, inflation, social security, national debt, international trade, the sub-prime crisis, and business cycles. Emphasis is placed upon the role and limits of government fiscal and monetary policy in promoting economic growth and stable prices.Typically offered Fall Spring Summer. CTL: ISH 1041 Macroeconomics**Credits:** 3.00

ECON 26000 - Data Visualization And Inference

Credit Hours: 3.00. Economics 260 is a self-contained introduction to statistics with economic applications. The goals of this course are to help students develop a working knowledge of data production and interpretation in an economics context, recognize the fundamental interconnectedness of economics and data, and introduce the basic concepts in statistics needed for further study of econometrics and provide basic preparation for ECON 36000. Topics include the organization, analysis, and interpretation of data; descriptive statistics; probability theory; sampling distributions; inference and hypothesis testing; and simple linear regression analysis. The approach of the class includes both learning the concepts behind basic statistics and also how to apply these concepts to make data-informed, real-world economic decisions. Students will become familiar with the common statistical techniques and databases for analyzing data by using both hand-calculations and STATA to analyze data. Typically offered Fall.**Credits:** 3.00

ECON 29000 - Sophomore Level Problems In Economics

Credit Hours: 1.00 to 4.00. Arrange with instructor before enrolling. Investigation in a specific economics field. Permission of instructor required.**Credits:** 1.00 to 4.00

ECON 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in economics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ECON 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in economics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ECON 30100 - Managerial Economics

Credit Hours: 3.00. This course provides a practical and business-focused approach to microeconomic theory. The course covers topics from consumer behavior and demand, decision under uncertainty, production and cost, factor demand, market structure, pricing strategies, and strategic behavior. Emphasis is placed on the tools used to analyze decisions made by managers at firms. This is a required course for several majors in the School of Management and for the business economics minor, but is not intended for economics majors. Typically offered Fall Spring Summer.**Credits:** 3.00

ECON 31200 - Energy Economics: Competition, Regulatory, And Environmental Policy

Credit Hours: 3.00. This course will introduce you to energy economics, divided into two broad categories - fuels (oil and natural gas) and electricity - and across three different areas of applied microeconomic theory: competition policy, regulatory policy, and environmental policy. We will analyze economic regulation in both fuels and electricity, developing the economic theory of regulation and exploring how regulation affects the decisions and behavior of regulated firms differently in the two different types of energy industries. We will also develop economic models to analyze the environmental consequences of energy use. Typically offered Spring.**Credits:** 3.00

ECON 32200 - Economics Of Public Policy

Credit Hours: 3.00. The examination and analysis of public finance practices and problems in the federal fiscal system. Government activities that involve spending and taxation are analyzed applying basic principles of economics. Topics include public education, social security, healthcare, environment and tax systems. State and local government issues are also addressed.**Credits:** 3.00

ECON 32500 - Economics Of Sports

Credit Hours: 3.00. This class applies economic principles to the professional sports entertainment industry and its derivative input markets. The class begins by examining the microeconomics of demand for (by fans) and supply of (by teams) sports entertainment. The labor markets for the primary input, athletic talent, receive significant attention. Coordination among economic agents, taking the forms of leagues, players' unions, and government, is considered at the end of the class, with an emphasis on how they affect the efficiency of the markets related to sports entertainment. Quantitative empirical analysis is emphasized throughout the class. This is not a sports trivia or fantasy sports strategy class. Typically offered Fall Spring.**Credits:** 3.00

ECON 34000 - Intermediate Microeconomic Theory

Credit Hours: 3.00. This course provides students with the techniques needed to model and analyze the behavior of individual economic agents. It introduces a variety of techniques that will allow students to solve business problems and make informed personal economic decisions. The course covers topics from consumer behavior and demand, decisions under uncertainty, production and cost, factor demand, market structure, pricing strategies, and strategic behavior. This is an upper-division

economics course required for all economics majors and it serves as a foundation for higher level elective courses in economics.**Credits:** 3.00

ECON 35200 - Intermediate Macroeconomics

Credit Hours: 3.00. This course offers a rigorous introduction to macroeconomic theory and empirics with real-world applications. We examine longstanding stylized facts about long-run economic growth, short-run economic fluctuations (booms and recessions), and the aggregate effects of government policy. We study determinants of equilibrium in labor, consumption, investment, and money markets as well as the role of fiscal and monetary policies in closed and open economies.**Credits:** 3.00

ECON 36000 - Econometrics

Credit Hours: 3.00. This course examines the statistical techniques economists use to analyze data, estimate causal effects, make predictions, and test economic theory. It emphasizes estimating multiple regression models including models of firm output, product prices, and wages. Students learn to make statistical and practical inferences about the true causal relationships. The course covers the data analysis skills required for careers as a consultant, financial analyst, researcher, or economist in the private and public sectors. The skills practiced in the course include using statistical software to analyze data.**Credits:** 3.00

ECON 36100 - Antitrust And Regulation

Credit Hours: 3.00. This course studies the influence of laws and regulations on market performance and on the functioning of a free-enterprise system. The focus is on two types of government policies: antitrust law and economic regulation. Antitrust laws define the rules by which firms are supposed to compete. Regulations may require that firms obtain approval to set prices, change prices, or enter new markets. They may require firms to adhere to environmental or safety standards. The focus is on current topics in both areas, including comparison of U.S. practice with that of European Union and elsewhere. Typically offered Spring.**Credits:** 3.00

ECON 36200 - Health Economics

Credit Hours: 3.00. This course is designed to introduce upper level undergraduate students in economics to the field of health economics. We will analyze health and health care theories, institutions, and key policy issues using tools from intermediate microeconomic theory. The course begins with an analysis of health care as a commodity and why health is different from other consumer goods. The course then examines the demand for and the production of health and health care, and the behavior and organization of health care providers. The discussion then switches to information asymmetries and the functioning of health insurance markets. Afterwards, the course turns to the analysis of government involvement in the health care system. The class concludes with an examination of medical care systems around the world, paying particular attention to the U.S. health care system.**Credits:** 3.00

ECON 36500 - History Of Economic Thought

Credit Hours: 3.00. The course traces the development of theories of value and economic growth from the seventeenth century to Karl Marx. Among the authors studied are the mercantilists, Hume, Smith, Ricardo, and Marx. Excerpts from the original works are read and evaluated in light of modern theory. Typically offered Spring.**Credits:** 3.00

ECON 36700 - Law And Economics

Credit Hours: 3.00. It has become increasingly clear to economists, legal scholars and political scientists that it is impossible to understand economic institutions without first having an understanding of the legal framework within which they operate. Similarly, it is impossible to understand the impact of law on society without first having an understanding of economic principles. This problem is further complicated by the fact that there are often ambiguities in the written law that lead to significant differences between what the law appears to say and how the law is interpreted in the courts. This course is designed

to give the student an understanding of both legal and economic principles and the relationship between them. Finally, through the use of economic analysis, the student will acquire the tools to predict the likely outcomes of particular laws and how they will affect their family and business decisions. Typically offered Spring Summer.**Credits:** 3.00

ECON 37000 - International Trade

Credit Hours: 3.00. Develops an understanding of the economics of globalization, including the movement of goods, people, capital, and ideas across countries. Using the tools of intermediate economic theory, we discuss the benefits and costs of globalization, the implications of globalization for wages, earnings, and national welfare, and their intersection with government policies. Typically offered Fall Spring Summer.**Credits:** 3.00

ECON 37200 - Experimental Economics

Credit Hours: 3.00. This course will explore how experiments are used in economics to test economic theory, understand behavior, and evaluate new policies. Focusing on recent research, we read research papers on a variety of policy topics including labor market discrimination, payday lending, organ transplantation, media censorship, and voting. Applying the concepts from class, students will identify their own original research questions and design new experiments. **Credits:** 3.00

ECON 37300 - Computational Economics

Credit Hours: 3.00. The main goal of this course is to introduce economics students to the computation, programming, and data analysis in Python. In the first part of the course, we will cover basic programming techniques and the use of popular Python packages for data analysis. In the second part of the course, we will consider more advanced programming techniques including numerical methods, dynamic programming, and simulation-based methods. Throughout the course we will consider a number applications related to microeconomics, macroeconomics, and econometrics covered in the Economics program curriculum.**Credits:** 3.00

ECON 37600 - Economics Of The European Union

Credit Hours: 3.00. Current economic structure of the European Union, and the economic challenges it is now facing. Typically offered Fall Spring.**Credits:** 3.00

ECON 38000 - Money And Banking

Credit Hours: 3.00. The course analyzes the economics of money, monetary systems, investments, and financial intermediaries in modern industrial economies. Topics considered include the origin of money and the banking industry, financial asset markets, the role of central banks, and the effects of various monetary policies. The theory will be presented side by side with current economic and financial news, and the students will learn how to track financial and economic data via The Wall Street Journal. Typically offered Fall Spring Summer.**Credits:** 3.00

ECON 38500 - Labor Economics

Credit Hours: 3.00. The purpose of this course is to introduce important topics, theories, institutions, and policy issues relating to the functioning of labor markets. Topics to be considered include labor supply decisions, investments in human capital, compensating wage differentials, labor contract theory, unions, compensation programs, signaling in labor markets, the economics of unemployment, and government employment, retirement, and workplace safety.**Credits:** 3.00

ECON 39000 - Junior Level Problems In Economics

Credit Hours: 1.00 to 4.00. Investigation into a specific topic area of economics. Permission of instructor required.**Credits:** 1.00 to 4.00

ECON 39040 - Economics Internship

Credit Hours: 1.00. An Economics-related work experience. This internship experience is intended to complement the student's academic plan-of-study and help prepare him/her for his/her future role in Economics. A letter from the prospective employer stating the period of employment, hours per week, job title, job qualifications, and job description may be requested before registration will be permitted. Permission of instructor required. Typically offered Fall Spring.**Credits:** 1.00

ECON 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in economics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ECON 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in economics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ECON 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in economics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ECON 42200 - Public Finance And Taxation

Credit Hours: 3.00. This course examines the role of government in market economies. The aim of the course is to provide an understanding of the reasons for government intervention in the economy and how individuals and firms respond to taxation and other government actions and how to evaluate the benefits of public programs. For example, what effects do taxes have on incentives to work, save, and invest? Emphasis is placed on current U.S. policy issues including Social Security, health care, education, environmental regulation, welfare programs, and tax reform. Typically offered Spring.**Credits:** 3.00

ECON 43200 - Economics Of Growth & Innovation

Credit Hours: 3.00. Part one: we focus on this fact: the richest countries in the world have incomes nearly 200 times greater than the poorest, with profound consequences for the lives (and deaths) of their citizens. Why nations are poor and how they can become rich is one of the most important questions in Economics. We will look at the role of investment, schooling, population growth and technology. Part two: we explore how globalization affects productivity and innovation. This includes how international trade and domestic policies affect allocative efficiency, accelerate structural change, and discipline competitive behaviors by domestic firms. We explore how firms grow on global markets, how technology is embodied in traded inputs, and how international markets for ideas and the possibility of imitation can lead to explosive growth. Part three: we explore a rapidly growing literature on the economics of innovation. We'll wrestle with the questions of: where new ideas come from, and whether it is becoming more difficult to innovate; how cities become hotbeds of innovation and how this will be affected by remote work; and how innovation can be shaped by choices of firms and by government policies.**Credits:** 3.00

ECON 45100 - Game Theory

Credit Hours: 3.00. In the course, economic, political, and social interactions are represented as games, in which strategies and resulting outcomes can be analyzed. The analysis of these interactions is then used to demonstrate how one can make optimal decisions under uncertainty. This course uses Calculus. Typically offered Fall Spring Summer.**Credits:** 3.00

ECON 45200 - Empirical Macroeconomics

Credit Hours: 3.00. The course will combine theory and empirical evidence to analyze macroeconomic trends and policy questions. The topics to be covered are motivated by current debates in the economics profession and current challenges facing economic policymakers. Students will use state-of-the-art models and economic model-solving software to predict outcomes. Typically offered Fall Spring.**Credits:** 3.00

ECON 45500 - Historical Development Of Modern Economics

Credit Hours: 3.00. The development of economic thought and economic methodology from the advent of the mercantilists to the formation of current approaches in economics in the early 20th century. The course will focus on economics as an evolving body of thought and an ongoing conversation, with strong emphasis the movement from classical economics to neoclassical economics as a foundation for modern economic theory. Typically offered Fall.**Credits:** 3.00

ECON 45600 - Urban Economics

Credit Hours: 3.00. Examines the market forces that lead to the development, growth, and size of cities. In addition, this course covers the theory of location and land use, principles of local public finance, policy problems in the areas of urban housing, transportation, crime, and pollution.**Credits:** 3.00

ECON 46100 - Industrial Organization

Credit Hours: 3.00. This course examines the determinants of firm and market structure and the resulting market performance in imperfectly-competitive markets. Advanced topics include advertising, research and development, imperfectly competitive international markets, and market integration. Emphasis is placed on using theoretical models of firm and industry behavior to explain and analyze real-world examples of firm behavior. Typically offered Spring Summer.**Credits:** 3.00

ECON 46300 - Advanced Data Analysis And Machine Learning

Credit Hours: 3.00. This is an advanced applied econometrics course that introduces students to a variety of techniques and methods for the empirical study of economic data. This course focuses on the practical aspects of economic data analysis, including data organization (such as merging and appending datasets) and the implementation of econometric models. This course will cover multivaraite linear regression, non-linear least squares, models for binary and categorical outcomes, model selection using machine learning, and panel data models. As part of the course, students will learn to conduct empirical analysis of economic data using Stata, a statistical software package.**Credits:** 3.00

ECON 46600 - International Economics

Credit Hours: 3.00. Analyzes topics in international economics, using more advantage techniques and more detailed treatment than in ECON 37000 or 37100. While coverage varies somewhat with instructor, some topics could include: economic growth, innovation and technology transfer, and the role of multinational corporations. Typically offered Spring Summer.**Credits:** 3.00

ECON 47100 - Behavioral Economics

Credit Hours: 3.00. Students learn about human behavior in economic environments, with a strong emphasis on classroom laboratory exercises. Topics considered include behavior in a variety of markets - for example, markets with price controls,

markets for financial assets and auction markets -- and behavior in social dilemmas that arise when people try to provide public goods voluntarily or when sellers try to conspire to fix prices. Students will also learn how people bargain with, trust each other, and show social preferences towards others. Decision-making and anomalies for risky and uncertain choices will also be covered.**Credits:** 3.00

ECON 48500 - Economics Of Racial And Gender Discrimination

Credit Hours: 3.00. This course focuses on quantifying the extent of, and determining the underlying causes of racial and gender disparities in the labor market. Topics include the impact of prejudice on labor market outcomes, statistical discrimination, early childhood factors and differences in environment, and fertility and reproductive technology. Typically offered Spring.**Credits:** 3.00

ECON 49000 - Problems In Economics

Credit Hours: 1.00 to 4.00. Arrange with instructor before enrolling. Supervised reading and reports in various subjects. Open only to a limited number of seniors with superior records in previous courses. Permission of instructor required.**Credits:** 1.00 to 4.00

ECON 49900 - Economics Capstone Research

Credit Hours: 3.00. The course combines experiential learning with a hands-on research project that unfolds over the course of a semester, serving as a culminating experience at the end of their degree program. The overarching objective of the capstone project is for students to understand how business problems can be addressed with empirical methods. This course is designed to help students develop a more comprehensive and integrative understanding of the major, apply their knowledge to develop and execute a methodologically rigorous research a project, and demonstrate their mastery of critical thinking and research skills they have acquired throughout their time in the major. In addition to a paper, completion of the research project may involve the presentation of the findings in a seminar or workshop setting. **Credits:** 3.00

ECON 50000 - Mathematics For Economists

Credit Hours: 2.00 or 3.00. This is a Master's level course in mathematics and its application to economics. Students in this class will review and practice the mathematical methods required to solve micro and macroeconomic theoretical models, especially constrained optimization problems. Content covers algebra, univariate and multivariate calculus and constrained optimization methods**Credits:** 2.00 or 3.00

ECON 50100 - Statistical Analysis For Economists

Credit Hours: 1.00 to 3.00. A master's level course in statistics and its application to economics. Course will familiarize students with the elements of statistics needed to perform econometrics.**Credits:** 1.00 to 3.00

ECON 51100 - Intermediate Economics I

Credit Hours: 3.00. Consumer behavior and demand, production and cost, factor demand, market structure, general equilibrium and welfare. Emphasis on the tools used to analyze the behavior of individual economic units. Not open to students with credit in ECON 34000. Typically offered Fall Summer.**Credits:** 3.00

ECON 51200 - Intermediate Economics II

Credit Hours: 3.00. Course content includes money and banking, national income and aggregative economics; the analysis of the determination of national income, employment, the price level, and the balance of payments. Consideration of both theory and economic policy. Not open to students with credit in ECON 35200. Typically offered Spring.**Credits:** 3.00

ECON 51400 - Microeconomics

Credit Hours: 2.00. An introduction to microeconomic theory. Analysis of consumer demand, output and input decisions of firms, price determination, economic efficiency, market structures, and market failure. Typically offered Fall Spring.**Credits:** 2.00

ECON 51500 - Macroeconomics

Credit Hours: 1.00 to 3.00. Investigation of the causes of macroeconomic fluctuations in the economy. Looks at changes in inflation, unemployment, real output, interest rates, and exchange rates, and explores why they occur, what their effects are, and what, if any, role government should play in dealing with these problems. A mixture of theory and case studies with reference to historical case studies. Current macroeconomic problems will be discussed with a focus on the international aspects of macroeconomic problems. Typically offered Fall Spring Summer.**Credits:** 1.00 to 3.00

ECON 51900 - Economics For Pre-College Educators

Credit Hours: 1.00 to 3.00. Economics and economic education materials and instructional strategies for pre-college teachers in all grade levels and subject areas. Most sections, or workshops, survey both microeconomics and macroeconomics concepts and current public policy issues. Some workshops, however, deal with special themes or contemporary economics problems, and vary each time they are offered, e.g., international economics, economics in literature and children's literature or energy and environmental economics. Participants are usually expected to develop a package of classroom activities and supplements. Typically offered in the Summer, but occasionally in the Fall and Spring semesters.**Credits:** 1.00 to 3.00

ECON 52000 - Industrial Economics

Credit Hours: 2.00. This course will explore the division of economic activity among industries in developed and less-developed countries. It will examine patterns of private and public ownership in different countries. It will discuss the determinants of market and firm structure, firm conduct, and market performance in imperfectly competitive markets, and different approaches to regulating such markets. Emphasis is placed on using basic economic models of firm and industry behavior to explain and analyze real-world markets. Permission of department required. Typically offered Fall.**Credits:** 2.00

ECON 53600 - Public Economics

Credit Hours: 2.00. This course is designed to introduce masters' students in economics to the field of health economics. We will analyze health and health care theories, institutions, and key policy issues. The course covers how the markets for health and health services are different from other goods, with a particular emphasis on the role of government and market failure. We will examine the demand for and the production of health and health care, and the behavior and organization of health care providers. We will also explore information asymmetries and the functioning of health insurance markets. We will consider health and healthcare systems around the world, paying particular attention to the U.S. health care system and recent reforms to it.**Credits:** 2.00

ECON 53700 - Health Economics

Credit Hours: 2.00 or 3.00. This course is designed to introduce masters' students in economics to the field of health economics. We will analyze health and health care theories, institutions, and key policy issues. The course covers how the markets for health and health services are different from other goods, with a particular emphasis on the role of government and market failure. We will examine the demand for and the production of health and health care, and the behavior and organization of health care providers. We will also explore information asymmetries and the functioning of health insurance markets. We will consider

health and healthcare systems around the world, paying particular attention to the U.S. health care system and recent reforms to it. **Credits:** 2.00 or 3.00

ECON 53800 - International Economics

Credit Hours: 2.00 or 3.00. The course covers selected topics in international trade with a focus on real world applications. Typically offered Fall Spring Summer.**Credits:** 2.00 or 3.00

ECON 53900 - Wage Discrimination

Credit Hours: 1.00. This course is an applied economics course that focuses on race and gender discrimination in the labor market. We will use the tools you have developed so far in the MA program to study the extent, causes and consequences of disparities in wages and employment across race and gender.**Credits:** 1.00

ECON 55000 - Personnel Economics

Credit Hours: 2.00. Personnel Economics applies micro- and macroeconomic theory to the workings of the labor market while maintaining a focus on incentives in the workplace. The course will investigate the determination of wages and compensation (based on a study of labor demand and supply) and the differences in these forms of payment for labor services across workers within an occupation, across occupations, and across cultures. Other topics to be considered include the connection between investments in education and training and labor market outcomes and estimates of the costs and benefits of immigration and employee turnover and discuss the impact of unions, as well as discrimination in the labor market issues. Permission of department required. Typically offered Spring.**Credits:** 2.00

ECON 56200 - Econometrics I

Credit Hours: 3.00. This masters-level course in econometrics covers the tools that will enable students to conduct empirical analysis using economics data. The course examines the statistical techniques used in testing economic theories, estimating casual effects, and making predictions. Emphasis is placed on estimating a single equation (e.g., a demand function) and the problems associated with such estimation. As part of the course, students will estimate equations using STATA, a statistical software package. Permission of department required. Typically offered Fall.**Credits:** 3.00

ECON 56500 - Law And Economics

Credit Hours: 2.00. This course is designed to give the student an understanding of both legal and economic principles and the relationship between them. It will also show the student how to access various data bases, Lexis/Nexis, to get a formal statement of the law and how the laws have actually been interpreted and enforced. Finally, through the use of economic analysis, the student will acquire the tools to predict the likely outcomes of particular laws and how they will affect their family and business decisions. Permission of department required. Typically offered Fall.**Credits:** 2.00

ECON 56700 - Managerial Economics And Business Strategy

Credit Hours: 1.00 to 4.00. This course studies optimal decision-making processes made by managers and policymakers within firms and other organizations. The course is based on microeconomics and applies advanced microeconomics-related concepts with an emphasis on pricing strategies. The course covers topics such as monopolies (price discrimination, optimal pricing strategies), advanced strategic decision-making and imperfect competition (optimal pricing and production), new product introductions, product variety offered on the market, and entry deterrence strategies. We use a variety of examples and applications, and operate with modern tools (Game Theory) that facilitate the decision-making process for individuals, policymakers and managers. The main goal of this course is to provide a basis for a good understanding of the logical mechanics, and to provide a good intuition in managerial economics and business decision-making processes that facilitate the understanding of daily business problems. Permission of instructor required. **Credits:** 1.00 to 4.00

ECON 57000 - International Economics

Credit Hours: 2.00 or 3.00. Study of the economic characteristics of the contemporary transportation market with emphasis on the impact of governmental policies on resource allocation within the sector. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 2.00 or 3.00

ECON 57200 - Econometrics II

Credit Hours: 2.00. This course reviews basic concepts in probability, mathematical statistics and linear algebra in order to obtain a more rigorous understanding of the linear regression model, its representation and assumptions, procedures for estimation and properties associated with the OLS estimator. We move on and apply what we have learned to the linear regression model. We discuss estimation and prediction, establish properties such as efficiency, unbiasedness, consistency and convergence in mean square. We conclude by considering a few nonlinear models appropriate for modeling binary outcomes. Permission of department required. Typically offered Fall Spring Summer.**Credits:** 2.00

ECON 57300 - Financial Econometrics

Credit Hours: 2.00. This course offers an introduction of basic principles of econometric analysis that will help students understand finance theories and their empirical applications. It will also equip students with appropriate statistical techniques for doing applied financial research. The statistical techniques are particularly well suited for analyzing financial time-series data. Permission of department required.**Credits:** 2.00

ECON 57600 - Statistical & Machine Learning

Credit Hours: 2.00 or 3.00. This is an introductory course in statistical and machine learning. It will cover fundamental concepts and essential tools that are critical in understanding
cutting-edge machine learning techniques. Students will develop skills in applying a wide
variety of modeling and prediction methods. Topics include linear regression, classification, regularization and shrinkage methods, tree-based methods, and support vector machines. An integral part of this course is the extensive use of the open source statistical software R. Students will gain hands-on experience in analyzing datasets commonly used in business and economics.**Credits:** 2.00 or 3.00

ECON 57700 - Quantitative Economics With Python

Credit Hours: 2.00 or 3.00. Introduce students to computational and programming in Python.**Credits:** 2.00 or 3.00

ECON 58400 - Experimental Economics

Credit Hours: 2.00 or 3.00. This course introduces you to the experimental methods used by economists to study human behavior. These methods analyze data collected in controlled laboratory experiments. Throughout the course, we will discuss different types of experiments that have been extensively researched by experimental economists. To help introduce and motivate each topic, you will participate in weekly synchronous experiments with your classmates over the internet. You will then complete an assignment analyzing the data generated by your class in the online experiment. The following lecture will provide an overview of the theoretical framework and experimental predictions. We will also discuss commonly observed behavior and any relevant explanations for such behavior.**Credits:** 2.00 or 3.00

ECON 58500 - Behavioral Economics

Credit Hours: 2.00 or 3.00. This course explores human economic behavior, with a strong emphasis on laboratory and field experiment methodology used in behavioral economics research. Topics considered include behavior in markets for financial

assets and auction markets, and behavior in social dilemmas that arise when people try to provide public goods voluntarily or increase economic surplus through trust. Students will also study how people bargain with and exhibit social preferences towards others. Decision-making and anomalies for risky uncertain choices will also be covered. Typically offered Fall Spring Summer.**Credits:** 2.00 or 3.00

ECON 58700 - Advanced Quantitative Economics With Python

Credit Hours: 3.00. The main goal of this course is to extend the computational and programming toolkit developed in Quantitative Economics with Python course. In particular, we will cover advanced methods for working with, visualizing and analyzing data in Python. In addition, we will consider more advanced programming techniques including stochastic optimization and dynamic programming. Throughout the course, we will consider a number of applications related to microeconomics, macroeconomics, and econometrics covered in the MS Econ program curriculum.**Credits:** 3.00

ECON 59100 - Financial Valuation And Decision Making

Credit Hours: 2.00 or 3.00. A comprehensive introduction to finance. The object of this course is to provide the computational framework necessary to appreciate and understand how to make decisions based on sound financial reasoning.**Credits:** 2.00 or 3.00

ECON 60000 - Teaching Economics

Credit Hours: 1.00 to 3.00. This course traces the development of economic theory from the Mercantilist writers through the contributions of J. S. Mill and Karl Marx. Topics covered include the development of value theory (especially labor theories of value), theories of economic growth and business cycles, the classical debate over the meaning and validity of Say's Law, and changing views regarding the appropriate role of government in the marketplace. In each case, the contributions of the authors considered are evaluated in light of our modern understanding of economic theory. Typically offered Spring.**Credits:** 1.00 to 3.00

ECON 60600 - Microeconomics I

Credit Hours: 1.00 to 3.00. An introduction to basic consumer and producer theory, competitive markets (including using the continuum to model competition), basic general equilibrium theory, and basic risk/uncertainty. Co-requisite: ECON 61500. Typically offered Fall.**Credits:** 1.00 to 3.00

ECON 60700 - Microeconomics II

Credit Hours: 1.00 to 3.00. Building on Microeconomics I, more advanced consumer and producer theory using support functions, risk/uncertainty and information, and basic game theory and oligopoly. Prerequisite: ECON 60600. Typically offered Fall.**Credits:** 1.00 to 3.00

ECON 60800 - Macroeconomic Theory I

Credit Hours: 2.00 or 3.00. An introduction to general equilibrium macroeconomic models in both deterministic and stochastic settings. Topics studied include: static neoclassical models, social planner problems, dynamic programming, growth and capital accumulation, stochastic economies, asset pricing, and overlapping generations models. Typically offered Fall.**Credits:** 2.00 or 3.00

ECON 60900 - Microeconomics III

Credit Hours: 1.00 to 3.00. An advanced course in game theory and general equilibrium theory. Among the topics covered are: games in strategic form, games in extensive form, games of incomplete information, cooperative games with side payments, mechanism design, consumer choice theory, Pareto optimality, the Arrow-Debreu-McKenzie model, and the existence and stability of competitive equilibria. Prerequisite: ECON 60600. Typically offered Spring.**Credits:** 1.00 to 3.00

ECON 61000 - Advanced Game Theory

Credit Hours: 1.00 to 3.00. An advanced course in game theory and its applications. Among the topics covered are: extensive form games, normal form games, Nash equilibrium, mixed strategies equilibrium, subgame perfect equilibrium, learning and equilibrium, games with incomplete information, repeated games, cooperative games, noncooperative bargaining, and auctions. Prerequisite: ECON 60600. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

ECON 61100 - Macroeconomic Theory II

Credit Hours: 2.00 or 3.00. An introduction to selected topics in macroeconomics, including theories of business cycles, economic growth, microfoundations of labor markets and some miscellaneous issues. Topics covered include: theories of business cycles (real business cycles, information imperfections, coordination failures), economics of growth (neoclassical model, human capital model, endogenous growth), microfoundations of labor markets (recursive competitive equilibrium models, search and matching models, efficiency wages, implicit contracts, insider-outsider model), miscellaneous issues including monetary economics (cash-in-advance constraint models), the Lucas critique, time inconsistency, and endogenous cycles. Prerequisite: ECON 60800. Typically offered Spring.**Credits:** 2.00 or 3.00

ECON 61200 - Macroeconomic Theory III

Credit Hours: 1.00 to 3.00. Selected topics in contemporary research in macroeconomic theory. Emphasis on the implications of uncertainty in macroeconomic theory, including such topics as search theory, asset selection under uncertainty, stochastic optimal control, and asymmetric information. Typically offered Fall Summer.**Credits:** 1.00 to 3.00

ECON 61300 - Topics In Microeconomics

Credit Hours: 3.00. Economic theory workshop, with presentations given by departmental and external speakers. Typically offered Fall Spring.**Credits:** 3.00

ECON 61400 - Economics Of Information

Credit Hours: 1.00 to 3.00. An introduction to the economics of information. Key topics considered are nonexpected utility theory and the various implications of asymmetric information-either hidden action(s) and/or hidden types, including extensions of the basic principal-agent model as well adverse selection issues, mechanism design, and screening/signaling models. Other topics that may be considered include the value of information/real option theory, herd behavior, capital asset pricing models, stochastic calculus and options pricing models, organizational decision making, search theory and price dispersion models, and herd behavior. Prerequisite: ECON 60600. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

ECON 61500 - Mathematical Analysis For Economists

Credit Hours: 2.00 or 3.00. Topics include constrained optimization, comparative statics, and elementary topics in mathematical analysis. Students should be familiar with calculus, linear algebra, basic probability, and have a grasp of microeconomic theory (such as the material covered in ECON 51100). Typically offered Fall.**Credits:** 2.00 or 3.00

ECON 61800 - Advanced Topics In Economics

Credit Hours: 3.00. Macro/international theory workshop. Topics on macroeconomics and international economics are presented by departmental and external speakers. Typically offered Fall Spring.**Credits:** 3.00

ECON 62000 - Industrial Organization

Credit Hours: 1.00 to 3.00. A survey of some of the major theoretical issues in the field of industrial organization. Topics include: the welfare economics of competition and monopoly, static and dynamic oligopoly theory, differentiated products models, and entry deterrence. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

ECON 62100 - Applied Industrial Organization

Credit Hours: 1.00 to 3.00. A continuation of ECON 62000, with emphasis on empirical analysis and the application of theory to real-world situations. Topics covered include: empirical estimation of market structure, empirical tests of market conduct, the effect of anti-competitive behavior on economic performance, antitrust practice, regulation theory and practice, and experimental industrial economics. The material is selected from current journal articles. Prerequisite: ECON 62000. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

ECON 62400 - Estimating Game Theoretic Models

Credit Hours: 2.00 or 3.00. This course examines topics in empirical industrial organization (I.O.), which aims to use data to draw conclusions about how market and firm structure, firm conduct, and market performance interact in imperfectly competitive markets. We will take a "structural" approach, focusing on estimating the parameters of game theoretic models using real industry data, and then simulating those same models to generate predictions under alternative ("counterfactual") scenarios. We will cover theory only to the extent that it provides intuition or testable conclusions. The course is divided into two unequal parts. In the first part, we will learn about static games in the context of mergers, market power, and entry. In the second part, we will focus on the estimation of dynamic games, after first understanding how to solve and estimate dynamic single-agent problems.**Credits:** 2.00 or 3.00

ECON 63000 - Dynamic Macroeconomics

Credit Hours: 1.00 to 3.00. Covers current literature on decentralized monetary economies. Topics are selected from recent research publications that include: studies related to endogenous determination of pattern of exchange, valuation of assets and currencies, price determination and dispersion, and international finance. The material is selected from current journal articles. Prerequisite: ECON 53000. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

ECON 63100 - Industrial Organization

Credit Hours: 1.00 to 3.00. A study of asset selection within the expected utility approach, with some attention given to the nonexpected utility decision models. Topics covered include axioms for measurable utility, monetary models under uncertainty, models of capital budgets, and security-selection models. Prerequisite: Master's student standing or higher. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

ECON 63200 - Labor Economics

Credit Hours: 1.00 to 3.00. An area seminar. Theoretical and empirical research on the financial markets. Prerequisite: ECON 63000. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

ECON 63400 - International Trade

Credit Hours: 1.00 to 3.00. Application of microeconomic techniques to international trade. Topics include: classical, neoclassical, and modern theories of international trade; the theory of tariffs and commercial policy, (including aspects of political economy), welfare aspects of trade and tariff theory, and related topics. The material is selected from current journal articles. Prerequisite: ECON 60700. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

ECON 63500 - Monetary International Economics

Credit Hours: 1.00 to 3.00. A research seminar on international monetary issues. Topics include: theories of balance of payments and exchange-rate determination, international asset markets and capital flows, breakdowns of pegged exchange-rate regimes, currency substitution, monetary integration, international impacts of alternative monetary, and fiscal and intervention policies. Assignments are based on selected articles. Prerequisite: ECON 60800. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

ECON 63600 - Topics And Research In International Trade

Credit Hours: 1.00 to 3.00. A course in international trade theory and empirics, with emphasis on surveying the recent developments in the field-including empirical applications of material covered in ECON 634. While specific subject matter may vary from year to year, likely topics include: theory and empirics on trade and wages, trade and the environment, trade in the presence of multinational firms and vertical specialization, empirical evaluation of the positive theories of trade (especially factor endowment and variety models), and the identification and measurement of trade barriers and their effects. Material is selected from current journal articles. Prerequisite: ECON 60700. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

ECON 63800 - Advanced Topics In International Trade

Credit Hours: 1.00 to 3.00. Specific subject matters may vary year to year reflecting recent developments in the field of international trade. Generally, we first review benchmark models of trade that explain basic facts in international trade. Our focus remains on unifying these theories as well as learning tools to bring the theories to data to conduct policy and welfare analysis. Material is selected from current journal articles. Throughout the course, we study several applications including the impact of tariffs and trade agreements, the interaction between trade and labor market, the interaction between trade and environment, economic geography and the impact of spatial policies, and agricultural production and trade in the global economy. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

ECON 64000 - Economic And Social Policy

Credit Hours: 2.00 or 3.00. The role of government in the American economy. Policies relating to the environment, energy, transportation, labor markets, the distribution of income, macrostability, and international trade are analyzed. Prerequisite: ECON 51300 , Master's student standing or higher and Management majors only. Typically offered Fall Spring Summer.**Credits:** 2.00 or 3.00

ECON 64100 - Agent-Based Computational Economics

Credit Hours: 2.00 or 3.00. Computational study of economic systems involving interacting agents who do not necessarily possess perfect rationality and information. In addition to equilibrium analysis, agent-based models focus on out-of-equilibrium dynamics that may or may not lead to equilibrium in the long run,**Credits:** 2.00 or 3.00

ECON 64200 - Computational Economics

Credit Hours: 2.00 or 3.00. The purpose of this class is to give you a computational toolbox you can apply to economic questions. We will introduce and use numerical methods on computationally tractable problems. The goal of the course is to encourage Ph.D. students to apply these techniques to their own research. Our in-class applications
will primarily be public policy and macro-oriented, by solving and simulating the problems of microeconomic agents and aggregating the results.**Credits:** 2.00 or 3.00

ECON 65000 - Applied Microeconometrics

Credit Hours: 1.00 to 3.00. Topics in labor economics. While the specific subject matter varies from year to year, recent seminars have examined such topics as dynamic labor demand and supply analysis, human capital theory, screening and signaling theories, contract theory, efficiency wages, job matching, search, unions, and internal labor markets. Material is selected from current journal articles. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

ECON 65200 - Economics Of Labor Markets

Credit Hours: 2.00 or 3.00. Study of labor force concepts and measurements, the macroeconomic behavior of employment and earnings, and the functioning of labor markets. Emphasis is placed on empirical findings and research methods. Typically offered Fall.**Credits:** 2.00 or 3.00

ECON 65300 - Topics In Early Childhood Development

Credit Hours: 2.00 or 3.00. This course is the second in the Ph.D. Labor Economics sequence. We will focus on the economics of skill formation and its consequences on later outcomes like schooling choices, health, social behaviors and labor market variables. We will do this, by analyzing both static and dynamic settings, in which we recognize that skill formation is a process where early inputs affect the productivity of later ones. This course will be econometrically intense, covering from reduced form techniques to structural ones. We will pay special attention to econometric identification of effects and the analysis of skills as unobserved heterogeneity, its consequences on empirical estimation and models to address it. This course will emphasize the connection between theory and practice.**Credits:** 2.00 or 3.00

ECON 65400 - Topics In Empirical Labor & Public Economics

Credit Hours: 2.00. Provide an introduction to the baseline models of labor supply, including static and dynamic model of labot supply. Introduce students to several seminal and new papers on labor supply. Provide students with the conceptual understanding and computational tools (Stata and Matlab) required to adapt and apply the models presented in the course to address new research questions in labor and public economics. Provide students with an basic understanding of the Current Population Survey (CPS). Motivate and illustrate simulation-assisted estimation as a method for estimating structural models of labor supply.**Credits:** 2.00

ECON 65500 - Public Economics

Credit Hours: 2.00 to 3.00. Knowledge of various types of government programs, public policies and program administration. Prerequisite: ECON 65000.**Credits:** 2.00 to 3.00

ECON 65600 - Labor Economics II

Credit Hours: 2.00. This course is the third in the PhD Labor Economics sequence. This course is designed to be primarily a "topics" course. Class will focus on some of the most popular open questions in labor economics, however, we will take a long view to these questions in order to understand the progress that has been made over the last half-century.**Credits:** 2.00

ECON 66200 - Game Theory

Credit Hours: 2.00 or 3.00. In this course, we will examine some of the basic elements of Game Theory. Game Theory studies strategic environments in which each individual's payoff depends upon both their own actions as well as the actions of others. Game Theory attempts to develop an understanding of such situations and to provide a formal framework and solution concepts for making better strategic choices.**Credits:** 2.00 or 3.00

ECON 66800 - Topics In Applied Economics

Credit Hours: 3.00. Applied micro workshop. Topics on applied macroeconomics are presented by departmental and external speakers. Typically offered Fall Spring.**Credits:** 3.00

ECON 67000 - Probability And Statistics

Credit Hours: 2.00 or 3.00. An introduction to probability theory and the basic statistical estimation methods. Topics include: axiomatic development of probability theory, counting methods, conditional probability and Bayes' theorem, random variables and distributions, expectation, variance, covariance and correlation, special distributions, statistical inference, maximum likelihood estimators, unbiased estimation, and testing hypotheses. Prerequisite: ECON 61500. Typically offered Fall.**Credits:** 2.00 or 3.00

ECON 67100 - Econometrics I

Credit Hours: 1.00 to 3.00. An introduction to the modern techniques of econometrics and their applications. Topics include: the classical linear regression model (specification, estimation, inference, and prediction), specification analysis, functional form, heteroscedasticity, and autocorrelation. Prerequisite: ECON 67000. Typically offered Spring.**Credits:** 1.00 to 3.00

ECON 67200 - Econometrics II

Credit Hours: 1.00 to 3.00. Topics include generalized method of moments, estimation and inference with weak instruments, panel data models and bootstrap methods. Prerequisite: ECON 67100. Typically offered Fall.**Credits:** 1.00 to 3.00

ECON 67300 - Time Series Econometrics

Credit Hours: 1.00 to 3.00. This advanced course gives an up-to-date and comprehensive treatment of modern time series analysis and empirical macroeconomics. Topics include: ARIMA processes, spectral analysis, forecasting, covariance-stationary vector processes, vector autoregressions, state space representations in the Kalman filter, non-stationary time series and fractional integrated processes, and time series models of heteroscedasticity. Prerequisite: ECON 67200. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

ECON 67400 - Microeconometrics

Credit Hours: 1.00 to 3.00. This advanced course covers the econometrics and statistical methods needed to study data on individual agents in general qualitative response models and models of limited dependent variables. Special emphasis is placed on applying the alternate estimation and inference techniques to actual or simulated datasets. Topics include: univariate binary models, multinomial and multivariate qualitative response models, choice based sampling, distribution-free estimation methods, and Tobit models. Prerequisite: ECON 67200. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

ECON 67600 - Economics Of Uncertainty And Information I

Credit Hours: 2.00 to 4.00. Covers topics in decision theory and the economics of information. Topics include: insurance, nonexpected utility theory, capital asset pricing models, stochastic calculus and options pricing models, organizational decision making, herd behavior, search theory and price dispersion models, principal-agent models, multiple agents, multiple tasks, multiple periods, incomplete contracts, and adverse selection topics. Applications of these models arise in industrial organization, labor economics, and public economics, as well as various areas in management. Course readings are primarily from journal articles. Prerequisite: ECON 60700. Typically offered Fall Spring.**Credits:** 2.00 to 4.00

ECON 67700 - Economics Of Uncertainty And Information II

Credit Hours: 1.00 to 3.00. Continuation of ECON 67600. Prerequisite: ECON 67600. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

ECON 67800 - Search Theory And Applications

Credit Hours: 2.00 or 3.00. This course provides an overview to the tools and applications of search theory, which has been a very active area of research. The aim of this course is to provide students with a solid understanding of the search approach and to get started on engaging in research.**Credits:** 2.00 or 3.00

ECON 68500 - Experimental Economics I

Credit Hours: 1.00 to 3.00. An overview of seminal and recent developments in experimental economic research. Provides practical training in designing and conducting experiments and the analysis of experimental data. Content varies from year to year. Applications include: industrial organization, game theory, finance, international trade, information economics, and monetary economics. Course readings are primarily from journal articles. Prerequisite: ECON 60700. ECON 61000. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

ECON 68600 - Experimental Economics II

Credit Hours: 2.00 or 3.00. Covers topics different from ECON 685, and they vary from year to year. May be taken prior to ECON 685. Course readings are primarily from journal articles. Prerequisite: ECON 60700. 61000. Typically offered Fall Spring.**Credits:** 2.00 or 3.00

ECON 68900 - Experimental And Behavioral Economics

Credit Hours: 2.00. The course will cover: (i) experimental methodology; (ii) statistical considerations in experiments; (iii) behavioral game theory (including psychological games and boundedly rational thinking in games); (iv) loss aversion and reference points (including prospect theory, expectations-based reference points, and goal setting); and (v) experiments on gender. We will also discuss how to develop good research ideas in experimental economics, and how to write papers in a way that appeals to top journals in the field. Typically offered Fall Spring.**Credits:** 2.00

ECON 69000 - Advanced Problems In Economics

Credit Hours: 1.00 to 4.00. Advanced individual reading and investigation in a specific economic field at the graduate level. Open to individual students with superior records. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 4.00

ECON 69100 - Advanced Topics In Panel Data

Credit Hours: 2.00 or 3.00. This course covers selected topics in the econometrics of panel data with an emphasis on developing a clear understanding of the methodological issues involved as well as identifying a set of substantive empirical issues where such methods can be applied. Prerequisite: ECON 67100 and ECON 67200.**Credits:** 2.00 or 3.00

ECON 69200 - Advanced Topics In Time Series

Credit Hours: 2.00 or 3.00. This course covers a set of selected topics of current interest in eco-nomic forecasting. It is designed for students interested in conducting theoretical research related to the development and evaluation of new forecasting techniques as well as those inclined towards the application of state-of-the-art techniques to economic data.**Credits:** 2.00 or 3.00

ECON 69300 - Bayesian Econometrics I

Credit Hours: 2.00 or 3.00. This is a first course in Bayesian Econometrics. The overarching goal of the course is to expose students to the Bayesian perspective and get them up-to-speed with modern Bayesian simulation methods.**Credits:** 2.00 or 3.00

ECON 69400 - Bayesian Econometrics II

Credit Hours: 2.00 or 3.00. This is a second course in Bayesian Econometrics. After completion student should be able to conduct research in Bayesian econometrics using state-of-the-art models and techniques. Pre-requisite: ECON 69300.**Credits:** 2.00 or 3.00

ECON 69700 - Research Methods In Economics

Credit Hours: 2.00 or 3.00. The first steps in doing a thesis research paper, proposal/idea, growing the proposal/idea. Developing a set of critical professional skills. Pre-requisite: ECON 60700 and ECON 60800.**Credits:** 2.00 or 3.00

ECON 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 18.00

ECON 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 18.00

Education-Curriculum and Instruction

EDCI 20001 - Special Populations Seminar: Focus On Students With Disabilities And Differentiation Approaches

Credit Hours: 1.00. (EDPS 20001) This seminar is focused on special populations of learners for teacher education majors with an emphasis on exceptional students and approaches to curricular differentiation. Students will engage in mentoring activities and ongoing support in their development as a professional. The goal of the seminar is to connect theory to practice by engaging in an immersive field experience that connects to content and courses taken concurrently. The seminar provides an environment conducive to fostering rich relationships with schools and communities, pursuing common inquiry, thinking critically about theory, content and practice and advocating for equitable schooling. This seminar includes a field experience targeting schools and classrooms including exceptional students. This seminar is intended to be taken concurrently with EDPS 24800 and EDPS 26501. Typically offered Fall Spring Summer.**Credits:** 1.00

EDCI 20002 - Special Populations Seminar: English Language Learners And Students With Gifts And Talents

Credit Hours: 1.00. (EDCI 20002) This seminar is focused on special populations of learners for teacher education majors with an emphasis on students who are English learners and students with gifts, talents, and creativity. Students will engage in mentoring activities and ongoing support in their development as a professional. The goal of the seminar is to connect theory to practice by engaging in an immersive field experience that connects to content and courses taken concurrently. The seminar provides an environment conducive to fostering rich relationships with schools and communities, pursuing common inquiry, thinking critically about theory, content and practice and advocating for equitable schooling. This seminar includes a field experience targeting schools and classrooms with ELLs and students with gifts, creativity, and talents. This seminar is intended to be taken concurrently with EDPS 24000 and EDCI 37001. Typically offered Fall Spring Summer.**Credits:** 1.00

EDCI 20500 - Exploring Teaching As A Career

Credit Hours: 2.00 to 3.00. Students will become familiar with the work of teachers and begin to develop their educational philosophies through examining what it means to teach and to learn and the nature and purpose of schools. Students will critically evaluate teaching as their chosen profession. This course includes a required weekly field-based experience in an elementary, middle, or high school classroom. **Credits:** 2.00 to 3.00

EDCI 20700 - Construction And Textile Lab Management

Credit Hours: 3.00. A lecture/lab course which provides clothing construction and textile science content to be applied in the secondary family and consumer sciences classroom. Typically offered Fall.**Credits:** 3.00

EDCI 21000 - Education Scholars Program I

Credit Hours: 1.00 to 3.00. EDCI 21000 is the first course in a two course, introductory sequence for College of Education students enrolled in the Honors College and/or DeVito Program scholarship recipients. In this course, we will examine key concepts and ideas in educational thought and research, understand what research is, and begin to explore individual students' research interests.**Credits:** 1.00 to 3.00

EDCI 21100 - Education Scholars II

Credit Hours: 1.00 to 3.00. This is the second course in a two course, introductory sequence for College of Education students enrolled in the Honors College and/or DeVito Program scholarship recipients. In this course, students will work on a research project with a faculty mentor, will participate in reflection and discussion of that research experience, will participate in seminars with faculty to read and discuss research, and continue to explore their own research interests and campus resources. **Credits:** 1.00 to 3.00

EDCI 21510 - Language & Literacy Foundations For Teachers

Credit Hours: 1.00. The goal of the course is to provide background information in language and literacy necessary for success in literacy methods courses. The course will address basic linguistics and phonetic patterns of English, as well as the structures of literature and literary terms. Typically offered Fall Spring Summer.**Credits:** 1.00

EDCI 21610 - Teaching History: Standards And Strategies

Credit Hours: 1.00. Course prepares students for teaching history in powerful, exciting and innovative ways through a topical study (e.g., American Civil Rights Movement) approach. Required for all Social Studies Education majors. Typically offered Fall Spring Summer.**Credits:** 1.00

EDCI 21710 - Teaching Geography: Standards And Strategies

Credit Hours: 1.00. Course prepares students for teaching geography in powerful, exciting and innovative ways through a study of geographic concepts within the framework of inquiry design model (IDM) and an inquiry-based curriculum. Required for all Social Studies Education majors. Typically offered Fall Spring Summer.**Credits:** 1.00

EDCI 21810 - Teaching Civics And Government: Standards And Strategies

Credit Hours: 1.00. Course prepares students for teaching civics and government in powerful, exciting and innovative ways through a study of civics and political science concepts within the framework of inquiry design model (IDM) and an inquiry-based curriculum Required for all Social Studies Education majors. Typically offered Fall Spring Summer.**Credits:** 1.00

EDCI 21910 - Teaching For Economic Literacy: Developing An Economic Way Of Thinking

Credit Hours: 1.00. Course focuses on preparing students in the social studies education licensure program to teach high school economics and to integrate economics into other middle and/or high school social studies courses. Course addresses issues of economic pedagogy. It will address economic content/concepts specifically and only in a way to illustrate/expand on the teaching ideas, resources, methods, and assessment. Typically offered Fall Spring.**Credits:** 1.00

EDCI 22200 - Knowing The World Through Mathematics

Credit Hours: 3.00. In this course, *Knowing the World Through Mathematics*, students will connect their situated experiences to larger trends in equity and social justice around the globe through mathematical investigations embedded in the context of the United Nations 2030 Agenda (United Nations, 2015). Students in this course will make use of mathematics and global policy documents to critically interpret, model, and represent world phenomena. Students will collaboratively analyze quantitative information gathered through trustworthy, globally representative data sets and individual survey and questionnaire items to investigate local experiences in relation to students' area(s) of interest. Students will learn about and utilize the GAISE Framework for Statistical Problem Solving (Franklin, et al., 2005) and the Four Dimensions of Equity in Mathematics Education (Gutiérrez, 2012) to ground their discussions and deliverables for *Knowing the World Through Mathematics*. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 22550 - Mathematics Education Seminar

Credit Hours: 1.00. In this course, students will be introduced to many aspects of mathematics education, including pedagogies, professional organizations, standards, research, lesson planning, technology, etc. In addition, they will have opportunities to get to know others in their major earlier in their program. Typically offered Spring.**Credits:** 1.00

EDCI 25000 - Professional Development In Family And Consumer Sciences Education

Credit Hours: 1.00 or 2.00. This course focuses on students' professional development as family and consumer sciences educators. Characteristics and relationships among middle and high school family and consumer sciences standards, resources, and learning experiences; the Purdue Family and Consumer Sciences Education program; and expectations for Indiana FCS teacher-licensure are emphasized. Includes participation in professional organizations and meetings.**Credits:** 1.00 or 2.00

EDCI 27000 - Introduction To Educational Technology And Computing

Credit Hours: 1.00 to 3.00. Addresses fundamentals of educational technology, including the integration of instructional design, media, computers and related technologies within the classroom setting. **Credits:** 1.00 to 3.00

EDCI 28500 - Multiculturalism And Education

Credit Hours: 2.00 to 3.00. This course integrates an understanding of multiculturalism with principles of democratic education. Historical, sociological, cultural, political, philosophical, and pedagogical foundations of multiculturalism are explored and related to issues of pedagogy in a pluralistic society. Typically offered Fall Spring Summer.**Credits:** 2.00 to 3.00

EDCI 30101 - Inquiry Into Teaching And Learning In K-2

Credit Hours: 1.00. The goal of the seminar is to connect theory to practice by engaging in an immersive field experience that connects to content and courses taken concurrently through cycles of inquiry. In particular, this seminar is intended to be an inquiry space for questions and topics related to teaching using pedagogies of care in the K-2 classroom. Admission to Teacher Education required. Cannot be taken concurrently with EDCI 30002.**Credits:** 1.00

EDCI 30102 - Inquiry Into Teaching And Learning In 3-6

Credit Hours: 1.00. The goal of the seminar is to connect theory to practice by engaging in an immersive field experience that connects to content and courses taken concurrently through cycles of inquiry. In particular, this seminar is intended to be an inquiry space for questions and topics related to teaching using pedagogies of care in the 3-6 classroom. Admission to Teacher Education is required. Cannot be taken concurrently with EDCI 30101.**Credits:** 1.00

EDCI 30900 - Reading In Middle And Secondary Schools: Methods And Problems

Credit Hours: 1.00 to 3.00. For prospective teachers at junior and senior high schools. An overview of reading processes, fundamentals of reading instruction, factors that influence the ability to read text materials, strategies and materials for identifying and reducing reading problems, school resources, and programs for normal and deficient readers. Concurrent enrollment with program-specified methods course.**Credits:** 1.00 to 3.00

EDCI 31100 - Media For Children

Credit Hours: 3.00. Books and other resources designed for children and adolescents are studied and evaluated in terms of literary theory and aesthetic appreciation. Emphasis is placed on literature and its place in the child's world. **Credits:** 3.00

EDCI 31101 - Integrating Media In The K-2 Classroom

Credit Hours: 2.00. The goal of the course is for teacher candidates to understand how to choose and evaluate children's literature and media to use in K-2 classroom, develop ways to integrate literature and understanding of literature and media using a variety of methods, select appropriate materials for individual student's needs, and assess student's learning. Admission to Teacher Education is required.**Credits:** 2.00

EDCI 31102 - Integrating Media In The 3-6 Classroom

Credit Hours: 1.00. The goal of the course is for teacher candidates to understand how to choose and evaluate children's literature and media to use in the 3-6 classroom, develop ways to integrate literature and media throughout the curriculum, support students' understanding of literature and media using a variety of methods, select appropriate materials for individual student's needs, and assess students' learning.**Credits:** 1.00

EDCI 31950 - Approaches To English Learner Education

Credit Hours: 3.00. This course addresses English language instruction and content instruction for English Learning students in mainstream classrooms. The purpose of this course is to provide information necessary to the design of materials and instructional strategies for English Language Learners in K-12 context. In this course, we will focus on current issues and techniques in instruction for ELL students who are at different stages of English language acquisition in the K-12 school context. The course will also consider the nature of immigrants' experiences of a new country and school context. Practical field experiences integrated into the course will provide students with the opportunity to apply and demonstrate principles and strategies presented in the course.**Credits:** 3.00

EDCI 32250 - Physical Education In The Elementary School

Credit Hours: 2.00. Current conceptions of elementary school physical education, with a particular emphasis on curriculum implementation.**Credits:** 2.00

EDCI 32500 - Literacy In The Early Childhood Classroom

Credit Hours: 3.00. Students will study how children's oral language develops, how children learn to read and write in early childhood/K3 settings, and the teacher's role in this process. Students will learn how phonemic awareness, phonics, fluency, vocabulary, and comprehension influence children's literacy development. Students will learn how to select appropriate instructional materials; employ teaching strategies to meet the cognitive and affective literacy needs of all children; and collect, interpret, and use data from various types of assessments to inform literacy teaching and learning processes. **Credits:** 3.00

EDCI 32501 - Teaching Literacy In K-2

Credit Hours: 2.00. Students will study how children's oral language develops, how children learn to read and write in primary grade settings, and the teacher's role in this process. Students will learn how phonemic awareness, phonics, fluency, vocabulary and comprehension influence children's literacy development. Students will learn how to select appropriate instructional materials; employ teaching strategies to meet the cognitive and affective literacy needs of all children, and collect, interpret, and use data from various types of assessments to inform literacy teaching and learning processes.**Credits:** 2.00

EDCI 32600 - Literacy In The Intermediate Classroom

Credit Hours: 3.00. This course includes a field-based component. Students will build on material learned in EDCI 32500. They will concentrate on increasing student's literacy skills with a focus on fluency, phonics, strategic reading, vocabulary, literary analysis, content area reading, the writing process, and building comprehension skills. They will learn to select appropriate materials, employ strategies to meet the cognitive and affective literacy needs of all children; and create integrate, and use data from various forms of assessment to inform the teaching and learning process. **Credits:** 3.00

EDCI 32602 - Teaching Literacy In 3-6

Credit Hours: 2.00. Students will build on material learned in EDCI 32501. They will concentrate on increasing student's literacy skills with a focus on fluency, phonics, strategic reading, vocabulary, literary analysis, content area reading, the writing process, and building comprehension skills. They will learn to select appropriate materials, employ strategies to meet the cognitive and affective literacy needs of all children, and create integrate, and use data from various forms of assessment to inform the teaching and learning process.**Credits:** 2.00

EDCI 32650 - Introduction To Linguistics And Language Acquisition In Education

Credit Hours: 3.00. This course addresses foundational knowledge in language and linguistics for pre-service teachers and educational researchers. The purpose of this course is to survey linguistics, the study of the science of language. In this course, we will focus on phonetics, phonology, morphology, syntax, and semantics. These topics will be discussed in terms of theory, as well as in the context of ESL classroom instruction, materials development, and assessment.**Credits:** 3.00

EDCI 33500 - Reading Instruction For Tier 1 And Tier 2

Credit Hours: 2.00. Given the needs of struggling/striving readers throughout the educational system, this class will focus on effective interventions from the primary grades through high school. Instructors will present a balance of theoretical and practitioner-oriented aspects of reading development and instruction. The course will also examine a number of reading models and instructional approaches designed to ensure all students have access to effective, research-based literacy instruction. The goal is to ensure students complete the semester with a range of essential tools for working with this population. Typically offered Fall Spring.**Credits:** 2.00

EDCI 35000 - Community Issues & Applications For Educators

Credit Hours: 1.00 to 3.00. This course is an examination of diverse individual, family, and community characteristics and issues, and potential impacts on teaching and learning processes. Includes service learning with human service agencies and

personnel in the school and community. As part of this course, students complete certification to meet the Indiana Department of Education suicide prevention training requirement for teacher licensure.**Credits:** 1.00 to 3.00

EDCI 35001 - Tanzania Seminar

Credit Hours: 2.00. In this course, we will prepare for the Maymester in Tanzania study abroad program in a variety of ways, including investigating the history and culture of Tanzania, beginning to learn Kiswahili, conceptualizing service learning experiences, and collaborating on a plan for program logistics.**Credits:** 2.00

EDCI 35002 - International Comparative Education

Credit Hours: 3.00. In this course, students will explore the education system in an international context and compare particular aspects of the system (e.g., equity, funding, language, accessibility) to their own experiences with, and knowledge of, education in the United States. Students will consider the range of schools and policies in both countries in terms of issues of social justice (e.g., redistribution, recognition, representation).**Credits:** 3.00

EDCI 35003 - Knowing Africa Through Literature

Credit Hours: 3.00. Through a set of texts, this course will offer opportunities to understand, broaden and question a new (to you) and significantly different culture and your experiences in that culture. You will read a variety of African literature, including short stories, novels, and poetry, in order to investigate perspectives on African history, culture, language and education. You will then draw upon your personal encounters and activities while in Tanzania to extend your learning. Typically offered Summer.**Credits:** 3.00

EDCI 35004 - History, Culture, And Language In Tanzania

Credit Hours: 3.00. This course is a component of the Maymester in Tanzania study abroad program. In this course, students will study the history, culture, and language of Tanzania through experiences in local schools and the community, supplemented by course readings, assignments, discussions, and service learning projects. Typically offered Summer.**Credits:** 3.00

EDCI 35600 - Career Education In Family And Consumer Sciences

Credit Hours: 3.00. Examination of middle and high school career education accomplished through family and consumer sciences, including (1) life and career exploration and planning; (2) analysis of career paths and opportunities in family and consumer sciences; and (3) career preparation through laboratory and cooperative education programs. Historical and contemporary foundations for career education in family and consumer sciences is also are addressed. Includes observations and interactions with students and teachers in career-education programs and participation in professional meetings.**Credits:** 3.00

EDCI 35950 - Content Area Instruction For English Learners

Credit Hours: 3.00. This course identifies the linguistic challenges faced by English language learners (ELLs) in the content areas of English language arts, mathematics, science, and the social studies. Participants will learn to describe how language varies in the way it presents knowledge in different content areas. The course links these challenges to English language instruction and subject-matter instruction in English for ELLs who are in general education classrooms. The course emphasizes assessment tools designed to assess content knowledge and links these students' English language development. Participants will describe academic tasks that require advanced levels of reading and writing and the expectations for the development of academic literacy as ELLs move from elementary to secondary "literacy" contexts, or the kinds of meaning-making typical of secondary and postsecondary education.**Credits:** 3.00

EDCI 36000 - Curriculum And Instruction In Family And Consumer Sciences: Middle School

Credit Hours: 3.00. Instructional program development for family and consumer sciences. Developmental needs and issues of early adolescents; study of adolescent literacy; and curriculum integration of language arts, math, and other content areas are emphasized. Development of a comprehensive unit of instruction that incorporates standard-based curriculum, assessment, and instruction for family and consumer sciences is a major component of the course. Includes observations and interactions with family and consumer sciences teachers and students and participation in professional meetings.**Credits:** 3.00

EDCI 36100 - Social Studies In The Elementary School

Credit Hours: 3.00. Provides students with an overview of the field of social studies, of selected issues in the field, and of best practice strategies for teaching social studies to elementary school children. Encourages participants to reflect on social studies knowledge, skills and dispositions, how students learn these most effectively, and how best to teach social studies. Includes a field-based experiential component. No undergraduate students may be enrolled in any of these undergraduate courses until they have been admitted to teacher education. **Credits:** 3.00

EDCI 36101 - Teaching Social Studies In K-2

Credit Hours: 2.00. This course provides students with an overview of the field of social studies, of selected issues in the field, and of best practice strategies for teaching social studies to children in the K-2 classroom. Students will work to identify the most important social studies knowledge, skills and dispositions; investigate how K-2 children learn social studies most effectively. Students will then use their new understandings to implement lessons, analyzing the effectiveness of their instruction for children in the K-2 grades. Admission to Teacher Education is required.**Credits:** 2.00

EDCI 36102 - Teaching Social Studies In 3-6

Credit Hours: 2.00. This course provides students with an overview of the field of social studies, of selected issues in the field, and of best practices strategies for teaching social studies to children in the 3-6 classroom. Students will work to identify the most important social studies knowledge, skills and dispositions; investigate how 3-6 children learn social studies most effectively. Students will then use their new understandings to implement lessons, analyzing the effectiveness of their instruction for children in the 3-6 grades.**Credits:** 2.00

EDCI 36300 - Literacy In The Elementary School II

Credit Hours: 3.00. Focuses on teaching children who experience difficulty acquiring literacy. Assessments of children's strengths and needs are used to plan and evaluate instruction. Strategies for helping children develop more mature literacy understandings are applied in weekly small-group instructional sessions. Includes a field-based experiential component. Taken concurrently with EDPS 43000. **Credits:** 3.00

EDCI 36303 - Literacy Teaching And Assessment In K-6

Credit Hours: 2.00. This course is an undergraduate, elementary education course designed to provide preservice teachers with classroom and practicum experiences focused on literacy instruction for children experiencing difficulty learning to read and write. Students learn to administer and analyze individual assessments to determine the strengths and needs of a struggling reader/writer and set tutoring goals based on these results. Application of appropriate instructional strategies for developing comprehension, letter and word study, vocabulary, and fluency is the focus of twice-weekly, 30 minute tutoring sessions (22+ total) in local elementary schools. Teaching is designed around children's social justice concerns. Admission to Teacher Education is required.**Credits:** 2.00

EDCI 36400 - Mathematics In The Elementary School

Credit Hours: 3.00. Focuses on teaching mathematics in the elementary school. Students learn what it means to teach mathematics when reasoning, problem-solving, communication, and connections are the foci. Includes a field-based experiential component. **Credits:** 3.00

EDCI 36401 - Teaching Mathematics In K-2

Credit Hours: 2.00. This course focuses on teaching mathematics in the elementary school, grades K-2, and encouraging children as mathematical problem posers. Students learn what it means to teach math interactionally using children's ideas, beliefs, and experiences as primary resources. Eliciting and interpreting children's mathematical thinking as well as mathematical reasoning, problem solving, communication, and connections are foci. Admission to Teacher Education required.**Credits:** 2.00

EDCI 36402 - Teaching Mathematics In Grades 3-6

Credit Hours: 2.00. Focuses on teaching mathematics in the elementary school grades 3-6. Students learn what it means to teach mathematics interactionally using children's ideas, beliefs, and experiences as primary resources. Mathematical reasoning, problem solving, communication, and connections are foci.**Credits:** 2.00

EDCI 36500 - Science In The Elementary School

Credit Hours: 3.00. Investigates ways children learn science as a basis for planning, enacting, and assessing science curriculum and instruction. State and national standards, teaching cases, and science lab experiences are used as tools for reflecting on practice. Includes a field-based experiential component. Taken concurrently with EDCI 36400 and EDCI 37000. **Credits:** 3.00

EDCI 36501 - Teaching Science Through Design In Grades K-2

Credit Hours: 2.00. One of the primary goals of this course is to provide you with opportunities to enhance your pedagogical knowledge and skills so that you can become a culturally inclusive and effective teacher. Hence, learning to teach science in this class will involve conceptualizing science as a verb and not as a noun. To make the distinction more precise, we prefer to use the term critical cross-cultural science education instead of science education when referring to the teaching and learning of science in the increasingly culturally diverse context of schools in the US. Critical cross-cultural science education is defined as the process of actively engaging students in collaborative inquiry about what science is; whose interests are served by science; who decides what science is and what gets funded as science; and what kinds of individual and collective roles individuals could play as informed and responsible citizens in supporting the advancement of science to benefit society. Admission to teacher education required. At least 9 credits of science content required.**Credits:** 2.00

EDCI 36502 - Teaching Science Through Design In Grades 3-6

Credit Hours: 2.00. The aim of this course is to prepare students to teach science, engineering, and computational thinking with grade 3-6 learners by building on existing pedagogical and subject matter knowledge in science. Students will engage in science and engineering learning experiences; identify and analyze children's ideas and background experiences; and examine instructional strategies for leveraging students' sense making. Using this knowledge, students will plan for and implement standards-based lessons, reflecting on the strengths and areas of improvement of their instruction for grade 3 through 6 learners. At least 9 credits of science content courses are required.**Credits:** 2.00

EDCI 37001 - Teaching And Learning English As A New Language

Credit Hours: 2.00 or 3.00. This course builds foundational knowledge on the theories and practices related to the English language development of English language learners in the P-12 contexts. Particular attention is given to the current issues as well

as on techniques for instructing and assessing students at different stages of English language development in the school context. Students will learn to identify students' strengths and current needs in English, to design classroom experiences across the curriculum, and to assess student performance using current WIDA standards.**Credits:** 2.00 or 3.00

EDCI 38100 - Teaching For Social Justice: Culturally And Linguistically Diverse Learners

Credit Hours: 3.00. This course builds on the content of EDCI 28500 (Multicultural Education) with specific attention to issues of social justice related to literacy and linguistic diversity. Within this framework, students will learn strategies for teaching English language learners, deconstruct deficit perspectives of dialectical differences, and consider approaches to classroom management. Additionally, a field experience component with an ELL teacher will be included in the course. Typically offered Fall.**Credits:** 3.00

EDCI 42100 - The Teaching Of Biology In Secondary Schools

Credit Hours: 3.00. The rationale, objectives, methods, and materials of teaching biology and life science in junior and senior high schools. Extensive use of multimedia resources in planning specifically for the student teaching experience. No undergraduate students may be enrolled in any of these undergraduate courses until they have been admitted to teacher education. **Credits:** 3.00

EDCI 42200 - The Teaching Of English In Secondary Schools

Credit Hours: 3.00. Explores a wide variety of instructional practices suitable for teaching middle and high school English including language, literature, and writing - addressing specific pedagogical issues such as teaching diverse learners and developing cohesive units of instruction.**Credits:** 3.00

EDCI 42300 - The Teaching Of Social Studies In Secondary Schools

Credit Hours: 3.00. The purpose of this course is the development of a theoretical framework and pedagogical skills necessary to teach social studies to middle and high school students. Students are introduced to the general issues involved in planning and organizing a social studies curriculum.**Credits:** 3.00

EDCI 42400 - The Teaching Of Earth And Physical Science In The Secondary Schools

Credit Hours: 3.00. The methods and materials needed for the teaching of chemistry, earth-space, physics, and general science in the secondary schools, including field experience. No undergraduate students may be enrolled in any of these undergraduate courses until they have been admitted to teacher education. May be taken for two credits (no field experience) by students who are enrolled in another methods course with field experience. **Credits:** 3.00

EDCI 42500 - Teaching Of Secondary Mathematics - Methods I

Credit Hours: 3.00. This is the first of two methods courses designed for students who are planning to be secondary mathematics teachers. The course content is organized around principles of equity, curriculum, teaching, learning, assessment and technology. It also focuses on the cycle of effective teaching, which includes justifying planning decisions, analyzing teaching, and using data to inform instruction. The courses addresses NCTM's principles and standards, as well as the content and process standards included in Indiana Academic Standards for Mathematics, and pedagogical strategies for teaching these in ways that serve the diverse population of mathematics learners. **Credits:** 3.00

EDCI 42600 - Teaching Of Secondary Mathematics - Methods II

Credit Hours: 3.00. This is the second of two methods courses designed for students who are planning to be secondary mathematics teachers. The course content is organized around principles of equity, mathematical task design, classroom discourse, classroom environment assessment and technology. It also focuses on the cycle of effective teaching, which includes justifying planning decisions, analyzing teaching, and using data to inform instruction. The courses addresses NCTM's Professional Standards as well as the content and process standards included in Indiana Academic Standards for Mathematics and pedagogical strategies for teaching in ways that serve the diverse population of mathematics learners.**Credits:** 3.00

EDCI 42700 - Teaching Of World Languages

Credit Hours: 3.00. This is one of the two methods courses required for World Language Teaching major. While LC 47500 is a theoretical course, this course is a practical course on world language teaching in secondary school.**Credits:** 3.00

EDCI 42800 - Teaching Science In The Middle And Junior High School

Credit Hours: 2.00. Designed to prepare preservice teachers to teach science in the middle and junior high school (grades 5-9). No undergraduate students may be enrolled in any of these undergraduate courses until they have been admitted to teacher education.**Credits:** 2.00

EDCI 43000 - The Teaching Of Foreign Languages In Junior High And Middle School

Credit Hours: 2.00. An examination of second language listening, reading, speaking, and writing skills, along with information on cultural problems. No undergraduate students may be enrolled in any of these undergraduate courses until they have been admitted to teacher education. **Credits:** 2.00

EDCI 43300 - Advanced Social Studies Methods

Credit Hours: 2.00. Foundations of social studies; methods, techniques, strategies of teaching, and activities - with special attention to skills of planning, questioning, and testing. Includes observation, participation, and microteaching in social studies classrooms. No undergraduate students may be enrolled in any of these undergraduate courses until they have been admitted to teacher education.**Credits:** 2.00

EDCI 43400 - Literacy Teaching And Learning In Secondary Schools

Credit Hours: 2.00. Exploration and development of various instructional methods and materials appropriate for supporting adolescent literacy in secondary English (i.e., middle and high school English Language Arts), including the teaching of reading. Content-area literacy methods and materials are also addressed. Includes a field experience of up to 20 hours in a secondary English school setting. **Credits:** 2.00

EDCI 44400 - Methods For Teaching Family And Consumer Sciences

Credit Hours: 4.00. The culminating on-campus teacher-education course for the Purdue University Family and Consumer Sciences program. The course builds and consolidates teacher-candidates' knowledge and skills for teaching family and consumer sciences. Emphasis placed on standards-based instructional planning and materials; instructional strategies, including laboratories, assessment of student learning, and classroom management. Course includes field experiences. Program content requirements should be completed previous to or concurrent with this course. **Credits:** 4.00

EDCI 44600 - Directed Observation For Family And Consumer Sciences

Credit Hours: 1.00 to 4.00. Field-based experience in a middle or high school, a Cooperative Extension setting, or other applicable career setting for family and consumer sciences educators. Build professional capacity through focused, participatory

experiences that include interactions with family and consumer sciences educators, other school/agency personnel, and students/clients. Thirty-five hours of documented experience in approved setting needed for one credit. **Credits:** 1.00 to 4.00

EDCI 45200 - Global Studies Seminar

Credit Hours: 1.00. (EDPS 45200) The course builds on students' international cross-cultural experiences, particularly Study Abroad. The course is required for those wishing to complete the Global Studies minor in the College of Education. Typically offered Fall Spring Summer.**Credits:** 1.00

EDCI 49000 - Individual Research And Teaching Experience

Credit Hours: 1.00 to 8.00. Primarily for teacher candidates requiring special, individualized experience in research or teaching. Permission of instructor required. **Credits:** 1.00 to 8.00

EDCI 49200 - Honors Scholarly Project Capstone

Credit Hours: 1.00 to 6.00. This course is designed to provide students with an introduction to designing and writing a proposal for the Honors Scholarly Project. **Credits:** 1.00 to 6.00

EDCI 49600 - Student Teaching In The Elementary School

Credit Hours: 8.00 to 16.00. Full time elementary classroom teaching experiences and a student teaching seminar under the mentorship of the classroom teacher and a University supervisor. **Credits:** 8.00 to 16.00

EDCI 49601 - Elementary Education Expanded Student Teaching

Credit Hours: 1.00 to 8.00. This course is the initial residency experience that precedes a full semester of student teaching. The seminar and field experience focus on induction into the broader elementary school context and building mentoring relationships as both a mentee and mentor. Students will develop their identity as a professional educator who advocates for the profession, themselves, and their students. Includes a field experience. Admission to Teacher Education required.**Credits:** 1.00 to 8.00

EDCI 49800 - Supervised Teaching

Credit Hours: 8.00 to 16.00. Teaching full time in a school classroom under the supervision of the teacher in charge of the class and a University supervisor. Completion of education methods courses and other Gate requirements for the major area and admittance to teacher education required. **Credits:** 8.00 to 16.00

EDCI 50000 - Foundations Of Literacy

Credit Hours: 3.00. Survey course in the acquisition of and instruction in reading, writing, and other aspects of language. **Credits:** 3.00

EDCI 50200 - Reading In Middle And Secondary Schools

Credit Hours: 3.00. A course designed for teachers and prospective teachers in subject matter areas of the junior and senior high school. Surveys of techniques and objectives of reading instruction in the schools with special attention to the opportunities and obligations to teach reading within content areas. Teaching experience helpful but not required. May be taken as part of the sequence leading to reading specialist or for the junior high school endorsement program. Typically offered Fall Spring.**Credits:** 3.00

EDCI 50600 - Environmental Education

Credit Hours: 3.00. Synthesis of philosophies, scientific principles and methods for environmental education programs in forests, camps, and schools. Students conduct and summarize literature research on scientific and educational principles. In interdisciplinary teams, they develop, implement, and evaluate curricula for schools, nature centers, interpretive and outdoor education programs. Typically offered Fall Spring.**Credits:** 3.00

EDCI 50900 - Writing In Middle And Secondary Schools

Credit Hours: 3.00. Focuses on understanding philosophical and theoretical approaches, such as the writing process model, current reading/writing research, and how various approaches fit into existing school curriculum. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 51000 - Colloquium In Science And Mathematics Education

Credit Hours: 1.00. Weekly colloquia on individual research topics of interest to science and mathematics education faculty and graduate students. Colloquia will describe research programs in education. Course will be required of first-year graduate students. Typically offered Fall.**Credits:** 1.00

EDCI 51200 - Mathematics In The Secondary School

Credit Hours: 3.00. Models of mathematics learning, current curriculum trends and practices with emphasis on laboratory and individualized systems; designing instructional materials. Typically offered Fall Spring.**Credits:** 3.00

EDCI 51300 - Foundations Of Learning Design And Technology

Credit Hours: 3.00. Provides an historical overview of the field and delineates the foundational knowledge, skills, and attitudes needed by professionals in the field of educational technology and instructional design. Students explore the field by engaging in collaborative projects, along with thinking and writing about various aspects of educational technology and the underlying instructional design theories. Typically offered Summer Fall Spring.**Credits:** 3.00

EDCI 51600 - Seminar In Environmental Education

Credit Hours: 3.00. The seminar covers current research and literature in environmental education, focusing on teaching children and adults about the environment. Topics vary by semester and student interest. Typically offered Summer Fall Spring.**Credits:** 3.00

EDCI 51700 - Survey Of Science Education

Credit Hours: 3.00. Introduction to current issues and research in science education, broadly organized under themes of learning, teaching, and science curriculum. Typically offered Fall.**Credits:** 3.00

EDCI 51800 - The Nature Of Science In Science Teaching

Credit Hours: 3.00. Explores philosophical issues related to the scientific enterprise, such as the production and validation of scientific knowledge; the role of the scientific community; and the influence of gender and culture on doing science. Also examines the implications of these issues for science teaching and learning, as well as for research in science education. Typically offered Spring.**Credits:** 3.00

EDCI 51900 - Teaching English Language Learners

Credit Hours: 3.00. This course focuses on current issues and techniques in ESL instruction and assessment for students at the beginning or intermediate stages of English language acquisition Pre-K-12. Emphasis is on the design of materials and instruction that foster English language development in the content areas of the curriculum (i.e., Specially Designed Academic Instruction in English or SDAIE). Some familiarity with elementary and/or secondary teaching methods is assumed. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 52001 - Curriculum And Instruction Online MS Seminar I

Credit Hours: 1.00. This boot camp is designed to help you to understand the knowledge and skills necessary for your successful online learning in the Curriculum and Instruction program. In this orientation, you will explore what online learning entails and reflect on how you can best set yourself up to succeed in your studies. You will also learn about various learning strategies and online resources that you can utilize in your courses. In this seminar, you will be responsible for completing all assignments on time over the course of the semester. Read the guidelines for each week and complete the assignments. NOTE: This course is a core course in the C&I online masters program. A grade of B- or better is required (if a lower grade is received, the course must be retaken). Permission of department required. Typically offered Fall Spring Summer.**Credits:** 1.00

EDCI 52002 - Curriculum And Instruction Online MS Seminar II

Credit Hours: 1.00. This seminar is designed to help you to understand the knowledge and skills necessary for your success throughout the Curriculum and Instruction program. In addition to providing you with information that will help you succeed in the program, you are also asked to think about ways to make yourself more marketable to current and future employers. Permission of department required. Typically offered Fall Spring Summer.**Credits:** 1.00

EDCI 52003 - Theories And Trends In Curriculum And Instruction

Credit Hours: 3.00. This course focuses on current theories and trends influencing curriculum and instruction. A theory is a plausible or scientifically acceptable general principle or body of principles offered to explain phenomena. It is a belief, policy, or procedure proposed or followed as the basis of action. A trend, on the other hand, is a pattern of gradual change in a condition, output, or process. It reflects a general tendency of a series of moves in a certain direction over time. We will focus on understanding sources of current theories and trends and how they may influence work in curriculum and instruction. Permission of department required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 52004 - Teachers As Leaders

Credit Hours: 3.00. This course focuses on teacher leadership in instruction. Participants will examine the history of teacher leadership. Instructional coaching models will be examined and compared. Students will identify the various theories that support each coaching model and examine what is most present in their school contexts. Permission of department required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 52301 - Foundations Of Bilingual Education

Credit Hours: 3.00. This course builds foundational and practical knowledge of children's bilingual development and the sociocultural, cognitive, philosophical, and educational basis for high-quality dual language and other bilingual education programs. It focuses on research and current issues related to the bilingual development of emergent bilinguals in K-12 contexts. It is designed for pre-service and in-service bilingual teachers and administrators, in addition to other teachers of English language learners and researchers interested in high-quality and equitable educational programs for bilingual students. Typically offered Fall Spring Summer.
Credits: 3.00

EDCI 52401 - Teaching Methods In Bilingual Education

Credit Hours: 3.00. Application of theory, research, and guiding principles to providing high-quality instruction in dual language and other bilingual education programs in K-12 education. This course includes a specific focus on both program-level design of effective dual language programs, and effective language and literacy instruction for emergent bilingual students leading to high levels of bilingualism, biliteracy, and academic achievement. This course is designed for pre-service and in-service bilingual teachers and administrators, in addition to other teachers of English language learners and researchers interested in high-quality and equitable educational programs for bilingual students. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 52600 - Language Study For Educators

Credit Hours: 3.00. (ENGL 52900). Covers foundational knowledge in language and linguistics for teachers and educational researchers. Topics include structure and functions of language, language acquisition and development, language diversity, classroom discourse, language and media, and literacy-language arts curriculum. A foundation for work in Literacy and Language Education. Typically offered Spring.**Credits:** 3.00

EDCI 52700 - Science Methods In The Elementary School

Credit Hours: 3.00. The examination of learning theories, instructional methods, and curricular materials appropriate for teaching science concepts and skills in the elementary school setting. Students will apply, evaluate, and reflect upon elementary science teaching methods through class activities and field experience assignments. Acceptance into the Elementary Transition into Teaching (TTT) program. Typically offered Fall Spring.**Credits:** 3.00

EDCI 52800 - Human Performance Technology

Credit Hours: 3.00. This course provides an introduction to the field of human performance technology (HPT). It examines basic concepts and principles of human performance, the theoretical underpinnings of the field, research and application literature, and various approaches to solving human performance problems. A systematic approach to the analysis, design, development, implementation and evaluation of performance improvement interventions within organizations is emphasized. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 53000 - English Language Development

Credit Hours: 3.00. Focuses on theoretical and practical knowledge for teachers about how second languages are learned, and on the educational and philosophical basis for second language teaching and learning. Links English language development to teaching and learning strategies and is designed for undergraduate and graduate students in education and practicing teachers. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 53100 - Learning Theories And Instructional Design

Credit Hours: 3.00. This course has been designed to help you learn how theories of human learning and motivation can be applied to the instructional process in order to make the process more effective, efficient, and/or appealing. The focus of the course is on two areas: 1) the theoretical principles that have contributed to the field of Instructional Design (ID), and 2) how those principles can be applied within practical settings. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 53300 - Teaching And Learning Number And Operations.

Credit Hours: 3.00. This course is designed to provide opportunities for mathematics educators to develop understanding of teaching and learning in the domain of number and operation. Central to this work is the construction of models of learners' understanding of number and operation and the use of those models to build and select curriculum. While curricular efforts have

historically taken as central a formal view of mathematics and its construction, more recently curriculum has been written to engage learners and to build from knowledge of learners' understanding. In this course we will develop models of learner's understandings of different facets of number and operation and then use those models and our emerging understanding of curriculum to explore challenges in teaching and learning. Typically offered Fall Spring Summer**Credits:** 3.00

EDCI 53400 - Teaching And Learning Geometry And Measurement

Credit Hours: 3.00. This course is designed to provide opportunities for mathematics educators to develop understanding of teaching and learning in the related domains of geometry and measurement. Central to this work is the construction of models of learners' understandings of geometry and measurement and the use of models to design instruction. Geometry, as a discipline in school mathematics, has historically and more currently been debated. In this course we will explore research in the teaching and learning of geometry and measurement. A synthesis of select literature will inform our efforts to develop models of learners' geometric reasoning and understanding of measurement. We will move past the development of models to the design of instruction meant to support understandings of concepts that utilizes technology. Typically offered Fall Spring Summer**Credits:** 3.00

EDCI 53500 - Teaching And Learning Algebra And Functions

Credit Hours: 3.00. This is a course for current or prospective mathematics teachers wishing to explore ways of teaching algebra with a focus on addressing concerns related to student performance in algebra and increasing algebraic reasoning skills in the classroom. The course includes experiences with inquiry-based learning by engaging participants in algebra activities from two secondary National Council of Teachers of Mathematics (NCTM) standards-based curricula. The course will provide opportunities for participants to collaborate on the development of algebraic thinking in mathematics classrooms and will address pedagogical approaches to students' learning of algebra. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 53600 - Teaching And Learning Data Analysis And Probability

Credit Hours: 3.00. This course will provide opportunities for the growth of middle school mathematics teachers understanding of data analysis and probability as a means to help analyze and interpret experienced events. The course will address the following: selecting and using appropriate statistical methods to analyze data, developing and evaluating inferences and predictions that are based on data, and understanding and applying the basic concepts of probability. This course will also address pedagogical approaches to students' learning of data analysis and probability. Typically offered Fall Spring Summer**Credits:** 3.00

EDCI 53900 - Introduction To K-12 Integrated Science, Technology, Engineering And Mathematics (STEM) Education

Credit Hours: 3.00. This course will provide students with a conceptual understanding of integrated K-12 Science, Technology, Engineering and Mathematics (STEM) education and the nature of the disciplines of STEM. Students will explore implications for the teaching and learning of integrated STEM in a K-12 context through an evaluation of integrated approaches to STEM, national teaching standards and current research. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 54100 - Contemporary Issues In Career And Technical Education

Credit Hours: 3.00. Identification, analysis, synthesis, and implications of current issues and problems in career and technical education at the elementary, secondary, postsecondary, and adult levels; policy and literature review; formulation of alternatives and solutions. Typically offered Fall Spring.**Credits:** 3.00

EDCI 54300 - Instruction In Career And Technical Education

Credit Hours: 3.00. Contemporary trends and methods in teaching career and technical programs, learning styles and teaching styles, and a variety of creative instructional strategies for different educational contexts will be identified and analyzed. Typically offered Fall Spring.**Credits:** 3.00

EDCI 54400 - Career And Technical Education For Special Needs Learners

Credit Hours: 3.00. Legislative initiatives; identification of special needs learners at the elementary, secondary, postsecondary, and adult levels; learning characteristics; assessment; individualized planning; instructional adaptations; school and community resources; exemplary program models; research, trends, and issues; and evaluation. Typically offered Summer.**Credits:** 3.00

EDCI 54500 - Planning In Career And Technical Education

Credit Hours: 3.00. Principles and strategies in planning new and improving existing career and technical education programs, strategic planning, needs assessment, community and workforce market research, information and data analysis, program improvement. Permission of Department required. Typically offered Fall Spring.**Credits:** 3.00

EDCI 54501 - Teaching STEM Through Agriculture, Food, And Natural Resources

Credit Hours: 3.00. The course focuses on the background and history of STEM movement and agricultural education, contemporary models, strategies, and justification for incorporation of science, technology, engineering and mathematics (STEM) concepts and practices into K-12 formal and non-formal agricultural education programs. Consider and develop the best practices for STEM teaching and learning and enhancement of STEM content in agriculture, food and natural resources (AFNR) context. The goal of the course is to help students develop knowledge about STEM integration and equip them with teaching knowledge and skills for designing K-12 lesson plans by using integrated STEM through AFNR. Students will learn strategies that promote engagement in integrated STEM through AFNR activities. At the end of the course, students should be able to design and implement research-based integrated STEM through AFNR lesson plans and assessment plans. Typically offered Spring.**Credits:** 3.00

EDCI 54800 - Teaching Mathematics To Diverse Learners

Credit Hours: 3.00. This course is designed to provide opportunities for in-service teachers to engage around issues of equity in mathematics education. Equity here is used as a broad construct intended to help us think about how to provide meaningful opportunities to learn for all the students in our mathematics classrooms. The notion of "diverse" here is also taken broadly. All students have special needs, but it is sometimes helpful to think about the needs of particular groups of students while at the same time avoiding reducing differences among students to stereotypes. Issues of diversity here include, but are not limited to race, culture, gender, disabilities, language, SES, and sexual orientation. Typically offered Fall Spring Summer**Credits:** 3.00

EDCI 54900 - Assessment In STEM Education

Credit Hours: 3.00. This course is designed to help teachers of STEM recognize the link between productive assessment and productive instruction, using the STEM education standards for teacher competence in educational assessment. This course is designed to help teachers meet those professional standards and understand the public pressure as well as instructional need for effective formative and summative assessment.**Credits:** 3.00

EDCI 55000 - Career Education

Credit Hours: 3.00. An overview of contemporary legislation, educational reform, trends, and issues; career education program models; vocational and technical education, technology prep, and school-to-work systems; partnerships; foundations of career education; career development; curriculum; career guidance and counseling; career assessment; career planning practices; learning styles and instructional strategies; career information sources and resources; exemplary programs; and special needs populations and practices. Typically offered Summer Fall Spring.**Credits:** 3.00

EDCI 55100 - Young Adult Literature

Credit Hours: 3.00. This course is a survey of classic and contemporary young adult texts. Students are introduced to the genre through reading notable young adult texts, applying relevant literary criticism, and investigating effective pedagogical strategies. Typically offered Fall Spring.**Credits:** 3.00

EDCI 55200 - Generalizable Skills Instruction In Career And Technical Education

Credit Hours: 3.00. Curriculum, assessment, planning, implementation, and evaluation relating to generalizable skills (also known as generic, transferable, or workplace skills) in career and technical education, other content areas, and special education programs; philosophical, historical, social, economic, political, and educational influencing factors; analysis and synthesis of current research and conceptual models; practical applications for programs; instructional strategies; resources and support services, interdisciplinary collaboration approaches; applications for special needs learners; learning styles and characteristics. Typically offered Summer Fall Spring.**Credits:** 3.00

EDCI 55300 - Leadership Development In Career And Technical Education

Credit Hours: 3.00. Design, development, implementation, and evaluation of systems and strategies for enhancing the skills and knowledge of personnel seeking to become leaders in the field of Career and Technical Education (CTE); research related to critical and emerging leadership issues, strategies, policies, and resources are examined and applied to program improvement initiatives in schools, the workplace, agencies, and other organizations that serve a wide variety of youth, adolescents, young adults, and adults. Typically offered Summer Fall Spring.**Credits:** 3.00

EDCI 55600 - Educational Video Game Design

Credit Hours: 3.00. Designed to provide an introduction to the design of educational video games. The focus of the course is on two areas: 1) the learning, instructional design, and game design theories which can inform the design of effective and engage in educational video games, and 2) how to apply those theories within practical settings. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 55700 - Assessment Of Culturally And Linguistically Diverse Students

Credit Hours: 3.00. Critical review of research and practice in language proficiency and content-area assessment of culturally and linguistically diverse students in K-12 education, and the sociocultural dimensions of standardized testing, academic achievement, and accountability. Critical analysis of standardized language proficiency and literacy tests. Development of authentic alternative language, literacy and content-area assessments. Prerequisites: Background in K-12 education. Typically offered Summer.**Credits:** 3.00

EDCI 55800 - Integrated Science, Technology, Engineering And Mathematics (STEM) Education Methods-Secondary

Credit Hours: 3.00. Focuses on operationalizing the theoretical pedagogical approaches to integrated Science, Engineering, Mathematics and Agriculture (STEM) education. Collaboratively and cooperatively investigate, plan and deliver integrated learning experiences appropriate for secondary education. Course content will blend philosophical considerations with practical application. Permission of instructor required. Typically offered Fall Spring.**Credits:** 3.00

EDCI 55850 - Introduction To Teaching Engineering And Technology Design In The Context Of K-12 Integrated STEM

Credit Hours: 3.00. Engineering and technology design has gained considerable traction in many K-12 schools. In this course, we will examine principals of engineering design and technology as well as where and how engineering and technology design best fits in a K-12 integrated STEM curriculum. Course participants will engage in authentic engineering and technology design experiences. Course participants will also design, develop, deliver integrated lessons that help K-12 students develop the knowledge, skills, and practices of engineering and technology design.**Credits:** 3.00

EDCI 55900 - Academic Language And Content Area Learning

Credit Hours: 3.00. (ENGL 59900) Course focuses on theoretical and practical knowledge for teachers about how second languages are learned, and on the educational and philosophical basis for second language teaching and learning. The course links English language development to teaching and learning strategies and is designed for undergraduate and graduate students in education and practicing teachers. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 55950 - Engineering And Technology Design Practicum

Credit Hours: 3.00. EPICS is a service-learning design course in which teams of students from across campus work together on long- term projects that benefit the community. Project work centers around the engineering, technology, and computing needs of a community partner, but interdisciplinary team interaction is an integral element for project success. Students may participate in EPICS multiple semesters and participation for multiple consecutive semesters on a project team is encouraged. Teams are composed of first year students through seniors.

Most EPICS projects last at least one-year, though partnership with the community organization continues for several years. Projects are intended to solve real problems, are defined in partnership with their community partners, and span the complete design process cycle [problem identification - specification development - conceptual design - detailed design - delivery - service/maintenance - retirement].

You receive academic credit for participating in EPICS. How academic credits are applied to your major depends on your degree program and is determined by your department and/or advisor. See https://engineering.purdue.edu/EPICS/purdue/epics-purdue/credit.**Credits:** 3.00

EDCI 56000 - Educational Technology For Teaching And Learning

Credit Hours: 3.00. This course addresses the fundamentals of educational/learning technologies within both the traditional classroom, as well as the corporate/business training environments. Students will explore and evaluate various tools/technologies and determine how, when, and why such technologies can/should be infused into normal, hybrid, or fully online learning situations. The goal of the course is to help the student plan, implement, and evaluate technology for teaching and learning. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 56400 - Integration And Management Of Technology For Learning

Credit Hours: 3.00. This course focuses on techniques for and issues related to integrating technology in learning environments in a meaningful way. Topics covered stem from literature in the field and include (1) theoretical foundations of technology integration, including how technology can support a more personalized approach to learning, (2) instructional and learning issues with technology integration, (3) designing for the integration of technologies for in learning environments, and (4) emerging issues in research and practice with technology integration. Class activities are designed to model applications of learning technology, while class projects allow individuals to develop skills and knowledge in areas of your personal need or interest. The goal of the course is to help you develop an understanding of important issues associated with the integration and management of learning technology and to effectively plan, design, implement, and evaluate technology-based learning. **Credits:** 3.00

EDCI 56500 - Principles Of Adult Education

Credit Hours: 3.00. (ASEC 56500) Principles of adult education applied to helping adults learn, evaluating their performance, and determining their needs. Examines history, philosophy, and research of adult education. Explores techniques required in design and delivery of instruction for adults. Typically offered Spring.**Credits:** 3.00

EDCI 56600 - Educational Applications Of Multimedia

Credit Hours: 3.00. Examination of educational applications of hypermedia tools and related research. Creation of hypermedia instructional materials. Incorporation of digitized media (sound, photographs, and motion clips) in hypermedia is explored. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 56700 - Action Research In Science Education

Credit Hours: 3.00. An introduction to various models and conceptions of teacher action research in science education. Students review literature on action research, participate in small research cohorts, and plan and conduct action research within their respective educational situations. Typically offered Fall Spring.**Credits:** 3.00

EDCI 56800 - Partnering With Web-Based Tools For Learner Centered Environments

Credit Hours: 3.00. Provides an in-depth look at Web-based digital tools for teaching and learning, with a focus on learner-centered activities and environments. Emphasis is given to applying the knowledge and skills necessary to create a Web-based, student-centered lesson/unit that provides diverse learners with opportunities for formal and informal learning. Course content is applicable to both independent and collaborative learning, as well as use of the Web as the sole educational delivery system or in combination with other approaches, including traditional classroom instruction. Typically offered Summer Fall Spring.**Credits:** 3.00

EDCI 56900 - Introduction To E-Learning

Credit Hours: 3.00. This course examines how the design and development of instruction are impacted by the use of the computer as delivery system. A primary focus is on effective learning design strategies for e-learning. Learners will identify and apply effective design practices with emphasis on project management, planning, and implementation. Education or training materials will be developed using appropriate authoring tools as determined by the instructional context. Learners will design an E-Learning module with end-to-end documentation of the design process (Project Plan, Design Document, Storyboard). Opportunities for collaborative feedback and evaluation will also be featured elements of the course experience. **Credits:** 3.00

EDCI 57200 - Introduction To Learning Systems Design

Credit Hours: 3.00. An introduction to the principles of designing instructional materials and to instructional communication theory and techniques. Topics include objectives, student characteristics, media selection, communication variables, message design, and systematic evaluation. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 57300 - Instructional Development Practicum

Credit Hours: 2.00 or 3.00. Provides supervised field experience in programs involving instructional design development activities. Students participate in ongoing projects in the design, development, and evaluation of instructional materials and training programs in business and industry, medical facilities, or other settings deemed appropriate. Recommended prerequisites: EDCI 56900, EDCI 57200, and EDCI 67200. Permission of instructor required. Typically offered Fall Spring.**Credits:** 2.00 or 3.00

EDCI 57500 - Foundations Of Distance Learning

Credit Hours: 3.00. An introduction to the field of distance learning/education. Examination of basic concepts and principles of distance learning, the theoretical underpinnings of the field, research and application literature, and distance education delivery technologies. Focus is on integration of distance education technologies for learning and teaching. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 57700 - Strategic Assessment And Evaluation

Credit Hours: 3.00. This course explores principles and techniques that can be used to carry out evaluations within an organization. The course also examines several aspects of conducting evaluations, including planning and designing an evaluation, developing appropriate instruments, using various methods to collect information, analyzing information obtained from those methods, and communicating results and recommendations. This course is designed to help learners understand the multiple ways that evaluation is used in instructional systems and provides opportunities to design various types of evaluation instruments. A portion of the course will examine the study of learner assessment as part of the evaluation of instructional programs; however, the course's focus is dedicated to the study of program evaluation. **Credits:** 3.00

EDCI 58000 - Foundations Of Curriculum

Credit Hours: 3.00. Introduction to the major historical and philosophical sources of curriculum ideas. Significant forces influencing curriculum decision making. Different theoretical approaches to the construction and analysis of curriculum. Typically offered Fall.**Credits:** 3.00

EDCI 58500 - Multicultural Education

Credit Hours: 3.00. The course aims to develop understanding of multicultural education as an on-going reform process that addresses social justice issues through an examination of race, class, gender, ethnicity, language, sexual orientation, etc. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 58600 - Topics In Educational Reform

Credit Hours: 3.00. (EDFA 58600) Explore important and timely issues related to educational reform and restructuring. Topics include: school choice, curriculum reform, assessment, technology, and influences on the reform process. Typically offered Fall Spring.**Credits:** 3.00

EDCI 58700 - Leadership And Management In Educational Technology

Credit Hours: 3.00. This course addresses the fundamentals of leadership and management of educational technology in a K-12 setting. Students will explore and evaluate computer hardware, software, networks, and lab management, including how they fit into education. This course is designed to provide prospectives on organizational leadership of educational technology, as well as providing future teachers with the ability to troubleshoot basic problems often associated with computers and software in the classroom. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 58800 - Motivation And Instructional Design

Credit Hours: 3.00. This course has been designed to provide an in-depth study of motivation as one of the fundamental variables underlying human learning, behavior, and instructional design. The focus of the course is on two areas: 1) theories of motivation and the general principles that have contributed to the field of instructional design, and 2) how those principles are applied within practical design settings. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 58900 - Special Topics For Teachers

Credit Hours: 1.00 to 4.00. Consideration of appropriate professional problems of experienced educational personnel in workshops or in-service programs. Typically offered Fall Spring Summer.**Credits:** 1.00 to 4.00

EDCI 59000 - Individual Research Problems

Credit Hours: 1.00 to 6.00. Opportunities for students to study particular problems under the guidance of a member of the This plan of individualized instruction may be used in any field of education or vocational education. Does not include thesis work. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 6.00

EDCI 59100 - Special Topics In Education

Credit Hours: 1.00 to 4.00. Group study of a current problem or special topic of interest to professional educational personnel. Intensive study of research, theory, or practical aspects of a particular issue within the usual graduate class format. Typically offered Fall Spring Summer.**Credits:** 1.00 to 4.00

EDCI 59300 - Introductory Secondary Transition To Teaching Seminar

Credit Hours: 1.00. This seminar course offers an introduction to the TTT program, as well as an overview of general educational concerns and issues applicable to all content area instruction at the middle and high school levels. It is often the first course taken in the TTT program by program participants. The course centers on discussions of educational issues, theories, and approaches that the students who are seeking licensure in any of the secondary areas available at Purdue will find helpful. Additionally, the course provides general information about TTT program course sequences, the fee structure, application processes for student teaching placements, and the overriding philosophy of the TTT program at Purdue. Permission of instructor required. Typically offered Summer.**Credits:** 1.00

EDCI 59400 - Concluding Secondary Transition To Teaching Seminar

Credit Hours: 2.00. This seminar course offers a conclusion to the program, as well as a review of general educational concerns and issues applicable to all content area instruction at the middle and high school levels. It is often the last course taken in the TTT program by program participants. The course centers on discussions of educational issues, theories, and approaches that the students who are seeking licensure in any of the secondary areas available at Purdue will find helpful. Additionally, the course helps students prepare to obtain their teaching license and enter the teaching community as a secondary teacher. Permission of instructor required. Typically offered Summer.**Credits:** 2.00

EDCI 59500 - Advanced Studies In English Education

Credit Hours: 1.00 to 3.00. Advanced study of an English education topic, issue, problem and/or trend within the instructor's fields of specialization. Typically offered Fall Spring Summer.**Credits:** 1.00 to 3.00

EDCI 59600 - Pedagogy I: Introductory Methods For Secondary Education Transition To Teaching Program

Credit Hours: 3.00. This course is the introductory seminar for the secondary Transition to Teaching (TTT) programs across disciplines. Students who enroll in this course will be seeking teaching licensure in one of the secondary program areas available at Purdue University. Therefore, instruction in the course will revolve around general educational concerns and issues that are applicable to all content area instruction at the middle and high school levels. Admission to the Transition to Teaching program required. Permission of department required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 59700 - Pedagogy II: Advanced Methods For Secondary Education Transition To Teaching Program

Credit Hours: 3.00. This sixteen-week course is the capstone methods course for the online Transition to Teaching (TTT) program. Students who enroll in this course will be seeking teaching licensure in one of the secondary program areas available at Purdue University. Therefore, instruction in the course will revolve around general educational concerns and effective teaching approaches that are applicable to all content area instruction at the middle and high school levels. This course extends engagement with the pedagogical principles of practice introduced in *Transition to Teaching: Pedagogy I*. The course also includes a fifty-hour field experience component. Admission to Transition to Teaching program required. Permission of department required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 59900 - Research And Instructional Coaching

Credit Hours: 3.00. This independent study, field-based course is designed to teach you about field-based research, instruction, and coaching in teacher education and elementary schools. You will have the opportunity to apply what you learn by developing and executing a mini-inquiry project including research questions, data collection, analysis, and findings for publication and/or program materials development.**Credits:** 3.00

EDCI 60001 - Intro To Demonstrating Professional Competencies In LDT

Credit Hours: 1.00. This course is designed to help you to understand the knowledge and skills necessary for your successful online learning in the Learning Design and Technology program, with a focus on the process of earning digital badges aligned with professional competencies. In this orientation, you will explore what online learning entails and reflect on how you can best set yourself up to succeed in your studies. You will also learn and apply the process of both earning digital badges within the program and evaluating your peers' work as part of the badge earning process. Typically offered Fall Spring Summer.**Credits:** 1.00

EDCI 60002 - Demonstrating Professional Competencies In LDT

Credit Hours: 1.00. This course will primarily focus on the further earning of badges as part of demonstrating required program competencies. We will also further explore the purpose and process behind this. Additional resources and activities regarding a better understanding of the profession will also be available. Prerequisites: EDCI 60001. Typically offered Fall Spring Summer.**Credits:** 1.00

EDCI 60003 - LDT Professional Competencies Portfolio

Credit Hours: 1.00. This course will focus on completion of the competency portfolio reflecting on the depth and breadth of your educational growth since entering the Master's program. The purpose of the LDT competency portfolio is to demonstrate that you have mastered the graduate competencies. The portfolio will contain student evidence aligned with LDT competencies and will be reviewed by your committee. The completed competency portfolio is a requirement for graduation from the LDT Master's program. Prerequisites: EDCI 60001 and 60002. Typically offered Fall Spring Summer.**Credits:** 1.00

EDCI 60400 - Social Studies In The Elementary School

Credit Hours: 3.00. Social Studies-content and place in the modern elementary education curriculum. Materials, instruction techniques, evaluation procedures, and understanding the syntax of the structure of social studies. Prerequisite: EDCI 36100. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 60500 - Teaching Integrated Science, Technology, Engineering And Math

Credit Hours: 3.00. Analysis of historical developments and present trends in science education; the designing, implementation, and evaluation of science programs; the role of research in present and future developments. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 61200 - Seminar In Literacy

Credit Hours: 3.00. Recent trends and research in literacy. Topics provide in-depth study of literacy acquisition in educational settings. Typically offered Fall.**Credits:** 3.00

EDCI 61300 - Seminar In The English Language Arts

Credit Hours: 3.00. (ENGL 69100) Problems in the teaching of English: literature, language, rhetoric. Attention to recent scholarship and to its application in the public schools. Typically offered Fall Spring.**Credits:** 3.00

EDCI 61400 - Literacy And Development Of Young Children

Credit Hours: 3.00. Focuses on literacy development (reading, writing, other aspects of language) in pre-school and elementary age children. An emergent literacy model is contrasted with traditional models and school instruction. Particular experiences and materials that aid literacy acquisition are considered. Typically offered Fall.**Credits:** 3.00

EDCI 61450 - Seminar In Bilingualism And Multilingualism

Credit Hours: 3.00. This course examines theories, research and educational practices in bilingualism and multilingualism. Students will become familiar with major conceptual and methodological issues in research about the use and acquisition of two or more languages in bi/multilingual societal and educational contexts. Individual and societal dimensions will be considered through the examination of a wide range of approaches. Accordingly, the course is transdisciplinary in nature, bringing together work from anthropology, education, psychology, and (socio)linguistics. **Credits:** 3.00

EDCI 61500 - Qualitative Research Methods In Education

Credit Hours: 3.00. Focuses on expanding graduate students' research skills to include knowledge of the theories and methods associated with qualitative and qualitative-quantitative combined research. Prerequisite: EDPS 53300. Typically offered Spring.**Credits:** 3.00

EDCI 61600 - Qualitative Data Collection And Analysis In Educational Research

Credit Hours: 3.00. This course focuses on expanding and applying students' knowledge of qualitative data collection and analysis with an emphasis on multiple approaches to data collection, analysis, and interpretation. Prerequisite: EDCI 61500 or permission of instructor. Typically offered Fall.**Credits:** 3.00

EDCI 61800 - Gender And Culture In Science Education

Credit Hours: 3.00. An examination of the different perspectives on issues of gender, culture, and science. Major topics include feminist critiques of scientific theories and methods, the work of women and minorities in science, the role science has played in the construction of race and gender, and topics in science education, such as girls' learning in science and the potential of inclusive practices in the science classroom. Prerequisite: EDCI 51800 or EDCI 58500. Typically offered Summer Fall Spring.**Credits:** 3.00

EDCI 61900 - Learning Science

Credit Hours: 3.00. The course provides a holistic study of how children and adults learn science; how the learner's ideas, ways of thinking, abilities to do science, and their attitudes towards and beliefs about science learning influence how they learn science. Typically offered Fall Spring.**Credits:** 3.00

EDCI 62000 - Seminar In Mathematics Education

Credit Hours: 1.00 to 6.00. Selected topics in mathematics education. Typical topics considered are: (1) problem solving; (2) instructional strategies; (3) cognitive structure; (4) current curriculum; (5) current research. Permission of instructor required. Typically offered Spring.**Credits:** 1.00 to 6.00

EDCI 62100 - Technology For Qualitative Research

Credit Hours: 3.00. Exploration of the effective use of technology to facilitate data collection, organization, and analysis. Emphasis on application of theoretically-based methodologies for handling and analyzing qualitative data through the use of qualitative research software. Course also includes attention to other hardware or software relevant to the collection, organization and analysis of qualitative data. Prerequisites: EDCI 61500. Typically offered Summer.**Credits:** 3.00

EDCI 62200 - Seminar In Science Education

Credit Hours: 1.00 to 3.00. Current issues in science education. Typical topics considered are: (1) science curriculum; (2) concept learning; (3) teacher education; (4) intellectual developments; (5) current research. Prerequisite: EDCI 51700, EDCI 51800. Typically offered Spring.**Credits:** 1.00 to 3.00

EDCI 62400 - Seminar In Social Studies Education

Credit Hours: 3.00. An investigation of various aspects of the teaching of the social studies. One topic is dealt with in each enrollment. Master's candidates are expected to complete the first three topics. Areas include: (1) philosophic concepts used in the social studies; (2) curricular analysis and examination of new social studies materials; (3) methods of inquiry in the social studies; (4) research methodology in the social studies. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 62500 - Individualized Competency Earning in Learning Design & Technology

Credit Hours: 1.00. This course is designed to facilitate your progression towards graduation from the Learning Design and Technology program, with a focus on the process of earning digital badges aligned with professional competencies. In this individualized course, you will work with an instructor to earn the appropriate number of challenges and digital badges needed in order to be on track for graduation. Typically offered Fall Spring Summer.**Credits:** 1.00

EDCI 62700 - Current Topics In Learning Design And Technology

Credit Hours: 3.00. A critical analysis of problems, trends, issues, and programs related to the area of learning design and technology. Prerequisite: EDCI 51300 . Typically offered Summer Fall Spring.**Credits:** 3.00

EDCI 62800 - Curriculum And Instruction Doctoral Seminar I

Credit Hours: 1.00. An examination of current issues and concerns related to doctoral study in Curriculum and Instruction. This course is intended for all new doctoral students in the Department of Curriculum and Instruction and should be taken within the first year of doctoral study. Typically offered Fall.**Credits:** 1.00

EDCI 63300 - Instructional Design Project Management

Credit Hours: 3.00. This course focuses on the application of project management ideas, concepts, and strategies in instructional design settings. Students will be asked to consider the relationship between instructional design and project management, tools that can assist with managing instructional design projects, and factors influencing the instructional design project management

process. Students will explore these topics by creating deliverables for instructional design cases and other interactive assignments. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 63500 - Content And Goals In Mathematics Education

Credit Hours: 3.00. Examines conceptions of what mathematics is and how those conceptions have influenced the mathematics curriculum over the course of American history. Prerequisite: Master's student standing or higher and enrolled in Mathematics Education. Typically offered Fall.**Credits:** 3.00

EDCI 63600 - The Learning Of Mathematics: Insights And Issues

Credit Hours: 3.00. Examines research related to the learning of mathematics and to the relationships of social and cultural factors to the learning of mathematics. Prerequisite: Master's student standing or higher and enrolled in Mathematics Education. Typically offered Spring.**Credits:** 3.00

EDCI 63700 - The Teaching Of Mathematics: Insights And Issues

Credit Hours: 3.00. Examines research related to mathematics teaching, including research on characteristics of mathematics teachers, the features of effective mathematics teaching, and the professional preparation and development of mathematics teachers. Prerequisite: Master's student standing or higher and enrolled in Mathematics Education. Typically offered Spring.**Credits:** 3.00

EDCI 63800 - Curriculum And Instruction Doctoral Seminar II

Credit Hours: 1.00. This course consists of an examination of current educational research. EDCI and other faculty will present and lead discussions of their research. Students will be exposed to research within multiple paradigms and perspectives. This course is intended for all new doctoral students in the Department of Curriculum and Instruction and should be taken within the first year to doctoral study. Permission of instructor required. Typically offered Spring.**Credits:** 1.00

EDCI 64400 - Legal Issues In Career And Technical Education

Credit Hours: 3.00. Comprehensive examination of contemporary federal, state, and local legislation; rules, policy, regulations, provisions, guidelines, and initiatives affecting the nature, establishment, and implementation of state and local programs at the secondary and postsecondary levels in career and technical education; need for legislation and initiatives and the reauthorization of existing legislation; social, political, and economic aspects of legislation; advocacy for legislation; and public policy and policy development. Approval of Department required. Typically offered Fall Spring.**Credits:** 3.00

EDCI 64500 - Organization And Administration Of Career And Technical Education

Credit Hours: 3.00. Organizational structure and delivery systems at the national, regional, state, and local levels; program areas and services; legislative initiatives; federal, state, and local planning; administrative functions and practices; leadership development; trends; and issues. Typically offered Fall Spring.**Credits:** 3.00

EDCI 64600 - Supervision In Career And Technical Education

Credit Hours: 3.00. Purposes, principles, strategies, and procedures of supervision and management in career and technical education and related workforce education and development contexts: theory and practice: human resource development: environment, education, and management. Approval of Department required. Typically offered Fall Spring.**Credits:** 3.00

EDCI 64700 - Research In Career And Technical Education

Credit Hours: 3.00. Rationale for and history of research in career and technical education; analysis of the research process and research methods; examination of the environment and support required for research; proposal development, and strategies for dissemination and utilization of research. Offered in alternate years. Typically offered Fall.**Credits:** 3.00

EDCI 64800 - Curriculum In Career And Technical Education

Credit Hours: 3.00. Overview of curriculum in career and technical education programs; business and industry training programs; curriculum planning, development, implementation, and evaluation; review and analysis of curriculum models. Typically offered Fall Spring.**Credits:** 3.00

EDCI 64900 - Assessment In Career And Technical Education

Credit Hours: 3.00. Goals and rationale for evaluation in education and work training contexts; assessment and measurement methods, techniques, and procedures; reliability, validity, and accuracy; construction and selection of instruments; data and information collection, analysis, and interpretation; meta evaluation; adaptations and modifications for special needs populations; and using assessment data and information. Typically offered Fall Spring.**Credits:** 3.00

EDCI 65000 - Program Evaluation In Career And Technical Education

Credit Hours: 3.00. Goals and objectives of, and criteria for, program evaluation in career and technical education; evaluation models and methods; design and planning; issues; development and selection of instruments and procedures; data and information collection and analysis; preparing program evaluation reports; and using program evaluation results for program improvement. Typically offered Fall Spring.**Credits:** 3.00

EDCI 65200 - Seminar In Family And Consumer Sciences Education

Credit Hours: 2.00 to 6.00. A critical analysis of current problems, trends, issues, and programs in family and consumer sciences education. Prerequisite: 12 credit hours in Education or equivalent professional training. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 2.00 to 6.00

EDCI 65300 - Seminar In Career And Technical Education

Credit Hours: 1.00 to 9.00. Current trends, theory, and practices related to educational contexts and careers. Typically offered Fall Spring Summer.**Credits:** 1.00 to 9.00

EDCI 66000 - Learning Design And Technology Seminar

Credit Hours: 1.00. This course is an investigation of trends, developments, and issues in learning design and technology with a focus on current practices, problems, and research. This one-credit seminar is designed to help students learn about applications of instructional design and educational technology in various settings and to interact with faculty and guest speakers about topics related to the field and the LDT program.**Credits:** 1.00

EDCI 67000 - Learning Design And Technology Portfolio

Credit Hours: 1.00 to 2.00. This course was created to help guide LDT students near completion of their coursework to develop their competency portfolio. The competency portfolio is a requirement for graduation from the traditional LDT Master's program.**Credits:** 1.00 or 2.00

EDCI 67200 - Advanced Practices In Learning Systems Design

Credit Hours: 3.00. This course focuses on the application of learning systems design to real-world educational situations through the in-depth consideration of key instructional design processes (e.g., analysis, design, development, implementation, evaluation). Additionally, a key focus of the course is on the development of instructional design expertise. Prerequisite: EDCI 57200. **Credits:** 3.00

EDCI 67300 - Issues And Methods In Learning Systems Design Research

Credit Hours: 3.00. Provides preparation to conduct independent research in the field of learning design and technology through direct participation in the research process: critically reviewing research, designing and conducting a research study, synthesizing and presenting results in written and oral formats. Prerequisites: EDPS 53300, EDCI 67600, EDCI 67700.**Credits:** 3.00

EDCI 67400 - Advanced Instructional Design Theory

Credit Hours: 3.00. Examines the impact of both psychological learning theories and instructional applications upon the development of various instructional design theories. Emphasis is on theory construction, influence of learning and educational principles, and the current and future possibilities of instructional design theory. Prerequisite: EDCI 53100 and 57200. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 67500 - Instructional Strategies

Credit Hours: 3.00. Examines and applies the cognitive strategies and tactics that can be used by an instructional designer to improve human learning. Applications of various instructional strategies for specific cognitive tasks (e.g., concepts, mental models, problem solving) will to be covered. Additionally, best practices for a diverse range of instructional methods will be considered, as well as, the strategies for the entire instructional experience. Prerequisite: EDCI 57200. Permission of instructor required.**Credits:** 3.00

EDCI 67600 - Unpacking Research: Writing Literature Reviews In Learning Design And Technology

Credit Hours: 2.00. This course is designed to introduce the learner to the process of analyzing and preparing literature reviews on topics relevant to the field of Learning Design and Technology. Emphasis is placed on helping the learner to understand, critique, and synthesize the research literature in order to apply it to their own personal research agenda. Course activities and assignments are designed to help the learner develop the knowledge, tools, and strategies needed to become thoughtful consumers and producers of research and to use this knowledge to inform their practice. Learning experiences revolve around two major themes: 1) the examination and thoughtful critique of current research and 2) preparation of a thorough literature review that provides a rationale for continued study. Permission of instructor required.**Credits:** 2.00

EDCI 67700 - Unpacking Research: Writing Research Proposals In Learning Design And Technology

Credit Hours: 2.00. This course is designed to introduce the novice researcher to the process of developing a research problem statement supported by literature resulting in a professional organization conference proposal and a proposal for a funding agency in the field of Learning Design and Technology. Permission of instructor required. Prerequisite: EDCI 67600. **Credits:** 2.00

EDCI 67800 - Unpacking Research: Writing For Scholarly Publications In Learning Design And Technology

Credit Hours: 2.00. This course is designed to introduce the novice researcher to the process of publishing research in the field of Learning Design and Technology. Emphasis is placed on practical aspects of the publishing process as well as familiarizing students with the role that editors and reviewers play in that process. Prerequisite courses include: EDCI 67600 Writing

Literature Reviews and EDCI 67700 Writing Research Proposals. Students must bring a draft manuscript completed through the methods portion into the course, and students must have completed research and collected data to facilitate completion of a research-based manuscript for publication during the course. Permission of instructor required.**Credits:** 2.00

EDCI 67900 - Capstone: Inquiry Into Practice

Credit Hours: 3.00. This course conceptually centers on the Ghanaian Sankofa symbol of a bird retrieving an egg from its back while facing forward. This metaphor represents the need to "go back to the past and bring forward that which is useful" (About the Sankofa [n.d.]. Retrieved from https://cola.siu.edu/africanastudies/about-us/sankofa.php). The twin aspect of looking back with the future in mind plays out in consonance with the Portfolio course generally taken in tandem with this course. In this course, students will reinforce and extend their learning of key concepts across the program and deepen their engagement with a topic of interest to them through an action research project. Permission of department required. **Credits:** 3.00

EDCI 68000 - Curriculum & Instruction MS Portfolio

Credit Hours: 1.00. This course was created to help guide C&I students near completion of their coursework to develop their competency portfolio. A competency portfolio reflects the depth and breadth of a student's educational growth since entering the graduate program. The purpose of the C&I competency portfolio is to demonstrate that students have mastered the graduate competencies for the C&I online Master's program. The portfolio will contain student projects aligned with C&I competencies and will be reviewed by committee members. The competencies are based on the Curriculum & Instruction departmental competencies and several program-specific competencies. The competency portfolio is a requirement for graduation from the C&I Master's program. (Multiple media are welcome.) Permission of department required.**Credits:** 1.00

EDCI 68200 - Contemporary Curriculum Theory

Credit Hours: 3.00. Critical examination of contemporary concepts of curriculum theory. Rational/technical curriculum, social needs/child centered curriculum. Socio-political curriculum theory; curriculum as existential, aesthetic, and phenomenological. Implications for current practice, school reform, and educational research. Typically offered Spring.**Credits:** 3.00

EDCI 68400 - Seminar In Curriculum Studies

Credit Hours: 3.00. A course designed to allow for the in-depth exploration of specialized and timely topics in curriculum theory, practice, and reform. Though all specialized topics address both theory and practice, some topics focus more heavily on practice, and others focus more heavily on theory. Typically offered Fall Spring Summer.**Credits:** 3.00

EDCI 68500 - Global Issues In Education

Credit Hours: 3.00. Critical examination of contemporary global issues in education. Historical, social economic, political, and cultural theories of globalization in international context. Analysis and synthesis of current research. Implications and application to current practice, school reform, policy, curriculum, and educational research. Resources for instruction; curriculum design strategies for implementing global education. Prerequisite: 12 credit hours in Education. Typically offered Summer Fall Spring.**Credits:** 3.00

EDCI 69400 - Elementary Transition To Teaching Student Teaching/Internship

Credit Hours: 0.00 to 6.00. A full-time elementary classroom teaching experience and internship seminars. Students teach for a period of 14 weeks under the mentorship of a master teacher and a University supervisor. In order to provide support for student teachers and ongoing interactions among students and their supervisors, students will attend scheduled student-teaching seminars. After the classroom experience has ended, students will spend two additional weeks completing a variety of assignments. The purpose of the internship semester is to provide a structured experience for learning and refining the theories and practices necessary to become an effective teacher of all children in the inclusive classroom. Prerequisite: EDCI 50100(Inactive at PWL),

EDCI 51100 , EDCI 58500, EDCI 60300(Inactive at PWL), EDCI 60400, EDCI 60500. Permission of instructor required. Typically offered Fall Spring.**Credits:** 0.00 to 6.00

EDCI 69500 - Internship In Education

Credit Hours: 1.00 to 10.00. Amount of credit to be determined by nature and extent of the assignment. A special course in selected areas of education, designed to provide practical field experience under professional supervision in selected situations related to the candidate's area of specialization. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 10.00

EDCI 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 18.00

EDCI 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 18.00

EDU 50000 - Topical Exploration In Education

Credit Hours: 1.00 to 6.00. Explores topics related to being an effective, professional educator. **Credits:** 1.00 to 6.00

EDU 50004 - Integrated Professional Seminar

Credit Hours: 0.00 to 6.00. This seminar is linked to courses and field experiences included in the Transition to Teaching (T2T) program. It will allow for collaboration among school-based mentors, university-based instructors and T2T candidates in offering academic content appropriate to the program. The seminar will provide a technology-rich and performance-based professional experience. This course has a fee attached.**Credits:** 0.00 to 6.00

EDU 51000 - School-Community Relations

Credit Hours: 2.00 or 3.00. For teachers and school administrators. Characteristics of the community-school, including the multicultural quality of the resources, adapting the educational program to community needs; use of community resources in instruction; planning school-community relations.**Credits:** 2.00 or 3.00

EDU 53900 - Seminar In Student Affairs Leadership

Credit Hours: 3.00. Integrative, project-based learning experience for student affairs professionals. Develop and implement real-world projects in coordination with higher education staff in a variety of institutional settings.**Credits:** 3.00

Educational and Psychological Studies

EDPS 10101 - Learning In Context-An Introduction To The Learning Sciences

Credit Hours: 3.00. This introductory course is designed to acquaint first year Learning Science students with the core concepts, principles, and research findings of the learning sciences as they apply to a wide range of formal and informal educational contexts. The course provides students with opportunities to interact with and learn about the scholarship of College of Education

faculty who conduct research within the framework of the learning sciences. Students will learn about faculty projects that exemplify key features of the Learning Sciences such as attention to the complexity of learning environments, the study of social and cultural as well as individual dimensions of learning, and the cross-disciplinary nature of the field. **Credits:** 3.00

EDPS 10500 - Academic And Career Planning

Credit Hours: 3.00. Builds understanding of career interests and personality characteristics related to academic and career decisions. Expands knowledge of Purdue academic programs and of the world of work. Introduces decision-making strategies. **Credits:** 3.00

EDPS 10600 - Mapping Your Career

Credit Hours: 1.00. A course designed to help students explore professional development and create an individualized career plan toward their career goals. Students can use this career plan while meeting educational goals at Purdue.**Credits:** 1.00

EDPS 17700 - Learning And Regulation Strategies For College Success

Credit Hours: 3.00. This course is designed to help students improve their college academic success by studying more efficiently and effectively, through strategic engagement, learning, and performance. We examine and apply evidence-based learning, motivation, and regulation strategies beneficial for college and lifelong learning. Educational psychology provides the theoretical framework for practical application of intentional and informed learning, cognition, motivation and behavior regulation.**Credits:** 3.00

EDPS 20001 - Special Populations Seminar: Focus On Students With Disabilities And Differentiation Approaches

Credit Hours: 1.00. (EDCI 2001) This seminar is focused on special populations of learners for teacher education majors with an emphasis on exceptional students and approaches to curricular differentiation. Students will engage in mentoring activities and ongoing support in their development as a professional. The goal of the seminar is to connect theory to practice by engaging in an immersive field experience that connects to content and courses taken concurrently. The seminar provides an environment conducive to fostering rich relationships with schools and communities, pursuing common inquiry, thinking critically about theory, content and practice and advocating for equitable schooling. This seminar includes a field experience targeting schools and classrooms including exceptional students. This seminar is intended to be taken concurrently with EDPS 24800 and EDPS 26501. Typically offered Fall Spring Summer.**Credits:** 1.00

EDPS 20002 - Special Populations Seminar: English Language Learners And Students With Gifts And Talents

Credit Hours: 1.00. This seminar is focused on special populations of learners for teacher education majors with an emphasis on students who are English learners and students with gifts, talents, and creativity. Students will engage in mentoring activities and ongoing support in their development as a professional. The goal of the seminar is to connect theory to practice by engaging in an immersive field experience that connects to content and courses taken concurrently. The seminar provides an environment conducive to fostering rich relationships with schools and communities, pursuing common inquiry, thinking critically about theory, content and practice and advocating for equitable schooling. This seminar includes a field experience targeting schools and classrooms with ELLs and students with gifts, creativity, and talents. This seminar is intended to be taken concurrently with EDPS 24000 and EDCI 37001. Typically offered Fall Spring Summer.**Credits:** 1.00

EDPS 21100 - Special Education Law, Policy, And Ethical Guidelines

Credit Hours: 3.00. This course provides opportunities for analysis and practical application of special education law and policy through discourse and advocacy. It is designed to provide students with a foundational understanding of special education, including the historical context for special education and the laws, policies, and ethical guidelines that have driven current special education legislation. Special education professionals hold multiple roles...teacher, case manager, general education consultant, instructional aid supervisor, researcher, and administrator to name a few. Moreover, there are numerous responsibilities required to successfully work in each of these roles and in this course we focus on law, policy, and ethical guidelines where they are relevant to special education pre-service teachers and support personnel. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 21200 - Collaboration And Family Engagement To Support Students With Disabilities

Credit Hours: 3.00. Students will learn strategies for communicating and collaborating with a variety of team members. Finally culture will be explored. Strategies for collaborating with family members, administrators, paraprofessionals and related service personnel will be explored. This course includes a field experience.**Credits:** 3.00

EDPS 23500 - Learning And Motivation

Credit Hours: 2.00 or 3.00. Introduction to concepts of learning and motivation in educational contexts (i.e., Educational Psychology). Influence of development, culture, and individual differences on learning and motivation. Uses of assessment and technology in promoting learning and motivation. A field-based experiential component is included.**Credits:** 2.00 or 3.00

EDPS 24000 - Children With Gifts, Creativity, And Talents

Credit Hours: 1.00. This course is an introduction to the intellectual, social, and emotional characteristics of gifted children youth; philosophies of gifted education; and programmatic and classroom approaches for supporting gifted students generally and within different domains (e.g., intellectual, academic, creative, artistic, leadership). Cannot be taken concurrently with EDPS 24800. Typically offered Fall Spring.**Credits:** 1.00

EDPS 24800 - Differentiating Curriculum And Instruction

Credit Hours: 1.00. This course provides a solid foundation and set of principles for differentiating curriculum and instruction in any classroom at any grade level. Students will explore a variety of evidence-based strategies, tools, and curriculum models that effectively meet the diverse needs of all learners. Through readings, online class meetings and discussions, case studies, differentiated instruction examples, direct application, and reflection, students will deepen their understanding and need to differentiate. With an overarching goal of increasing achievement and developing student talents, this course includes the following major components:

- creating positive learning environments that support a) high-quality curriculum; b) diagnostic, formative, and summative assessments to inform instructional decision-making; and c) flexible grouping
- addressing student differences in readiness, interest, and learning profile (including learning preference, intelligence preference, gender, culture, language preference, locale, and opportunities to learn) and appreciating how these differences influence the ways in which students learn
- understanding that the process of differentiation involves modifying content, process, product, learning environment, and/or affect
- incorporating higher-order thinking skills, creative problem solving, project-based learning, authentic/respectful tasks, collaborative learning, and other evidence-based strategies to promote student achievement and talent development
- understanding how differentiation of curriculum and instruction fits within specific educational interventions and models, such as scaffolding, flexible grouping, Response to Intervention (RtI), and Multi-Tiered System of Support (MTSS)

Effective teachers do more than teach content; they teach unique individuals who enter classrooms with various levels of expertise, skills, abilities, social-emotional needs, and learning expectations. Effective teachers differentiate curriculum by personalizing content based on the particular needs and interests of their students. Effective teachers differentiate instruction by

applying various grouping strategies, technology applications, and thinking skills. *The goal of every effective teacher is that every child learns something new every day.* Cannot be taken concurrently with EDPS 24000. Typically offered Fall Spring.**Credits:** 1.00

EDPS 26500 - The Inclusive Classroom

Credit Hours: 3.00. Characteristics of students with special needs/talents; strategies for helping students learn and develop in general educational settings. Emphasis placed upon research evidence, case studies, problem-based learning, and development of a plan for an inclusive classroom. A field-based component is included. **Credits:** 3.00

EDPS 26501 - The Inclusive Classroom

Credit Hours: 2.00. This course is designed to provide an overview of the characteristics of children (birth through age 21) with disabilities, causes of disability, assessment techniques, and instructional strategies. Emphasis is placed upon the development of an inclusive lesson plan based on student needs in the field experience classroom. Characteristics addressed include learning, behavioral, social-emotional, and communicative abilities and needs for students with mild and intense support needs. Issues related to cultural differences and family impact will also be addressed. A field-based component is included. Typically offered Spring Summer Fall.**Credits:** 2.00

EDPS 27001 - Characteristics Of Individuals With Mild Disabilities

Credit Hours: 3.00. This course addresses the characteristics of students with mild disabilities and the social, legal, and ethical issues that surround their academic and social-emotional concerns, educational experiences, implications and life-long outcomes. This course has a shared field experience with EDPS 36201.**Credits:** 3.00

EDPS 30000 - Student Leadership Development

Credit Hours: 1.00 to 3.00. Leadership in students is developed through lectures and experiential activities. Topic areas include leadership styles; campus organizational structures; program planning; social and intellectual activities; human relations and cultural differences; motivation; team building; public relations. Permission of instructor required. **Credits:** 1.00 to 3.00

EDPS 30100 - Peer Counseling Training

Credit Hours: 1.00 to 3.00. Students are trained to help peers deal with their problems and concerns. Training modules are used to build knowledge and skills in the duties of peer helpers; student development, communication, goal setting, and use of community resources are stressed. (EDPS 30100 and 30100 are for Horizon students only.) Permission of instructor required. **Credits:** 1.00 to 3.00

EDPS 30101 - Motivation To Learn

Credit Hours: 3.00. This course introduces students to current social-cognitive and sociocultural theories of motivation for learning and academic achievement, and research framed by those theories. Both individual-level and contextual factors associated with motivation will be considered. The course will also address applications of theory in educational settings, including motivational interventions. **Credits:** 3.00

EDPS 30102 - Social-Emotional Aspects Of Learning In Diverse Environments

Credit Hours: 3.00. The course examines the role of social emotional competence in learning and builds understandings of the inter-relationships between theory, empirical evidence, and instructional practice. It takes the perspective that experiences across different learning contexts are interrelated and may influence each other in reciprocal ways. The course views social-emotional

dimensions of learning as: embedded in person-environment transactions; tied to specific instructional (formal and/or informal) contexts over time; co-evolving with cognition and language; critical to psychological, behavioral, and learning outcomes. The focus is on intersection of social-emotional competence, learning, and instruction. The course is intended to provide the foundations (theoretical and empirical) that can help those interested in formal and informal instructional environments make informed educational decisions by considering the social-emotional dimensions of learning. **Credits:** 3.00

EDPS 30200 - Adolescents Classroom Teacher

Credit Hours: 3.00. Students will develop understanding of physical, intellectual, emotional and social development of learners. Emphasis on individual differences and behavior patterns that influence the establishment of an orderly, healthy learning environment, and upon the teacher as an influence of the learning environment. **Credits:** 3.00

EDPS 30400 - Assessment And Transition (Data-Based Decision-Making)

Credit Hours: 3.00. This course addresses assessment techniques and transition planning in special education, with applications to curriculum. It includes norm-referenced and curriculum-based measurement, error analyses, observational ratings, data-based decision-making, and transition planning from early intervention to post-secondary settings. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 30500 - Special Education Seminar: Perspectives On Disability

Credit Hours: 1.00. This course is designed to broaden student understanding of disability by exploring across related fields including disability studies, neurodiversity, speech language development, and behavioral characteristics. The goal of this seminar is for students to make connections between special education theory and practice and theories and views of disability beyond special education. Through lecture, discussion, and reflection, students will learn about the construct of disability and how individual strengths, needs, services, and supports extend across the lifespan and beyond the special education classroom.**Credits:** 1.00

EDPS 30900 - Systematic And Explicit Instruction

Credit Hours: 3.00. Students will learn evidence based instructional strategies for students with disabilities. The key components of systematic and explicit instruction will be explored. Students will learn how to use explicit instructional strategies to foster engagement and motivation. Methods for implementing systematic instruction across academic, functional, communication, social, and behavior goals will be addressed. Additionally, implementation in a variety of settings including 1:1, small group, and large group settings will be explored. Planning for generalization and maintenance of skills will also be addressed. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 31001 - Characteristics Of Individuals With Disability Who Require Intense Intervention

Credit Hours: 3.00. This course addresses the characteristics of individuals who require intense intervention and how learning, behavioral, social-emotional, and communicative needs impact their lives. This course will also explore the cultural differences, legal and ethical guidelines, family impact, transition to adulthood, and wraparound services. A field experience will provide opportunities to observe and participate in a school setting (early childhood through age 21).**Credits:** 3.00

EDPS 31100 - Supporting Exceptional Learners: Foundations And Mathematics

Credit Hours: 3.00. Teaching students with special needs requires the ability to locate evidence-based interventions, implement those interventions with fidelity, and track student performance over time. Mathematics is a content area in which success or

failure yields major ramifications for postsecondary success. This course will cover the common math interventions employed for mild to severe disabilities across grade levels K-12. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 31200 - Inclusive Practices In Cross-Content Curriculum

Credit Hours: 3.00. This course aims to teach best practices for cross-content integration in an inclusive or self-contained classroom. It develops pre-service teacher understanding of core curricula along with how to integrate the curricula across subject areas. This course will also cover curricula to implement a well-rounded education (e.g., visual arts, dance, theater, music, etc.), provide methods for inclusive practices within the content, and discuss the implementation of collaborative approaches to cross-content planning and delivery.**Credits:** 3.00

EDPS 31500 - Collaborative Leadership: Interpersonal Skills

Credit Hours: 3.00. The purpose of this course is to provide integrated study of listening as a collaborative leadership skill necessary for interpersonal and intrapersonal development. Focus is on the development of professional listening skills, and the understand of the role listening plays in collaborative leadership conflict resolution, interviewing, team building, and ethics.**Credits:** 3.00

EDPS 31600 - Collaborative Leadership: Cross-Cultural Settings

Credit Hours: 3.00. In this course, students will explore the cultural nuances of leadership in the United States as well as around the world. This course will include impact of globalism as a context for leadership, conflict resolution in a global environment, and other important factors that impact culturally diverse or global teams.**Credits:** 3.00

EDPS 31700 - Collaborative Leadership: Mentoring

Credit Hours: 3.00. The purpose of this course is to provide a theoretical and experiential overview of the basic elements of mentoring as a key aspect of effective collaborative leadership. The hallmark of this course is the inclusion of a service-learning component in which students will be paired with undergraduate mentees and required to participate in weekly mentoring meetings for the duration of the semester. This learning experience is designed to promote development of the knowledge, skills, and dispositions required for competent mentorship. Emphasis on peer mentoring. **Credits:** 3.00

EDPS 32000 - Happiness And Well-Being: Introduction To Positive Psychology

Credit Hours: 3.00. Happiness and Well-Being: An Introduction to Positive Psychology is an undergraduate course designed to provide students with an introduction to the field of positive psychology while also learning valuable, impactful life skills that can improve individual well-being, resilience, flow, happiness, and mindfulness for those enrolled. The course is designed in such a way time is devoted to both lecture and discussion based learning as well as experiential activities in the classroom designed to expose students to positive psychology constructs. Students will be exposed to strength oriented approaches to understanding human behavior, the instillation of hope and optimism, and multiple other positive psychology concepts that augment understanding of psychology. Students should be willing to participate in experiential exercises using positive psychology methods designed to promote self-awareness and growth. Though this course derives material from psychology, applications of the material can be made across fields and majors; thus, all students will benefit from better understanding human behavior, happiness, and well-being from an inclusive, positive psychology perspective.
This class introduces the student to the major topics of the growing area of positive psychology. Students will learn theories, techniques and research associated with methods that promote happiness and psychological well-being. This introductory class will begin the journey into positive psychology and provides a foundation for further study of applied psychology and counseling at the graduate level. Typically offered Fall Spring.**Credits:** 3.00

EDPS 32600 - Foundations Of Adapted Physical Education

Credit Hours: 3.00. Lecture and physical education practicum in teaching children with disabilities. An introduction to the basic concepts and techniques of adapted physical education. Laboratory experience in carrying out adapted physical education programs for children is provided. **Credits:** 3.00

EDPS 32700 - Classroom Assessment

Credit Hours: 1.00 to 3.00. Evaluating the impact of instruction on student performance is one of the most important skills for an educator. Effective teachers ask themselves, "How do I know if students are truly learning? Are they meeting educational objectives in the content area?" Using well-chosen assessment approaches, teachers can address these questions. In this course, students will acquire assessment literacy: the ability to gather accurate information about student achievement, and use that information to make instructional decisions that will improve learning. Course activities will focus on assessment tasks relevant to P- 12 classroom settings.**Credits:** 1.00 to 3.00

EDPS 33500 - Reading Instruction For Tier 1 And Tier 2

Credit Hours: 2.00. Given the needs of struggling/striving readers throughout the educational system, this class will focus on effective interventions from the primary grades through high school. Instructors will present a balance of theoretical and practitioner-oriented aspects of reading development and instruction. The course will also examine a number of reading models and instructional approaches designed to ensure all students have access to effective, research-based literacy instruction. The goal is to ensure students complete the semester with a range of essential tools for working with this population. Typically offered Fall Spring.**Credits:** 2.00

EDPS 34100 - Introduction To Philosophical Underpinnings And Concepts Of Applied Behavior Analysis

Credit Hours: 3.00. This course is the first of four courses in the Applied Behavior Analysis pathway for undergraduates in teacher licensure programs and is also part of the course content required to become a Board Certified Assistant Behavior Analyst (BCaBA). The course will provide an introduction into the primary concepts and principles of applied behavior analysis. Students will be introduce to the fundamental knowledge and experiences for understanding Applied Behavior Analysis principles, concepts, and techniques, including operant behavior, reinforcement, punishment, choice, antecedent stimulus control, and verbal behavior. Students learn concepts and principles to increase or decrease target behavior, to facilitate behavior maintenance and generalization, and to evaluate effectiveness of instruction. This course includes a field placement.**Credits:** 3.00

EDPS 34200 - Applied Behavior Analysis - Assessment And Intervention

Credit Hours: 3.00. This course is one of four courses in the Applied Behavior Analysis pathway for undergraduates in teacher licensure programs and is also part of the course content required to become a Board Certified Assistant Behavior Analyst (BCaBA). This course offers the interventionist with the techniques for designing, implementing, and evaluating instructional and behavioral interventions grounded in the theories of applied behavior analysis. Specifically, the learner will be exposed to techniques for measuring target academic, behavior, social and adaptive skills, as well as methods for displaying and interpreting data. Additionally, learners will design interventions, and monitor progress and will be exposed to the foundational concepts and methods of ABA including defining behaviors, collecting data, and understanding the three-term contingency of behavior. This course includes a field placement.**Credits:** 3.00

EDPS 36100 - Use Of Assessment Techniques In Special Education

Credit Hours: 3.00. Assessment techniques for the exceptional child, with applications to curriculum. Includes norm-referenced and curriculum-based measurement, error analyses, and observational ratings. Admission to Teacher Education Program, passage of Gate A. **Credits:** 3.00

EDPS 36201 - Positive Behavioral Supports

Credit Hours: 2.00 or 3.00. This course provides an overview of the theory, principles, and application of applied behavior analysis within positive behavior interventions and support. The course focuses on pre-service teacher preparation in designing and implementing group and individual behavior supports. Emphasis is on universal supports, targeted interventions, and data-driven decision-making.**Credits:** 2.00 or 3.00

EDPS 36300 - Psychoeducational, Medical, And Physical Aspects Of Individuals With Disabilities

Credit Hours: 3.00. Introduction to characteristics of individuals with mild and severe intellectual disabilities: defining characteristics, etiological factors, assessment, social, legal and educational issues, and basic physical or medical disability management issues and techniques. Admission to Teacher Education Program, passage of Gates A required.**Credits:** 3.00

EDPS 40099 - Topics In Design Based Research, Assessment And Evaluation

Credit Hours: 3.00. Design-Based Research (DBR) is inquiry that is driven by educational practice- the desire to understand and improve the practice of teaching and learning. Learning scientist employ DBR in order to implement innovative designs for teaching and learning in a variety of formal and informal educational settings (e.g., schools, museums, and extramural clubs) and to conduct research no teaching and learning that occurs in the context of their design innovations. The focus of this course is to help students develop a set of core competencies for systemically studying the teaching and learning of science in designed environments. **Credits:** 3.00

EDPS 40200 - K-12 Reading Methods For Exceptional Learners

Credit Hours: 2.00. This course is designed to meet the exceptions of CEC, NCTQ, and REPA 3 and prepare students in the science of reading for exceptional learners (including students with dyslexia and those with intensive needs) in Tiers 2 and 3. This course will provide implementation details on Response to Intervention (RTI) and Multi-tiered Systems of Support (MTSS). The course will present strategies and programs used in strategic and intensive intervention efforts for those learners needing additional, unique, and/or more focused remediation efforts. Topics will include understanding reading intervention research, the behavior analytic and learning sciences' contributions to understanding the reading process, the sequence of learning to read (systematic instruction), reading to learn, and the five components of reading instruction for both K-3 and 4-12 learners. This course will specifically address the REPA 3 Standard: Focused work using ("interventions that are direct, explicit, and multi-sensory) as a component of scientifically-based reading.**Credits:** 2.00

EDPS 40300 - Individual Social, Emotional, Behavioral Supports

Credit Hours: 3.00. This course is designed to prepare students with advanced knowledge and skills in designing and delivering individualized social-emotional and behavioral supports for learners. Emphasis will be placed on functional behavior assessment and function-based interventions and supports. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 41001 - Collaboration And Transition Practices For Individuals With Disabilities

Credit Hours: 3.00. This course addresses the professional collaborative practices for special educators, who work with school age students with disabilities. The topics of this course include collaboration with professionals, ancillary personnel, agencies, and families, problem-solving and dealing with conflict, co-teaching, and transition planning from early intervention to post-secondary settings. The possible products from this course include community resources, transition plans, co-teaching plans, and family interviews. No undergraduate student may be enrolled in this undergraduate course until they have been admitted to the teacher education program and passed Gates A and B. Typically offered Spring.**Credits:** 3.00

EDPS 41700 - Special Education Knowledge And Skills For General Educators

Credit Hours: 3.00. This course is the capstone course for the Special Education certificate and pathway. This course is designed to expose students to innovative strategies and best practices for promoting inclusive education. Students in this course will develop the habits of ongoing training and professional development to support the variety of student needs in inclusive general education classes.**Credits:** 3.00

EDPS 42100 - Supporting Exceptional Learners: Social Studies And Science

Credit Hours: 3.00. Teaching students with special needs requires the ability to locate evidence-based interventions, implement those interventions with fidelity, and track student performance over time. Mathematics is a content area in which success or failure yields major ramifications for postsecondary success. This course will cover the common math interventions employed for mild to severe disabilities across grade levels K-12. This course includes assignments that will be linked to EDPS 46100 the Special Education Student Teaching Residency. Typically offered Fall Spring Summer.
Credits: 3.00

EDPS 43000 - Creating And Managing Learning Environments

Credit Hours: 2.00 or 3.00. The purpose of this course is to enable you to develop a supportive, challenging, and growth-enhancing classroom community for students in elementary grades. Teachers need insightful understanding and strong skills to create a classroom community that enhances achievement, welcomes diversity, makes effective use of technology, and provides appropriate educational experiences for students with diverse needs, backgrounds, and developmental levels.**Credits:** 2.00 or 3.00

EDPS 43010 - Secondary Creating And Managing Learning Environments

Credit Hours: 1.00 to 3.00. This course is designed to develop advanced pre-service teachers' skills in recognizing classroom processes and understanding how teachers' beliefs and practices affect secondary students' engagement, learning, and motivation. It focuses on Effective Teaching - what it is, what it looks like, and different ways to enact it in the classroom. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

EDPS 44100 - Introduction To Ethics And Practice Of Applied Behavior Analysis

Credit Hours: 3.00. This course is the final course in the Applied Behavior Analysis pathway for undergraduates in teacher licensure programs and is also part of the course content required to become a Board Certified Assistant Behavior Analyst (BCaBA). This course will address the professional and ethical responsibilities of behavior analysts. Key issues of responsible conduct as it relates to areas such as confidentiality, consent, consultation, treatment planning, and research will be discussed and applied through case studies. Learners will be able to consider ABA techniques within the bounds of both legal and ethical frameworks.**Credits:** 3.00

EDPS 44200 - Advanced Intervention In Applied Behavior Analysis

Credit Hours: 3.00. This course is one of four courses in the Applied Behavior Analysis pathway for undergraduates in teacher licensure programs and is also part of the course content required to become a Board certified Assistant Behavior Analyst (BCaBA). This course will provide fundamental knowledge and experiences for understanding instructional and behavior interventions grounded in the principles of Applied behavior Analysis including a pivotal response training, functional communication training, video modeling, self-management, social skills training, and augmentative and alternative communication (AAC). Students learn procedures to increase or decrease target behavior, to facilitate behavior maintenance and generalization, and to evaluate effectiveness of instruction. Students will also learn strategies for consultation with other service providers as well as practices for effective supervision of others such as paraeducators.**Credits:** 3.00

EDPS 45200 - Global Studies Seminar

Credit Hours: 1.00. (EDCI 45200) The course builds on students' international cross-cultural experiences, particularly Study Abroad. The course is required for those wishing to complete the Global Studies minor in the College of Education. Typically offered Fall Spring Summer.**Credits:** 1.00

EDPS 45901 - Assistive Technology

Credit Hours: 1.00. This course explores the use of Universal Design for Learning as a framework for Differentiated Instruction. Additionally, this course addresses the use of Augmentative and Alternative Communication and Assistive Technology by individuals with disability requiring mild, moderate, and intense intervention.**Credits:** 1.00

EDPS 46000 - Strategies For Teaching Individuals With Mild And Moderate Disabilities Primary & Elementary Grades

Credit Hours: 3.00. This course is designed to prepare future special educators to plan and provide content area instruction in the core content areas to primary and elementary students with mild and moderate disabilities. Course content will include information on assessment, instructional design, and development of individualized education programs, research-based practices for promoting academic and behavioral growth, and content area literacy and numeracy, and your professional role as a teacher of students with mild disabilities. This course has a required concurrent enrollment in EDPS 46100.**Credits:** 3.00

EDPS 46100 - Practicum In Strategies For Teaching Individuals With Disabilities

Credit Hours: 1.00 to 6.00. Practicum experience in assessment and teaching of individuals with disabilities. Experience in design, delivery, implementation, and evaluation of instruction. No undergraduate students may be enrolled in any of these undergraduate courses until they have been admitted to teacher education. Admission to Teacher Education Program, passage of Gates A and B. **Credits:** 1.00 to 6.00

EDPS 46200 - Strategies For Teaching Individuals With Mild And Moderate Disabilities (Middle And High School)

Credit Hours: 3.00. This course is designed to prepare future special educators to plan and provide content area instruction in the areas of mathematics, science, and social studies to elementary and secondary students with mild disabilities. Course content will include information on assessment, instructional design, development of individualized education programs, research-based practices for promoting academic and behavioral growth, and content area literacy, and the professional role as a teacher of students with mild disabilities. **Credits:** 3.00

EDPS 46300 - Teaching Individuals With Severe Disabilities

Credit Hours: 3.00. Education of individuals with severe or multiple disabilities. Application of innovative technology, design of individual educational programs, strategies and methods for instruction, evaluation of instruction, community-based instruction, generalization and maintenance of skills. Admission to Teacher Education Program, passage of Gate A required.**Credits:** 3.00

EDPS 49000 - Individual Research And Teaching Experience

Credit Hours: 1.00 to 8.00. Primarily for teacher candidates requiring special, individualized experience in research or teaching. Permission of instructor required. **Credits:** 1.00 to 8.00

EDPS 49100 - Topics And Issues In Education

Credit Hours: 1.00 to 3.00. Provides student with opportunity to strengthen preparation through study of selected educational topics and issues based upon individual needs and interests. One topic is considered in each enrollment. **Credits:** 1.00 to 3.00

EDPS 49500 - Practicum In Gifted, Creative, And Talented Education

Credit Hours: 3.00. The Practicum in Gifted, Creative, and Talented (GCT) Education is designed to be the culminating experience for those who are pursuing the GCT pathway as part of their teacher education undergraduate licensure program, with or without Indiana licensure. The overall goal of the course is derived from Standard 6 of the NAGC-CEC Teacher Preparation Standards in Gifted and Talented Education. Includes experiential learning. Required for those seeking GCT pathway in teacher education.**Credits:** 3.00

EDPS 49800 - Supervised Teaching- Special Education

Credit Hours: 1.00 to 16.00. A student planning to enroll in EDCI 49600, EDCI 49800, EDCI 49900; EDPS 49800, EDPS 49900, EDPS 56100, or EDPS 56600 in the spring or fall semester of any academic year must secure, complete, and submit a student teaching application form between the middle of September and November 1 preceding the academic year during which he or she will be enrolled in the course. Failure to file the application during or prior to this time will make it virtually impossible for the student to receive a student teaching assignment for that year. Application forms may be obtained in and submitted to Room 3241, Liberal Arts and Education Building. Teaching full time in a school classroom under the supervision of the teacher in charge of the class and a University supervisor. No undergraduate students may be enrolled in any of these undergraduate courses until they have been admitted to teacher education. Admission to Teacher Education Program, passage of Gates A, B, and C. **Credits:** 1.00 to 16.00

EDPS 49900 - Supervised Teaching Or Practicum In Endorsement Area

Credit Hours: 3.00 to 9.00. A student planning to enroll in EDCI 49600, EDCI 49800, EDCI 49900; EDPS 49800, EDPS 49900, EDPS 56100, or EDPS 56600 in the spring or fall semester of any academic year must secure, complete, and submit a student teaching application form between the middle of September and November 1 preceding the academic year during which he or she will be enrolled in the course. Failure to file the application during or prior to this time will make it virtually impossible for the student to receive a student teaching assignment for that year. Application forms may be obtained in and submitted to Room 3241, Liberal Arts and Education Building. Teaching full time in an endorsement area in a school classroom under the supervision of the teacher in charge of the class and a University supervisor. No undergraduate students may be enrolled in any of these undergraduate courses until they have been admitted to teacher education. completion of education courses required for the endorsement area and admittance to teacher education program. **Credits:** 3.00 to 9.00

EDPS 50000 - Group Counseling Theories And Techniques

Credit Hours: 3.00. Theoretical and experiential overview of fundamental elements of group work and group counseling processes. Broad topics include purposes and types of groups, therapeutic factors and stages of leadership skills, and multicultural, ethical, and legal aspects of group counseling. **Credits:** 3.00

EDPS 50001 - Foundations Of Online Learning

Credit Hours: 1.00. This course is designed to help you to understand the knowledge and skills necessary for your successful online learning in the Online MSEd in Special Education program, with a focus on the process of completing University and Program specific requirements. In this orientation, you will explore what online learning entails and reflect on how you can best set yourself up to succeed in your studies. Typically offered Fall Spring Summer. **Credits:** 1.00

EDPS 50002 - Foundations Of Licensure

Credit Hours: 1.00. This course is designed to guide candidates to complete required documents needed to determine appropriate clinical practice placement(s) for candidates within unique employment situations. This course includes two process applications required of all employed candidates: 1) Clinical Practice Pre-Application Process and 2) Clinical Practice Application Process. Typically offered Fall Spring Summer.**Credits:** 1.00

EDPS 50100 - Introduction To School Counseling

Credit Hours: 3.00. Presents an overview of counseling in elementary, middle, and secondary schools. Treats the history of school counseling, developmental characteristics and problems of students, and counseling program elements and issues. Typically offered Summer Fall Spring.**Credits:** 3.00

EDPS 50500 - Foundations Of Career Development And Assessment

Credit Hours: 3.00. Treats career development theories which emphasize aspects of the self in decision making, occupational classification systems, and educational and vocational information with applications to individual and group counseling. Typically offered Summer Fall Spring.**Credits:** 3.00

EDPS 50700 - Counseling Multicultural And Diverse Populations

Credit Hours: 3.00. Counseling strategies for multicultural and diverse populations encountered by helping professionals. Among the populations considered are ethnic and cultural minorities, older persons, the gifted, and the disabled. Typically offered Spring Summer.**Credits:** 3.00

EDPS 50701 - Foundational Techniques For Telemental Health Providers

Credit Hours: 3.00. The purpose of this course is to provide a broad overview of individual therapy with adults via telemental health using a videoconferencing platform. Within this course, students will develop general, foundational knowledge related to pre-screening adults for individual therapy, conducting intakes with adult clients, engaging in individual therapy sessions with adult clients, terminating with adult clients, and managing risk with adult clients. Additionally, this course offers a brief overview of telemental health therapy with children, couples, families, and groups. This course is taught in an asynchronous manner and uses various strategies to facilitate student learning, which include: discussion boards, case studies, role plays, self-assessment papers, and pre-recorded lectures with associated PowerPoint slides. Access to necessary technology resources which includes but is not limited to: stable internet access, Brightspace, a telemental health or associated platform, and a computer, is required to complete the course.**Credits:** 3.00

EDPS 50702 - Addressing Demographic Health Disparities In Telehealth

Credit Hours: 3.00. The practice of tele-mental health is expanding rapidly. This expansion reflects both increased opportunities afforded by technological advances within the healthcare field, as well as pressing needs to resolve persistent healthcare disparities associated with in-person services. As part of the Certificate in Telemental Health Counseling, this course will prepare students to take a systematic view of the challenges and opportunities of transitioning live practices to telehealth, by preparing students to Identify demographic telemental health disparities at local, national, and international levels; describe key barriers that produce demographic telemental health disparities; generate a telemental health access toolkit to address demographic disparities within a specific practice and/or field. **Credits:** 3.00

EDPS 50703 - Introduction To Telemental Health Assessment And Intervention

Credit Hours: 3.00. As part of the Certificate in Telemental Health, this course will prepare students to take a systematic view of the challenges and opportunities of transitioning live practices to telehealth, by preparing students to apply intervention skills within a telehealth framework; identify key differences in telehealth procedures compared to in-person practice; apply skills for working with individuals, groups and families via telemental health processes and practices.**Credits:** 3.00

EDPS 50800 - Cultural And Linguistic Diversity In Special Education Programs

Credit Hours: 3.00. Living in a diverse society provides special education teachers and support personnel the opportunity to encounter a wide array of cultures in their educational settings. The course, designed for special education stakeholders (i.e., teachers, staff, support personnel, administrators), considers issues of human diversity, broadly defined to include ability, ethnicity, culture, gender identity, linguistic background, race, religion, socioeconomic status, and sexual orientation. This course challenges biased assumptions that influence the provision of educational services, and examines issues related to promoting equal learning opportunities in the classroom and other educational settings. It is designed to facilitate student examination of how diversity and diverse experiences shape systems that affect individuals, families, communities, and society. It allows students to explore their own cultures and the biases and internalized messages about those who are different from themselves. Students will be introduced to specific approaches to practice, and frameworks for equity, advocacy, and empowerment to support students who receive special education and/or applied behavior analysis (ABA) service, as well as their families. The course also includes information and discussion topics pertaining to the culturo-behavior science (CBS) specialization of the Association for Behavior Analysis International (ABAI) and to interpersonal communication skills - to include speaking, listening, reading, and writing - and their effect on students and families. Permission of instructor required.**Credits:** 3.00

EDPS 51500 - Foundations Of Applied Behavioral Analysis In School Settings

Credit Hours: 3.00. Application of learning theory, measurement procedures, verification of functional relationships, and developing knowledge of current significant research in applied behavior analysis. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 52000 - Characteristics Of Students With Intense Intervention Needs

Credit Hours: 3.00. EDPS 52000 will explore typical and atypical human development, characteristics and etiologies, as well as the influence of cultural, linguistic, and socioeconomic factors of students with intense intervention needs. Candidates will study medical conditions, physical and health needs, common medications, and the importance of transition plans, health-care plans, and behavioral and academic intervention plans designed to help students with intense intervention needs achieve desired positive learning outcomes. Candidates will be introduced to AAC systems, technology, materials, and other resources to support and enhance the communication skills of students with intense intervention and English learning needs. This course will also explore strategies for using digital tools and resources to communicate and collaborate with students, families, general education teachers, related service providers, paraprofessionals, community agencies, and other stakeholders to help students with mild disabilities achieve desired positive learning outcomes. In addition, candidates will analyze relationships across theory and practice, multiple perspectives and trends, and the application of these relationships within educational settings. Candidates will explore major theories and concepts related to online learning, virtual instruction, twenty-first-century skills, information literacy skills, and the diverse perspectives of online students and develop strategies for effectively integrating technologies into teaching and learning, discuss the benefits and challenges of technologies as educational tools, and apply technologies to meet a variety of learning purposes and needs.**Credits:** 3.00

EDPS 52400 - Effective Instruction For Students With Significant Reading Difficulties

Credit Hours: 3.00. This course will explore significant reading difficulties, such as dyslexia, and essential components of effective reading instruction. This course will investigate scientifically-based reading research (SBRR), evidence-based and developmentally appropriate reading instruction and interventions to support students with exceptionalities.**Credits:** 3.00

EDPS 52700 - Literacy Curricula For Learners With Exceptionalities

Credit Hours: 3.00. This course will explore research-supported general and specialized literacy curricula to prepare candidates to design and/or adapt instructional lessons and materials to meet the needs of students with exceptionalities.**Credits:** 3.00

EDPS 53000 - Cognition And Learning In Context

Credit Hours: 3.00. Theories of learning and development, research on instruction and learning, and principles of measurement applied to educational problems.**Credits:** 3.00

EDPS 53100 - Introduction To Measurement And Instrument Design

Credit Hours: 3.00. An application-oriented introduction to constructing educational and psychological tests and surveys. Class sessions include guided practice with the process of instrument development, from trait and test task domain definition, item writing and revision, and item analysis, to score interpretation and validation. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 53300 - Introduction To Educational Research I: Methodology

Credit Hours: 3.00. This course presents a sequence of journal articles and exercises that help introduce the foundational concepts of the course, including: research design, reliability and validity, various methodologies commonly used in educational research, and basic quantitative and qualitative data analyses. In addition, contrasting research conclusions are shown in the articles to help students learn why careful analysis of articles and their theoretical framing is critical to evaluating their conclusions. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 53400 - Introduction To Educational Research II: Measurement Consideration

Credit Hours: 3.00. This course is designed to provide an overview of introductory quantitative data analysis methods in education. The course in specially designed to enhance students' quantitative reasoning and skills through discussions of issues in educational data and authentic data analysis experiences of a variety of education data. The topics to be covered in this course include data collection and description, sampling distributions, methods of quantitative data analysis often used in education research. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 53600 - Achievement Motivation And Performance

Credit Hours: 3.00. Study of current theory and research on the nature and development of achievement motivation. Motivation for intellectual and academic performance will be emphasized. Applications of theory in educational settings will be considered. Typically offered Fall.**Credits:** 3.00

EDPS 54000 - Gifted, Creative And Talented Children

Credit Hours: 3.00. This course is an introduction to the intellectual, social, and emotional characteristics of gifted youth; philosophies of gifted education; and programmatic and classroom approaches for supporting gifted students generally and within different domains (e.g., intellectual, academic, creative, artistic, leadership). Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 54100 - Identification And Evaluation In Gifted Education

Credit Hours: 3.00. This course provides an introduction to the instruments and procedures for identifying gifted, creative, and talented students, as well as the issues and procedures for evaluating gifted programs and individual student progress. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 54200 - Curriculum And Program Development In Gifted Education

Credit Hours: 3.00. This course is an introduction to the curriculum development and program design for meeting the needs of gifted, creative, and talented students. Students will be exposed to established program and curriculum models, as well as the nuts and bolts of developing curricular plans, materials, and specialized programs that support the advanced learning needs of gifted students. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 54500 - Social And Affective Development Of Gifted Students

Credit Hours: 3.00. This course focuses on the social and emotional development of gifted and talented students. An overview of the characteristics and needs of gifted subpopulations, diversity issues, and family/parenting concerns along with an introduction to current educational approaches and counseling interventions are provided. The course is designed to complement EDPS 54000. Typically offered Summer.**Credits:** 3.00

EDPS 54700 - Foundations And Principles Of Applied Behavior Analysis

Credit Hours: 3.00. This course will provide a historical perspective of Applied Behavior Analysis as well as the core principles of ABA. The learner will be exposed to the foundational concepts and methods of ABA including defining behaviors, collecting data, and understanding the three-term contingency of behavior. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 54800 - Ethics And Professional Practice Of Applied Behavior Analysis

Credit Hours: 3.00. This course will address the professional and ethical responsibilities of behavior analysts. Key issues of responsible conduct as it relates to areas such as confidentiality, consent, consultation, treatment planning, and research will be discussed and applied through case studies. Learners will be able to apply ABA techniques within the bounds of both legal and ethical frameworks. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 54900 - Verbal Behavior And Social Communication

Credit Hours: 3.00. This course will explore the development of verbal and social behavior as explained through tenets of applied behavior analysis. Students will identify the similarities and differences between verbal operants as well as appropriate function-based interventions to develop each including augmentative communication systems and functional communication training. Measurement and intervention for more complex social-communication skills will also be addressed. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 55000 - Behavioral Consultation And Systems Change

Credit Hours: 3.00. This course will address the provision of behavioral analytic services through consultation within an implementation science framework. Application of ABA principles to evaluate and address system change will be explored including application of behavioral skills training. Techniques for program evaluation, collaborative planning, and progress monitoring will be discussed. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 55100 - Practicum In Applied Behavior Analysis

Credit Hours: 3.00. University-supervised fieldwork in applied behavior analysis. This practicum will facilitate development and fluency of essential professional and ethical skills necessary for the delivery of high-quality ABA services. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 55200 - Basic Concepts Of Applied Behavior Analysis

Credit Hours: 3.00. This course is the first in a sequence of courses for the Applied Behavior Analysis Certificate Program. This course, in combination with the other courses, will provide fundamental knowledge and experiences for understanding Applied Behavior Analysis principles, concepts, and techniques, including observational analysis, data-based instruction, and social validity to increase students' social and task related behavior. Students learn procedures to increase or decrease target behavior, to facilitate behavior maintenance and generalization, and to evaluate effectiveness of instruction. Permissoin of instructor required. Typically offered Fall Spring Summer.

Credits: 3.00

EDPS 55300 - Application Of Applied Behavior Analysis To Manage And Support Personnel

Credit Hours: 3.00. This course will teach students how to use applied behavior analysis to maximize the potential of an organization. Students will learn the role of a Behavior Analyst in implementing principles of applied behavior analysis to motivate employees, intervene with challenges in the organization, evaluate the program, and collect and deliver ongoing performance feedback. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 55400 - Positive Learning Environments And Classroom Management

Credit Hours: 3.00. This course will focus on classroom PBIS practices to create positive learning environments (online and face-to-face), establish classroom expectations, and develop academic and behavioral routines to meet the social, emotional, and behavioral needs of students with exceptionalities. EDPS 55400 will support candidates as they develop classroom practices that are positive and preventative in nature and align to larger school and district positive behavioral supports.**Credits:** 3.00

EDPS 55500 - Differentiating Curriculum & Instruction

Credit Hours: 3.00. This course provides a solid foundation and set of principles for differentiating curriculum and instruction in any classroom at any grade level. Students will explore a variety of evidence-based strategies, tools, and curriculum models that effectively meet the diverse needs of all learners. Through readings, online class meetings and discussions, case studies, differentiated instruction examples, direct application, and reflection, students will deepen their understanding and need to differentiate. With an overarching goal of increasing achievement and developing student talents, this course includes the following major components: creating positive learning environments that support a) high-quality curriculum; b) diagnostic, formative, and summative assessments to inform instructional decision-making; and c) flexible grouping; addressing student differences in readiness, interest, and learning profile (including learning preference, intelligence preference, gender, culture, language preference, locale, and opportunities to learn) and appreciating how these differences influence the ways in which students learn and are motivated; understanding that the process of differentiation involves modifying content, process, product, learning environment, and/or affect; incorporating higher-order thinking skills, creative problem solving, project-based learning, authentic/respectful tasks, collaborative learning, and other evidence-based strategies to promote student achievement and talent development; understanding how differentiation of curriculum and instruction fits within specific educational interventions and models, such as scaffolding, flexible grouping, Response to Intervention (RTI), and Multi-Tiered System of Support (MTSS). **Credits:** 3.00

EDPS 55600 - Introduction To Quantitative Data Analysis Methods In Education I

Credit Hours: 3.00. This online course is designed to provide an overview of introductory quantitative data analysis methods in education. The course is specially designed to enhance students' quantitative reasoning and skills through discussions of issues in educational data and authentic data analysis experiences of a variety of education data. The topics to be covered in this course include data collection and description, sampling distributions, methods of quantitative data analysis often used in education research. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 55700 - Introduction To Quantitative Data Analysis Methods In Education II

Credit Hours: 3.00. This online course is the second quantitative data analysis methods sequences within the college of education. This course is specially designed to enhance students' quantitative reasoning and skills through discussions of issues in educational data and authentic data analysis experiences of a variety of education data. The topics to be covered in this course include simple/multiple linear regression, different types of group comparison methods (including n-way ANOVA, ANCOVA, Repeated-measures ANOVA, and Mixed ANOVA). The course is specifically designed: 1) to understand how the quantitative methods covered in the course can be used appropriately to address proposed research questions in education, and 2) to interpret

quantitative results meaningfully for a given context. It is expected that all students who enroll in this course have completed at least one semester of introductory statistics course (e.g. STAT 50100 or equivalent.) Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 55800 - Transition Education And Services

Credit Hours: 3.00. This course will explore a variety of resources, strategies, and techniques for promoting successful life transitions for students with mild and intense intervention needs before and throughout the school years and into postsecondary and adult settings.**Credits:** 3.00

EDPS 56010 - Clinical Practice I Experience: Practicum

Credit Hours: 1.00 to 6.00. This is a supervised clinical practice experience across two (2) special education settings, one at the elementary level (K-6) and a second experience at the secondary level (5-12) serving students with Mild and/or Intense Intervention Needs. These experiences take place over the course of 8-16 weeks depending upon availability and individual agreements with our partner district. These experiences are a coordinated effort between the Clinical Practice Coordinator, University Supervisor, and highly qualified, practicing Cooperating Teachers from both the elementary and secondary placements. Candidates assess, design and deliver lessons, manage student needs and behaviors, develop IEPs, integrate technology to support learning outcomes, collaborate with families and colleagues, and analyze the experience of facilitation a classroom and caseload of students. In addition, candidates will analyze relationships across theory and practice, multiple perspectives and trends, and the application of these relationships within educational settings. Candidates will explore major theories and concepts related to online learning, virtual instruction, twenty-first-century skills, informative literacy skills, and the diverse perspectives of online students and develop strategies for effectively integrating technologies into teaching and learning, discuss the benefits and challenges of technologies as educational tools, and apply technologies to meet a variety of learning purposes and needs.**Credits:** 1.00 to 6.00

EDPS 56300 - Data-Based Decision Making For Learners With Exceptionalities

Credit Hours: 3.00. Advanced procedures for educational assessment of exceptional individuals: norm-referenced and curriculum-based measurement, error analyses, and observational ratings. Adaptations and selections of tests for sensory impairments, behavioral styles, different intelligence levels and ages. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 56400 - Mild Mental Handicaps: Historical Perspectives, Etiology, And Characteristics

Credit Hours: 3.00. Advanced study of persons with varying disabilities. Topics include: historical development; theoretical models; etiological factors; characteristics; assessment and intervention. Typically offered Fall.**Credits:** 3.00

EDPS 56500 - Math Curricula For Learners With Exceptionalities

Credit Hours: 3.00. This course will explore research-supported general and specialized math curricula to prepare candidates to design and/or adapt math lessons and instructional materials to meet the math needs of students with exceptionalities.**Credits:** 3.00

EDPS 56510 - Collaboration And Transition Practices In Special Education

Credit Hours: 3.00. Three modules related to collaboration and transition practices in special education are addressed. Included are theoretical frameworks and assessment for consultation and collaboration involving paraeducators and families. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 56600 - Graduate Supervised Teaching Special Education

Credit Hours: 1.00 to 16.00. Demonstration of ability to function independently in special education setting by appropriately planning for student needs, implementing and evaluating plans, establishing appropriate classroom discipline, and interacting professionally with staff and parents. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 16.00

EDPS 56601 - Clinical Practice Experience II (Student Teaching)

Credit Hours: 1.00 to 6.00. This course is a supervised 16-week teaching experience in special education. Candidates assess, design and deliver lessons, manage student needs and behaviors, develop IEPs, integrate technology to enhance learning outcomes and communication, collaborate with families and colleagues, and analyze the experience of facilitating a classroom and caseload of students.**Credits:** 1.00 to 6.00

EDPS 56800 - Social, Legal, And Ethical Issues Across The Lifespan

Credit Hours: 3.00. Survey of difference and similarities of children with exceptionality, including their nature and characteristics related to their developmental and educational needs. Analysis and practical application of social, legal, and ethical issues in the field of special education. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 57100 - Advanced Assistive Technology

Credit Hours: 3.00. Introduction and overview of assistive technology for communication, education, employment, recreation, and daily living activities. Typically offered Spring.**Credits:** 3.00

EDPS 57300 - Medical And Physical Management Of Learners With Disability Or Chronic Illness

Credit Hours: 3.00. This course will explore instructional programs, interventions, services, and implications specific to independent living, career, education, and medical self-management procedures that support students with intense medical, physical, or chronic health care needs.**Credits:** 3.00

EDPS 57600 - Curricula For Learners With Intense Intervention Needs

Credit Hours: 3.00. This course will explore research-supported general and specialized content-area (reading, Math, Writing, Science, Social Studies) curricula as well as functional and independent skill curricula to prepare candidates to design and/or adapt instructional lessons and materials to meet the needs of students with intense intervention needs.**Credits:** 3.00

EDPS 57701 - Development Of Learners With Mild Intervention Needs

Credit Hours: 3.00. This course will explore the 4 areas of child development and the milestones associated with Cognitive, Social/Emotional, Language and Communication, and Movement and Physical development. This foundation in typical development will allow candidates to better understand atypical development in relation to characteristics and etiologies of mild disabilities. Candidates will investigate the multiple impacts systems have on individuals with mild disabilities and their families.**Credits:** 3.00

EDPS 58900 - Special Topics For Teachers

Credit Hours: 1.00 to 4.00. Consideration of appropriate professional problems of experienced educational personnel in workshops or in-service programs. Typically offered Fall Spring Summer.**Credits:** 1.00 to 4.00

EDPS 59000 - Individual Research Problems

Credit Hours: 1.00 to 6.00. Opportunities for students to study particular problems under the guidance of a member of the This plan of individualized instruction may be used in any field of education or vocational education. Does not include thesis work. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 6.00

EDPS 59100 - Special Topics In Education

Credit Hours: 1.00 to 4.00. Group study of a current problem or special topic of interest to professional educational personnel. Intensive study of research, theory, or practical aspects of a particular issue within the usual graduate class format. Typically offered Fall Spring Summer.**Credits:** 1.00 to 4.00

EDPS 60000 - Counseling Theories And Techniques

Credit Hours: 3.00. Examination of major counseling theories and counseling techniques, professional and ethical issues. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 60100 - Counseling Theories And Techniques Laboratory

Credit Hours: 3.00. Use of counseling techniques in a supervised laboratory; application of theories and techniques within varying employment settings. Concurrent Prerequisite: EDPS 60000. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 60400 - Advanced Counseling Theories And Techniques

Credit Hours: 3.00. Integration of counseling theory, practice, and research. Emphasis on integrating counseling knowledge and skills with major counseling theories and interventions. Prerequisite: EDPS 60000. Permission of instructor required. Typically offered Spring.**Credits:** 3.00

EDPS 60700 - Mixed Methods Research Designs And Applications

Credit Hours: 3.00. This course provides an overview of mixed methods research designs within social science and educational research. The focus of the course will emphasize the philosophical pragmatism embedded in enacting mixed methods research. Further, the course will demonstrate the utility and plausibility of integrating quantitative and qualitative data into a single study. This demonstration will be accomplished through reviewing the historical context of qualitative and quantitative research in social sciences and students' application of mixed methods research within their respective fields of study. Prerequisites: EDPS 53300, EDPS 55600, and EDPS 55700 and an introductory qualitative methods course (one of COM 58500, EDCI 61500, SOC 68600). Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 61000 - School Counseling Practicum

Credit Hours: 3.00. EDPS 61000 is a field experience for first year master's students in school counseling, consisting of a minimum of 100 hours in a school, under the supervision of both a site supervisor and a campus supervisor. Permission of instructor required. Prerequisites: EDPS 60000 and EDPS 60100 . Permission of instructor required. Typically offered Spring.**Credits:** 3.00

EDPS 61100 - School Counseling Seminar

Credit Hours: 3.00. Attention given to current topics, such as special education, gifted education, data management, grant writing, crisis intervention, service learning, K-12 career development, and systemic change. Prerequisite: EDPS 50100 . Permission of instructor required. Typically offered Fall.**Credits:** 3.00

EDPS 61200 - Advanced Applied Behavior Analysis

Credit Hours: 3.00. The purpose of this course is to expand knowledge and understanding of advanced applied behavior analytic theories and interventions. Specifically, this course will focus on interventions aimed at developing new skills as well as increasing and decreasing behaviors. Procedures for identifying and designing function based interventions will be addressed. Prerequisite: EDPS 36200 or 51500 and EDPS 58800. Typically offered Fall Spring.**Credits:** 3.00

EDPS 61400 - Advanced Counseling Practicum

Credit Hours: 3.00. Supervised use of personal and career counseling techniques applied to complex and difficult client situations. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 61500 - Theories Of Counseling Supervision

Credit Hours: 3.00. Critical analysis of the theories and counseling supervision. Experiential exercises may be included. Prerequisite: EDPS 61400. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 61700 - Professional Issues, Ethics, And History Of Counseling Psychology

Credit Hours: 3.00. Three primary areas in counseling psychology: 1) historical development within psychology; 2) American Psychological Association ethics, professional, and legal issues; and 3) the scientist-practitioner training model in counseling psychology identity. Permission of instructor required. Typically offered Fall Spring.**Credits:** 3.00

EDPS 61801 - Intellectual & Neuropsychological Assessment

Credit Hours: 4.00. This course is designed to expose students to the theory and practice of intellectual and neuropsychological assessment. Students will receive instruction on the theoretical, psychometric, and best practice foundations of these types of assessment in the context of a lecture component, which will be followed by laboratory time in which students will gain experience in administering and scoring relevant tests. Although the WAIS-IV and WISC-IV will be the primary foci of this course, other tests of achievement, cognitive ability, and neuropsychological functioning will be covered. Students will also (a) gain experience in preparing written reports of their interpretations of assessment results, (b) develop an understanding of the history and development of cognitive ability and neuropsychological tests, and (c) explore implications for intellectual and neuropsychological assessment with diverse populations. Permission of instructor required. Prerequisite: EDPS 53300, B-. Typically offered Fall Spring Summer.**Credits:** 4.00

EDPS 61900 - Counseling Psychology Research Practicum

Credit Hours: 3.00. Application of qualitative and quantitative research designs in counseling psychology. Concurrent prerequisite: EDPS 61800(Inactive at PWL) and (PSY 60100 or STAT 50200) and Doctoral student standing enrolled in the Counseling Psychology Program. Typically offered Fall Spring.**Credits:** 3.00

EDPS 62000 - Counseling Seminar

Credit Hours: 1.00 to 4.00. Recent investigation and research in (1) counselor supervision; (2) professional issues; (3) counseling theories; (4) education of counselors and student personnel workers; (5) counseling methodology; (6) vocational development; (7) elementary school counseling; (8) counselor consultation; and (9) other relevant topics. One topic is dealt with in each

enrollment. Prerequisite: Open to graduate students who have successfully completed 12 credit hours of previous counseling personnel services courses. Typically offered Fall Spring Summer.**Credits:** 1.00 to 4.00

EDPS 62100 - Advanced Multicultural Counseling Theory And Practice

Credit Hours: 3.00. Advanced study and clinical application of racial and cultural theories in counseling. Knowledge and practicum components are integrated to facilitate development of awareness and skill competencies central to "Guidelines on Multicultural Education, Training, Research, Practice and Organizational Change for Psychologists" of the American Psychological Association. Prerequisite: EDPS 50700 . Permission of instructor required. Typically offered Fall.**Credits:** 3.00

EDPS 62200 - Systems Concepts In Counseling And Development

Credit Hours: 3.00. Introduction to the use of systems concepts in the counseling professions. Individuals' development within relationships and family matrix, contemporary person-environment issues, and constructs for research and preventive, developmental, and remedial practice. Prerequisite: EDPS 61700. Typically offered Summer Fall Spring.**Credits:** 3.00

EDPS 62300 - Personality Assessment

Credit Hours: 3.00. Applied introduction to methods of administration, scoring, and interpretation of primarily objective personality assessments. Emphasis is placed on assessment of normative population with attention given to personal strengths, developmental factors, and issues of diversity. Typically offered Summer Fall Spring.**Credits:** 3.00

EDPS 62400 - Advanced Off-Site Counseling Practicum And Supervision Theory

Credit Hours: 3.00. Supervised use of personal and/or career counseling and assessment applied to complex and difficult client situations. Critical analysis of counseling supervision theories. Prerequisite: EDPS 61400. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 62500 - Human Growth And Development

Credit Hours: 3.00. An overview of lifespan development. Study of major development theories of childhood, adolescence, and adulthood. Prerequisite: EDPS 60000. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 62800 - The Behavior Analyst As Supervisor

Credit Hours: 3.00. This course will address the provision of supervision of behavior analysis trainees and technicians utilizing principles and procedures of applied behavior analysis. Application of goal development, behavioral skills training, and progress monitoring within a behavioral analytic framework will be explored. Must be enrolled in ABA Certificate or Masters Program. Pre-requisite: EDPS 61200. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 63000 - Research Procedures In Education

Credit Hours: 3.00. Development of a philosophy of educational research and consideration of the methods for the selection and evaluation of techniques used in educational research. Techniques discussed are methods to control variables, sampling procedures, data collection procedures, statistical procedures, and research proposal development and writing. Prerequisite: EDPS 53300, (PSY 60100 or EDPS 53300), STAT 50200. Typically offered Fall Spring.**Credits:** 3.00

EDPS 63100 - Applied Educational Research Design Seminar

Credit Hours: 1.00 to 3.00. This seminar seeks to promote professionalism, research and scholarly productivity and collegial support among graduate students in gifted, creative (GCT), and talented studies, associated graduate students, visiting scholars, and interested others. A secondary purpose involves assisting GCT students, COE students, and associates with successful study and career preparation by focusing on research, grants, thesis preparation, graduate writing, proposal development, professional development, and degree completion. Finally, seminar offers students the opportunity to discuss, learn and "mess" around with current issues in the field and of personal interest. Seminar creates time and incentive for students to become more productive with their scholarship efforts, and offers students credit for work completed and formal support for the professional development and scholarship processes. In this course students should expect to attend, contribute, and participate. A variety of formats will be used, including, but not limited to: discussion, simulations, group work, lecture, guest speakers, and peer feedback. Prerequisite: EDPS 63000 and one graduate course in Statistics. Typically offered Fall.**Credits:** 1.00 to 3.00

EDPS 63200 - Seminar In Research Procedures In Education

Credit Hours: 1.00 to 3.00. Experimental, field study, scientific survey, and prediction study methods in education. Internal and external validity, identification and development of research problems, criteria development, common methodological errors, strategies of analysis, and sources of acceptable educational research literature will be reviewed. Critical analyses of the research methodology of educational research reports in the student's field. Prerequisite: EDPS 63000 or EDPS 53300 and course work in Statistics. Typically offered Spring.**Credits:** 1.00 to 3.00

EDPS 63300 - Seminar In Educational Psychology

Credit Hours: 1.00 to 3.00. Recent investigations and research in educational psychology. One topic is dealt with in each enrollment. The topics provide an in-depth study of those areas of psychological investigation in educational settings and problems. These areas include: (1) instructional technology and design; (2) individual differences and educational growth; (3) school learning: theory and research; (4) classroom behavior and social processes; (5) educational assessment; and (6) other relevant topics. Prerequisite: EDPS 53000. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

EDPS 63500 - Psychometric Theory And Application

Credit Hours: 3.00. Advanced classical test theory and application of psychometric methods to study technical properties of tests. Prerequisite: (EDPS 53100 and STAT 50200), or (PSY 60100 or PSY 51200) or consent of Instructor. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 63600 - Item Response Theory

Credit Hours: 3.00. Models and model-data fit, estimation of ability and item parameters, item and test information, test construction, obtaining evidence of test reliability and validity, differential item functioning, norming, and equating. Prerequisite: EDPS 53100, (PSY 60100 or STAT 50200 or STAT 51200). Typically offered Summer Fall Spring.**Credits:** 3.00

EDPS 63800 - Factor Analytic Procedures

Credit Hours: 3.00. Introduction to exploratory and confirmatory factor analysis techniques and examination of the use of factor analysis in social sciences. Emphasis on application of methods. Students will develop skills to conduct factor analytic research and critically review use of factor analysis in research. Prerequisite: STAT 51200, STAT 52400. Typically offered Spring.**Credits:** 3.00

EDPS 65000 - Critical Issues In Special Education

Credit Hours: 3.00. This course is designed for advanced graduate students in special education and related disciplines. The goals of this course are: (a) to familiarize students with current topics and critical controversies in special education, (b) to help

students gain skills in critical analyses of issues, and (c) to provide students with opportunities to develop skills that are linked to the professorate (e.g., researching, writing, and speaking about contemporary issues). Typically offered Fall Spring.**Credits:** 3.00

EDPS 65300 - Collaborative Learning

Credit Hours: 3.00. Techniques for fostering productive collaboration in classrooms will be discussed along with the evidence for their educational effectiveness. The course will be research focused. Truth-wins, most -competent-member, and average-member models for comparing group performance to individual performance will be described. The goal will be to have students learn how to implement successful collaborative activities in classrooms while also developing the ability to further research in the field. In addition to course readings and class participation, students will be expected to propose a research study related to collaborative learning with emphasis on the literature review. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 66100 - Review And Implications Of Research In Special Education

Credit Hours: 3.00. Investigation and research in (1) special issues; (2) mental retardation; (3) learning disabilities; (4) emotional disturbance; (5) early education for exceptional children; (6) curriculum development; (7) career education; (8) parent education; and (9) other relevant topics. One or more topics are dealt with in each enrollment period. Prerequisite: Must have post-master's status. Typically offered Fall Spring Summer.**Credits:** 3.00

EDPS 66300 - Organization And Administration Of Special Education

Credit Hours: 3.00. (EDST 66300) A comprehensive course in the organization and administration of special education including the organizational arrangements, identification, placement and service delivery, tests and assessments, program evaluation, personnel, and school/community relations. Typically offered Spring.**Credits:** 3.00

EDPS 66400 - Seminar In Special Education

Credit Hours: 1.00 to 4.00. A critical analysis of or special assignments related to research, practice, and selected problems in special education or in specific disability areas. One topic is considered in each enrollment. For advanced graduate students. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 4.00

EDPS 68800 - Single Subject Research Design

Credit Hours: 2.00 or 3.00. Designed to introduce advanced level students to single subject research methodology in context of a science of human behavior, including design theory and application, measurement, experimental validity, applied behavior analysis, and data analysis procedures.**Credits:** 2.00 or 3.00

EDPS 69500 - Internship In Education

Credit Hours: 1.00 to 10.00. Amount of credit to be determined by nature and extent of the assignment. A special course in selected areas of education, designed to provide practical field experience under professional supervision in selected situations related to the candidate's area of specialization. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 10.00

EDPS 69600 - Internship In Counseling Psychology

Credit Hours: 0.00. A special course in the practice activities of counseling psychology. Provides field experience under the supervision of a licensed psychologist. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 0.00

EDPS 69700 - Education Specialist Project-Research

Credit Hours: 0.00 to 18.00. Educational Specialist project research. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 0.00 to 18.00

EDPS 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 18.00

EDPS 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 18.00

EDST 64500 - Higher Education Leadership And Management

Credit Hours: 3.00. This is the second in the series of courses on the Higher Education Organization. The aim of this course is to provide an overview of leadership and management of higher education institutions in the U.S. from relationship-rich and cultural lenses. The scope of the course seeks to create an appreciation for the complexity of the higher education system, specifically of colleges and universities as ecosystems, through exploration of the leadership and management types, systems and structures both horizontally across institutions and institutional types and vertically within the individual, single institution. The course will examine leadership and management from the presidency to managers at all levels in both academic and administrative units. Permission of instructor required. Prerequisite: EDST 64000. **Credits:** 3.00

Educational Leadership and Cultural Foundations

EDST 20010 - Educational Policies And Laws

Credit Hours: 1.00 to 3.00. The interactive course will provide an understanding of the history of schooling in the United States. A special emphasis will be placed on reviewing historical and contemporary educational policies and educational laws as each subject is critical to understanding social, historical, and cultural issues in the United States. Focus will also be on contemporary applications of historical ideas in the classroom and in school systems. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

EDST 49000 - Individual Research And Teaching Experience

Credit Hours: 1.00 to 8.00. Primarily for teacher candidates requiring special, individualized experience in research or teaching. Permission of instructor required. **Credits:** 1.00 to 8.00

EDST 49100 - Topics And Issues In Education

Credit Hours: 1.00. Provides student with opportunity to strengthen preparation through study of selected educational topics and issues based upon individual needs and interests. One topic is considered in each enrollment. **Credits:** 1.00

EDST 51200 - Foundations Of Educational Policy

Credit Hours: 3.00. (EDFA 51200) An examination of the relationship between policy, values, and social change in education, including the roles of local, state, and federal government in educational policymaking and the effects of educational policies on societal issues such as equity, cultural diversity, and opportunity. Typically offered Summer Fall Spring.**Credits:** 3.00

EDST 51300 - Educational Facilities Planning

Credit Hours: 3.00. (EDFA 51300) The course utilizes a systems approach as a basis for planning, construction, and utilization of school facilities. The primary audience for which the course is designed is aspiring school superintendents and central office leaders. Emphasis is placed on gaining the performances, dispositions, and knowledge necessary for successfully providing facilities to enhance the teaching/learning processes in meeting the educational needs of diverse learners. It is intended as a practical course oriented toward "tools" and school facilities in the state of Indiana. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDST 51400 - Economics Of Education

Credit Hours: 3.00. A general course in financing education, including current economic theories, sources of revenues, and trends in fiscal structure and operations in education. **Credits:** 3.00

EDST 51600 - School-Community Relations

Credit Hours: 3.00. (EDFA 51600) This course will stress concepts and principles relevant to school-community interaction. It will focus on the new roles of the public in education and will deal with problems encountered by educators in communicating with the public. Typically offered Fall.**Credits:** 3.00

EDST 52000 - Educational Leadership, Governance, And Policy

Credit Hours: 3.00. The aim of this course is to explore and examine the complexities of contemporary PK-22 education leadership, administration, and governance. This course will cover the foundational administrative knowledge and skills necessary for transformational leadership at the modern primary, secondary, and post-secondary educational settings. The scope of this course seeks to cultivate an understanding of the functionality of educational systems as organizations within the context of a technologically, socially, and culturally changing world. **Credits:** 3.00

EDST 52100 - Foundations In PK-XXII Educational Systems

Credit Hours: 3.00. This survey course broadly explores the complex foundations of U.S. educational systems from pre-kindergarten (PK) through the doctoral level of education (PK-22). Through the lenses of culture, history, politics, and society, this course seeks to examine factors that impact the policies and practices of PK-22 educational systems. From theoretical knowledge to philosophical orientations, the course interrogates the ways schools transform society and ways society transforms schools. The course incorporates a variety of engaged learning activities including discussion prompts, reflective journaling of course readings, and literature review and research writing. As such, this course challenges students to: 1. Describe and analyze the cultural, historical, political, and social foundations of PK-22 education systems; 2. Examine the interrelationships of culture, politics, and social structures related to educational systems; 3. Analyze and evaluate current issues in PK-22 education systems; 4. Construct connections between and among course topics, specifically drawing from educational models and philosophies.**Credits:** 3.00

EDST 52200 - Culture And Social Issues In PK-XXII Education

Credit Hours: 3.00. The aim of this course is to engage students in the critical examination of cultural and social issues impacting PK-22 education at the local, state, and federal levels. This course will review the evolving functional role of PK-22 education in a diversifying global society. By way of critical intercultural and intracultural examination and reflection, this course seeks to cultivate a deeper understanding of the ways that education influences and is influenced by issues related to cultural and social change and conflict. **Credits:** 3.00

EDST 58900 - Special Topics For Teachers

Credit Hours: 1.00 to 4.00. (EDFA 58900) Consideration of appropriate professional problems of experienced educational personnel in workshops or in-service programs. Typically offered Fall Spring Summer.**Credits:** 1.00 to 4.00

EDST 59000 - Individual Research Problems

Credit Hours: 1.00 to 6.00. (EDFA 59000) Opportunities for students to study particular problems under the guidance of a member of the This plan of individualized instruction may be used in any field of education or vocational education. Does not include thesis work. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 6.00

EDST 59100 - Special Topics In Education

Credit Hours: 1.00 to 4.00. (EDFA 59100) Group study of a current problem or special topic of interest to professional educational personnel. Intensive study of research, theory, or practical aspects of a particular issue within the usual graduate class format. Typically offered Fall Spring Summer.**Credits:** 1.00 to 4.00

EDST 60000 - Seminar In The Foundations Of Education

Credit Hours: 3.00. Recommended for those who have had a prior foundations course. Specialized studies in such areas as educational history, educational philosophy, educational sociology, religion and public education, current educational issues, and classical literature of education. Typically offered Fall, Spring, Summer.**Credits:** 3.00

EDST 60200 - Seminar: The School Principalship

Credit Hours: 3.00. Individual exploration in depth of selected aspects of the school principalship and critical analysis of related issues. Prerequisite: EDST 51200. Typically offered Summer Fall Spring.**Credits:** 3.00

EDST 60700 - Administration Of Educational Systems

Credit Hours: 3.00. An examination of administrative function, process, structure, and practice. Special emphasis given to theory development in administration. Exploration of system analysis applications to educational administration. Prerequisite: EDST 51200.**Credits:** 3.00

EDST 60800 - Business Management In Education

Credit Hours: 3.00. (EDFA 60800) This course explores the management and operation of the school business environment, the critical trends and issues in the field, and the internal and external determinants of school fiscal policy. As applicable, selected core and supplemental content and skills from the district level educator standards of the Indiana Standards for School Leaders are addressed in this course. Emphasis is on the integration of theory and practice. Prerequisite: EDST 51400 . Typically offered Fall Spring Summer.**Credits:** 3.00

EDST 60900 - Legal Aspects Of American Education

Credit Hours: 3.00. (EDFA 60900) Legal foundations of education as established by constitutional provisions, court decisions, opinions of attorney generals, administrative rulings, and executive directives. Emphasis on legal theory and principles currently in state of change. Stress of case study method of investigation into educational law. Prerequisite: 9 credit hours in Education. Typically offered Fall Spring Summer.**Credits:** 3.00

EDST 61000 - Supervision Of Instruction And Instructional Personnel

Credit Hours: 3.00. (EDFA 61000) A comprehensive approach to supervision and instruction that develops the knowledge, interpersonal, and leadership skills, which are then applied in a school setting for the purpose of instructional improvement. Models of supervision, leadership and evaluation will be examined to gain knowledge in order to apply effective strategies for diverse situations. The study of transformational change in today's schools will guide leadership knowledge to the task of direct

assistance, collegiality, collaboration, culture of trust, professional development, dialectic inquiry, curriculum development and action research. Prerequisite: EDST 51200 . **Credits:** 3.00

EDST 61200 - Seminar In Educational Administration And Curriculum

Credit Hours: 3.00. An analysis of current research and theory related to selected topics in educational administration and curriculum. One topic is studied in each enrollment. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDST 61300 - Clinic For Educational Leaders

Credit Hours: 1.00 to 6.00. (EDFA 61300) Clinic for educational leaders. Typically offered Summer.**Credits:** 1.00 to 6.00

EDST 61400 - Leadership For Community Collaboration And Development

Credit Hours: 3.00. In this course, we will consider how school leaders can help develop and strengthen relationships between districts/corporations and their publics, for the mutual benefit of students, schools, families, and communities. Throughout selected core and supplemental district level educator standards of the Indiana Standards for School Leaders and the National Policy Board for Educational Administration are addressed. Emphasis is on the integration of theory and practice. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

EDST 61500 - Educational Policy And Decision Making

Credit Hours: 3.00. This course explores a variety of current legal, political, social, cultural and economic issues as they relate to educational policy and decision making. As applicable, selected core and supplemental content and skills from the district level educator standards of the Indiana Standards for School Leaders and ELCC/NPBEA standards are addressed in this course. Emphasis is on the integration of theory and practice. Prerequisite: EDST 51200 . Typically offered Fall Spring Summer.**Credits:** 3.00

EDST 61600 - Analytical Techniques In Educational Management

Credit Hours: 3.00. This course is a mix of theory and practice concerning planning and implementation of the fiscal responsibilities that a superintendent of schools would engage in at the district level. The course exposes students to some of the key processes and activities related to planning for and implementing the school budget and related activities. The course examines such planning concepts as goal definition, decision-making, and evaluation of planning as it relates to the fiscal issues of a school corporation. A feature of the course is an emphasis on the process of dealing with the elements of change and planning for such as it relates to fiscal issues in educational organizations. Prerequisite: EDST 51400 or EDST 60800 . **Credits:** 3.00

EDST 64000 - Higher Education Law

Credit Hours: 3.00. This course explores the legal framework within which institutions of higher education operate. Course materials, activities, and assignments will give students a deep understanding of how state and federal legislative bodies and courts operate. Students will read statutory materials and case law on legal issues related to higher education, including: free speech, religion, academic freedom, searches and seizures, due process rights, equal protection issues, individuals with disabilities, contracts and employment, torts and university liability. Permission of instructor required. **Credits:** 3.00

EDST 64100 - Organization And Adminstration In Higher Education

Credit Hours: 3.00. The aim of this course is to explore and examine the complexities of organization and administration in higher education. To do so, the course will have a dual focus: organization, which includes forms, structures, systems, roles, and functions; and administration, including the three "Ps" - processes, products, and "players." The scope of the course seeks to create an appreciation for the complexity of the higher education system, specifically of colleges and universities as ecosystems, through exploration of these systems both horizontally across institutions and institutional types and vertically within the individual, single institution. Throughout the semester students will engage in a variety of analytic and critical perspectives through course readings, discussions, and assignments that encourage a multifaceted perspective. The course intends to provide an organizational framework and serve as the foundation for the courses in the Higher Education program of study. **Credits:** 3.00

EDST 64200 - Cultural Engagment In Higher Education Communities

Credit Hours: 3.00. The influence of culture is of particular import with issues facing the world today and Higher Education institutions (HEIs) are not immune to this reality. HEIs often serve as an institutional base for communities and have a vested interest in meaningful engagement with the communities that surround their campuses. This course is designed to enable learners to confidently communicate, build relationships, and work effectively in culturally diverse communities. Through exploration of a variety of intercultural theories, students will become aware of and be able to navigate the cultural influences in local, state, regional, national, and international higher education communities. As part of the course, students will engage in their communities through experiential, real-world, case study, and project management methods. Permission of instructor required. **Credits:** 3.00

EDST 64300 - Higher Education Economics And Finance

Credit Hours: 3.00. This course provides students with an overview of financial issues related to higher education. Students will discuss and evaluate topics such as the public versus private financial benefits of higher education, the financial relationship between institutions of higher education and both state and federal governments, and issues related to labor economics. Permission of instructor required. **Credits:** 3.00

EDST 64400 - Policy And Politics In Higher Education

Credit Hours: 3.00. In this course, focused on historic and contemporary issues, research, and theories that shape public policy in higher education, students will critically examine the policy issues facing higher education today. The course will interrogate the ways politics and policy are leveraged to address issues of access and college success for all, dismantle systemic oppression, and improve upon higher education's ability to carry out its mission, vision, and purpose. Three main foci will be reviewed and applied throughout the course: The policymaking process: Students will gain a foundational knowledge of policy formation and implementation process at the federal, state, tribal/local levels; Methods of policy analysis: methods of analyzing, interpreting, and evaluating policy/policy issues; Policy research: multiple theoretical lenses and research trends focused on continued improvement and development of higher education institutions, programs, and services. Permission of instructor required. **Credits:** 3.00

EDST 64600 - Assessment And Evaluation In Higher Education

Credit Hours: 3.00. The aim of this course is to explore and examine the complexities of assessment and evaluation within higher education systems, including but not limited to student learning, academic programs, student support services, and administrative services. The scope of the course seeks to create a practical understanding of assessment and evaluation, whereby we examine the foundations of assessment planning and development, explore various assessment techniques, explicate and develop a comprehensive assessment plan, and explain how approaches to data collection work in concert and separately to assess both student learning outcomes and program effectiveness. **Credits:** 3.00

EDST 64700 - History Of American Higher Education

Credit Hours: 3.00. This course engages students to better understand the history of higher education in the United States from the Colonial era to the present. Upon completion, students will have an appreciation for how higher education institutions (HEIs) were (and continue to be) developed, as well as an understanding of who had access to these institutions over the past 200+ years, and who did not, from a social justice perspective. **Credits:** 3.00

EDST 64800 - International And Intercultural Higher Education

Credit Hours: 3.00. This doctoral-level course critically examines the interconnected and interdependent world of international higher education through an intercultural lens. The course will employ a variety of critical theoretical perspectives (post-development, feminist, & equity frameworks as well as organizational/institutional models) to examine both the historical and contemporary developments in higher education throughout the globe. Topics will vary based on current issues but will center on the influences cultural, economic, political, & social factors have had on national and international higher education development. Permission of instructor required.**Credits:** 3.00

EDST 66300 - Organization And Administration Of Special Education

Credit Hours: 3.00. (EDPS 66300) A comprehensive course in the organization and administration of special education including the organizational arrangements, identification, placement and service delivery, tests and assessments, program evaluation, personnel, and school/community relations. Typically offered Spring.**Credits:** 3.00

EDST 69400 - Intern In Educational Administration: Building Administrator

Credit Hours: 1.00 to 3.00. (EDFA 69400) Field experience in educational administration under university supervision in selected situations related to school building administration. Amount of credit to be determined by nature and extent of assignment. Permission of instructor required.**Credits:** 1.00 to 3.00

EDST 69500 - Internship In Education

Credit Hours: 1.00 to 10.00. (EDFA 69500) Amount of credit to be determined by nature and extent of the assignment. A special course in selected areas of education, designed to provide practical field experience under professional supervision in selected situations related to the candidate's area of specialization. Typically offered Fall Spring Summer.**Credits:** 1.00 to 10.00

EDST 69700 - EdS Project-Research

Credit Hours: 0.00 to 18.00. Educational Specialist project in research. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 0.00 to 18.00

EDST 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 18.00

Electrical and Computer Engineering

ECE 19595 - Selected Topics In Electrical And Computer Engineering

Credit Hours: 1.00 to 5.00. Topics vary. Permission of department required. **Credits:** 1.00 to 5.00

ECE 20001 - Electrical Engineering Fundamentals I

Credit Hours: 3.00. This course covers fundamental concepts and applications for electrical and computer engineers as well as for engineers who need to gain a broad understanding of these disciplines. The course starts by the basic concepts of charge, current, and voltage as well as their expressions with regards to resistors and resistive circuits. Essential concepts, devices, theorems, and applications of direct-current (DC), 1st order, and alternating-current (AC) circuits are subsequently discussed. Besides electrical devices and circuits, basic electronic components including diodes and transistors as well as their primary applications are also discussed. Typically offered Fall Spring Summer.**Credits:** 3.00

ECE 20002 - Electrical Engineering Fundamentals II

Credit Hours: 3.00. Continuation of Electrical and Computer Engineering Fundamentals I. The course addresses mathematical and computational foundations of circuit analysis (differential equations, Laplace Transform techniques) with a focus on application to linear circuits having variable behavior as a function of frequency, with emphasis on filtering. Variable frequency behavior is further considered for applications of electronic components through single-transistor and operational amplifiers. The course ends with consideration of how circuits behave and may be modeled for analysis at high frequencies. Permission of Department required. Typically offered Fall Spring Summer.**Credits:** 3.00

ECE 20007 - Electrical Engineering Fundamentals I Lab

Credit Hours: 1.00. This is an introduction course in electronic measurement and circuit modeling, simulation and design techniques. These skills are developed through a variety of laboratory experiments ranging from voltage, current, and frequency, to resistors, inductors, capacitors, and operational amplifiers. When possible, the experiments develop practical skills through small design and soldering tasks. Finally, the course culminates in a
two week group design project. In many ways this course is the laboratory of the co-requisite lecture course ECE 20001: Electrical Engineering Fundamentals I; however, we remind students that this is a standalone course that expects students will learn and demonstrate material not taught in ECE 20001. Typically offered Fall Spring Summer.**Credits:** 1.00

ECE 20008 - Electrical Engineering Fundamentals II Lab

Credit Hours: 1.00. This is a course in electronic measurement, circuit modeling, simulation and design techniques. These skills are developed through a variety of laboratory experiments including discrete semiconductor measurement, transistor amplifiers, motor control, and operational amplifier internals. The experiments develop practical skills through small design and soldering tasks. Finally, the course culminates in a two week group design project. In many ways this course is the laboratory of the co-requisite lecture course ECE 20002 Electrical Engineering Fundamentals II; however, we remind students that this is a standalone course that expects students will learn and demonstrate material not taught in other courses. Typically offered Fall Spring Summer.**Credits:** 1.00

ECE 20100 - Linear Circuit Analysis I

Credit Hours: 3.00. Volt-ampere characteristics for circuit elements; independent and dependent sources; Kirchhoff's laws and circuit equations. Source transformations; Thevenin's and Norton's theorems; superposition, step response of 1st order (RC, RL) and 2nd order (RLC) circuits. Phasor analysis, impedance calculations, and computation of sinusoidal steady state responses. Instantaneous and average power, complex power, power factor correction, and maximum power transfer. Instantaneous and average power.**Credits:** 3.00

ECE 20200 - Linear Circuit Analysis II

Credit Hours: 3.00. Continuation of ECE 20100. Use of Laplace Transform techniques to analyze linear circuits with and without initial conditions. Characterization of circuits based upon impedance, admittance, and transfer function parameters. Determination of frequency response via analysis of poles and zeros in the complex plane. Relationship between the transfer function and the impulse response of a circuit. Use of continuous time convolution to determine time domain responses.

Properties and practical uses of resonant circuits and transformers. Input - output characterization of a circuit as a two-port. Low and high-pass filter design.**Credits:** 3.00

ECE 20700 - Electronic Measurement Techniques

Credit Hours: 1.00. Experimental exercises in the use of laboratory instruments. Voltage, current, impedance, frequency, and wave form measurements. Frequency and transient response. Elements of circuit modeling and design. **Credits:** 1.00

ECE 20800 - Electronic Devices And Design Laboratory

Credit Hours: 1.00. Laboratory experiments in the measurement of electronic device characteristics. Design of biasing networks, small signal amplifiers, and switching circuits. **Credits:** 1.00

ECE 20875 - Python For Data Science

Credit Hours: 3.00. This course will introduce Python programming to students through data science problems. Students will learn Python concepts as well as introductory data science topics, and will use their knowledge of Python (and prior programming experience) to implement data analyses. Typically offered Fall Spring.**Credits:** 3.00

ECE 25500 - Introduction To Electronic Analysis And Design

Credit Hours: 3.00. Diode, bipolar transistor, and FET circuit models for the design and analysis of electronic circuits. Single and multistage analysis and design; introduction to digital circuits. Computer-aided design calculations, amplifier operating point design, and frequency response of single and multistage amplifiers. High-frequency and low-frequency designs are emphasized.**Credits:** 3.00

ECE 26400 - Advanced C Programming

Credit Hours: 3.00. Continuation of a first programming course. Topics include files, structures, pointers, and the proper use of dynamic data structures. A basic knowledge of the UNIX operating system and an introductory C programming course; C programming knowledge should include basic syntax, control structures, and file I/O, as well as experience in declaring and using functions. **Credits:** 3.00

ECE 27000 - Introduction To Digital System Design

Credit Hours: 4.00. An introduction to digital system design and hardware engineering, with an emphasis on practical design techniques and circuit implementation.**Credits:** 4.00

ECE 27900 - Sophomore Participation In Vertically Integrated Projects In Electrical And Computer Engineering

Credit Hours: 1.00 or 2.00. This course provides an opportunity for undergraduate students to explore and develop comprehensive applications of electrical and computer engineering technologies, especially as they relate to active research areas of Purdue faculty members. Students will learn about the underlying research, and will work on teams to formulate applications of the research that address real-world needs. Students will attend a weekly lecture that provides an introduction to a broad range of applicable technologies and development tools - some associated with the activities of specific teams, and some addressing topics of more general value to students enrolled in the course. **Credits:** 1.00 or 2.00

ECE 29101 - Internship Experience

Credit Hours: 0.00 to 3.00. A supervised internship experience linking academic studies with relevant work experience. Part-time employment concurrent with full-time study. Permission of instructor required. **Credits:** 0.00 to 3.00

ECE 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in electrical and/or computer engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ECE 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in electrical and/or computer engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ECE 29401 - Electrical And Computer Engineering Sophomore Seminar

Credit Hours: 1.00. An introduction to the School of Electrical and Computer Engineering, the program's objectives, and outcomes, BSEE and BSCmpE degree requirements, professional writing and multicultural and professional development. Typically offered Fall Spring.**Credits:** 1.00

ECE 29595 - Selected Topics In Electrical And Computer Engineering

Credit Hours: 1.00 to 5.00. Topics vary. Permission of department required. **Credits:** 1.00 to 5.00

ECE 29600 - Electrical And Computer Engineering Projects

Credit Hours: 0.00 to 18.00. Projects in Electrical and Computer Engineering. Permission of Department required. **Credits:** 0.00 to 18.00

ECE 30010 - Introduction To Machine Learning And Pattern Recognition

Credit Hours: 3.00. Intelligent information processing, search and retrieval, classification, recognition, prediction and optimization with machine learning and pattern recognition algorithms such as neural networks, support vector machines, decision trees and data mining methods, current models and architectures, implementation topics especially in software, applications in areas such as information processing, search and retrieval of internet data, forecasting (prediction), classification, signal/image processing, pattern recognition, optimization, simulation, system identification, communications, control, management and finance. Topics covered will also be illustrated with the software package MATLAB and related toolboxes. Permission of instructor required. **Credits:** 3.00

ECE 30100 - Signals And Systems

Credit Hours: 3.00. Classification, analysis and design of systems in both the time- and frequency-domains. Continuous-time linear systems: Fourier Series, Fourier Transform, bilateral Laplace Transform. Discrete-time linear systems: difference equations, Discrete-Time Fourier Transform, bilateral Z-Transform. Sampling, quantization, and discrete-time processing of continuous-time signals. Discrete-time nonlinear systems: median-type filters, threshold decomposition. System design examples such as the compact disc player and AM radio.**Credits:** 3.00

ECE 30200 - Probabilistic Methods In Electrical And Computer Engineering

Credit Hours: 3.00. An introductory treatment including probability of events, discrete and continuous random variables, multiple random variables, sums of random variables and long-term averages, and elementary random processes. Applications involving uniform, Gaussian, exponential, geometric and related random variables. Introduction to parameter estimation and hypothesis testing. Discussion of wide-sense stationary random processes, including correlation functions, spectral densities and the response of linear time invariant systems. Course examples are drawn from signal processing, wireless communications, system reliability, and data science.**Credits:** 3.00

ECE 30411 - Electromagnetics I

Credit Hours: 3.00. This course is a continued study of vector calculus, electrostatics, magnetostatics, and Maxwell's Equations. It serves as an introduction to electromagnetic waves and transmission lines, which is continued in ECE 30412.**Credits:** 3.00

ECE 30412 - Electromagnetics II

Credit Hours: 3.00. Electromagnetics II builds on Electromagnetics I (ECE 31100) and emphasizes time-varying electromagnetic fields. Both fundamental understanding and an appreciation for applications that span all technologies related to electrical and computer engineering are emphasized. The topics covered include: Maxwell's equations, plane waves, transmission lines, waveguides and cavities, and antennas and radiation. Applications addressed relate to photonics, communications, and imaging and sensing. More generally, illustrations cover the basic principles on which devices and systems used every day operate.**Credits:** 3.00

ECE 30414 - Elements Of Fiber Optics, Lasers And Optoelectronics

Credit Hours: 3.00. Fundamental of photonics, guided-wave optics, optical fibers, lasers, photon detectors, integrated optical components, optical information processing, devices in communication and sensor applications. Topics include generation, transformation, modulation and detection of laser beams and their applications.**Credits:** 3.00

ECE 30415 - Fiber Optics And Lasers Laboratory

Credit Hours: 1.00. This laboratory course exercises in lasers, modulation of laser beams, fiber components and systems. It covers some simple optical measurements like Power and beam spot measurement of Gaussian beams. Students learn about lens-pinhole spatial filters and beam expanders. Fourier transform, convolution and correlation are covered. Characteristics of LEDs and ILDs are shown. Students become familiar with optical fibers related experiments like Fiber-optic microbend intensity sensors, Electrooptic modulation, Fiber optic Mach-Zehnder interferometer etc. Students also learn how to build laser systems based on the knowledge acquired from previous labs and with some simple set up. Finally there is a final project where students can design a practical optical instrument based on their knowledge from the lab.**Credits:** 1.00

ECE 30416 - Basics Of Engineering Optics

Credit Hours: 3.00. Fundamental of photonics, guided-wave optics, optical fibers, lasers, photon detectors, integrated optical components, optical information processing, devices in communication and sensor applications. Topics include generation, transformation, modulation and detection of laser beams and their applications.**Credits:** 3.00

ECE 30417 - Engineering Optics Laboratory

Credit Hours: 1.00. A set of laboratory experiments dealing with fundamentals and basic applications of geometrical optics, beams, polarization optics, wave optics and Fourier optics. Permission of instructor required.**Credits:** 1.00

ECE 30500 - Semiconductor Devices

Credit Hours: 3.00. Introduces and explains terminology, models, properties, and concepts associated with semiconductor devices. Provides detailed insight into the internal workings of the "building-block" device structures such as the pn-junction diode, Schottky diode, BJT, and MOSFET. Presents information about a wide variety of other devices including solar cells, LEDs, HBTs, and modern field-effect devices. Systematically develops the analytical tools needed to solve practical device problems.**Credits:** 3.00

ECE 30600 - Electronic Circuits And Systems Laboratory

Credit Hours: 1.00. Experiments in electronic circuits and systems, including spectral analysis techniques, sampling, distortion measurements, random signals, signal-to-noise ratio and correlation.**Credits:** 1.00

ECE 30653 - Introduction To Nanotechnology And Quantum Science & Technology

Credit Hours: 3.00. This interdisciplinary course offers an introduction to nanotechnology and quantum science and technology for undergraduate students in science and engineering. The students will develop understanding of interdisciplinary nature of these fields and utilize concepts in physics, chemistry and mechanics to describe and analyze unique properties of quantum and nanoscale objects. The course will provide the opportunity to get exposed to highly interdisciplinary nature of today's most active and rapidly expanding fields of research and technologies. **Credits:** 3.00

ECE 30700 - Electromagnetic Fields And Waves Laboratory

Credit Hours: 1.00. Experimental exercises illustrating concepts in electric and magnetic fields, transmission lines, electromagnetic fields, simple waveguides, and antennas.**Credits:** 1.00

ECE 30800 - Systems Simulation And Control Laboratory

Credit Hours: 1.00. Instruction and laboratory exercises in the solution of differential equations that arise in the modeling of physical systems. Instruction in the principles of operation and design of linear control systems.**Credits:** 1.00

ECE 30834 - Fundamentals Of Computer Graphics

Credit Hours: 3.00. Fundamental principles and techniques of computer graphics. The course covers the basics of going from a scene representation to a raster image using OpenGL. Specific topics include coordinate manipulations, perspective, basics of illumination and shading, color models, texture maps, clipping and basic raster algorithms, fundamentals of scene constructions. Permission of department required. **Credits:** 3.00

ECE 30862 - Object-Oriented Programming In C++ And Java

Credit Hours: 3.00. C++ and Java programming languages, including classes, inheritance, encapsulation, polymorphism, class derivation, abstract classes, interfaces, static class members, object construction and destruction, namespaces, exception handling, function, overloading and overriding, function name overload resolution, container classes, and template classes. **Credits:** 3.00

ECE 30864 - Software Engineering Tools

Credit Hours: 1.00. This course will acquaint students with the toolkit of the modern software engineer. Students will learn the tools surrounding the software application itself, e.g., tools for software process, software construction, and software deployment. Examples include: integrated development editors (IDEs), version control systems, project management, bug tracking, scripting languages, testing aids, deployment technologies. **Credits:** 1.00

ECE 31032 - Power Systems Engineering

Credit Hours: 3.00. Introduction to the economic operation of power systems, three-phase circuit analysis, modeling of transformers and transmission lines, steady-state network analysis using a power flow, analysis during faults and state estimation.**Credits:** 3.00

ECE 31033 - Power Electronics

Credit Hours: 3.00. Introduction to the fundamental operating principles of power conditioning circuits that are currently being used to effect power flow from AC to DC and vice versa. Emphasis is on the relationship between form and function of these circuits. Circuits discussed will include AC/DC line-commutated converters, DC/DC converters, DC/variable frequency converters, resonant converters, and AC/AC converters. Computer simulations will be used as a part of the coursework.**Credits:** 3.00

ECE 31100 - Electric And Magnetic Fields

Credit Hours: 3.00. Continued study of vector calculus, electrostatics, and magnetostatics, and Maxwell's equations. Introduction to electromagnetic waves, transmission lines, and radiation from antennas.**Credits:** 3.00

ECE 32100 - Electromechanical Motion Devices

Credit Hours: 3.00. The general theory of electromechanical motion devices relating electric variables and electromagnetic forces. The basic concepts and operational behavior of DC, induction, brushless DC, and stepper motors used in control applications are presented.**Credits:** 3.00

ECE 32300 - Electromechanical Motion Devices and Systems Laboratory

Credit Hours: 1.00. Experiments closely coordinated with ECE 32100 involving measurement of fundamental parameters of various electromechanical devices using modern instrumentation techniques. Computer simulation is used to predict steady-state and dynamic operating characteristics. Comparison of predicted and measured performance is emphasized.**Credits:** 1.00

ECE 32600 - Engineering Project Management

Credit Hours: 3.00. (ME 32600) Project management is an important skill that is needed in the private and public sectors as well as specialty businesses. This course will explore the challenges facing today's project managers and will provide a broad understanding of the project management environment focused on multiple aspects of the project.**Credits:** 3.00

ECE 32700 - Engineering Economics

Credit Hours: 3.00. (ME 32700) Engineering Economics is designed as an overview of economics with a focus on how it relates to the practice of engineering. Topics include interest formulas, rate of return, life cost analysis, depreciation, taxes, and cash flow.**Credits:** 3.00

ECE 33700 - ASIC Design Laboratory

Credit Hours: 2.00. Introduction to standard cell design of Application Specific Integrated Circuits (ASICs) using modern hardware description languages (HDLs). Emphasis on how to write HDL code that will map readily to hardware. Laboratory experiments using commercial grade computer-aided design (CAD) tools for HDL based design, logic simulation, automatic placement and routing, timing analysis and verification.**Credits:** 2.00

ECE 34000 - Simulation, Modeling, and Identification

Credit Hours: 3.00. Investigation and evaluation of design problems through simulation of systems described by ordinary differential and difference equations. Development of simulation models from physical parameters and from experimental data. Topics include continuous, discrete, and hybrid models of electrical, mechanical, and biological systems. Laboratory experiences demonstrate concepts studied in text and lecture.**Credits:** 3.00

ECE 36200 - Microprocessor Systems And Interfacing

Credit Hours: 4.00. An introduction to basic computer organization, microprocessor instruction sets, assembly language programming, and microcontroller peripherals. Typically offered Fall Spring.**Credits:** 4.00

ECE 36800 - Data Structures

Credit Hours: 3.00. Provides insight into the use of data structures. Topics include stacks, queues and lists, trees, graphs, sorting, searching, and hashing.**Credits:** 3.00

ECE 36900 - Discrete Mathematics For Computer Engineering

Credit Hours: 3.00. This course introduces discrete mathematical structures and finite-state machines. Students will learn how to use logical and mathematical formalisms to formulate and solve problems in computer engineering. Topics include formal logic, proof techniques, recurrence relations, sets, combinatorics, relations, functions, algebraic structures, and finite-state machines. **Credits:** 3.00

ECE 37900 - Junior Participation In Vertically Integrated Projects (VIP) In Electrical And Computer Engineering

Credit Hours: 1.00 or 2.00. This course provides an opportunity for undergraduate students to explore and develop comprehensive applications of electrical and computer engineering technologies, especially as they relate to active research areas of Purdue faculty members. Students will learn about the underlying research, and will work on teams to formulate applications of the research that address real-world needs. Students will attend a weekly lecture that provides an introduction to a broad range of applicable technologies and development tools - some associated with the activities of specific teams, and some addressing topics of more general value to students enrolled in the course.**Credits:** 1.00 or 2.00

ECE 38199 - Professional Practice Co-Op I

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Permission of department required. **Credits:** 0.00

ECE 38200 - Feedback System Analysis And Design

Credit Hours: 3.00. In this course, classical concepts of feedback system analysis and associated compensation techniques are presented. In particular, the root locus, Bode diagram, and Nyquist criterion are used as determinants of stability. **Credits:** 3.00

ECE 38299 - Professional Practice Co-Op II

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Permission of department required. **Credits:** 0.00

ECE 38399 - Professional Practice Co-Op III

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Permission of department required. **Credits:** 0.00

ECE 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in electrical and/or computer engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ECE 39401 - Professional Communications And Diversity

Credit Hours: 1.00. This course provides ECE students with practice in relevant aspects of communication. Topics include: successfully seeking employment, working effectively in teams, delivering engaging presentations, and leveraging the advantages and challenges of diversity and inclusion. Typically offered Fall Spring.**Credits:** 1.00

ECE 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in electrical and/or computer engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ECE 39595 - Selected Topics In Electrical And Computer Engineering

Credit Hours: 1.00 to 5.00. Topics vary. Permission of department required. **Credits:** 1.00 to 5.00

ECE 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in electrical and/or computer engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ECE 39600 - Industrial Practice Seminar I

Credit Hours: 1.00. A special seminar for cooperative education and curricular practical training students. Permission of instructor required.**Credits:** 1.00

ECE 39699 - Professional Practice Internship

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Permission of department required. **Credits:** 0.00

ECE 40020 - Sound Reinforcement System Design

Credit Hours: 3.00. An introduction to computational tools used in the measurement and analysis of electro-acoustic systems, and their application to sound reinforcement system engineering. Service learning based projects, serving the needs of community clients, provide the context for application of sound reinforcement system design principles and practices. **Credits:** 3.00

ECE 40100 - Engineering Ethics and Professionalism

Credit Hours: 1.00. Some ethical, social, political, legal, and ecological issues that practicing engineers may encounter. (ECE 401 and ME 401 are cross-listed courses; students may not get credit for both ECE 401 and ME 401.)**Credits:** 1.00

ECE 40400 - Introduction To Computer Security

Credit Hours: 3.00. Introduction to security issues related to the operation of computers and the workings of computer networks. Topics covered include introduction to cryptography, authentication protocols, digital signature algorithms, internet vulnerabilities, worms and virus propagation, denial of service attacks, etc. The students will also learn how to design firewalls to protect a system against unwanted intrusions. Permission of department required. **Credits:** 3.00

ECE 40862 - Software For Embedded Systems

Credit Hours: 3.00. This course provides an introduction to software design for embedded computing systems. Major topics covered include the importance of time and timing in embedded systems, embedded software organization (FSM-based program design, polled loop systems, foreground-background systems, event driven architectures, multi-tasking, etc.), real-time scheduling and real-time operating systems, wired/wireless networked embedded systems, debugging techniques for embedded software, and advanced topics such as memory-safe programming, implementing reentrant functions, and minimizing code space, memory usage, and power consumption. The course features a series of integrated assignments using state-of-the-art embedded hardware platforms, embedded software design tools, and real-time operating systems that reinforce the concepts taught in the lectures. Typically offered Fall Spring.**Credits:** 3.00

ECE 40875 - Data Mining Basic Concepts And Techniques

Credit Hours: 3.00. This course introduces fundamental techniques in data mining, such as the techniques that extract useful knowledge from a large amount of data. Topics include data preprocessing, exploratory data analysis, association rule mining, clustering, classification, anomaly detection, recommendation and graph analysis. The applications of these techniques in real-world decision making in various domains, such as science, business, biology, health care, transportation, will be discussed. **Credits:** 3.00

ECE 41023 - Electromechanical Motion Control

Credit Hours: 3.00. The operation, analysis, and control of electromechanical systems are covered, including a treatment of electromechanical devices, power electronics, and control systems. Sample applications include servo-systems, propulsion drives, and variable-speed rotational equipment.**Credits:** 3.00

ECE 41200 - Introduction To Engineering Optics

Credit Hours: 3.00. The control and characteristics of optical radiation are covered. Applications to optical instrumentation, thin films, holography, and polarizing optics are discussed.**Credits:** 3.00

ECE 41300 - Introduction To Optics Laboratory

Credit Hours: 1.00. A set of laboratory experiments dealing with fundamentals and applications of geometrical optics, polarization optics, wave optics, and Fourier optics.**Credits:** 1.00

ECE 41400 - Elements Of Electro And Fiber Optics

Credit Hours: 3.00. Introduction to the use of lasers, fiber and integrated optical components and devices in communication and sensory applications. Topics include generation, transformation, modulation, deflection, and detection of laser beams, and their applications in fiber communication sensory systems.**Credits:** 3.00

ECE 41500 - Electro- And Fiber Optics Laboratory

Credit Hours: 1.00. Laboratory exercises in lasers, hologram, modulation and deflection of laser beams, fiber components, and systems.**Credits:** 1.00

ECE 43200 - Elements Of Power System Engineering

Credit Hours: 3.00. Fundamental concepts of power system analysis, transmission line parameters, basic system models, steady-state performance, network calculations, power flow solutions, fault studies, symmetrical components, operating strategies, and control. **Credits:** 3.00

ECE 43201 - Elementary Power Systems Engineering

Credit Hours: 3.00. Fundamental concepts of power systems analysis, transmission line parameters, basic system models, steady state performance, network calculations, power flow solutions, fault studies, symmetrical components, operating strategies and control.**Credits:** 3.00

ECE 43500 - Object-Oriented Design Using C++ And Java

Credit Hours: 3.00. Review of OO design with C++ and Java. Difficulties caused by multiple inheritances in C++. Taking advantage of Run-Time Identification in C++. Multi-threading, AWT, and Network Programming in Java. Discussion of Java applets, beans, and servlets. Unified modeling language. Use-case analysis. Constructing conceptual models. System sequence diagrams. "Gang of Four" design patterns. Case studies. Permission of instructor required. **Credits:** 3.00

ECE 43700 - Computer Design And Prototyping

Credit Hours: 4.00. An introduction to computer organization and design, including instruction set selection, arithmetic logic unit design, datapath design, control strategies, pipelining, memory hierarchy, and I/O interface design. **Credits:** 4.00

ECE 43800 - Digital Signal Processing With Applications

Credit Hours: 4.00. The course is presented in five units. Foundations: the review of continuous-time and discrete-time signals and spectral analysis; design of finite impulse response and infinite impulse response digital filters; processing of random signals. Speech processing; vocal tract models and characteristics of the speech waveform; short-time spectral analysis and synthesis; linear predictive coding. Image processing: two-dimensional signals, systems and spectral analysis; image enhancement; image coding; and image reconstruction. The laboratory experiments are closely coordinated with each unit. Throughout the course, the integration of digital signal processing concepts in a design environment is emphasized.**Credits:** 4.00

ECE 44000 - Transmission Of Information

Credit Hours: 4.00. Analysis and design of analog and digital communication systems. Emphasis on engineering applications of theory to communication system design. The laboratory introduces the use of advanced engineering workstations in the design and testing of communication systems.**Credits:** 4.00

ECE 44100 - Distributed Parameter Systems

Credit Hours: 3.00. Transient and steady-state behavior of transmission lines, wave guides, antennas, propagation, noise, microwave sources, and system design.**Credits:** 3.00

ECE 45300 - Fundamentals Of Nanoelectronics

Credit Hours: 3.00. Nanoelectronic devices are an integral part of our life, including the billion-plus transistors in every smartphone, each of which has an active region that is only a few hundred atoms long. This course is designed to convey the key concepts developed in the last 25 years which constitute the fundamentals of nanoelectronics and mesoscopic physics, assuming a minimal set of prerequisites. Topics covered include the new Ohm's law, conductance quantization, the nanotransistor, spin valves, thermoelectricity, quantum systems and the non-equilibrium Green's function (NEGF) method. **Credits:** 3.00

ECE 45500 - Integrated Circuit Engineering

Credit Hours: 3.00. Analysis, design, and fabrication of silicon bipolar and MOSFET monolithic integrated circuits. Consideration of amplifier circuit design and fabrication techniques with circuit simulation using Spice-2. Integrated operational amplifiers with difference amplifiers, current sources, active loads, and voltage references. Design of IC analog circuit building blocks.**Credits:** 3.00

ECE 45600 - Digital Integrated Circuit Analysis And Design

Credit Hours: 3.00. As applied t digital integrated circuits, the MDs transistor is studied in depth-from its fabrication to its electrical characteristics. Combinational, sequential, and dynamic logic circuits are considered. While the focus of the course is on CMOS technology, bipolar, nMOS, and BiCMOS circuits are introduced as well. SPICE is used as both an analysis and design tool. Semiconductor memory circuits are also discussed.**Credits:** 3.00

ECE 45700 - Electronic Design Laboratory

Credit Hours: 1.00. Laboratory exercises illustrating the design and application of electronic circuits. Case studies of circuits presently in existing instruments, such as the color television receiver sampling oscilloscope, are used as a basis for the circuits investigated or designed. Pulse and analog circuits studied, as well as high voltage and power supplies. Signal processing, modulation, and sampling are used to demonstrate the circuits as interconnected into a complete system.**Credits:** 1.00

ECE 46100 - Software Engineering

Credit Hours: 3.00. Introduction to software engineering principles, with special emphasis on the process, methods, and tools needed to develop and test quality software products and systems. **Credits:** 3.00

ECE 46300 - Introduction To Computer Communication Networks

Credit Hours: 3.00. An introduction to the design and implementation of computer communication networks. The focus is on the concepts and the fundamental design principles that have contributed to the global Internet success. Topics include: digital transmission and multiplexing, protocols, MAC layer design (Ethernet/802.11), LAN interconnects and switching, congestion/flow/error control, routing, addressing, performance evaluation, internetworking (Internet) including TCP/IP, HTTP, DNS etc. This course will include one or more programming projects.**Credits:** 3.00

ECE 46800 - Introduction To Compilers And Translation Engineering

Credit Hours: 4.00. The design and construction of compilers and other translators. Topics include compilation goals, organization of a translator, grammars and languages, symbol tables, lexical analysis, syntax analysis (parsing), error handling, intermediate and final code generation, assemblers, interpreters, and an introduction to optimization. Emphasis is on engineering a compiler or interpreter for a small programming language - typically a C or Pascal subset. Projects involve the stepwise implementation (and documentation) of such a system. Department permission required.**Credits:** 4.00

ECE 46900 - Operating Systems Engineering

Credit Hours: 4.00. The design and construction of operating systems for both individual computers and distributed (networked) systems. Basic concepts and methods for managing processor, main memory, block-structured storage, and network resources are covered. Detailed examples are taken from a number of operating systems, emphasizing the techniques used in networked versions of UNIX. These techniques are applied to design improvements of portions of a simplified, networked, UNIX-based operating system; the improvements are implemented and their performance is evaluated in laboratory experiments.**Credits:** 4.00

ECE 47000 - Curricular Practical Training

Credit Hours: 0.00. An electrical and/or computer engineering work experience. This internship experience is intended to complement the student's academic plan of study and help prepare him/her for his/her future role as a practicing engineer. A letter from the prospective employer stating the period of employment, hours per week, job title, job qualifications, and job minimum period of employment is required. This course may not be taken in successive semesters. Permission of department required. **Credits:** 0.00

ECE 47001 - Part-Time Curricular Practical Training

Credit Hours: 0.00. A part-time electrical and/or computer engineering work experience. This internship experience is intended to complement the student's academic plan of study and help prepare him/her for his/her future role as a practicing engineer. Permission of department required.**Credits:** 0.00

ECE 47300 - Introduction To Artificial Intelligence

Credit Hours: 3.00. The course introduces fundamental areas of artificial intelligence: knowledge representation and reasoning; machine learning; planning; game playing; natural language processing; and vision. **Credits:** 3.00

ECE 47301 - Machine Learning

Credit Hours: 3.00. This course introduces the fundamental concepts and algorithms of machine learning (ML) with their implementations and applications to practical problems consisting of modeling and prediction. Students will gain knowledge on the formulation of learning representation, over-fitting, generalization, clustering, classification, regression, and probabilistic modeling. Topics include linear regression, supervised and unsupervised learning, dimensionality reduction, Naïve Bayes, feedforward neural networks, deep convolutional neural networks, and the state-of-the-art machine learning libraries.**Credits:** 3.00

ECE 47700 - Digital Systems Senior Project

Credit Hours: 4.00. A structured approach to the development and integration of embedded microcontroller hardware and software that provides senior-level students with significant design experience applying microcontrollers to a wide range of embedded systems (e.g., instrumentation, process control, telecommunications, and intelligent devices). The primary objective is to provide practical experience developing integrated hardware and software for embedded microcontroller systems in an environment that models one which students will most likely encounter in industry. Permission of instructor required.**Credits:** 4.00

ECE 47900 - Senior Participation In Vertically Integrated Projects (VIP) In Electrical And Computer Engineering

Credit Hours: 1.00 or 2.00. This course provides an opportunity for undergraduate students to explore and develop comprehensive applications of electrical and computer engineering technologies, especially as they relate to active research areas

of Purdue faculty members. Students will learn about the underlying research, and will work on teams to formulate applications of the research that address real-world needs. Students will attend a weekly lecture that provides an introduction to a broad range of applicable technologies and development tools - some associated with the activities of specific teams, and some addressing topics of more general value to students enrolled in the course. **Credits:** 1.00 or 2.00

ECE 48300 - Digital Control Systems Analysis And Design

Credit Hours: 3.00. The course introduces feedback computer controlled systems, the components of digital control systems, and system models on the z-domain (z-transfer functions) and on the time domain (state variable representations.) The objectives for system design and evaluation of system performance are considered. Various discrete-time controllers are designed including PID-controllers, state and output feedback controllers, and reconstruction of states using observers. The systems with the designated controllers are tested by simulations. **Credits:** 3.00

ECE 49022 - Electrical Engineering Senior Design Projects

Credit Hours: 4.00. Lecture sessions provide the student with background information on the design and management of projects. Formal lectures cover, for example, design for manufacturability, design for quality, test and evaluation, reliability and ethics, patents and copyrights, plus case studies. During the laboratory sessions, the students work in teams on challenging open-ended electrical engineering project that draws on previous coursework. Projects routinely involve standard design facets (such as consideration of alternative solutions, feasibility considerations, and detailed system descriptions) and include a number of realistic constraints (such as cost, safety, reliability, and aesthetics). Lectures require use of the I-Clicker system.**Credits:** 4.00

ECE 49401 - Professional Communication Capstone

Credit Hours: 1.00. This course provides ECE students an opportunity to refine their professional communication skills before launching into the workplace or graduate school. Topics include: ethics in ECE, workplace communication (written and verbal), and plans for professional growth. Typically offered Fall Spring.**Credits:** 1.00

ECE 49500 - Selected Topics In Electrical And Computer Engineering

Credit Hours: 1.00 to 4.00. Topics vary. Permission of department required. **Credits:** 1.00 to 4.00

ECE 49595 - Selected Topics In Electrical And Computer Engineering

Credit Hours: 1.00 to 5.00. Topics vary. Permission of department required. **Credits:** 1.00 to 5.00

ECE 49600 - Electrical And Computer Engineering Projects

Credit Hours: 0.00 to 18.00. Arrange Hours and Credit. Topics vary. Permission of department required.**Credits:** 0.00 to 18.00

ECE 50024 - Machine Learning

Credit Hours: 3.00. An introductory course to machine learning, with a focus on supervised learning using linear models. The course will have four parts: (1) mathematical background on linear algebra, probability, and optimization. (2) classification methods including Bayesian decision, linear regression, logistic, regression,
and support vector machine. (3) robustness of classifier and adversarial examples. (4) learning theory on the feasibility of learning, VC dimension, complexity analysis, bias-variance analysis. Suitable for senior undergraduates and graduates with a background in probability, linear algebra, and programming.**Credits:** 3.00

ECE 50616 - Physics And Manufacturing Of Solar Cells

Credit Hours: 3.00. This course introduces the electronic, optical and material properties and the manufacturing of photovoltaic devices. Topics include electronic charge separation, transportation and recombination; optical concentration, trapping and confinement; material preparations in photovoltaic systems; bulk crystal, thin-film and organic photovoltaic device configurations; energy storage; as well as emerging concepts in photovoltaics. Discussions also involve the process and equipment for the manufacturing of various photovoltaic modules, with special emphasis on driving down the cost of photovoltaic systems. Typically offered Fall.**Credits:** 3.00

ECE 50631 - Fundamentals Of Current Flow

Credit Hours: 1.00. Traditional description of electronic motion through a solid is based on diffusive transport which means that the electron takes a random walk from the source to the drain. However, modern nanoelectronic devices often have channel lengths comparable to a mean free path so that electrons travel ballistically, or "like a bullet." This course provides a unified conceptual framework for ballistic and diffusive transport of both electrons and phonons, that is very different from what is taught in standard courses, but indispensable to understanding nanolectronic devices.**Credits:** 1.00

ECE 50632 - Introduction To Quantum Transport

Credit Hours: 1.00. This course introduces the Schrödinger equation, uses the tight-binding method to discuss the concept of bandstructure and E(k) relations, along with simple quantum transport problems. No prior background in quantum mechanics or statistical mechanics is assumed.**Credits:** 1.00

ECE 50633 - Boltzmann Law: Physics To Computing

Credit Hours: 1.00. This course introduces the key concepts of equilibrium statistical mechanics leading to the celebrated Boltzmann law and how it leads to Boltzmann machines and related concepts in modern machine learning. No prior background in statistical mechanics is assumed.**Credits:** 1.00

ECE 50635 - An Introduction To Data Analysis, Design Of Experiment, And Machine Learning

Credit Hours: 1.00. This course will provide the conceptual foundation so that a student can use modern statistical concepts and tools to analyze data generated by experiments or numerical simulations. We will also discuss the principles of the design of experiments so that the data generated by experiments/simulations are statistically relevant and useful. We will conclude with a discussion of analytical tools for machine learning and principal component analysis. At the end of the course, a student will be able to use a broad range of tools embedded in MATLAB and Excel to analyze and interpret their data.**Credits:** 1.00

ECE 50653 - Fundamentals Of Nanoelectronics

Credit Hours: 3.00. The modern smartphone is enabled by a billion-plus nano-transistors, each having an active region that is barely a few hundred atoms long. Interestingly the same amazing technology has also led to a deeper understanding of the nature of current flow on an atomic scale. The aim of this course is to make the fundamentals of nanoelectronics accessible to anyone in any branch of science or engineering, assuming very little background beyond linear algebra and differential equations, although we will be discussing advanced concepts in non-equilibrium statistical mechanics that should be of interest even to specialists. We first introduce a new perspective connecting the quantized conductance of short ballistic conductors to the familiar Ohm's law of long diffusive conductors, along with a brief description of the modern nano-transistor. We then address fundamental conceptual issues related to the meaning of resistance on an atomic scale, the interconversion of electricity and heat, the second law of thermodynamics and the fuel value of information. Finally we introduce the concepts of quantum transport as applied to modern nanoscale electronic devices. Typically offered Fall.**Credits:** 3.00

ECE 50836 - Introduction To Data Mining

Credit Hours: 3.00. This course introduces fundamental techniques in data mining, i.e., the techniques that extract useful knowledge from a large amount of data. Topics include data preprocessing, exploratory data analysis, association rule mining, clustering, classification, anomaly detection, recommendation and graph analysis. Students are expected to gain the skills to formulate data mining problems, solve the problems using data mining techniques and interpret the output. **Credits:** 3.00

ECE 50863 - Computer Network Systems

Credit Hours: 3.00. The goal of this course is to provide students with a proper grounding in the basic concepts and seminal work in computer network protocols and systems, and to introduce students to research in the field. The course will cover classical concepts such as network architecture, switching, routing, congestion control, and quality-of-service, and discuss recent developments in these areas. The course will also cover new developments in networking such as network measurements, network management, overlay networking and peer-to-peer systems, network security, and new network architectures. The course will emphasize a system-oriented and empirical view of internet architecture. Graduate standing or consent of instructor. Typically offered Spring.**Credits:** 3.00

ECE 51000 - Introduction To Biometrics

Credit Hours: 3.00. Biometrics is an emerging technology for automatic human identification and verification using unique biological traits. Compared to traditional identification and verification methods, biometrics is more convenient for users, reduces fraud, and is more secure. It is becoming an important ally of security, intelligence, law enforcement, and e-commerce. The principle of various biometric technologies and systems is introduced. Especially, students analyze and design fingerprint recognition, face recognition, iris recognition, voice recognition, and multimodal biometric systems. Students have hands-on experience in designing and analyzing biometric systems.**Credits:** 3.00

ECE 51012 - Electromechanics

Credit Hours: 3.00. The general theory of electromechanical motion devices relating electric variables and electromagnetic forces. The basic concepts and operational behavior of dc, induction, brushless dc, and stepper motors used in control applications are presented. Prerequisite by Topic: Basic circuit analysis; Elementary electromagnetics; Elementary mechanics. Typically offered Spring.**Credits:** 3.00

ECE 51018 - Hybrid Electric Vehicles

Credit Hours: 3.00. Introduction to architectures and technologies associated with electric and hybrid electric vehicles including their constituent components. Specific topics include electric and hybrid electric drive trains, energy storage (batteries/ultracapacitors, fuel cells), electromechanical energy conversion (induction and permanent magnet motors and generators), power electronics, vehicle-level modeling and control, and optimization. Prerequisite by Topic: Energy conversion and power electronics. Typically offered Spring.**Credits:** 3.00

ECE 51032 - Computational Methods For Power System Analysis

Credit Hours: 3.00. System modeling of power networks. Description of modern electricity markets. Analysis of the economic dispatch problem using optimality conditions. Planning of distributed energy resources. Smart grid applications. Machine learning applications to power systems (forecasting, demand-side management, and fault detection). Assigned projects will involve implementing some of the methods using realistic power system models.**Credits:** 3.00

ECE 51100 - Psychophysics

Credit Hours: 3.00. (PSY 51100) An examination of the relationship between physical stimuli and perception (visual, auditory, haptics, etc.). Includes a review of various methods for studying this relationship and of the mathematical and computational tools used in modeling perceptual mechanisms. Permission of department required. Typically offered Fall.**Credits:** 3.00

ECE 51214 - CMOS Analog IC Design

Credit Hours: 3.00. The course covers general topics in CMOS analog IC design; biasing, noise, single stage amplifiers, differential amplifiers, OP-Amp, OTA, frequency domain analysis, and active filters. While the focus of the course is on CMOS IC design, design in bipolar andBi CMOS technologies are introduced as well. A design project is a key component of the course. The students conduct group or individual design projects. Process Design *Kit* and EDA tools are provided for the design projects.**Credits:** 3.00

ECE 51216 - Digital Systems Design Automation

Credit Hours: 3.00. This course will provide an introduction to the tools used to design and analyze circuits at the logic level of abstraction (where circuits are composed of gates and flip-flops). Most digital chips used in computing and electronic systems (including microprocessors, graphics processors, chips used in network routers, cell phones, digital audio/video appliances, automotive electronics) are entirely or largely designed using EDA tools. This course will focus on the foundations of logic-level EDA tools, including the design of exact and heuristic algorithms that form the basis for VLSI Computer-Aided Design. Topics covered include an overview of the IC design flow and levels of abstraction, synthesis of two-level (AND-OR / PLA) circuits, multi-level logic synthesis and technology mapping, sequential circuit synthesis, Logic-level verification using Boolean Satisfiability and BDDs, Timing Analysis, Power analysis and Reduction, and design techniques for emerging nanoscale technologies.**Credits:** 3.00

ECE 51220 - Applied Algorithms

Credit Hours: 3.00. Solving large-scale problems typically rely on many clever data structures and algorithms. This course aims to cover many such useful algorithms for solving large-scale problems. These algorithms include greedy algorithms, dynamic programming and more advanced graph algorithms. The course also aims to demonstrate how such algorithms can be applied to solve optimization problems encountered in engineering applications. In particular, applications in the design of VLSI (very large scale integration) at circuit, layout, or system level will be used to demonstrate how an engineering problem can be formulated as a tree/graph problem and solved using established tree/graph algorithms.**Credits:** 3.00

ECE 51300 - Diffraction, Fourier Optics, And Imaging

Credit Hours: 3.00. Modern theories of diffraction and Fourier optics for imaging, optical communications, and networking. Imaging techniques involving diffraction and/or Fourier analysis with application to tomography, magnetic resonance imaging, synthetic aperture radar, and confocal microscopy. Additional topics in optical communications and networking, including wave propagation in free space, fiber, integrated optics, and related design issues. Simulation studies, using Matlab and other software packages for analysis and design. Offered odd years. Typically offered Fall.**Credits:** 3.00

ECE 51500 - Software Engineering For Embedded Systems

Credit Hours: 3.00. This course teaches the object-oriented system analysis and design for embedded systems. Unified modeling language and Shlaer/Mellor methodology are studied. Assigned project will lead students through the cycles of information gathering, problem analysis, model design, and model implementation for software development.**Credits:** 3.00

ECE 51501 - Smart Grid

Credit Hours: 3.00. The course analyzes the history of the U.S. power grid and to the basic concepts on the current electric power system. The main challenges on the transition of the traditional power system with unidirectional power flow to the new and complex system connected to renewable sources and bidirectional power flow capability is also presented in this course. In addition, the impact of distributed generation and electric vehicles is discussed along with cybersecurity and information privacy issues inherent in this new power grid.**Credits:** 3.00

ECE 52301 - Nanosystems Principles

Credit Hours: 3.00. (ME 52301) This is the introductory course in the nanosystems area. It introduces students to the principles and applications of nanosystems. The course begins with an introduction to the nanometer scale phenomena. It then introduces students to the basic elements resulting in nanosystems: nanoscale materials, processes, and devices. It also provides students with a basic understanding of the tools and approaches that are used for the measurement and characterization of nanosystems, and their modeling and simulation. Moreover, the course covers the applications of nanosystems in a wide range of industries, including information technology, energy, medicine, and consumer goods. The course concludes with a discussion of the societal and economical significance of these applications, including benefits and potential risks.**Credits:** 3.00

ECE 52600 - Fundamentals Of MEMS And Micro-Integrated Systems

Credit Hours: 3.00. (BME 58100) Key topics in micro-electro-mechanical systems (MEMS) and biological micro-integrated systems; properties of materials for MEMS; microelectronic process modules for design and fabrication. Students will prepare a project report on the design of a biomedical MEMS-based micro-integrated system. Offered in alternate years. Permission of department required. Typically offered Fall.**Credits:** 3.00

ECE 52601 - Integrated Nanosystems Processes And Devices

Credit Hours: 3.00. (ME 52601) This course covers processes and devices associated with integrated nanosystems. Integrated nanosystems refer to systems which consist of integrated micro-, meso-, and/or macro-scale parts, and their core components are realized by nano-scale materials, processes, and devices. The course, while covering processes which result in integrated nanosystems, will focus on the theory and operation of select electronic, electromechanical, and biomedical devices which are used for information technology, sensing, medical, and other applications. The lectures will be complemented by hands-on laboratory experience. Permission of instructor required.**Credits:** 3.00

ECE 52702 - Advanced Power Electronics Converters

Credit Hours: 3.00. The course introduces students to advanced power electronics converters dealing with ac voltage. The power electronics topologies considered in this course are sorted into two groups: multilevel configurations and back-to-back converters. The multilevel configurations presented are: a) neutral-point-clamped, b) cascade, c) flying capacitor, and d) non-conventional multilevel configurations. The back-to-back converters presented are: a) three-phase to three-phase, b) single-phase to three-phase, c) single-phase to single-phase ac-dc-ac converters. A new methodology will be employed to present comprehensively multilevel and back-to-back converters topologies. The main applications of those converters are in renewable energy systems, active power filters, energy efficiency devices and motor drive systems. Permission of instructor required.**Credits:** 3.00

ECE 52800 - Measurement And Stimulation Of The Nervous System

Credit Hours: 3.00. (BME 52800) Engineering principles addressing questions of clinical significance in the nervous system: neuroanatomy, fundamental properties of excitable tissues, hearing, vision, motor function, electrical and magnetic stimulation, functional neuroimaging, disorders of the nervous system, development and refinement of sensory prostheses. Typically offered Spring.**Credits:** 3.00

ECE 53301 - Wireless And Multimedia Computing

Credit Hours: 3.00. A treatment of Voice and Video over IP and wireless communication algorithms, protocols, standards, and implementation using multicore digital signal processors and communications processor modules. Discussion of voice over IP and wireless communication algorithms, protocols and standards, and advanced wireless and voice over IP applications.**Credits:** 3.00

ECE 53401 - Embedded Autonomous Systems In Automotive Platforms

Credit Hours: 3.00. A treatment of Embedded and Autonomous Systems: Motor Control, Image Vision, Sensors, Security, Neural Networks, SLAM, Machine and Deep Learning, Protocols, Standards and Implementation using Multiprocessors, Multicores, ISP, Bluebox and APEX.**Credits:** 3.00

ECE 53600 - Introduction To Computational Intelligence

Credit Hours: 3.00. Basic concepts in theory and paradigms for neural networks, evolutionary computation, and fuzzy logic; algorithms and applications for hybrids of these tools known as computational intelligence are explored. Topics include artificial neural networks, fuzzy systems, and evolutionary computation. Implementations of a number of paradigms are presented, including particle swarm optimization. Applications to various areas, such as biomedical engineering and nonlinear control, are examined.**Credits:** 3.00

ECE 53700 - Multimedia Applications

Credit Hours: 3.00. Treatment of multimedia algorithms and implementation using high-speed multimedia processors. Detailed discussion of entropy coding, transform coding, speech compression, image compression, video compression, and architecture, addressing modes, and instruction set of multimedia processors.**Credits:** 3.00

ECE 53800 - Digital Signal Processing I

Credit Hours: 3.00. Theory and algorithms for processing of deterministic and stochastic signals. Topics include discrete signals, systems, and transforms, linear filtering, fast Fourier transform, nonlinear filtering, spectrum estimation, linear prediction, adaptive filtering, and array signal processing. Typically offered Fall.**Credits:** 3.00

ECE 53801 - Discreet Event Dynamic Systems

Credit Hours: 3.00. This course introduces discrete event dynamic systems with their applications in system modeling, analysis, and control. Models such as automata, Petri nets, Markov chain, and queueing systems are introduced, along with analysis of their dynamics. Discrete event simulation methods are included. Examples from various engineering applications are given. Permission of instructor required.**Credits:** 3.00

ECE 53900 - Foundations Of Advanced Engineering I

Credit Hours: 3.00. Several mathematical tools applied in the engineering discipline are discussed. Statistical methods, including construction of confidence interval and hypothesis testing, as well as regression and regression analysis, are discussed. Discrete tools are discussed; these include logic and mathematical reasoning, combinatorics, groups and finite fields. Applications of some of these tools in engineering problems are introduced. Decision Theory including Bayes Theorem and applying Bayes Theorem to form decision problems. Permission of instructor required.**Credits:** 3.00

ECE 54400 - Digital Communications

Credit Hours: 3.00. Introduction to digital communication systems and spread spectrum communications. Topics include analog message digitization, signal space representation of digital signals, binary and M-ary signaling methods, detection of binary and M-ary signals, comparison of digital communication systems in terms of signal energy and signal bandwidth requirements. The principal types of spread spectrum systems are analyzed and compared. Application of spread spectrum to multiple access systems and to secure communication systems is discussed. Typically offered Fall.**Credits:** 3.00

ECE 54700 - Introduction To Computer Communication Networks

Credit Hours: 3.00. A qualitative and quantitative study of the issues in design, analysis, and operation of computer communication and telecommunication networks as they evolve toward the integrated networks of the future, employing both packet and circuit switching technology. The course covers packet and circuit switching, the OSI standards architecture and protocols, elementary queuing theory for performance evaluation, random access techniques, local area networks, reliability and error recovery, and integrated networks. Typically offered Fall.**Credits:** 3.00

ECE 54800 - Introduction To 2D And 3D Digital Image Processing

Credit Hours: 3.00. An introduction to 2D and 3D image processing. Lecture and projects covering a wide range of topics including 2D and 3D image analysis, image segmentation; color image processing, image sharpening, linear and filtering, image restoration, and image registration. Permission of instructor required.**Credits:** 3.00

ECE 55200 - Introduction To Lasers

Credit Hours: 3.00. An introduction to lasers and laser applications which does not require a knowledge of quantum mechanics as a prerequisite. Topics include: the theory of laser operation; some specific laser systems; nonlinear optics; optical detection; and applications to optical communications, holography, laser-driven fusion, and integrated optics. Typically offered Spring.**Credits:** 3.00

ECE 55400 - Electronic Instrumentation And Control Circuits

Credit Hours: 3.00. Analysis and design of special amplifiers, pulse circuits, operational circuits, DC amplifiers, and transducers used in instrumentation, control, and computation.**Credits:** 3.00

ECE 55700 - Integrated Circuit Fabrication Laboratory

Credit Hours: 3.00. Laboratory exercises in the fabrication and testing of silicon integrated circuits. Both bipolar and MOS integrated circuit test chips are fabricated and tested. Laboratory technique, the technology of integrated circuit fabrication, and electrical characterization are emphasized. Permission of department required. Typically offered Fall Spring.**Credits:** 3.00

ECE 55801 - Advanced Systems On A Chip (SoC) Designs For Image Processing Using FPGAs

Credit Hours: 3.00. This class covers advanced concepts in using Field Programmable Gate Arrays (FGPAs) designed with and HDL (VHDL for example: Very High Speed IC Hardware Description Language). The students will learn complex interface design, advanced hardware and embedded system design and parallel processing. Projects and lessons will focus on application in Digital Imaging Systems. Lecture and projects covering topics including: VHDL mapped to FPGA for state machine design, hardware and software VGA control, image filtering, data transfer to bus, and embedded controller integration. Permission of instructor required.**Credits:** 3.00

ECE 55900 - MOS VLSI Design

Credit Hours: 3.00. An introduction to most aspects of large-scale MOS integrated circuit design including: device fabrication and modeling; inverter characteristics; designing CMOS combinational and sequential circuits; designing arithmetic building blocks and memory structures; interconnect and timing issues; testing and verification; and system design considerations. Term projects involve the complete design of a functional logic block or system using CAD tools. Typically offered Fall.**Credits:** 3.00

ECE 56200 - Introduction To Data Management

Credit Hours: 3.00. Emphasis is on the design of systems that can manipulate and retrieve data from large databases using high level formal languages. Topics covered are: data models and data independence, normalization in relational databases, development of high level query languages for relational and hierarchical models, pictorial query languages, object oriented systems, and object oriented databases. The course includes a project that accounts for about 20 percent of the grade for the course. Offered odd years. Permission of department required. Typically offered Fall.**Credits:** 3.00

ECE 56300 - Programming Parallel Machines

Credit Hours: 3.00. This course presents methods and techniques for programming parallel computers, such as multicore and high-end parallel architectures. Various parallel algorithms will be presented to demonstrate different techniques for identifying parallel tasks and mapping them onto parallel machines. Realistic science/engineering applications and their characteristics will be discussed. Parallel architectures to be considered are shared-memory and distributed-memory multiprocessor systems. Programming paradigms for these machines will be compared, including directive-based (OpenMP), message passing (MPI) and thread-based (Posix threads) methods. Methodologies for analyzing and improving the performance of parallel programs will be discussed. There will be a class project in which each student parallelizes and tunes the performance of a large computation application or develops/improves a tool that helps this process. Each student will prepare one lecture for a selected topic. Offered during odd years. Typically offered Spring.**Credits:** 3.00

ECE 56401 - Computer Security

Credit Hours: 3.00. In this course the discussion will include the following topics: (not necessarily in this order) security policies, confidential policies, integrity policies, security models, security design, access control, cryptography, key management, authentication, program and software, security, malicious logic, intrusion detection, network security, security attacks and countermeasures, operation system security, smartcard tamper-resistant devices, phishing, legal and ethical issues in computer security, and selected topics.**Credits:** 3.00

ECE 56500 - Computer Architecture

Credit Hours: 3.00. An introduction to the problems involved in designing and analyzing current machine architectures. Major topics include performance and cost analysis, pipeline processing, vector machines and numerical applications, hierarchical memory design, and multiprocessor architectures. A quantitative approach allowing a computer system designer to determine the extent to which a design meets design goals is emphasized. Typically offered Fall.**Credits:** 3.00

ECE 56601 - Real-Time Operating Systems And Applications

Credit Hours: 3.00. This course introduces students to the principles of modern operation systems focusing on real-time operation systems and embedded operation systems and their applications. Permission of instructor required.**Credits:** 3.00

ECE 56800 - Embedded Systems

Credit Hours: 3.00. This course provides an introduction to the design of embedded and ubiquitous computing systems including their hardware and software architectures, design methodologies and tools, and communication protocols. The lectures are organized into three parts namely, (a) basic design principles including specification and modeling, hardware components and platforms, software organization, embedded and real-time operating systems, interfacing with external environments using sensors and actuators, and communication in distributed embedded systems, (b) advanced topics such as energy management, safety and reliability, and security, and (c) case-studies of real-world systems from a variety of embedded application domains such as biomedical devices, smart cards and RFID, networked sensors, personal computing devices, home appliances and electronics, mobile robotics, etc. In addition to hands-on programming assignments using off-the-shelf embedded system development kits, the course will feature a comprehensive project where students will design, implement, and evaluate a prototype embedded system. Typically offered Spring.**Credits:** 3.00

ECE 56810 - Design With Embedded Systems

Credit Hours: 3.00. This course provides an overview of the architectures, design considerations, features and applications of embedded processors with digital signal processing capabilities. The course emphasizes design consideration for embedded systems. Different applications such as Internet of Things, Voiceover IP, Machine to Machine, Wearable Devices, Smart Homes, Medical Devices, Drones and Wireless Systems, are considered.**Credits:** 3.00

ECE 56900 - Introduction To Robotic Systems

Credit Hours: 3.00. (CS 56900) The topics to be covered include: basic components of robotic systems; selection of coordinate frames; homogeneous transformations; solutions to kinematic equations; velocity and force/torque relations; manipulator dynamics in Lagrange's formulation; digital simulation of manipulator motion; motion planning; obstacle avoidance; controller design using the computed torque method; and classical controllers for manipulators. Basic knowledge of vector-matrix manipulations required. Typically offered Fall.**Credits:** 3.00

ECE 57000 - Artificial Intelligence

Credit Hours: 3.00. Introduction to the basic concepts and various approaches of artificial intelligence. The first part of the course deals with heuristic search and shows how problems involving search can be solved more efficiently by the use of heuristics and how, in some cases, it is possible to discover heuristics automatically. The next part of the course presents ways to represent knowledge about the world and how to reason logically with that knowledge. The third part of the course introduces the student to advanced topics of AI drawn from machine learning, natural language understanding, computer vision, and reasoning under uncertainty. The emphasis of this part is to illustrate that representation and search are fundamental issues in all aspects of artificial intelligence. Typically offered Fall.**Credits:** 3.00

ECE 57101 - System Modeling And Design For Smart Devices

Credit Hours: 3.00. Introduction to the mobile computing and the principles to design and implement application system for a smart device, including mobile computing architecture, mobile and pervasive computing environments, applications and services, context-aware computing, and human-computer interaction. Permission of instructor required.**Credits:** 3.00

ECE 57300 - Compilers And Translator Writing Systems

Credit Hours: 3.00. This course presents the concepts needed to efficiently design and implement translators. Basic compiler/translation theory and technology are briefly reviewed, after which the course focuses on software tools for the automatic construction of translators, as well as more complex concepts involving the construction of compiler symbol tables, etc. Using C on ECN UNIX, each student will construct a simple lexical-recognizer generator, parser generator, and code-generator generator. Basic understanding of compilers and proficiency in C language required. Typically offered Fall.**Credits:** 3.00

ECE 57700 - Engineering Aspects Of Remote Sensing

Credit Hours: 3.00. Introduction to the concepts of multispectral image data generation and analysis. Basic principles of optical radiation, reflection, and measurement in natural scenes. Fundamentals of multispectral sensor design and data analysis for complex scenes. Application of signal processing and signal design principles and of statistical pattern recognition to these problems. Spatial image processing methods and algorithms as appropriate to land scene data. Practice with analysis of actual aircraft and spacecraft data in a cross-disciplinary environment. Offered even years. Typically offered Spring.**Credits:** 3.00

ECE 58000 - Optimization Methods For Systems And Control

Credit Hours: 3.00. Introduction to optimization theory and methods, with applications in systems and control. Nonlinear unconstrained optimization, linear programming, nonlinear constrained optimization, various algorithms and search methods for optimization, and their analysis. Examples from various engineering applications are given. Elements of linear algebra and calculus of several variables and some experience with MATLAB helpful. Typically offered Spring.**Credits:** 3.00

ECE 58500 - Automotive Control

Credit Hours: 3.00. Basic engine operation; Air-Fuel Ratio control, Idle Speed control, Knock control,Fuel injection timing control, Ignition control of SI engines; Engine fault diagnosis; Driveline modeling and control, Clutch phasing control; Hybrid Electric Vehicle and its control; Wheel model and complete vehicle model; Observers, Friction coefficient estimators, Tire contact patch force estimators; Anti-lock brake control, Traction control, Yaw stability control, Drive-By-Wire systems.**Credits:** 3.00

ECE 58900 - State Estimation And Parameter Identification Of Stochastic Systems

Credit Hours: 3.00. Introduction to point estimation, least squares, Bayes risk, and maximum likelihood. Optimum mean-square recursive estimation for nondynamic stochastic systems. State estimation for discrete-time and continuous-time dynamic systems. Parameter identification of stochastic systems using maximum likelihood. Stochastic approximation, least squares, and random search algorithms. Offered in alternate years.**Credits:** 3.00

ECE 59500 - Selected Topics In Electrical Engineering

Credit Hours: 1.00 to 3.00. Formal classroom or individualized instruction on topics of current interest. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 3.00

ECE 60000 - Random Variables And Signals

Credit Hours: 3.00. Engineering applications of probability theory. Problems on events, independence, random variables, distribution and density functions, expectations, and characteristic functions. Dependence, correlation, and regression; multivariate Gaussian distribution. Stochastic processes, stationarity, ergodicity, correlation functions, spectral densities, random inputs to linear systems; Gaussian processes. Prerequisite: Master's student standing or higher. Typically offered Fall Spring Summer.**Credits:** 3.00

ECE 60004 - Communication For Engineering Leaders

Credit Hours: 1.00. The goal of this course is to upskill talented engineers' communication abilities. By the end of the course, you should have new adeptness at creating and delivering powerful presentations on a short deadline, as well as strategies for leading others effectively.**Credits:** 1.00

ECE 60022 - Wireless Communication Networks

Credit Hours: 3.00. This course will cover fundamental concepts in mobile wireless systems such as propagation and fading, cellular systems, channel assignment, power control, handoff, mobility management. It will also cover system and standards issues including second-generation circuit switched and third-generation packet switched networks, wireless LANs, mobile IP, and ad hoc networks. Besides providing an overview of current technologies, the emphasis on the course will be to identify the challenges that face the engineers of wireless communications networks. Prerequisites: ECE 54700. Prerequisite by Topic: Students are expected to enter the course with an introductory graduate-level understanding of networking, as well as a basic understanding of probability obtained from a typical undergraduate EE program. Permission of instructor required. Typically offered Spring.**Credits:** 3.00

ECE 60146 - Deep Learning - Theory And Practice Of Deep Neural Networks

Credit Hours: 3.00. This course teaches the theory and practice of deep neural networks from basic principles through state-of-the-art methods. The class blends hands-on programming, using a variety of state-of-the-art programming frameworks, with theoretical treatment based on current literature. Implementation will emphasize the use of the Pytorch language and the use of dynamic computational graphs. Some previous experience with optimization techniques is important for success in the course.**Credits:** 3.00

ECE 60200 - Lumped System Theory

Credit Hours: 3.00. An investigation of the basic theory and techniques of modern system theory, emphasizing linear state model formulations of continuous and discrete time systems in the time domain and frequency domain. Coverage includes notions of linearity, time invariance, discrete and continuous time state models, canonical forms, associated transfer functions and impulse response models, the state transition matrix, the Jordan form, controllability, observability, and stability. Prerequisite: Master's student standing or higher and concurrent prerequisite: MA 51100. Typically offered Fall Spring Summer.**Credits:** 3.00

ECE 60270 - Structure And Dynamics Of Large-Scale Networks

Credit Hours: 3.00. Large-scale networks are prevalent in both engineered systems (e.g., the Internet, the power grid, industrial control networks, large robotic swarms and sensor networks) and in natural systems (e.g., genetic networks, ecological networks, social and economic networks). While the specific details of such networks will depend on the application, the last few decades have seen the emergence of an underlying "science" of networks, comprised of a common language (graph theory) for representing large-scale networks, along with mathematical models and analytical techniques for studying structure and dynamics. This course will provide a detailed introduction to the field of network science. It will develop common mathematical representations of networks, metrics for identifying important features of networks, generative mechanisms for networks (including both random-graph and strategic network formation perspectives), and tools for studying dynamical processes on networks (such as information cascades, opinion dynamics and interconnected dynamical systems). This is an introductory course that establishes several of the fundamental tools and concepts in network science, and requires only an undergraduate background in probability and linear algebra.**Credits:** 3.00

ECE 60281 - Intro To Mathematical Fundamentals For Systems And Control

Credit Hours: 1.00. This course serves as background for ECE 60200 Lumped System Theory, ECE 69500 Epidemic Processes over Networks, and ECE 69500 Structure and Dynamics of Large-Scale Networks, and other similar courses. The course will make the necessary mathematical background for the aforementioned courses accessible by decomposing and illustrating difficult concepts with a number of real-world examples and problems for students to work out. Namely, the course consists of five modules: 1) Linear Algebra, 2) Basic Graph Theory, 3) Basic Control Theory, 4) Probability, and 5) Optimization. Prerequisite: Linear Algebra (MA 26500 or MA 26200) or equivalent, ECE 30200 or equivalent. **Credits:** 1.00

ECE 60282 - Epidemic Processes

Credit Hours: 1.00. This course provides a control theory and data science approach to traditional epidemic models. Traditional epidemiological ideas will be explored and combined with probability theory and systems theoretic ideas to be able to capture spread behavior, learn from data, and design mitigation techniques. Namely, the course consists of four modules: 1) Virus Models, 2) Limiting Behavior, 3) Parameter Identification, and 4) Mitigation Algorithms. Prerequisite: ECE 60281. **Credits:** 1.00

ECE 60283 - Epidemic Processes Over Networks

Credit Hours: 1.00. This course presents a class of epidemic models from a network science, control theoretic, and data science perspective. Networked epidemiological ideas will be explored combined with probability theory and systems theoretic ideas to

be able to capture spread behavior, learn the behavior from data, and design mitigation techniques. Namely, the course consists of three modules: 1) Networked Virus Models, 2) Limiting Behavior of Networked Virus Models, and 3) Parameter Identification & Mitigation Algorithms. Prerequisites: ECE 60281 and ECE 60282. **Credits:** 1.00

ECE 60400 - Electromagnetic Field Theory

Credit Hours: 3.00. Review of general concepts (Maxwell's equations, materials interaction, boundary conditions, energy flow); statics (Laplace's equation, Poisson's equation); distributed parameter systems (classification of solutions, transmission lines, and wave-guides); radiation and antennas (arrays, reciprocity, Huygen's principle); a selected special topic (e.g., magnetostatics, waves in anisotropic media and optical fibers). Offered in alternate years. Prerequisite: Master's student standing or higher. Typically offered Fall Spring.**Credits:** 3.00

ECE 60419 - Numerical Simulations Of Electro-Optic Energy Systems

Credit Hours: 3.00. Introduction to computational techniques employed in research on energy systems involving quantum electronics and electromagnetics. You will learn the strengths and weaknesses of each approach; what types of problem call for which one; and how your simulation will perform. Techniques include eigenvalue problems, fast Fourier transforms, band structure calculations, rigorous-coupled wave analysis, beam-propagation methods, finite-difference time-domain, and finite element methods. Applications include nanophotonics, photovoltaics, thermal management, radiative control, and nonlinear optics. Prerequisite by Topic: Elect/Magn Interactions (ECE 60400 or equivalent); Programming For Engineers (C, MATLAB, or similar); Linear Algebra; Ordinary Differ. Equatn; and Signals and Systems. Typically offered Spring.**Credits:** 3.00

ECE 60420 - Radio Frequency Integrated Circuits

Credit Hours: 3.00. This course aims at analysis and design of CMOS integrated radio frequency (RF), microwave and mm-wave circuits. Various modules of an RF transceiver are discussed including low noise amplifiers, mixers, oscillators, frequency synthesizers and power amplifiers. A term project on design of an RF to mm-wave module is also required. Typically offered Fall.**Credits:** 3.00

ECE 60421 - Nanophotonics And Metamaterials

Credit Hours: 3.00. The course will cover nanoscale processes and devices and their applications for manipulating light on the nanoscale. The following topics will be covered: Fundamentals, Maxwell's equations, light-matter interaction, dispersion, EM properties of nanostructures; Photonic crystals and photonic crystal fibers; Photonic and plasmonic nanocircuits; Silicon nanophotonics; Metal optics; Manipulating light with plasmonic nanostructures; Plasmonic nano-sensors; Near-field optics; Metamaterials: artificial magnetism and negative refractive index; Metamaterials: superlens and hyperlens; Transformation optics and cloaking; Nanolasers; Tunable and active plasmonic materials; Refractory plasmonics; Plasmonics for energy conversion, data storage and biomed applications; Metasurfaces; Intro to quantum photonics. Prerequisites by Topic: Basic knowledge of electromagnetism and solid state materials, Maxwell equations and band structure of solids. Typically offered Spring.**Credits:** 3.00

ECE 60422 - Primer On RF Design

Credit Hours: 1.00. This course covers the fundamentals of RF design. It is designed as a first course for students or engineers with limited background in high-frequency electronics. Engineers that need to understand the 'RF language' and gain working knowledge of critical RF concepts will benefit from taking this course. Students in this class will learn the basic RF tools and design principles. By the end of this class students will be able to understand important RF concepts and how these are related to the design of practical RF blocks. Typically offered Fall Spring Summer.**Credits:** 1.00

ECE 60423 - RF System Design

Credit Hours: 1.00. Following the 'Primer on RF Design' course, this class focuses on system-level issues. We discuss several important design considerations including noise, non-linearity, distortion, sensitivity and dynamic range and their impact in selecting the appropriate system architecture. The course also covers common receiver architectures including superheterodyne and direct-conversion receivers. **Credits:** 1.00

ECE 60424 - RF Design: Passive And Active Components

Credit Hours: 1.00. Following the 'Primer on RF Design' course, this class focuses on passive and active components. We use the techniques learnt in the previous course, to design advanced RF devices including couplers, filters and amplifiers. Current research topics are discussed as appropriate. **Credits:** 1.00

ECE 60432 - Nanophotonic Modeling

Credit Hours: 1.00. This course is an introduction to photonic materials and devices structured on the wavelength scale. Generally, these systems will be characterized as having critical dimensions at the nanometer scale. These can include nanophotonic, plasmonic, and metamaterials components and systems. Co-requisite: ECE 60400 or equivalent. **Credits:** 1.00

ECE 60600 - Solid State Devices

Credit Hours: 3.00. A relatively-broad, moderate-depth coverage of semiconductor devices and related topics. The first portion of the course presents and examines semiconductor fundamentals required in the operational analysis of solid state devices. A detailed examination of the PN junction diode and PN junction devices follows. The final portion of the course treats heterojunction surface devices including the Schottky diode, the MOS capacitor and the MOSFET. Offered in alternate years. Prerequisite: Master's student standing or higher. Typically offered Fall Spring.**Credits:** 3.00

ECE 60614 - Reliability Physics Of Nanoelectronic Transistors

Credit Hours: 3.00. This course will focus on the physics of reliability of small semiconductor devices. In traditional courses on device physics, the students learn how to compute current through a device in response to applied voltage. However, as transistors are turned on and off trillions of times during the years of operation, gradually defects accumulate within the device so that at some point the transistor does not work anymore. The course will explore the physics and mathematics regarding how and when things break a topic of great interest to semiconductor device engineers. Prerequisites: ECE 60600 required; ECE 61200 and ECE 55800 are recommended. Typically offered Spring.**Credits:** 3.00

ECE 60645 - High-speed Semiconductor Devices

Credit Hours: 3.00. As semiconductor device geometry miniaturizes, the device becomes faster and some devices move into the quantum-effect region. These high-speed devices are the key components for future electronic systems in communications, computers, control, and consumer applications. This course covers the physics and operational principles of these devices to meet the needs of microelectronics in the 21st century. This course emphasizes the integration of the state-of-the-art technologies such as high-k dielectrics, SiGe, SiC and GaN devices. This course is intended for graduate students in science and engineering who are either i) interested in pursuing research in semiconductor materials, structures or devices, or ii) seeking the broad device background on the state-of-the-art technologies for a future R&D career in the microelectronic industry. Co-requisite: ECE 60600. **Credits:** 3.00

ECE 60800 - Computational Models And Methods

Credit Hours: 3.00. Computation models and techniques for the analysis of algorithm complexity. The design and complexity analysis of recursive and nonrecursive algorithms for searching, sorting, set operations, graph algorithms, matrix multiplication, polynomial evaluation and FFT calculations. NP-complete problems. Prerequisite: Master's student standing or higher. Typically offered Fall Spring.**Credits:** 3.00

ECE 60827 - Programmable Accelerator Architectures

Credit Hours: 3.00. Programmable hardware accelerators seek to fulfill the promise of continued performance and energy-efficiency gains in the era of a slowing Moore's law, larger problem sizes and an increased focused on energy-efficiency. These factors have caused hardware acceleration to become ubiquitous in today's computing world and critically important in computing's future. This class will introduce students to the architectures of programmable accelerators. We will delve deeply into the architectures of modern massively parallel accelerators like GPUs, culminating in a course project. General topics in hardware acceleration will be discussed, including but not limited to GPGPU and massively parallel computing, approximate accelerators, reconfigurable hardware and programmable hardware for machine learning. Pre-requisite: ECE 43700 or equivalent and ECE 56500. **Credits:** 3.00

ECE 60872 - Fault Tolerant Computer System Design

Credit Hours: 3.00. The course provides an introduction to the hardware and software methodologies for specifying, modeling and designing fault-tolerant systems supported by case studies of real systems. The material presents a broad spectrum of hardware and software error detection and recovery techniques that can be used to build reliable networked systems. The lectures discuss how the hardware and software techniques interplay, what techniques can be provided in COTS hardware, what can be embedded into operating system and network communication layers, and what can be provided via a distributed software layer and in the application itself. Prerequisite by Topic: Any one high level programming language experience; A basic background in probability. Typically offered Fall.**Credits:** 3.00

ECE 60874 - Mobile Computing Systems

Credit Hours: 3.00. This course will introduce the technologies of mobile computing systems for various applications, including multimedia, cloud services, location-based services, data collections and privacy. This course will include both hands-on assignments writing mobile applications as well as reading recently published papers on the technologies. The students will design mobile services and present their projects. Typically offered Spring.**Credits:** 3.00

ECE 61000 - Energy Conversion

Credit Hours: 3.00. Basic principles of static and electromechanical energy conversion. Control of static power converters. Reference frame theory applied to the analysis of rotating devices. Analysis and dynamic characteristics of induction and synchronous machines. State variable analysis of electromechanical devices and converter supplied electromechanical drive systems. Prerequisite: Master's student standing or higher. Typically offered Fall.**Credits:** 3.00

ECE 61010 - Time Domain Simulation And Optimization For Design

Credit Hours: 1.00. This is a skills course that teaches time domain simulation and multi-objective design optimization. This course will serve the needs of students in power
and energy system and component design, but is widely applicable to all areas of engineering and does not require domain specific knowledge.**Credits:** 1.00

ECE 61014 - Electromagnetic And Electromechanical Component Design

Credit Hours: 3.00. This course focuses on the design of electromagnetic and electromechanical systems, with power applications. The course includes optimization methods, modeling techniques for design (as opposed to for simulation), and the formulation of design problems as optimization problems. Prerequisite by Topic: Knowledge of the use of field and co-energy techniques to calculate force/torque, Understanding of theory of operation of permanent magnet ac machines (brushless dc machines), basic knowledge of electromagnetic fields. Typically offered Fall.**Credits:** 3.00

ECE 61016 - Power Electronic Converters And Systems

Credit Hours: 3.00. The objective of this course is to educate students in the operation, detailed modeling, average-value modeling, and control design of power electronics converters and systems of converters. Prerequisite by Topic: Basic knowledge of ordinary differential equations, solution of ODEs using numerical methods, state-space system representation, basic feedback control design with frequency domain methods, reference frame theory, some knowledge of rotating electric machinery. Permission of instructor required. Prerequisites: ECE 61010. Concurrent prerequisites: ECE 61000 and ECE 38200. Concurrent prerequisites by topic: synchronous machines (wound rotor and permanent magnet), reference frame theory, three-phase inverters, basic frequency domain control techniques, state-space representation of systems. **Credits:** 3.00

ECE 61020 - Operation Of Modern Power Systems

Credit Hours: 3.00. Overview of modern power system operations. Economic dispatch of assets as a constrained optimization problem, and solution methods. The unit commitment problem formulation, and solution methods. Power flow solution methods. Security-constrained economic dispatch and unit commitment. The optimal power flow. Automatic generation control. Operation of power markets. Prerequisites: ECE 43200. Co-Requisites: ECE 58000. Typically offered Spring.**Credits:** 3.00

ECE 61025 - Finite Element Analysis Of Electric Machines

Credit Hours: 3.00. Application of advanced numerical methods for the characterization of the steady-state and dynamic characteristics of electromechanical energy conversion devices including solenoids, synchronous, induction, and permanent-magnet machines. **Credits:** 3.00

ECE 61200 - Advanced VLSI Devices

Credit Hours: 3.00. Device physics of advanced transistors. Process, device, circuit, and systems considerations affecting development of new integrated circuit technologies. Review of metal oxide semiconductor (MOS) fundamentals along with key process and circuit concepts. Short channel effects in sub-micron channel length metal oxide semiconductor field-effect transistors (MOSFETs) including device scaling considerations. Device physics and technology issues for sub-100 nm (nanoscale) MOSFETs. Limits of silicon device technology and key issues in the continuing miniaturization of devices. Alternative device structures to replace bulk MOSFET. Computer simulation employed throughout the course to examine device issues and prototype new device technologies. Offered in alternate years. Prerequisite: ECE 60600. Typically offered Spring.**Credits:** 3.00

ECE 61220 - Advanced VLSI Design

Credit Hours: 3.00. The objective of this course is to train the students with advanced digital circuit design techniques that can be instrumental in achieving higher energy efficiency and resilience to process variations in scaled technologies. Prerequisite: ECE 55900 or equivalent. **Credits:** 3.00

ECE 61500 - Nonlinear Optics

Credit Hours: 3.00. An in-depth study of nonlinear optics. After a review of linear effects, several nonlinear optical processes and applications are discussed. These include electro-optic switches and modulators, harmonic light generators, sum and difference frequency mixing, parametric amplifiers and oscillators, and phase conjugate mirrors. Discussions of nonlinear spectroscopy include topics such as two-photon absorption, saturation spectroscopy, Raman spectroscopy and double-optical resonance measurements. Photonechoes and other transient effects, and surface effects are also discussed. Offered in alternate years. Prerequisite: ECE 55200, ECE 60400. Typically offered Fall.**Credits:** 3.00

ECE 61600 - Ultrafast Optics

Credit Hours: 3.00. A study of the physics, technology, and applications of ultrashort laser pulses. Topics covered include the following: methods for generating and measuring ultrafast laser pulses; basic physical processes affecting ultrashort pulses; devices for manipulating ultrashort pulses; ultrafast nonlinear optics, including nonlinear optics in fibers, nonlinear refractive index effects, pulse compression, solitons, and all-optical switching; time-resolved spectroscopy of ultrafast materials processes; and applications to ultrafast optoelectronics. In addition, each student will select a specific topic for in-depth study. Offered in alternate years. Prerequisite: ECE 55200. Typically offered Fall.**Credits:** 3.00

ECE 61700 - Antennas: Design And Applications

Credit Hours: 3.00. Electrically small antennas; arrays; wire antennas and feeding arrangements; aperture antennas such as slots, horns, and parabolic reflectors; antennas for multiple frequencies including log-periodic and other frequency independent types; receiving antennas and the concept of antenna temperature; antenna measurements and evaluation. Prerequisite: ECE 44100 and concurrent prerequisite: ECE 60400. Typically offered Fall Spring.**Credits:** 3.00

ECE 61800 - Numerical Electromagnetics

Credit Hours: 3.00. The numerical solution of Maxwell's equations is studied. Numerical methods such as the Finite Element Method and the Finite Difference Method are presented for the solution of both differential and integral equations. Applications studied include: waveguides (microstrip, VLSI interconnects, optical, discontinuities), scattering (frequency selective surfaces, arbitrary scatterers), antennas, magnetics, semiconductor devices, and inverse scattering. Papers in the current literature are used. Offered every third semester. Prerequisite: ECE 60400. Typically offered Fall Spring.**Credits:** 3.00

ECE 62000 - Introduction To Biomedical Imaging Systems

Credit Hours: 3.00. (BME 63000) Overview of biomedical imaging systems and analysis. Examination of various imaging modalities, including X-ray, ultrasound, nuclear, and MRI. Microscopy including how images are formed and what types of information they provide. Image analysis techniques, including analysis of cardiac ultrasound, mammography, and MRI functional imagery. Offered in alternate years. Concurrent prerequisite: ECE 63700. Typically offered Spring.**Credits:** 3.00

ECE 62400 - Multimedia Systems

Credit Hours: 3.00. Provides a general coverage of three major areas that include multimedia data management (logical and physical modeling), broadband network architectures and protocols for distributed multimedia communication, and user interface environments. Various models and specification methodologies in these areas are introduced. The discussion is augmented with various case studies. Prerequisite: ECE 54700, ECE 56200. Typically offered Fall.**Credits:** 3.00

ECE 62500 - Analysis Of Electromechanical Systems II

Credit Hours: 3.00. Extension of ECE 525. Electric propulsion systems including presentation of cycloconverter and rectifier-inverter drive systems. Dynamic and steady-state analysis of machine performance with series controlled rectifiers in the stator or rotor phases. MMF space harmonic analysis. Prerequisite: ECE 62500. Typically offered Spring.**Credits:** 3.00

ECE 62700 - Introduction To Cryptography And Secure Communication

Credit Hours: 3.00. Introduces the basic concepts of cryptography. Various cipher systems are presented, including transposition and substitution systems, Block ciphers, RSA, and Knapsack. Methods used to attack ciphers are discussed with emphasis on complexity. Case studies of the use of cryptographic methods in communication systems are presented with some consideration given to privacy issues. Offered in alternate years. Prerequisite: ECE 60000. Typically offered Spring.**Credits:** 3.00

ECE 62900 - Introduction To Neural Networks

Credit Hours: 3.00. Information processing with neural networks, biological and engineering implications, learning algorithms, current neural network models and architectures, implementational topics, applications in areas such as signal/image processing, pattern recognition, optimization, simulation, system identification, nonlinear prediction, communications, and control. Concurrent prerequisite: ECE 60000. Typically offered Fall.**Credits:** 3.00

ECE 63300 - Modeling And Simulation Of Power System Components

Credit Hours: 3.00. Recommended for those interested in learning to use computer simulation to investigate the dynamic and controlled behavior of electrical power components. Beginning with an introduction to MATLAB/SIMULINK, the course goes through the key steps of modeling, implementing and verifying the simulation of single and three-phase transformers, single and three-phase induction machines, three-phase wound field synchronous machines and permanent magnet machines useful in power applications, each case amply illustrated in projects around some interesting topics. Students are expected to implement and verify about 10 simulation projects and also discuss observed behaviors on topics such as inrush current in transformers, motoring, generating and braking operation of machines, and pulsating torque from subsynchronous resonance. Prerequisite: ECE 43200. Typically offered Fall.**Credits:** 3.00

ECE 63400 - Digital Video Systems

Credit Hours: 3.00. Digital video systems. Characteristics of basic analog video systems, including bandwidth constraints, color encoding, and composite signal formation. Digital video concepts with emphasis on processing of time-varying images. Topics include: filtering, enhancement, restoration, and motion estimation and prediction. Digital video compression techniques, including intraframe coding approaches, with particular emphasis on JPEG. MPEG1 and MPEG2 video compression standards. Low bit rate approaches, including H.261, H.263, and MPEG4. Applications include: video servers, transmission systems, high definition television, multimedia systems, and videoconferencing systems. Offered in alternate years. Concurrent prerequisite: ECE 60000. Typically offered Spring.**Credits:** 3.00

ECE 63700 - Digital Image Processing I

Credit Hours: 3.00. Introduction to digital image processing techniques for enhancement, compression, restoration, reconstruction, and analysis. Lecture and experiments covering a wide range of topics. 2-D signals and systems, image analysis, and image segmentation. Achromatic vision, color image processing, color imaging systems, image sharpening, interpolation, decimation, linear and nonlinear filtering, printing and display of images. Image compression, image restoration, and tomography. Offered every third semester. Typically offered Spring.**Credits:** 3.00

ECE 63800 - Principles Of Digital Color Imaging Systems

Credit Hours: 3.00. Basic principles of color science: physiology of the human eye, trichromatic and color opponent models for color, and uniform color spaces. Color reproduction in electronic imaging systems: color models for input and output devices, color imaging system calibration, color quantization and halftoning, and color printing. Color appearance and computational color: color appearance models, models for color constancy, and physics-based models for color. Offered in alternate years. Prerequisite: 51100 and Master's student standing or higher. Typically offered Fall.**Credits:** 3.00

ECE 63900 - Error Control Coding

Credit Hours: 3.00. The theory and practice of error control coding is examined. The study includes the arithmetic of Galois fields as well as linear block, cyclic, and convolutional codes. Some applications of codes in digital communication systems and in computer systems are presented. Offered every third semester. Concurrent prerequisite: ECE 60000. Typically offered Fall Spring.**Credits:** 3.00

ECE 63901 - Error Correction Coding And Secret Sharing

Credit Hours: 3.00. The theory and practice of error control coding is examined. The study includes the arithmetic of Galois fields as well as linear block, cyclic, and convolution codes. Some applications of codes in digital communication systems and in computer systems are presented. The dual of error coding, secret sharing is also discussed. Several secret sharing schemes will be presented. Applications of secret sharing are discussed. Permission of instructor required.**Credits:** 3.00

ECE 64100 - Model Based Image And Signal Processing

Credit Hours: 3.00. An advanced treatment of the methods in model-based signal and image processing including stochastic modeling of multidimensional signals, Bayesian estimation, inverse methods, doubly stochastic models, regularized inversion, the EM algorithm, Bayesian networks, Markov chains, optimization, convexity, majorization techniques, and stochastic simulation. The underlying theory is presented in the context of applications including image restoration, tomographic reconstruction, clustering, classification, and segmentation. Prerequisite: ECE 60000, 63700. **Credits:** 3.00

ECE 64200 - Information Theory And Source Coding

Credit Hours: 3.00. A treatment of the basic concepts of information theory. Determination of channel capacity and its relation to actual communication systems. Rate distortion theory is introduced, and the performance of various source codes is presented. Offered in alternate years. Prerequisite: ECE 60000. Typically offered Fall.**Credits:** 3.00

ECE 64500 - Estimation Theory

Credit Hours: 3.00. This course presents the basics of estimation and detection theory that are commonly applied in communications and signal processing systems. Applications in communications and signal processing will be considered throughout. Prerequisite: ECE 60000. Typically offered Spring.**Credits:** 3.00

ECE 64700 - Performance Modeling Of Computer Communication Networks

Credit Hours: 3.00. The mathematical background needed for the performance and stability analysis of computer communication networks is developed. Point processes, Markov processes, and queuing processes are used in the modeling and analysis of queues, interconnected queues such as ARPANET, and random multiple access networks such as Xerox's ETHERNET. Distributed control of random access networks and centralized control of queuing networks is considered. The techniques developed are useful in the design of computer systems as well as computer networks. Offered in alternate years. Prerequisite: ECE 60000. Typically offered Spring.**Credits:** 3.00

ECE 64800 - Wavelet, Time-Frequency, And Multirate Signal Processing

Credit Hours: 3.00. Advanced topics in signal processing, including time-frequency analysis, multiscale edge detection, wavelet bases and filter banks, and techniques for approximation, estimation, and compression using wavelets. Offered in alternate years. Prerequisite: ECE 53800. Typically offered Spring.**Credits:** 3.00

ECE 65000 - Topics In Solid-State Devices And Materials

Credit Hours: 1.00 to 3.00. An introductory treatment of selected device and materials related topics. Topics will change from semester to semester and will be announced in advance. The list of possible topics includes solid state microwave devices, optoelectronics, laser-quantum electronics, magnetics, noise in semiconductor devices, acoustic wave devices, energy conversion, device fabrication, electroceramics, MOS devices, thin-film devices, and memory devices. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

ECE 65400 - Solid State Devices II

Credit Hours: 3.00. Introduction to advanced concepts in semiconductor devices as an extension and continuation of ECE 60600. Topics include charge storage and transfer in deep depletion MOS devices (CCDs and DRAMs); negative differential mobility and transit time effects in microwave oscillators (Gunn and IMPATT diodes); spontaneous and stimulated emission, quantum efficiency, and charge confinement in photonic devices (LEDs and double heterojunction lasers); and quantum efficiency and spectral response in conventional and avalanche photodiodes. Prerequisite: ECE 60600. Typically offered Spring.**Credits:** 3.00

ECE 65600 - Electronic Transport In Semiconductors

Credit Hours: 3.00. A treatment of the microscopic and phenomenological physics of carrier transport in bulk semiconductors and in semiconductor devices. The Boltzmann transport equation is introduced as are techniques for solving it analytically and numerically. The physics of carrier scattering in common semiconductors is explored. Theoretical treatments of low and high field transport are compared with measured results. Balance equations are derived as moments of the Boltzmann Transport Equation and are applied to the analysis of sub-micron semiconductor devices. Students are expected to be able to apply elementary concepts of quantum mechanics and solid state physics. Offered every third semester. Prerequisite: ECE 60600. Typically offered Fall Spring.**Credits:** 3.00

ECE 65800 - Semiconductor Material And Device Characterization

Credit Hours: 3.00. A comprehensive survey of modern characterization techniques routinely used to determine solid-state material and device parameters. Concepts and theory underlying the techniques are examined, and sample experimental results are presented. The coverage includes electrical, optical, chemical, and physical characterization methods. Offered in alternate years. Prerequisite: ECE 60600. Typically offered Spring.**Credits:** 3.00

ECE 65900 - Quantum Phenomena In Semiconductors

Credit Hours: 3.00. This course is designed for graduate students familiar with semiconductor fundamentals, with engineering electromagnetics and with linear algebra, but having no significant acquaintance with either quantum mechanics or statistical mechanics. The purpose of the course is to introduce the relevant concepts of quantum mechanics and nonequilibrium statistical mechanics as possible using device-related examples. Topics include: preliminary concepts, equilibrium, restoration of equilibrium, transport, effective mass equation, optical properties, advanced concepts. Offered every third semester. Prerequisite: ECE 60600, MA 51100. Typically offered Fall Spring.**Credits:** 3.00

ECE 66100 - Computer Vision

Credit Hours: 3.00. This course deals with how an autonomous or a semi-autonomous system can be endowed with visual perception. The issues discussed include: sampling from a topological standpoint; grouping processes; data structures, especially hierarchical types such as pyramids, quadtrees, octrees, etc.; graphic theoretic methods for structural description and consistent labeling; issues in 3-D vision such as object representation by Gaussian spheres, generalized cylinders, etc. Prerequisite: ECE 57000. Typically offered Spring.**Credits:** 3.00

ECE 66200 - Pattern Recognition And Decision-Making Processes

Credit Hours: 3.00. (CS 66200) Introduction to the basic concepts and various approaches of pattern recognition and decision-making processes. The topics include various classifier designs, evaluation of classifiability, learning machines, feature extraction and modeling. Prerequisite: ECE 30200. Typically offered Spring.**Credits:** 3.00

ECE 66300 - Advanced Compilation And Automatic Programming

Credit Hours: 3.00. This course presents the concepts needed to design and implement production quality code generators for any of the more popular languages and families of computer architecture (including various pipelined, superscalar, and macro-parallel machines). Flow analysis and concurrency detection, as well as optimizations and loop and irregular code

parallelizations, are covered in detail. Using C on ECN UNIX, each student will complete a project implementing a simple optimizer/parallelizer. Prerequisite: ECE 56500, CS 50200 or ECE 46800 or ECE 57300. Typically offered Spring.**Credits:** 3.00

ECE 66400 - Formal Languages, Computability, And Complexity

Credit Hours: 3.00. Topics in computability theory and formal languages include recursive function theory, the equivalence of various generic programming languages for numeric calculations and string manipulations, regular languages and finite state automata, and context-free and context-sensitive languages. In complexity theory, emphasis is on the theory of NP-completeness, including proof methods, the distinctions between strong- and weak-sense NP-completeness, NP-hardness, and performance-guaranteed approximation algorithms. Offered in alternate years. Prerequisite: ECE 60800. Typically offered Fall.**Credits:** 3.00

ECE 66600 - Advanced Computer Systems

Credit Hours: 3.00. The study of theoretical aspects of advanced computer systems where multiprocessing is used. Topics include the design, architecture, and performance evaluation of multiprocessor memories, interconnection networks, and computational pipelines. Also included are the topics of scheduling, synchronization, resource allocation, load-balancing, partitioning and deadlock avoidance in multiprocessors. Also covered are the design and analysis of parallel algorithms, programming languages and automatic approaches to parallelism detection/exploitation for concurrent computation. Prerequisite: ECE 56500, ECE 60800. Typically offered Spring.**Credits:** 3.00

ECE 67000 - Modeling And Optimization Of High-Performance Interconnects

Credit Hours: 3.00. RLC extraction of VLSI interconnects. Modeling of interconnects as RLC trees or networks. Elmore delay model. Reduced-order modeling: moment matching, Pade approximation, and Krylov-subspace methods. Device modeling with consideration of resistive shielding in the interconnection load. Delay calculation with consideration of devices and interconnects. Repeater insertion and planning at floorplanning. Timing-driven placement: zero-slack algorithm for delay budgeting, net-based placement, and path-based placement. High-performance clock synthesis: zero-skew routing, bounded-skew routing, and useful-skew routing. Term projects investigating interconnect-related issues are assigned. Prerequisite: ECE 55900. Typically offered Fall (even years).**Credits:** 3.00

ECE 67300 - Distributed Computing Systems

Credit Hours: 3.00. Discussions of the design issues of distributed computing systems (DCS). The general theory of distributed transaction management, reliability, and resource management is discussed. Various algorithms and specification methodologies for DCS are introduced. A general coverage of the three major areas of DCS, namely: distributed operating systems, distributed databases, and distributed AI is provided. The discussion is augmented with various case studies. Prerequisite: ECE 46900 or introductory course in operating systems. Typically offered Spring.**Credits:** 3.00

ECE 67500 - Introduction To Analysis Of Nonlinear Systems

Credit Hours: 3.00. An introduction to modeling of dynamic control systems. State plane and numerical methods for solving modeling equations. Linearization and describing function techniques. Stability concepts. Controller and state estimator design for nonlinear systems. Variable structure sliding mode control. Vector field techniques. Introduction to chaos. Offered in alternate years. Prerequisite: ECE 60200. Typically offered Fall.**Credits:** 3.00

ECE 67600 - Academic Oral Communication For International Research Students

Credit Hours: 0.00. Discussions of and activities related to such topics as appropriate nonverbal communication; learning styles; strategies for effective speech and listening; and speech acts for the classroom, office, and laboratory. Individual weekly tutoring sessions to improve speech comprehension. Prerequisite: Master's student standing or higher and Electrical & Computer Engineering majors only. Permission of department required. Typically offered Fall Spring.**Credits:** 0.00

ECE 67700 - Communication Aspects Of Academic Research

Credit Hours: 0.00. Topics relevant to oral and written communication needs of Ph.D. students. Three papers are written: a journal article review, a literature review, and the choice of a thesis proposal, conference paper, or a journal article. Library and Internet research strategies and resources; research/writing ethics; citing sources; citation styles; and academic language. Oral presentations based on the written projects. Extensive peer revision and editing and out-of-class writing conferences with the instructor. Prerequisite: Master's student standing or higher and Electrical & Computer Engineering majors only. Permission of department required. Typically offered Fall Spring.**Credits:** 0.00

ECE 67800 - Radar Engineering

Credit Hours: 3.00. An introduction to the system aspects of modern radar engineering. The theoretical basis for radar performance analysis is developed and applied to radars designed for a variety of different applications. Consideration is given to system parameters such as receiver noise, antenna characteristics, operating frequency, target characteristics, transmitted signal modulation, and methods of detection. Attention is given to radars for special purposes, such as automatic range and angle tracking, moving target indication, and resolution enhancement through synthetic aperture techniques. Offered in alternate years. Prerequisite: ECE 60000. Typically offered Fall.**Credits:** 3.00

ECE 67900 - Advanced Digital Communications

Credit Hours: 3.00. Provides a detailed examination of optimum digital communication principles and introduces three advanced topics critical to the design of digital communication systems: system synchronization; techniques for communication in nonideal channels (equalization); and communication over fading/multipath channels. Theoretical principles and practical implementations are considered. Prerequisite: ECE 54400, ECE 60000. Typically offered Spring.**Credits:** 3.00

ECE 68000 - Modern Automatic Control

Credit Hours: 3.00. Theoretical methods in optimal control theory. Topics include the calculus of variations and the Pontryagin minimum principle with applications to minimum energy problems. Geometric methods will be applied to the solution of minimum time problems. Computational methods, singular problems, observer theory, and sufficient conditions for existence of solutions are also discussed. Offered in alternate years. Prerequisite: ECE 60200. Typically offered Fall.**Credits:** 3.00

ECE 68400 - Linear Multivariable Control

Credit Hours: 3.00. A state space investigation of multi-input, multi-output control design problems from the geometric perspective. The course will detail the theory and design algorithms needed for a solution to the state feedback eigenvalue assignment problem, the disturbance decoupling problem with and without internal stability, the output stabilization problem, and the tracking (or regulator) problem with internal stability. Offered in alternate years.**Credits:** 3.00

ECE 68800 - VLSI Testing And Verification

Credit Hours: 3.00. Discusses different aspects of VLSI testing and formal verification of designs. Design and manufacturing defect models are introduced along with test generation and fault simulation algorithms targeting the different fault models. Both combinational and sequential logic testing are covered, and different synthesis for testability schemes such as BIST (Built-In-Self-Test), scan path design, etc., are introduced. Other new and emerging test and verification techniques also are discussed. Offered every third semester. Prerequisite: ECE 55900. Typically offered Fall Spring.**Credits:** 3.00

ECE 69200 - Introduction To Graduate Research

Credit Hours: 1.00 to 3.00. Research-related activities supervised by an ECE faculty member to introduce newly admitted ECE graduate students to the methods and culture of doing research. Possible activities might include, but are not limited to, participation in group research meetings, association with an advanced graduate student, and individualized reading or project work. A description of the activity, approved by the faculty supervisor, must be filed with the ECE Graduate Office. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 3.00

ECE 69300 - Advanced Intern Project

Credit Hours: 1.00. Graduate-level project course in ECE based on off-campus intern position. Individual research projects are approved by the supervising Purdue ECE faculty member before registering for the course. An approved written report must be filed before credit is accepted. This course cannot be used to satisfy the minimum course requirements for the master's or Ph.D. degrees. Permission of instructor required. Typically offered Summer Fall Spring.**Credits:** 1.00

ECE 69311 - Advanced Internship

Credit Hours: 1.00 to 3.00. Graduate-level Internship based course, in an off-campus internship position. Internship must be in the area of Electrical & Computer Engineering. Individual Internship must be preapproved by the supervising ECE faculty member before the student can register for the course. A written report must be submitted and approved by the faculty before credit is accepted. This course cannot be used to satisfy the minimum course requirements for the Master's or Ph.D. degrees. Permission of instructor required.**Credits:** 1.00 to 3.00

ECE 69400 - Electrical And Computer Engineering Seminar

Credit Hours: 0.00. Seminar presentations by representatives from industry, members of the faculty of the School of Electrical and Computer Engineering, and other staff and faculty of Purdue University. The presentations introduce the student to a wide variety of current topics relevant to the technical and career aspects of electrical and computer engineering. Technical topics span the entire spectrum of electrical and computer engineering. Career topics include the importance of interpersonal communications, opportunities beyond graduate school, interviewing techniques, and descriptions of non-typical jobs. Required of electrical and computer engineering graduate students at Purdue during one of their first two semesters in residence. Typically offered Fall Spring.**Credits:** 0.00

ECE 69401 - Electrical And Computer Engineering Graduate Seminar

Credit Hours: 0.00. Seminar presentations by members of the faculty of the Department of Electrical and Computer Engineering, staff and other faculty of IUPUI, researchers from academia, and representatives from industry. The presentations introduce the student to a wide variety of current topics relevant to the technical, educational and career aspects of electrical and computer engineering. This course cannot be used to satisfy the PhD seminar requirement. Permission of department required.**Credits:** 0.00

ECE 69409 - Electrical And Computer Engineering PhD Student IUPUI Residency Course

Credit Hours: 1.00. This course is for ECE PhD students who are required to be enrolled at Purdue West Lafayette for their PhD program although research instruction and all related activities occur at the IUPUI Campus.**Credits:** 1.00

ECE 69500 - Advanced Topics In Electrical And Computer Engineering

Credit Hours: 1.00 to 3.00. Formal classroom or individualized instruction on advanced topics of current interest. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 3.00

ECE 69600 - Advanced Electrical Engineering Projects

Credit Hours: 0.00 to 18.00. Individual research projects to be approved by the supervising faculty member before registering for the course. An approved written report must be filed before credit is accepted. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 0.00 to 18.00

ECE 69700 - Directed Reading In Electrical Engineering

Credit Hours: 1.00 to 3.00. Individualized reading course supervised by an appropriate faculty member and pertaining to a topic not intended for a subsequent project or thesis done by that student. Approval for each reading course must be obtained from the department prior to registration. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 3.00

ECE 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 18.00

ECE 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 18.00

ECE 533001 - Wireless And Multimedia Computing

Credit Hours: 3.00. A treatment of Voice and Video over IP and wireless communication algorithms, protocols, standards, and implementation using multicore digital signal processors and communications processor modules. Discussion of voice over IP and wireless communication algorithms, protocols and standards, and advanced wireless and voice over IP applications.**Credits:** 3.00

Electrical and Computer Engineering Technology

ECET 10300 - Topics In Electrical Technology

Credit Hours: 1.00 to 4.00. This course includes specialized topics and skills associated with electrical technology. The level of coverage varies according to the audience. Since various electrical/electronics topics may be offered under this title. Does not carry credit toward degree requirements in Electrical Engineering Technology. Typically offered Fall Spring Summer.**Credits:** 1.00 to 4.00

ECET 12000 - Gateway To Electrical Engineering Technology

Credit Hours: 3.00. This course introduces students to the academic and professional field of electrical and computer engineering technology. Familiar applications of technology that impact today's and tomorrow's society are blended with foundational electrical and electronics principles. Practical systems are examined to illustrate the diverse knowledge required to design, analyze, and solve problems in multifaceted systems. Skills needed to explore electronic systems using standard laboratory instrumentation and methods of measurement are introduced. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 15700 - Electronics Circuit Analysis

Credit Hours: 4.00. Capacitors, inductors, switching circuits, transformers, rectifiers, linear regulators, dependent sources, operational amplifiers, BJT- & MOSFET-based small-signal amplifiers, waveform generation, and programmable analog devices

are studied. Circuit fundamentals such as Kirchhoff's laws are utilized in analysis and design of circuits. Computer simulation is used.**Credits:** 4.00

ECET 16400 - Applied Object-Oriented Programming

Credit Hours: 3.00. Problem solving and computing with emphasis on electrical engineering technology applications. Introduction to an object programming language as applied to solving electrical technology problems.**Credits:** 3.00

ECET 17700 - Data Acquisition And Systems Control

Credit Hours: 3.00. Fundamental electrical parameters and measurement techniques are introduced. These are then applied to implementing power interfaces, actuators and sensors. Modules that provide signal conditioning, data conversion, filtering and controllers are evaluated. A full, closed loop control system is built and evaluated.**Credits:** 3.00

ECET 17900 - Introduction To Digital Systems

Credit Hours: 3.00. This course introduces computing systems and defines the major classes of computing devices. Sequential and concurrent operations, along with logic and control structures, are covered. Knowledge of fundamental computing principles is discovered. Common software tools are used to create, test, and debug systems. Systems are constructed from standard blocks with a focus on subsystem operation and performance, troubleshooting/debugging and testing. Common applications of embedded systems are introduced.**Credits:** 3.00

ECET 20900 - Introduction To Microcontrollers

Credit Hours: 4.00. This course is an introduction to microcontroller hardware and software, focusing on embedded control applications. Interconnections of components, peripheral devices, bus timing relationships, structured C-language programming, debugging, input/output techniques, and use of PC based software development tools are studied.**Credits:** 4.00

ECET 22000 - Professional Career Development

Credit Hours: 1.00. This course expands the student's knowledge about the EET program. Included are topics such as: options and electives in the EET curriculum; the EET plan of study; student activities, including professional practice and organizations; international opportunities; employment and career opportunities; plant tours; and guest lectures, featuring EET alumni. Typically offered Fall Spring Summer.**Credits:** 1.00

ECET 22400 - Electronic Systems

Credit Hours: 3.00. This course is a survey of key electrical and electronics systems, their basic performance and applications. DC fundamentals include sources, resistance, Ohm's and Kirchhoff's Laws with simple circuits. AC systems include transformers and reactive elements, power production and distribution, filtering, motors and relays. Computer systems are presented with a microprocessor and provide the ability to write and read both digital and analog data. Analog systems include diodes, transistors, IC amplifiers, and analog-digital and digital to analog conversions. The semester closes by combining all of the topics presented in the control of motor speed. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 22700 - DC And Pulse Electronics

Credit Hours: 3.00. Capacitors, inductors, oscillators, rectifiers, bipolar and MOSFET power switches, switching power supplies, half-and full-H bridges, switching audio power amplifiers, and linear regulators are studied. Computer-aided analysis of circuits is utilized. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 22900 - Concurrent Digital Systems

Credit Hours: 3.00. This course establishes a foundation for concurrent digital systems. Common methods of describing digital circuit operation are studied along with the techniques for translation between any two methods. Basic building blocks of digital systems are defined and applied. Analysis techniques for combinational and sequential logic circuits or subsystems are covered. Computer-based development tools, programmable logic devices, and technical reference sources are used to build, test, and evaluate digital systems. **Credits:** 3.00

ECET 23120 - Industrial Controls

Credit Hours: 3.00. An introduction to Industrial Controls with a focus on relay logic and PLC logic. Design and optimization of control systems based on National Electrical Code guidelines and methods for development of schematics and coding for industrial controls. Laboratory experiments in the design, coding, operation, and documentation of industrial control systems.**Credits:** 3.00

ECET 27000 - Electronics Prototype Development And Construction

Credit Hours: 3.00. This course introduces project planning and basic concepts in electronic design automation (EDA). The student develops a portion of an electronic system by utilization of EDA, design for testing, design for manufacturability (DFM), and component selection techniques. New construction methods and testing techniques are introduced. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 27300 - Modern Energy Systems

Credit Hours: 3.00. This course is an introduction to modern energy system technologies. Topics include energy conversion fundamentals, efficiency, and renewable energy technologies such as wind, solar, and geothermal. Other topics include central and distributed generation, and power plant fundamentals. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 27400 - Wireless Communications

Credit Hours: 3.00. The theory and techniques of wirelessly sending information (voice, music, data) from one location to another is studies from a systems point of view. This includes a signal analysis, modulation techniques, transmitters, receivers, low noise amplifiers, and filters in the RF frequency spectrum. In addition, special topics of current interest are introduced. This course incorporated a student-based communication design and analysis laboratory. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 27700 - AC And Power Electronics

Credit Hours: 3.00. AC Circuits including the j operator, phasors, reactance and impedance are studies. Circuit laws, network theorems, and the application of circuit analysis techniques to amplifiers used in power electronics, including power MOS devices, thyristors, and other appropriate applications. Computer-aided analysis of circuits is used. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 27900 - Embedded Digital Systems

Credit Hours: 3.00. A course emphasizing the advanced applications of embedded digital systems. Topics include embedded system architecture, use of advanced programmable counter/timer arrays, analog interfaces, serial communication, and interrupts. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 29000 - International Experience

Credit Hours: 1.00 to 3.00. This variable-title, variable-credit course establishes student credit for ECET department approved international activities such as study abroad or industrial internships in foreign countries. Permission of department is required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 3.00

ECET 29801 - Laboratory Teaching Aide In Electrical Engineering Technology

Credit Hours: 1.00 to 3.00. This course allows a student to serve as an undergraduate teaching aide in the laboratory. The student will work with and support a course instructor in the undergraduate teaching labs. Hours, subject matter, and credit to be arranged by faculty. Course content applies toward the EET Professional Experience requirement. Department and Instructor permission required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 3.00

ECET 29900 - Selected Electrical Engineering Technology Subjects

Credit Hours: 0.00 to 6.00. Hours and subject matter to be arranged by staff. Permission of instructor required. Typically offered Summer Fall Spring.**Credits:** 0.00 to 6.00

ECET 30201 - Introduction To Industrial Controls

Credit Hours: 3.00. This course examines the concepts, devices and common practices associated with control systems with a primary focus on industrial implementations. Additionally, the course provides a hierarchical examination of the implantation of control theory. Programmable logic controllers serve as the primary platform for presenting applications in interfacing and control of electromechanical and pneumatic devices. Electrical industrial safety standards are presented and emphasized throughout the course. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 31800 - Foundations Of Audio Electronics

Credit Hours: 3.00. The design, fabrication, and testing of the electronics that comprise audio signal transduction, transmission, processing, amplification and delivery to a loudspeaker are studied at an introductory level. Computer-aided analysis of circuits is used.**Credits:** 3.00

ECET 32100 - Introduction To Nanotechnology

Credit Hours: 3.00. This course explores the downsizing of electronic and mechanical devices and introduces the field of nanotechnology. Properties of nanomaterials and the tools of nanotechnology are studied. Interdisciplinary research and commercial applications are reviewed. The course involves participation in research seminars and hands-on laboratory experiences with nanotechnology instrumentation.**Credits:** 3.00

ECET 32300 - Introduction To Electric Vehicle Systems

Credit Hours: 3.00. The course is an introduction to electric vehicle (EV) technology analysis and configuration. The course explores the integrated mechanical and electrical power and control systems including the management of integrated power and control systems within an electric vehicle. Students perform detailed analysis of and develop design approaches for electrically powered vehicles. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 32700 - Instrumentation And Data Acquisition Design

Credit Hours: 3.00. This course builds upon the prerequisite knowledge and covers implementation of electric systems to measure and record mechanical, electrical, and biological parameters. Signal characteristics, transducer specification and selection, signal conditioning and transmission design, data conversion, software, and an overall system error budget are developed. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 32900 - Advanced Embedded Digital Systems

Credit Hours: 3.00. This course focuses on the study and application of real-time embedded systems. Real-time operating systems (RTOS) are introduced and applied. Students learn and use programming and scripting languages to discover the advantages and limitations of RTOS application in the lab. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 33300 - Power Electronics In Energy Systems

Credit Hours: 3.00. A study of fundamentals and applications of switch-mode DC-DC and DC-AC power electronic converters. The emphasis is given to hardware development aspects. Students will learn how to safely work with high power and high voltage circuits. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 33400 - Embedded Cross-Platform Interface And Communication

Credit Hours: 3.00. Project-oriented, hands-on study of embedded communication protocols, advanced OOP targeted for hand-held devices and low power embedded systems interface. A PC based OS with cross-platform development environments designing system solutions targeted for device platforms and interfacing with microcontroller systems. Topics include microcontrollers, SoC, various OS platforms, RTOS, embedded IoT protocols.**Credits:** 3.00

ECET 33500 - Computer Architecture And Performance Evaluation

Credit Hours: 3.00. The course focuses on the application and evaluation of computers. The architecture of modern computer CPUs and their peripheral subsystems are presented. Analytic performance evaluation techniques are introduced and developed. Common benchmarking tools for quantifying performance are used. Students also apply performance evaluation algorithms of their own creation to evaluate CPU and subsystem performance. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 33700 - Continuous Systems Analysis And Design

Credit Hours: 3.00. This is an advanced course in continuous systems analysis and design. Systems may include RCL circuits, op amp circuits, and DC permanent magnet motors. Systems analyses using differential equations and Laplace Transform techniques are developed, culminating in active filter and closed loop PID system design. Software tools, circuit simulation, and advance calculators are used to solve differential, integral, and differential equation problems. **Credits:** 3.00

ECET 33900 - Digital Signal Processing

Credit Hours: 3.00. The course introduces students to the fundamental principles associated with processing discrete time signals. The architecture, instruction set and hardware and software development tools associated with a fixed point general purpose VLSI digital signal processor are examined. Some common real-time applications are implemented such as digital filters and DFT-based spectral estimation on a typical fixed point digital signal processor. **Credits:** 3.00

ECET 34900 - Advanced Digital Systems

Credit Hours: 3.00. This course investigates complex digital systems that are implemented with field programmable gate arrays (FPGAs) using concurrent and sequential digital design techniques. Applications will include interfacing with analog signals and memory systems. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 35100 - Instrumentation Applications For Technology

Credit Hours: 3.00 or 4.00. Introduction to the basic concepts and terminology of instruments. This course covers the procedures and techniques essential to measurement of physical quantities (such as pressure, flow, temperature, and level measurements) and

analysis of that data. Students will use data acquisition systems and computer control software to complete laboratory exercises.**Credits:** 3.00 to 4.00

ECET 35901 - Computer Based Data Acquisition Applications

Credit Hours: 3.00. This course focuses on the study and application of computer based data acquisition (DAQ) systems. Concepts of high resolution and high throughput data acquisition are introduced and applied. Students learn and use programming and scripting languages to discover the interfacing, advantages and limitations of computer based (DAQ) systems. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 36400 - Fundamentals Of Electromagnetics

Credit Hours: 3.00. This course introduces the fundamentals of electromagnetics in both theory and application. Wave propagation, transmission lines, port parameters, antenna theory, and antenna design are studied. Other topics include Maxwell's equations, propagation losses, RF signal measurement, impedance matching, and Smith chart applications. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 36900 - Applied Computer Vision For Sensing And Automation

Credit Hours: 3.00. This course provides fundamental knowledge of integrated computer imaging or vision systems for sensing, quality control and automation applications. Fundamental basis of optics, illumination, camera types with associated technologies, and image acquisition to develop a customized computer imaging or vision systems will be covered. Algorithms for image processing, image analysis and pattern recognition will also be covered. Emerging technologies-based integrated computer vision or imaging system for sensor system, inspection, quality control and automation in different sectors (medical, manufacturing, security, construction etc.) will be examined. Parallel laboratory hands-on experience will allow the students to apply and validate the concepts learned in the lecture.**Credits:** 3.00

ECET 37100 - Automation, Instrumentation, and Process Control

Credit Hours: 3.00 or 4.00. A project-oriented course combining key areas of automation, instrumentation and process control. The course covers automatic testing, computer interfacing, data collection, robotic controls, programmable logic controllers, and graphical process control software. A final project is an integrated system.**Credits:** 3.00 to 4.00

ECET 37201 - Continuous Control Electronics

Credit Hours: 3.00. A study of the electronic design of the elements of closed-loop analog and digital systems. Topics include characteristics of process and servo systems, analysis and design of the electronics used to acquire the process variable; condition, transmit, and receive the signal; implement a single loop control algorithm, and provide proportional power. Several sensor types and interpretation of their static and dynamic specifications are included. Controllers employed include student designed analog, and embedded microprocessor, and commercial single loop controllers. Software is used to model components and analyze open and closed-loop systems. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 37300 - Applied Electronic Drives

Credit Hours: 3.00. This course covers operational principles and application development consideration of all subsystems that make up electric drives: electric machines, power-electric based converters, mechanical system requirements, feedback controller design, and the interaction of drives with the utility grid. State of the art drive development tools are introduced through hands-on activities. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 37600 - Electrical Energy Systems

Credit Hours: 3.00. This course is an introduction to a wide range of electrical energy systems technologies. Topics include fundamentals of energy conversion, which includes large- and small-scale generation, energy storage, and end-use. Processes include coal, nuclear, solar, wind, hydro, and biomass and their application in central and distributed power systems. The power grid, micro-grids, and smart grid technologies are also explored. The goal is to introduce students to the breadth of technology in the rapidly growing and changing field of energy systems.**Credits:** 3.00

ECET 38001 - Global Professional Issues In Engineering Technology

Credit Hours: 3.00. This course addresses professional ethics, legal issues, professional development, technology transfer, and corporate culture as they relate to EET graduates and our global society. Information relating to personal job and career choices, resumes, and interviews are included. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 38100 - Electrical Distribution Systems

Credit Hours: 4.00. A study of the design and operation of electric distribution systems including estimated demand, demand calculations, energy conservation, faults on power systems, power quality, power factor improvement, electric rates, voltage drops, protective devices, illumination, and the applicable portions of the National Electric Code (NEC). Both new facilities and additions to existing facilities are included.**Credits:** 4.00

ECET 38404 - Fundamentals Of Contemporary Signal Of Processing

Credit Hours: 4.00. Fundamentals of processing techniques applied to signals and systems in both time and frequency domains are studies. Both continuous-time and discrete-time linear systems are introduced. Analysis methods such as: Fourier series, Fourier transform, bilateral Laplace transform, difference equations, discrete-Time Fourier transform, bilateral 7-Transform are introduced. Common applications such as waveform generation, FIR and IIR digital filtering, DFT and FFT based spectral analysis and filtering are covered. Use of software tools is emphasized throughout the course. Department permission required.**Credits:** 4.00

ECET 38600 - Building Electrical Codes And Standard Practices

Credit Hours: 3.00. A course in the design of building wiring, machine wiring and electrical control systems using relevant codes and standards to layout commercial and industrial facilities and manufacturing processes. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 38800 - Analog IC Applications

Credit Hours: 3.00. This course is a study of the applications of analog integrated circuits. Topics include linear amplifiers, IC specifications, linear regulators, waveform generation, linear and switched-capacitor active filters, and nonlinear circuit applications. Computer aided analysis of these circuits is also presented. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 39000 - Lab Assistant In Electrical Engineering Technology

Credit Hours: 0.00 to 3.00. This course allows a student to serve like an employee as an undergraduate teaching assistant in the laboratory, lab exercise/apparatus developer, or undergraduate researcher. Hours, subject matter, and credit to be arranged by faculty. Course content applies toward the EET Professional Experience requirement. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 0.00 to 3.00

ECET 41500 - Digital Hardware Modeling Using Hardware Description Languages (HDL)

Credit Hours: 3.00. This course introduces students to various contemporary Hardware Description Languages (HDL) for modern digital logic systems. The course will emphasize on Verilog HDL. It covers logic-synthesis and high-level-synthesis in the context of HDL coding constructs for platform-independent and dependent technologies applicable to modern semiconductor industry testing. Students are also exposed to the subset of HDL that may be used for synthesis of custom logic for edge devices. HDL simulation and synthesis labs and projects are performed using commercial and/or academic VLSI CAD tools.**Credits:** 3.00

ECET 42301 - Electrical Vehicle Integration And Fabrication

Credit Hours: 3.00. This course requires students to develop a detailed design, develop a time/action plan, perform research on existing electronic vehicle systems, develop a procurement plan for electronic vehicle components, design and fabricate custom electric vehicle components, and construct an electric vehicle. The completed electric vehicle is extensively tested for safety, performance, and energy efficiency. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 42800 - Audio Electronics-Selected Topics

Credit Hours: 3.00. Define, implement, and evaluate the performance of the electronic elements in a professional audio system such as preamplifiers, signal encoding and transmission, signal reception and decoding, mixers, post processors, power amplifiers, limiting and protection, and intelligent power supplies. Both analog and digital signal processing may be implemented in each of the electronic elements. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 42801 - Advanced Acoustics And Audio Engineering Technologies

Credit Hours: 3.00. This course introduces topics on acoustics and audio features/elements from hardware and/or software perspectives. Topics covered include the preparation and augmentation of audio data and designing, implementing, and evaluating the audio data using AI machine learning. This course also investigates electro-acoustic applications, their hardware element details, and their contributions to the system. This will pave students' understanding of the state-of-the-art technology in the acoustic and audio engineering technology field.**Credits:** 3.00

ECET 43000 - Electrical And Electronic Product And Program Management

Credit Hours: 3.00. This course deals with the planning of electrical and electronic products and projects. Research methods are studied to support new product development including customer needs and the development of engineering requirements. Formal techniques such as functional decomposition, top-down and bottom-up design techniques are studied. Planning and design alternatives to meet cost, performance, and user-interface foals are emphasized. Technical topics are revisited with emphasis on new applications. The various types and levels of new product system tests are studied. New product planning, scheduling, and management techniques are studied, along with the usage of software tools for project scheduling and management. Creativity is stressed, and the different approaches taken by the designers are compared and discussed. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 43100 - International Capstone Project Planning And Design

Credit Hours: 3.00. The course deals with the planning and execution of an industry sponsored senior capstone project carried out jointly with students from a foreign academic institution. Project management and systems engineering methods are studied to support the development of solutions to open-ended problems proposed by industry. Formal techniques such as functional decomposition, top-down and bottom-up, requirement matrix, analysis of alternatives are studied and applied to the projects. Project planning techniques including work breakdown structures, Gantt charts and resource planning are studied and applied to meet cost, performance and project goals. The various types and levels of new system tests are studied and applied. Electronic and internet communication tools shall be used to maintain team and project progress. Foreign travel shall be required for at least one face to face team meeting during the execution of the project. Permission of Instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 43600 - Electrical Power Transmissions, Distribution, And Smart Control

Credit Hours: 3.00. A course on the simple modeling and simulation of the power grid systems, power flow analysis, and advanced meter infrastructure (AMI). The fundamentals learned in this course will be useful in the study of the effects of distributed energy resources and storage in Smart Grid environment. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 43900 - Advanced Digital Signal Processing

Credit Hours: 3.00. The course builds on the basic principles and applications of Digital Signal Processing with a view to implementing advanced DSP techniques. These techniques are chosen to form some of the building blocks that are used in specialization areas such as the biomedical, communications and energy management fields. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 44200 - Programming Robots With ROS

Credit Hours: 3.00. Robot Operating Systems (ROS) will be used as a programming platform to explore the topics of computer vision, SLAM (Simultaneous Localization and Mapping), path planning, grasping, and social interaction in robotic systems, as well as programming large systems for physical interaction with the world. Self-contained implementation projects are core to the class. Student knowledge of a procedural programming language, familiarity with robotics, and a rudimentary understanding of matrices is assumed. **Credits:** 3.00

ECET 44400 - Wireless Systems: Design And Measurement

Credit Hours: 3.00. In this course wireless RF signals and microwave circuit designs are studied. Topics include signal analysis, RF signal measurement, microstrip design and analysis, Smith chart applications, RF circuit design, s-parameters, power dividers and couplers, filter design, and advanced RF PCB layout. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 46000 - Project Design And Development

Credit Hours: 3.00. An extensive individual or small group design project is carried out with guidance from a faculty advisor. This course includes determining customer requirements, considering design alternatives, prototyping, project integration, and testing. The project is completed as a robust prototype. The course concludes with a formal written report and a presentation of the project to faculty and invited industrial guests. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 46100 - International Capstone Project Execution

Credit Hours: 3.00. This course completes the development and execution of an international industry sponsored senior capstone project carried out jointly with students from a foreign academic institution. Project management and systems engineering methods are applied in the development of solutions to open-ended problems proposed by industry. Design tools including failure mode and effects analysis and configuration management are studied and applied. A manufacturing plan supported by both in process and validation test plans are developed and applied to demonstrate compliance to project requirements. The project is completed with the generation of a proof of concept demonstration that satisfies project requirements. The course concludes with a formal written report and presentation. Electronic and internet communication tools shall be used to maintain team and project progress. Foreign travel shall be required for at least one face to face team meeting during the execution of the project. Permission of Instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

ECET 47600 - Smart Grid Technology And Applications

Credit Hours: 3.00. This smart-grid (SG) technology and applications is designed to introduce new topics related to distributed generation, micro-grids, renewable energy sources, and smart home applications. Topics covered include design, modeling,

control, and analysis of smart-grid systems. Concepts dealing with computational intelligence, decision support systems, smart metering, optimization, and energy storage are addressed. The laboratory component will provide students with hands-on experience in the utilization of smart-grid technologies and applications.**Credits:** 3.00

ECET 49000 - Senior Design Project Phase I

Credit Hours: 1.00 or 2.00. An extensive individual design and/or analytical project performed in consultation with one or more faculty advisors. Collaboration with representatives of industry, government agency, or community institutions is encouraged. Evidence of extensive and thorough laboratory performance is required. PHASE I includes, but is not limited to, faculty acceptance of project proposal, defining and limiting project objectives, initial research and source contacts, procurement of materials, and periodic progress reports.**Credits:** 1.00 or 2.00

ECET 49500 - Intensive Project Design/Development

Credit Hours: 3.00. Credit will not be granted for both ECET 495 and ECET 49700. This course is an intensive conclusion to the senior design process begun in ECET 496. The course concludes with a formal demonstration and oral presentation on the finished product and a written report on the final design. Typically offered Summer Fall Spring.**Credits:** 3.00

ECET 49700 - Project Design And Development, Phase II

Credit Hours: 1.00 or 2.00. This conclusion of the design project begun in ECET 49600 [Inactive] emphasizes system integration and testing. The course concludes with a formal demonstration of and oral presentation on the finished product and a written report on the final design. Typically offered Fall Spring Summer.**Credits:** 1.00 or 2.00

ECET 49900 - Electrical Engineering Technology

Credit Hours: 1.00 to 9.00. Hours and subject matter to be arranged by staff. Cannot be used to replace EET 48000, 49600, or 49700. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 9.00

ECET 52500 - Applications In Forensic Engineering Technology

Credit Hours: 3.00. An interdisciplinary consideration of the applications of forensics in the American jurisprudence system. Topics include: failure analysis of electrical and mechanical systems, accident reconstruction, product liability, codes and standards, ethics, and expert witness testimony. Typically offered Spring.**Credits:** 3.00

ECET 53500 - Energy Sustainability

Credit Hours: 3.00. A study of energy auditing, energy saving opportunities of commercial and industrial systems, utility rate structures, economic evaluation of investments, potential energy saving retrofits, maintenance considerations, and cogeneration opportunities. Data analysis and report writing are practiced using data from a real world energy audit. Typically offered Fall.**Credits:** 3.00

ECET 53600 - Embedded Systems Security

Credit Hours: 3.00. This course focuses on the implementation and application of cryptographic algorithms and protocols in embedded systems. An overview of the security problem and the science of cryptography and cryptanalysis is presented. The notion of the security perimeter in terms of physical access to assets in embedded hardware subsystems is studied. Students implement and apply various ciphers on 8-bit to 32-bit embedded platforms, comparing and contrasting computational and data throughout performance. Permission of instructor required. Typically offered Fall Spring.**Credits:** 3.00

ECET 54100 - Robotics And Cyber-Physical Systems Seminar

Credit Hours: 0.00 to 1.00. This course is a series of lectures from eminent local, national, and international researchers in the field of robotics, cyber-physical systems, and related areas (such as computer vision, autonomy, wearables, etc.).**Credits:** 0.00 to 1.00

ECET 54400 - Real-Time And Embedded Systems

Credit Hours: 3.00. Real-time systems are hardware/software systems in which a timely response by a computer to external stimuli is vital to the performance of the system's objectives. This is the study of temporal determinism. Embedded systems are those with special-purpose microcomputers designed into the system for explicit purposes. Examples of such are the computers on your car's engine that control fuel injection, fly-by-wire attitude controls in modern jet aircraft, even the microcontroller inside a cellular phone. In these examples, the computer has a specific, limited task that is part of the functionality of the device and specifying average performance of that computer is insufficient for successful completion of the task at hand. Imagine if the flight controls of a Boeing 787 on final landing approach experienced a "network lag" similar to that which occurs occasionally while you're reading e-mail. If the controls stop responding at a critical time, a horrific crash could occur. Even if the system doesn't freeze up 99.999% of the time, it can still result in disaster.**Credits:** 3.00

ECET 54900 - Advanced Computer Vision For Sensing And Automation

Credit Hours: 3.00. This course focuses on advanced issues related to an integrated computer vision system for sensing, quality control and automation applications.**Credits:** 3.00

ECET 58100 - Workshop In Electrical And Computer Engineering Technology

Credit Hours: 0.00 to 8.00. Advanced study of technical and professional topics. Emphasis is on new developments relating to technical, operational, and training aspects of industry and technology education. Typically offered Summer Fall Spring.**Credits:** 0.00 to 8.00

ECET 59000 - Special Problems In Electrical And Computer Engineering Technology

Credit Hours: 1.00 to 6.00. Independent study of a special problem under the guidance of a member of the staff. Does not substitute for either M.S. thesis or M.S. project credit. Permission of instructor required. Typically offered Summer Fall Spring.**Credits:** 1.00 to 6.00

ECET 59800 - Directed MS Project

Credit Hours: 1.00 to 3.00. A formal investigation of a particular problem under the guidance of the advisory committee. Not applicable to a thesis option plan of study. Enrollment during at least two consecutive terms for a total of three credits is required. Permission of instructor required. Typically offered Summer Fall Spring.**Credits:** 1.00 to 3.00

ECET 63800 - Selected Topics In Sensor Networks

Credit Hours: 3.00. This course examines general sensor network concepts, with a focus on a particular area of research and development. Current applications are studied, culminating with the analysis, characterization and/or examination of a sensor network. Permission of instructor required. Typically offered Fall Spring.**Credits:** 3.00

ECET 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. Typically offered Summer Fall Spring.**Credits:** 1.00 to 18.00

Engineering

ENGR 10000 - First-Year Engineering Lectures

Credit Hours: 0.00 or 1.00. An introduction to the engineering profession. **Credits:** 0.00 or 1.00

ENGR 10300 - Introduction To Engineering In Practice

Credit Hours: 1.00. Weekly small group seminars led by faculty designed to introduce a specific topic, problem, or discipline of engineering to First-Year Engineering students. Seminars are designed to help students explore a single area of engineering and/or to assist in their decision of an engineering degree program. **Credits:** 1.00

ENGR 10301 - Introduction To Engineering In Practice

Credit Hours: 1.00. Weekly small seminars led by faculty designed to introduce a specific topic, problem or discipline of engineering to First-Year Engineering students. Seminars are designed to help students explore a single area of engineering and/or assist in their decision of an engineering degree. Permission of department required. **Credits:** 1.00

ENGR 10400 - Introduction To Engineering And Purdue

Credit Hours: 1.00. Weekly small group seminars led by upper-class engineering students, enabling a broader understanding of engineering disciplines at Purdue, covering skills and techniques for academic success, and offering instruction and practice in career preparation and employment-finding skills. **Credits:** 1.00

ENGR 10500 - First-Year Engineering Seminar

Credit Hours: 1.00. A selection of invited lectures, participation exercises, and lab tours designed to acquaint exceptionally well-motivated students with opportunities to enhance their undergraduate engineering education through independent study, special research projects, overseas study, and other opportunities that may be available for students who are inclined to seek extraordinary challenges. **Credits:** 1.00

ENGR 11700 - First-Year Engineering Honors Seminar

Credit Hours: 3.00. A course in computer programming, covering fundamentals of the C programming language. Other language(s) or materials will be covered to prepare Honors students to do the best possible work in their professional school courses. Students will be introduced to structured problem-solving and top-down programming techniques. Laboratory exercises will accelerate learning of fundamental materials through supervised repetitive practice, while more traditional individual and team projects will provide practice in the decomposition and solution of larger problems. **Credits:** 3.00

ENGR 12600 - Engineering Problem Solving And Computer Tools

Credit Hours: 3.00. Introduction to the solving of open-ended engineering problems and the use and of computer software, including UNIXTM, computer communications, spreadsheets, and MATLAB. Explicit model-development activities are utilized, and students are expected to develop skill at working in teams. This is emphasized both in laboratories and on projects. **Credits:** 3.00

ENGR 13000 - Transforming Ideas To Innovation, EPICS/VIP

Credit Hours: 4.00. This introductory course to engineering teaches skills in managing complex problems related to design, systems analysis with computational tools, and academic professional development. Through multiple experiences, students will learn effective methods to design and analyze behaviors of complex engineering systems with an eye for innovation. These experiences will develop their skills in teaming, project management, logical reasoning, sustainability, coupled with oral, written and visual communication for multiple audiences. This course also develops students ability to build computational tools (e.g., Python, MATLAB and Excel) to analyze the performance of systems using fundamental concepts associated with physical science and data science (e.g., mathematical modeling, data processing, numerical modeling, statistics). Professional identify development is critical to preparing students for making an informed decision in their choice of major and the development of professional skills to succeed in that major. Therefore, the course includes learning experiences to help them gather and process information about all the engineering academic pathways they could choose at Purdue. Permission of instructor required.**Credits:** 4.00

ENGR 13100 - Transforming Ideas To Innovation I

Credit Hours: 2.00. A partnership between Schools and Programs within the College of Engineering, introduces students to the engineering professions using multidisciplinary, societally relevant content. Developing engineering approaches to systems, generating and exploring creative ideas, and use of quantitative methods to support design decisions. Explicit model-development activities (engineering eliciting activities, EEAs) engage students in innovative thinking across the engineering disciplines at Purdue. Experiencing the process of design and analysis in engineering including how to work effectively in teams. Developing skills in project management, engineering fundamentals, oral and graphical communication, logical thinking, and modern engineering tools (e.g., Excel and MATLAB). **Credits:** 2.00

ENGR 13200 - Transforming Ideas To Innovation II

Credit Hours: 2.00. A partnership between Schools and Programs within the College of Engineering continues building on the foundation developed in ENGR 13100. Students take a more in-depth and holistic approach to integrating multiple disciplines perspectives while constructing innovative engineering solutions to open-ended problems. Extending skills in project management engineering fundamentals, oral and graphical communication, logical thinking, teamwork, and modern engineering tools (e.g., Excel and MATLAB). **Credits:** 2.00

ENGR 13300 - Transforming Ideas To Innovation, EPICS/VIP

Credit Hours: 2.00. Introduces students to the engineering professions using multidisciplinary, societally relevant content. Students will develop engineering approaches to systems, generate and explore creative ideas, and use quantitative methods to support design decisions. Students will experience the process of design and analysis in engineering including how to work effectively in teams, and will develop skills in project management, engineering fundamentals, oral and graphical communication, logical thinking, and modern engineering tools (e.g., Excel and MATLAB). An emphasis will be placed on computing logic development and builds upon the co-requisite experience of the students in the EPICS class.**Credits:** 2.00

ENGR 14100 - Honors Creativity And Innovation In Engineering Design I

Credit Hours: 3.50. This course introduces students to the engineering professions using multidisciplinary, societally relevant content. Students develop engineering approaches to systems, generate and explore creative and innovative ideas, and use of computational methods to support design decisions. Design challenges and projects engage students in innovative thinking across the engineering disciplines at Purdue. Students experience the process of design and analysis in engineering including how to work effectively in teams. Students also develop skills in project management, engineering fundamentals, oral and graphical communication, logical thinking, and modern engineering tools (e.g., Excel®, LabView®, MATLAB®, and Python). **Credits:** 3.50

ENGR 14200 - Honors Creativity And Innovation In Engineering Design II

Credit Hours: 3.50. This course continues building on the foundation developed in ENGR 14100. Students take a more in-depth and holistic approach to integrating multiple disciplines perspectives while constructing innovative engineering solutions to open-ended problems. The students extend and continue to develop skills in project management, engineering fundamentals, oral and graphical communication, logical thinking, teamwork, and modern engineering tools (e.g., C, Excel®, LabView®, MATLAB®, and Python). **Credits:** 3.50

ENGR 16100 - Honors Introduction To Innovation And The Physical Science Of Engineering Design I

Credit Hours: 4.00. This course introduces students to the engineering profession using physics-based, multidisciplinary, societally relevant content. Students develop engineering approaches to systems, generate and explore creative and innovative ideas, and use of computational methods to support design decisions. In particular, the students will develop the ability to model and investigate physical systems at the microscopic and macroscopic levels with a focus on vectors analysis, linear momentum, angular momentum, work-energy, and solid material interactions. Design challenges and projects will explore a wide range of natural phenomena experimentally and computationally (utilizing MATLAB and Python) and engage students in innovative thinking across the engineering disciplines at Purdue. They will learn the basics of descriptive statistics, data analysis, sensitivity analysis, and decision-making. Students experience the process of design and analysis in engineering including how to work effectively in teams. Students also develop skills in project management, engineering fundamentals, oral and graphical communication, logical thinking, and modern engineering tools. **Credits:** 4.00

ENGR 16200 - Honors Introduction To Innovation And The Physical Science Of Engineering Design II

Credit Hours: 4.00. Students will take an in-depth and holistic approach to integrating multiple disciplines perspectives while constructing innovative engineering solutions to open-ended problems. The students continue to explore more complicated models of physical systems, especially internal energy, entropy, models of gases and fluids, and statistical thermodynamics. The students will extend the concepts learned in ENGR 16100 and continue to develop skills in project management, engineering fundamentals, oral and graphical communication, logical thinking, teamwork, and modern engineering tools (e.g. MATLAB and Python). In addition, students will learn how to use hypothesis testing to make informed, quantitative decisions. Finally, they will build systems that incorporate feedback control in an effort to identify and characterize physical material systems. **Credits:** 4.00

ENGR 17600 - Professional Internship I

Credit Hours: 0.00. Professional experience in engineering. Program coordinated by department with cooperation of participating employers. Students submit a summary report. **Credits:** 0.00

ENGR 18000 - Minorities In Engineering Seminar

Credit Hours: 1.00. Explores the challenges that minority engineering students have in making a smooth and informed transition to college from high school. The content and activities may be of particular interest to engineering students from underrepresented groups as they adjust to the University's environment. The course provides a setting for entering students to explore career opportunities in the various fields of engineering. Open to all entering engineering students. **Credits:** 1.00

ENGR 18500 - Engineering Career Planning

Credit Hours: 1.00. An engineering-oriented course designed to assist students in planning for their educational, career, and personal development. Individual and group projects, computer-aided guidance. Course will incorporate autobiographies, resumes, and academic and career planning exercises. Interest inventories and personal appraisal surveys will be utilized.

Computer-based guidance systems will be utilized, including ESCAPE (Engineering Specific Career Advisory Problem-solving Environment). (Eight-week session) **Credits:** 1.00

ENGR 19400 - Women In Engineering Seminar

Credit Hours: 1.00. An overview of the career opportunities for women in engineering. The content and activities of the course may be of particular interest to women. Speakers from a variety of engineering organizations discuss their career paths and share their strategies for success. Students also meet weekly in small groups led by engineering seniors for additional information, interaction, and support from their peers in engineering. Open to all entering engineering students. **Credits:** 1.00

ENGR 19500 - First-Year Engineering Projects

Credit Hours: 1.00 to 6.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 6.00

ENGR 19700 - Introduction To Programming Concepts

Credit Hours: 2.00. Basic concepts and applications of software programming for solving engineering problems. Topics include techniques for developing structured algorithms, data input and output, conditional statements, loops, recursion, functions, arrays, and elementary concepts in mathematical programming. Examples, homework, and applications of programming concepts make extensive use of the C programming language.**Credits:** 2.00

ENGR 20000 - Cooperative Education Practice I

Credit Hours: 1.00. A semester or summer of external, full time, related career experiences designed to enhance the student's preparedness for an intended career with business, industry or government agency. A comprehensive written report on the internship practice is required. A minimum of 10 weeks and 200 hours are required for credit. Typically offered Fall Spring Summer.**Credits:** 1.00

ENGR 20010 - Engineering Career Enrichment Internship I

Credit Hours: 1.00. Semester of external career related experiences designed to enhance the student's preparedness for entering an initial or second career. A minimum of 10 weeks and 200 hours are required for credit. Typically offered Fall Spring Summer.**Credits:** 1.00

ENGR 23099 - Cooperative Education Seminar I

Credit Hours: 1.00 or 2.00. (PSY 23099) This seminar course is optional for Co-Op students when they are on campus. In this course, students share their work experiences, receive feedback from the instructor and seminar participants, and continue their professional development. Prerequisite: Student must have completed at least one Co-Op work term. May be repeated once after the second work term. Can be taken for two credits subsequent to completing two back-to-back work terms. Instructor permission required. **Credits:** 1.00 or 2.00

ENGR 25000 - Cooperative Education Practice II

Credit Hours: 1.00. A semester or summer of external, full time, related career experiences designed to enhance the student's preparedness for an intended career with business, industry or government agency. A comprehensive written report on the internship practice is required. A minimum of 10 weeks and 200 hours are required for credit. Typically offered Fall Spring Summer.**Credits:** 1.00

ENGR 25010 - Engineering Career Enrichment Internship II

Credit Hours: 1.00. Semester of external career related experiences designed to enhance the student's preparedness for entering and initial or second career. Typically offered Fall Spring Summer.**Credits:** 1.00

ENGR 26099 - Learning While Working Full-Time Co-Op I

Credit Hours: 0.00. Co-Op is an academic program with oversight by assigned Faculty Coordinators who serve as the instructor for participating students. Learning While Working participants are undergraduate students who work part-time (10-20 hours per week) in paid computer science, engineering, polytechnic, or management positions during the academic year terms (fall and spring semesters) for an employer with a local operations or offering a remote work opportunity. During the summer term, Learning While Working students work in full-time positions at any location offered by the employer. During the academic year, Learning While Working students register for a full-time course load, and also for this zero-credit hour Learning While Working course. During the summer term, Learning While Working students register for a zero-credit hour Co-Op course. This course will help students set goals for their work experiences and reflect on skill growth and receive feedback from their employer supervisor and Purdue Co-Op supervisor. Prerequisite: Student must be eligible to participate in the Cooperative Education (Co-Op) program and have written documentation of valid work session with approved Co-Op employer. Permission of instructor required. **Credits:** 0.00

ENGR 27199 - Professional Practice Flex Co-Op I

Credit Hours: 0.00. Co-Op is an academic program with oversight provided by assigned Faculty Coordinators who serve as the Instructor for participating students. In the Flex Co-Op program, students must work for their first employer for a minimum of two work sessions, and then have the option to continue for one-to-three additional work sessions; or, after completing two work sessions with the first employer, the student may elect to start with a second employer. If the student elects to change employers, they must notify their first employer and their Faculty Coordinator in writing at the conclusion of the second work session. The student must commit to work for the second Co-Op employer for a minimum of two work sessions. Permission of instructor required. **Credits:** 0.00

ENGR 27299 - Professional Practice Flex Co-Op II

Credit Hours: 0.00. Co-Op is an academic program with oversight provided by assigned Faculty Coordinators who serve as the Instructor for participating students. In the Flex Co-Op program, students must work for their first employer for a minimum of two work sessions, and then have the option to continue for one-to-three additional work sessions; or, after completing two work sessions with the first employer, the student may elect to start with a second employer. If the student elects to change employers, they must notify their first employer and their Faculty Coordinator in writing at the conclusion of the second work session. The student must commit to work for the second Co-Op employer for a minimum of two work sessions. Permission of Instructor required. **Credits:** 0.00

ENGR 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ENGR 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ENGR 29600 - Experimental Courses

Credit Hours: 0.00 to 6.00. Experimental classes offered at the freshmen/sophomore level on a temporary basis to test the viability of offering the course on a permanent basis. **Credits:** 0.00 to 6.00

ENGR 29701 - Global Engineering Orientation

Credit Hours: 1.00. Forum in preparation of study and work abroad. Understanding of cultural differences and collaborating across cultural boundaries, professionalism and ethics in foreign work and academic environments, leadership and teamwork options in foreign environments. Permission of instructor required. **Credits:** 1.00

ENGR 30500 - Fundamentals Of Innovation Theory And Practice

Credit Hours: 3.00. This course is designed to provide students with initial exposure to the fundamental patterns, mindsets, behaviors, attributes, tools, and methods employed in the innovative activity of individuals and organizations. Emphasis is placed on understanding and effectively utilizing techniques to systematically drive innovation that are drawn from the fields of business, design, problem-solving, engineering, and the social sciences. Lecture, in-class small group activities, and individual and team assignments are employed across an array of contemporary socio-technical challenges to provide students with the opportunity to apply conveyed theory and methods to rigorously structure problems, understand involved stakeholders, utilize innovation motifs and analogical reasoning to develop robust views of potential solutions spaces, tailor solution design to stakeholder context, consider the full suite of functional, social, and emotional dimensions that could influence solution prioritization, and document and systematically assess underlying solution assumptions to iterate toward a viable and sustainable forward-looking plan that could achieve target outcomes. This course counts toward, serves as a required entry course for, the College of Engineering Minor in Innovation and Transformational Change. **Credits:** 3.00

ENGR 31000 - Engineering In Global Context

Credit Hours: 3.00. This course provides students with opportunities to study how engineering is intertwined with larger economic, social, cultural, and technological dynamics in an era of intensified globalization. Its major goals are to help students understand and appreciate what engineering is, how engineers are trained, what engineers do, and how engineering and society interact. The course approaches these themes through discussion of: the relation and interaction of engineering, science, technology, and society; the historical origins and development of engineering as a profession; diversity issues in engineering and other STEM fields; engineering in cross-national/cultural contexts; and contemporary challenges related to globalization, ethics, and sustainability. In summary, the course is designed to help students understand what it means to identify as, and/or work with, engineers. Recitation sections and/or independent projects (at the instructor's discretion) provide further opportunities for students to expand their knowledge and improve their skills in relation to course themes. **Credits:** 3.00

ENGR 33099 - Cooperative Education Seminar II

Credit Hours: 1.00 or 2.00. This seminar is optional for Co-Op students when they are on campus. In this course, students share their work experiences, receive feedback from the instructor and seminar participants, and continue their professional development. Prerequisite: Student must have completed at least two Co-Op work terms. May be repeated once after the fourth work term. Can be taken for two credits subsequent to completing two back-to-back work terms. Instructor permission required. **Credits:** 1.00 or 2.00

ENGR 35000 - Cooperative Education Practice IV

Credit Hours: 1.00. A semester or summer of external, full time, related career experiences designed to enhance the student's preparedness for an intended career with business, industry or government agency. A comprehensive written report on the internship practice is required. Typically offered Fall Spring Summer.**Credits:** 1.00

ENGR 36099 - Learning While Working Full-Time Co-Op II

Credit Hours: 0.00. Co-Op is an academic program with oversight by assigned Faculty Coordinators who serve as the instructor for participating students. Learning While Working participants are undergraduate students who work part-time (10-20 hours per week) in paid computer science, engineering, polytechnic, or management positions during the academic year terms (fall and spring semesters) for an employer with a local operations or offering a remote work opportunity. During the summer term, Learning While Working students work in full-time positions at any location offered by the employer. During the academic year, Learning While Working students register for a full-time course load, and also for this zero-credit hour Learning While Working course. During the summer term, Learning While Working students register for a zero-credit hour Co-Op course. This course will help students set goals for their work experiences and reflect on skill growth and receive feedback from their employer supervisor and Purdue Co-Op supervisor. Prerequisite: Student must be eligible to participate in the Cooperative Education (Co-Op) program and have written documentation of valid work session with approved Co-Op employer. Permission of instructor required. **Credits:** 0.00

ENGR 36199 - Learning While Working Part-Time Co-Op I

Credit Hours: 0.00. Co-Op is an academic program with oversight by assigned Faculty Coordinators who serve as the instructor for participating students. Learning While Working participants are undergraduate students who work part-time (10-20 hours per week) in paid computer science, engineering, polytechnic, or management positions during the academic year terms (fall and spring semesters) for an employer with a local operations or offering a remote work opportunity. During the summer term, Learning While Working students work in full-time positions at any location offered by the employer. During the academic year, Learning While Working students register for a full-time course load, and also for this zero-credit hour Learning While Working course. During the summer term, Learning While Working students register for a zero-credit hour Co-Op course. This course will help students set goals for their work experiences and reflect on skill growth and receive feedback from their employer supervisor and Purdue Co-Op supervisor. Prerequisite: Student must be eligible to participate in the Cooperative Education (Co-Op) program and have written documentation of valid work session with approved Co-Op employer. Permission of instructor required. **Credits:** 0.00

ENGR 36299 - Learning While Working Part-Time Co-Op II

Credit Hours: 0.00. Co-Op is an academic program with oversight by assigned Faculty Coordinators who serve as the instructor for participating students. Learning While Working participants are undergraduate students who work part-time (10-20 hours per week) in paid computer science, engineering, polytechnic, or management positions during the academic year terms (fall and spring semesters) for an employer with a local operations or offering a remote work opportunity. During the summer term, Learning While Working students work in full-time positions at any location offered by the employer. During the academic year, Learning While Working students register for a full-time course load, and also for this zero-credit hour Learning While Working course. During the summer term, Learning While Working students register for a zero-credit hour Co-Op course. This course will help students set goals for their work experiences and reflect on skill growth and receive feedback from their employer supervisor and Purdue Co-Op supervisor. Prerequisite: Student must be eligible to participate in the Cooperative Education (Co-Op) program and have written documentation of valid work session with approved Co-Op employer. Permission of instructor required. **Credits:** 0.00

ENGR 37399 - Professional Practice Flex Co-Op III

Credit Hours: 0.00. Co-Op is an academic program with oversight provided by assigned Faculty Coordinators who serve as the Instructor for participating students. In the Flex Co-Op program, students must work for their first employer for a minimum of two work sessions, and then have the option to continue for one-to-three additional work sessions; or, after completing two work sessions with the first employer, the student may elect to start with a second employer. If the student elects to change employers, they must notify their first employer and their Faculty Coordinator in writing at the conclusion of the second work session. The student must commit to work for the second Co-Op employer for a minimum of two work sessions. Permission of Instructor required. **Credits:** 0.00

ENGR 37499 - Professional Practice Flex Co-Op IV

Credit Hours: 0.00. Co-Op is an academic program with oversight provided by assigned Faculty Coordinators who serve as the Instructor for participating students. In the Flex Co-Op program, students must work for their first employer for a minimum of two work sessions, and then have the option to continue for one-to-three additional work sessions; or, after completing two work sessions with the first employer, the student may elect to start with a second employer. If the student elects to change employers, they must notify their first employer and their Faculty Coordinator in writing at the conclusion of the second work session. The student must commit to work for the second Co-Op employer for a minimum of two work sessions. Permission of Instructor required. **Credits:** 0.00

ENGR 37599 - Professional Practice Flex Co-Op V

Credit Hours: 0.00. Co-Op is an academic program with oversight provided by assigned Faculty Coordinators who serve as the Instructor for participating students. In the Flex Co-Op program, students must work for their first employer for a minimum of two work sessions, and then have the option to continue for one-to-three additional work sessions; or, after completing two work sessions with the first employer, the student may elect to start with a second employer. If the student elects to change employers, they must notify their first employer and their Faculty Coordinator in writing at the conclusion of the second work session. The student must commit to work for the second Co-Op employer for a minimum of two work sessions. Permission of Instructor required. **Credits:** 0.00

ENGR 38199 - Professional Practice Co-Op I

Credit Hours: 0.00. Professional experience in engineering. Program coordinated by Office of Professional Practice with cooperation of participating employers. Students submit a summary report and company evaluation. Permission of Instructor required. **Credits:** 0.00

ENGR 38299 - Professional Practice Co-Op II

Credit Hours: 0.00. Professional experience in engineering. Program coordinated by Office of Professional Practice with cooperation of participating employers. Students submit a summary report and company evaluation. Permission of Instructor required. **Credits:** 0.00

ENGR 38399 - Professional Practice Co-Op III

Credit Hours: 0.00. Professional experience in Engineering. Program coordinated by Office of Professional Practice with cooperation of participating employers. Students submit a summary report and company evaluation. Permission of Instructor required. **Credits:** 0.00

ENGR 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ENGR 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ENGR 39501 - Breakthrough Thinking Complex Challenges

Credit Hours: 3.00. This course is intended to help students understand and effectively employ the principles underlying breakthrough thinking. Students will participate in cross-disciplinary teams to design solutions to a complex societal challenge in conjunction with a partner organization, in an experiential learning setting. Case discussions of historical breakthroughs will be used to introduce techniques for the identification of opportunities, the design of solutions, and the launch, test, and iteration of such solutions. Emphasis will be placed on the effective use of techniques from various fields, such as business, design, problem-solving, engineering, and the social sciences. **Credits:** 3.00

ENGR 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ENGR 39600 - Experimental Courses

Credit Hours: 0.00 to 6.00. Experimental classes offered at the junior level on a temporary basis to test the viability of offering the course on a permanent basis. **Credits:** 0.00 to 6.00

ENGR 39602 - Undergraduate Experiential Training - Research

Credit Hours: 0.00. This course is meant to promote meaningful reflection on the different experiential learning research environments a student may participate in such as Summer Undergraduate Research Fellowship and Research for Pay internship. Additional data will be collected on each student's experience regarding pay, project, position, etc. Assignments will include goal setting, goal evaluation, reflection, and resume writing. Guidance will be provided within the Brightspace page and throughout the pre/post-experience survey assignments. Permission of instructor required.**Credits:** 0.00

ENGR 39603 - Undergraduate Experiential Training - Semiconductors

Credit Hours: 0.00. This course is meant to promote meaningful reflection on the different experiential learning environments a student may participate in which focus on workforce development and the acquisition and practice of technical skills. This course will supplement the Summer Training Awareness & Readiness for Semiconductions (STARS) program. Additional data will be collected on each student's experience regarding pay, project, position, etc. Assignments will include goal setting, goal evaluation, reflection, public speaking as it relates to the workforce domain, and resume writing in addition to industry/sector-specific technical training. Guidance will be provided within the Brightspace page and throughout the pre/post-experience survey assignments. Permission of instructor required.**Credits:** 0.00

ENGR 39697 - Global Engineering Projects

Credit Hours: 1.00 to 3.00. Students will work in teams to formulate solutions to engineering problems. Project topics will focus on a problem outside the U.S. and/or incorporate teammates from international universities. International teams may work remotely with the possibility for international travel and in-person collaboration. Permission of instructor required. **Credits:** 1.00 to 3.00

ENGR 39699 - Professional Practice Internship

Credit Hours: 0.00. Professional experience in engineering. Program coordinated by Office of Professional Practice with cooperation of participating employers. Students submit a summary report and company evaluation. Permission of Instructor required. **Credits:** 0.00

ENGR 39700 - Global Engineering Experience

Credit Hours: 1.00. Forum for students participating in an international internship or study abroad experience. Students will complete weekly guided writing assignments during the first 15 weeks of their international experience. Assignments will aid students with integration into the host community. Students will demonstrate increased awareness of the nature and complexities of intercultural communication by applying various theories to their lived experiences. To be taken concurrently with international internship/study abroad experience. Permission of instructor is required. **Credits:** 1.00

ENGR 39799 - GEARE Domestic Internship

Credit Hours: 0.00. Domestic internship experience for GEARE program. Program coordinated by Office of Professional Practice with cooperation of participating employers. Students to obtain professional practice with domestic employers within industry, government or small business. Permission of instructor required. **Credits:** 0.00

ENGR 39899 - GEARE Global Internship

Credit Hours: 0.00. Global internship experience for GEARE program. Program coordinated by Office of Professional Practice with cooperation of participating employers. Students to obtain professional practice with global employers within industry, government or small business. Permission of instructor required. **Credits:** 0.00

ENGR 40400 - Instruction, Mentorship And Leadership

Credit Hours: 1.00. This course provides students with valuable mentorship, leadership, and instructional opportunities through participation in the College of Engineering mentorship programs. The weekly seminar will feature a combination of student-led discussions, guest speakers, and practical team-building skills. **Credits:** 1.00

ENGR 40600 - Engineering Ambassador Leadership Seminar

Credit Hours: 1.00. Students will engage in a weekly seminar that includes topics such as leadership, professional skills, teamwork, and Purdue culture. Students will utilize these skills while representing Purdue College of Engineering to current and prospective students, alumni, donors, legislators, and other supporters of Purdue College of Engineering. Student must be selected as a College of Engineering Ambassador; be currently enrolled full-time in the College of Engineering; have completed no less than three academic semesters at Purdue; have a cumulative GPA of 2.8 or higher. Permission of department required. **Credits:** 1.00

ENGR 43099 - Cooperative Education Seminar III

Credit Hours: 1.00 or 2.00. This seminar course is optional for Co-Op students when they are on-campus. In this course, students share their work experiences, receive feedback from the instructor and seminar participants, and continue their professional development. Prerequisite: Student must have completed at least three Co-Op work terms. Can be taken for two credits subsequent to completing two back-to-back work terms. Instructor permission required. **Credits:** 1.00 or 2.00

ENGR 46099 - Learning While Working Full-Time Co-Op III

Credit Hours: 0.00. Co-Op is an academic program with oversight by assigned Faculty Coordinators who serve as the instructor for participating students. Learning While Working participants are undergraduate students who work part-time (10-20 hours per week) in paid computer science, engineering, polytechnic, or management positions during the academic year terms (fall and spring semesters) for an employer with a local operations or offering a remote work opportunity. During the summer term, Learning While Working students work in full-time positions at any location offered by the employer. During the academic year, Learning While Working students register for a full-time course load, and also for this zero-credit hour Learning While Working course. During the summer term, Learning While Working students register for a zero-credit hour Co-Op course. This course will help students set goals for their work experiences and reflect on skill growth and receive feedback from their employer supervisor and Purdue Co-Op supervisor. Prerequisite: Student must be eligible to participate in the Cooperative Education (Co-Op)

program and have written documentation of valid work session with approved Co-Op employer. Permission of instructor required. **Credits:** 0.00

ENGR 46399 - Learning While Working Part-Time Co-Op III

Credit Hours: 0.00. Co-Op is an academic program with oversight by assigned Faculty Coordinators who serve as the instructor for participating students. Learning While Working participants are undergraduate students who work part-time (10-20 hours per week) in paid computer science, engineering, polytechnic, or management positions during the academic year terms (fall and spring semesters) for an employer with a local operations or offering a remote work opportunity. During the summer term, Learning While Working students work in full-time positions at any location offered by the employer. During the academic year, Learning While Working students register for a full-time course load, and also for this zero-credit hour Learning While Working course. During the summer term, Learning While Working students register for a zero-credit hour Co-Op course. This course will help students set goals for their work experiences and reflect on skill growth and receive feedback from their employer supervisor and Purdue Co-Op supervisor. Prerequisite: Student must be eligible to participate in the Cooperative Education (Co-Op) program and have written documentation of valid work session with approved Co-Op employer. Permission of instructor required. **Credits:** 0.00

ENGR 46499 - Learning While Working Part-Time Co-Op IV

Credit Hours: 0.00. Co-Op is an academic program with oversight by assigned Faculty Coordinators who serve as the instructor for participating students. Learning While Working participants are undergraduate students who work part-time (10-20 hours per week) in paid computer science, engineering, polytechnic, or management positions during the academic year terms (fall and spring semesters) for an employer with a local operations or offering a remote work opportunity. During the summer term, Learning While Working students work in full-time positions at any location offered by the employer. During the academic year, Learning While Working students register for a full-time course load, and also for this zero-credit hour Learning While Working course. During the summer term, Learning While Working students register for a zero-credit hour Co-Op course. This course will help students set goals for their work experiences and reflect on skill growth and receive feedback from their employer supervisor and Purdue Co-Op supervisor. Prerequisite: Student must be eligible to participate in the Cooperative Education (Co-Op) program and have written documentation of valid work session with approved Co-Op employer. Permission of instructor required. **Credits:** 0.00

ENGR 49001 - Breakthrough Thinking For Complex Challenges

Credit Hours: 3.00. This course helps students learn and effectively employ high-impact design principles and structured problem solving methods to address complex multi-stakeholder socio-technical challenges. Case discussions of historical and contemporary high impact solutions to complex challenges are used to introduce techniques to frame problems, structure ambiguity, intentionally design non-incremental solutions, and communicate, trial, and iterate solutions to drive adoption and multifaceted sustainability. Techniques are drawn from multiple schools of thought such as business, design, engineering, and the social sciences. Over the course of the term, multi-disciplinary student teams directly apply cumulative learning to address selected parts of a real-world complex societal challenge in close collaboration with a partner organization, in an experiential learning format. This course can be counted toward the College of Engineering Minor in Innovation and Transformational Change and the Burton D. Morgan Center for Entrepreneurship (BDMCE) Certificate in Entrepreneurship and Innovation. Permission of instructor required. **Credits:** 3.00

ENGR 49400 - Women In Engineering Senior Seminar: Gender In The Workplace

Credit Hours: 1.00. This course provides junior and senior engineering students an opportunity to maximize their earning potential, promotion opportunities, and retention within engineering or related fields. Enrolled students will 1) become aware of and discuss solutions for internal and external barriers which can prevent women from reaching their greatest potential in the workforce; 2) enhance professional development and transition skills required to move successfully from an academic to professional environment; and 3) acquire skills and knowledge to serve as engineering role models/ambassadors for diverse

populations. The content and activities of the course may be of particular interest to women. Permission by instructor required. **Credits:** 1.00

ENGR 49600 - Experimental Courses

Credit Hours: 0.00 to 6.00. Experimental classes offered at the senior level on a temporary basis to test the viability of offering the course on a permanent basis. **Credits:** 0.00 to 6.00

ENGR 49700 - Global Engineering Capstone

Credit Hours: 1.00. Forum for students returning from international internship and/or study abroad experience. Students will explore personal development resulting from the international experience as it relates to changes in world-view, understanding of culture, interpersonal skills and career aspirations. They will learn to highlight international experiences on resumes and in interviews. Students will apply and share their cultural knowledge through structured activities and summarize their entire global experience through a poster presentation. To be taken in semester following international internship/study abroad experience. Permission of instructor is required. **Credits:** 1.00

ENGR 50000 - Global Design Team V

Credit Hours: 0.00 to 3.00. Global Design Team brings together undergraduate and graduate students from different disciplines, inside and outside of the College of Engineering to design solutions to solve real-world problems over the course of one academic semester. Depending on the size and scope of the project, teams may range from one to twenty students under the advisement of a faculty member. GDTs partner student teams with non-governmental organizations, businesses and/or other research institutions in international development projects. Approval for registration is granted based on an application process that takes into consideration previous design experience, level of interest in the topic and GPA. Permission of department required. **Credits:** 0.00 to 3.00

ENGR 50100 - Engineering Management Graduate Program Seminar

Credit Hours: 1.00. Seminar focused on graduate-level development for Interdisciplinary Engineering (IDE) professional master's students in key professional skill areas including technical management, engineering industry awareness, networking, and methods for obtaining a professional position after graduation. Permission of instructor required. **Credits:** 1.00

ENGR 50200 - Engineering Leadership

Credit Hours: 3.00. Engineering leadership is the ability to inspire and guide engineering and technology-focused teams and organizations to achieve strategic outcomes. The successful engineering leader creates value at the intersection of technical systems and human systems. This course introduces students to evidence-based, practice-proven frameworks and tools related to (1) leadership presence, (2) cognitive diversity and psychological safety in teams, and (3) designing and transforming organizations and ecosystems. **Credits:** 3.00

ENGR 59600 - Special Topics

Credit Hours: 0.00 to 6.00. Special topic courses for projects or special interest in Engineering.**Credits:** 0.00 to 6.00

ENGR 60100 - Doctor Of Engineering Fundamentals

Credit Hours: 1.00. This course is designed to guide students in creating individual development plans tailored to their academic and professional aspirations as part of the Doctor of Engineering (D.Eng.) program. Students will learn to assess their skills, interests, and values, aligning them with potential research and academic paths. The course will cover setting realistic goals,

identifying resources, and developing strategies for personal and academic growth. The course will also detail the differences between a professional doctorate (D.Eng) and a PhD program. Students will engage in workshops and activities that foster self-reflection and practical planning skills. By the end of the course, students will have a personalized roadmap that outlines the steps necessary to achieve their graduate school objectives. As the foundational course for the Doctor of Engineering program, students are expected to take this course during their first year of the program. **Credits:** 1.00

ENGR 69199 - Professional Practice Graduate Co-Op I

Credit Hours: 0.00. Graduate cooperative education experience. Program coordinated by the Office of Professional Practice with cooperation from academic disciplines and participating employers. Students submit technical report and company evaluation. Permission of Instructor required. **Credits:** 0.00

ENGR 69299 - Professional Practice Graduate Co-Op II

Credit Hours: 0.00. Graduate cooperative education experience. Program coordinated by the Office of Professional Practice with cooperation from academic disciplines and participating employers. Students submit technical report and company evaluation. Permission of Instructor required. Prerequisite: ENGR 69199. **Credits:** 0.00

ENGR 69399 - Professional Practice Graduate Co-Op III

Credit Hours: 0.00. Graduate cooperative education experience. Program coordinated by the Office of Professional Practice with cooperation from academic disciplines and participating employers. Students submit technical report and company evaluation. Permission of Instructor required. Prerequisite: ENGR 69299. **Credits:** 0.00

ENGR 69499 - Professional Practice Graduate Co-Op IV

Credit Hours: 0.00. Graduate cooperative education experience. Program coordinated by the Office of Professional Practice with cooperation from academic disciplines and participating employers. Students submit technical report and company evaluation. Permission of Instructor required. Prerequisite: ENGR 69399. **Credits:** 0.00

ENGR 69699 - Professional Practice Graduate Internship

Credit Hours: 0.00. Graduate internship experience. Program coordinated by the Office of Professional Practice with cooperation from academic disciplines and participating employers. Students submit technical report and company evaluation. Permission of Instructor required. **Credits:** 0.00

ENGR 69810 - Engineering Research

Credit Hours: 1.00 to 18.00. Designed for online engineering graduate students to participate in a mentored research experience. Permission of instructor required. **Credits:** 1.00 to 18.00

Engineering Education

ENE 49800 - Undergraduate Research In Engineering Education

Credit Hours: 1.00 to 3.00. Individual research projects for students with the approval of their academic advisors. Requires prior approval of, and arrangement with, a faculty research advisor in the Department of Engineering Education. Written and oral final reports are required. Permission of instructor required. **Credits:** 1.00 to 3.00

ENE 50100 - Professional Development In Engineering Education

Credit Hours: 1.00. This course provides beginning engineering education graduate students opportunities to define themselves with the engineering education department and within the field of engineering education. Students, faculty, and outside speakers present research topics, academic opportunities, and other information that will enhance students' graduate experiences. Permission of instructor required. Typically offered Fall.**Credits:** 1.00

ENE 50101 - Foundations Of Engineering Education

Credit Hours: 3.00. In this course, new doctoral students in engineering education explore their roles within the field of engineering education, create a learning plan that maps to program requirements, and develop habits of mind to support their ongoing professional development. Students learn to write clearly and coherently in an academic context. Students examine research trends and faculty interests so they can make informed choices about advising and program opportunities. Permission of instructor required. **Credits:** 3.00

ENE 50200 - History And Philosophy Of Engineering Education

Credit Hours: 3.00. Examines the history and philosophy of engineering education by: (1) exploring the history of engineering education through archival research and historical documents (critical moments, tensions, issues); (2) investigating philosophies of education and the philosophies that have guided engineering as a profession; and (3) critiquing the evolution of engineering education, identifying alternative scenarios, and imagining a future role in engineering education. This course introduces students to the field of engineering education while broadening their views of the roles of interrelationships between teaching and research. Open to students in Engineering Education. Permission of instructor required. Typically offered Fall.**Credits:** 3.00

ENE 50300 - Engineering Education Inquiry

Credit Hours: 3.00. This course is conceived as a bridge between beginning graduate students' knowledge of technical research and modes of inquiry appropriate to the new field of engineering education. It is designed as the entryway to required research method courses taken as part of the students' plan of study. By the end of this survey course, students will be able to critique research in terms of the quality of the authors' argument based on their chain of reasoning, and will recognize that the articulation of a research question, the significance of the question, the choice of methods in regards to the research goals, and the transparency of the explanation of the methodology are all the parts of the chain of reasoning. Permission of instructor required. Typically offered Fall.**Credits:** 3.00

ENE 50400 - Leadership, Policy, And Change In Science, Technology, Engineering, And Mathematics (STEM) Education

Credit Hours: 3.00. This course provides a foundation for examining historical and current perspectives of STEM education programs and policy at the secondary and postsecondary levels. Focusing on the relationships among education policy, leadership theories, and models of systemic change, this course will enable students to situate and envision their potential role in shaping engineering education within the context of the larger education landscape. Students will synthesize course readings, examine education policy, and reflect on leadership theories and change, as well as explore how they can influence leadership, policy, and /or organizational change in STEM education through a semester project. Typically offered Spring.**Credits:** 3.00

ENE 50500 - Theories Of Development And Engineering Thinking

Credit Hours: 3.00. This course examines theories of human development, learning and epistemology in the context of Engineering Education. A broad survey of readings guides an in-depth study of fundamental theories of development and knowledge generation as it relates to pedagogy and research. A rich body of theoretical literature will be studied in order to explore its relation to engineering education. Work in the course aims to construct answers to the following three questions: (1) How do theories of human learning, development, and epistemology help us think about engineering? (2) How do they relate to

engineering education? (3) How do they inform research method and practice in engineering education? No restrictions. It is helpful, however, for students to have engaged in prior reading-and writing- intensive courses that required them to synthesize large amounts of information. For this reason, it is recommended that students are enrolled currently in a graduate program at Purdue University. Permission of department required. Typically offered Spring.**Credits:** 3.00

ENE 50600 - Content, Assessment And Pedagogy: An Integrated Engineering Design Approach

Credit Hours: 3.00. The course is explicitly identified in the ENE-PhD requirements as a "foundation course" required for all students. This course is intended to be taken early in a graduate student's curriculum and therefore is designed to be a bridge between the student's previous experience with engineering (education, work, and teaching) and new engineering education research-based approaches. It is intended as an entryway to help students apply an engineering design approach to the design of instruction. To meet this aim, the course involves an iterative project-based approach in a context (design site) that is chosen by the student for its relevance, interest and potential application. Typically offered Spring.**Credits:** 3.00

ENE 55400 - Globalization And Engineering

Credit Hours: 3.00. The focus is on the multifaceted dynamics of globalization, and its impact on engineering practice and the lives and education of engineers. The course emphasizes engineering and globalization from the perspectives of the emerging Asian economies and Europe, as well as the United States. This course is designed for practicing engineers and engineering educators. It is taught within a learner-centric, highly interactive, collaborative learning environment in which students are expected to learn from the experiences and thinking of each other, as well as from the instructor, and other course resources. The course places emphasis on reading, writing, web-based research, and discussion. Students are recommended (but not required) to have a minimum of two years work experience as a practicing engineer and strong communication skills (self-assessed). Permission of instructor is required. Typically offered Fall.**Credits:** 3.00

ENE 58600 - Exploring Alternative Career Paths As An Engineering Educator

Credit Hours: 3.00. This course is designed for graduate students in engineering or closely related fields who want to be involved in educating current or future engineering students or practicing engineers or in communicating technical material to others, including teachers, the public, or policymakers - but are not currently interested in a tenure-track faculty position. It explores a wide range of positions in formal education, informal education (e.g., museums, foundations), industry, and government and offers an opportunity to learn and practice some skills typically required for success in those positions.**Credits:** 3.00

ENE 59000 - Special Problems In Engineering Education

Credit Hours: 1.00 to 6.00. Project or special topics of contemporary importance or of special interest that are outside the scope of the standard graduate curriculum. Interested students should seek a faculty advisor by meeting individual faculty members who work in their area of special interest and prepare a brief description of the work to be undertaken and expected outcomes and deliverables. An individual project must be approved by the faculty member supervising the project and the student's advisor before registering for the course. An approved written report is required. Permission of instructor required.**Credits:** 1.00 to 6.00

ENE 59500 - Special Topics In Engineering Education

Credit Hours: 0.00 to 6.00. Primarily designed for specialized topic areas for which there is no specific course, workshop, or individual study plan, but having enough student interest to justify the formalized teaching of a course. Permission of instructor required.**Credits:** 0.00 to 6.00

ENE 62000 - Design, Cognition And Learning

Credit Hours: 3.00. Design is central to engineering: it is an integral part of the engineering profession and how we educate future professionals. Design cognition and learning is an area of engineering education research that seeks to understand what designers know and how they learn, and what tools best support design activity (e.g., collaboration, innovation, etc.). This research draws from many perspectives including cognitive psychology and the learning sciences, organizational learning, engineering and product design, architecture, human-centered interaction, and creativity and innovation. Themes in the course include (1) design knowledge, (2) what theories help understand design knowing and learning, (3) what are ways to study designers and design activity, and (4) how may design research inform design education and practice? Permission of instructor required. Typically offered Fall.**Credits:** 3.00

ENE 63000 - Cognitive Devices In Science, Technology, Engineering And Mathematics Learning Environments

Credit Hours: 3.00. This course explores the nature of technologies we use to assist in thinking, learning and teaching. Specific focus is on cognitive tools associated with engineering activities and how to blend these tools with science and mathematical knowledge. These will range from representational tools, computational tools and cognitive tools for supporting individual and group thinking and learning. Participants in this course will be able to evaluate various learning technologies relative to specific learning goals and outcomes and will design a technological tool to support thinking, learning and/or teaching about concepts in science, engineering, mathematics and technology. Participants will also be able to identify assessment methods that indicate cognitive change in learners as a measure of the effectiveness of a device/tool in context of an activity. **Credits:** 3.00

ENE 68500 - Educational Methods In Engineering

Credit Hours: 3.00. (CHE 68500) Students will learn how to teach in an engineering environment where both classroom and laboratory instruction is intertwined. Classroom techniques, such as lectures, cooperative groups, mastery and PSI, TV and video, and guided design will be studied, in addition to class preparation issues, such as ABET accreditation and design content. Students will study motivation, learning theories and cycles, and personality types. Includes teaching practice and group projects. Student must be admitted into a Ph.D. program in Engineering or other technical discipline (Finished with MS or MS-bypass). Not open to students who have taken PSY 69500/EDPS 63400. Permission of Instructor required. Typically offered Fall Spring.**Credits:** 3.00

ENE 68700 - Mentored Teaching In Engineering

Credit Hours: 1.00 or 3.00. Mentored experience in the teaching of engineering, with structured opportunities for individual reflection. All students create a scholarly teaching portfolio. Students who register for three credits conduct a scholarship of teaching and learning project. Prerequisites: Significant concurrent responsibility for teaching an engineering course. Registration in or completion of ENE 50600 (Content, Assessment And Pedagogy) or ENE 68500 (Educational Methods In Engineering); or instructor permission required. Typically offered Fall Spring.**Credits:** 1.00 or 3.00

ENE 69000 - Seminar In Engineering Education

Credit Hours: 0.00. Seminar course covering a broad range of current discovery, learning, and engagement topics in Engineering Education. Seminar presentations by representatives from academia, industry, other external institutions, and members of the Purdue University community. This is a required course for the graduate program in the Department of Engineering Education. Typically offered Fall Spring.**Credits:** 0.00

ENE 69500 - Advanced Topics In Engineering Education

Credit Hours: 0.00 to 6.00. Primarily designed for specialized topic areas for which there is no specific course, workshop, or individual study plan, but having enough student interest to justify the formalized teaching of a course. Permission of instructor required. Typically offered Summer Fall Spring.**Credits:** 0.00 to 6.00

ENE 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. MS Thesis. Permission of instructor required. Typically offered Summer Fall Spring.**Credits:** 1.00 to 18.00

ENE 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. PhD Thesis. Permission of instructor required. Typically offered Summer Fall Spring.**Credits:** 1.00 to 18.00

Engineering Projects in Community Service

EPCS 10100 - First Year Participation In EPICS

Credit Hours: 1.00. Together, Engineering Projects in Community Service (EPICS) courses create a vertical project track under which students work in multidisciplinary teams on long-term engineering-based design projects. Projects of at least one year in duration are intended to solve real problems that are defined in consultation with "customers" from not-for-profit community and education organizations. EPCS courses are open to students from all disciplines; each student contributes expertise in his/her academic discipline. Each team consists of a mix of first-year, sophomores, juniors, and seniors. Students are encouraged to participate in an EPICS project team for two or more semesters. First-year students participating in EPCS 10100 gain insight into the specific project, and more generally, into the design and development process. They attend planning and reporting meetings with the customer and are expected attend all team meetings. Under the mentorship of the team's sophomores, juniors and seniors they perform and report upon tasks consistent with their level of discipline expertise. May be repeated for credit. **Credits:** 1.00

EPCS 10200 - First Year Participation In EPICS

Credit Hours: 2.00. Continuation of EPCS courses (see EPCS 10100). Participants in EPCS 10200 gain insight into the specific project, and more generally, into the design and development process. They attend planning and reporting meetings with the customer and are expected to attend all team meetings. Working with team's sophomores, juniors and seniors they perform and report upon tasks consistent with their level of discipline expertise. EPCS 10200 is offered for two credits and is intended for students who have exhibited significant achievement in EPCS 10100 and desire the level of responsibility that is appropriate for two credits. May be repeated for credit. Permission of department required. **Credits:** 2.00

EPCS 11100 - First Year Participation In EPICS I

Credit Hours: 1.00. Together, Engineering Projects in Community Service (EPICS) courses create a vertical project track under which students work in multidisciplinary teams on long-term engineering-based design projects. Projects of at least one-year in duration are intended to solve real problems that are defined in consultation with "customers" from not-for-profit community and education organizations. EPCS courses are open to students from all disciplines; each student contributes expertise in his/her academic discipline. Each team consists of a mix of first-year, sophomores, juniors, and seniors. Students are encouraged to participate in an EPICS project team for two or more semesters. First-year students participating in EPCS gain insight into the specific project, and more generally, into the design and development process. They attend planning and reporting meetings with the customer and are expected to attend all team meetings. Under mentorship from upper-level students and instructors, they perform and report upon design tasks consistent with their level of discipline expertise. **Credits:** 1.00

EPCS 12100 - First Year Participation In EPICS II

Credit Hours: 1.00. Together, Engineering Projects in Community Service (EPICS) courses create a vertical project track under which students work in multidisciplinary teams on long-term engineering-based design projects. Projects of at least one year in duration are intended to solve real problems that are defined in consultation with "customers" from not-for-profit community and

educational organizations. EPCS courses are open to students from all disciplines; each student contributes expertise in his/her academic discipline. Each team consists of a mix of first-year, sophomores, juniors, and seniors. Students are encouraged to participate in an EPICS project for two or more semesters. First-year students participating in EPICS gain insight into the specific project, and more generally, into the design and development process. Under mentorship from upper-level students and instructors, they perform and report upon design tasks consistent with their level of discipline expertise. **Credits:** 1.00

EPCS 20100 - Sophomore Participation In EPICS

Credit Hours: 1.00. Continuation of EPCS courses (see EPCS 10100). Sophomores participating in EPCS 20100 gain insight into the specific project, and, more generally, into the design and development process. They attend planning and reporting meetings with the customer and are expected attend all team meetings. Under the mentorship of the team's juniors and seniors they perform and report upon tasks consistent with their level of discipline expertise. EPCS 20100 is offered for one credit. **Credits:** 1.00

EPCS 20200 - Sophomore Participation In EPICS

Credit Hours: 2.00. Continuation of EPCS courses (see EPCS 10100). Sophomores participating in EPCS 20100 gain insight into the specific project, and, more generally, into the design and development process. They attend planning and reporting meetings with the customer and are expected attend all team meetings. Under the mentorship of the team's juniors and seniors they perform and report upon tasks consistent with their level of discipline expertise. EPCS 20200 is offered for two credits. Permission of instructor required. **Credits:** 2.00

EPCS 30100 - Junior Participation In EPICS

Credit Hours: 1.00. Continuation of EPCS courses (see EPCS 10100). The responsibilities of juniors include working with the seniors in the planning and organization of the project, contributing to the design process, problem-solving by contributing expertise from their discipline, meeting with the customer, and the mentorship of sophomores and freshmen. EPCS 30100 is offered for 1 credit. The EPICS procedures manual provides information on expected relative workload for EPCS 30100 and EPCS 30200 students. May not be taken concurrently with EPCS 30200. **Credits:** 1.00

EPCS 30200 - Junior Participation In EPICS

Credit Hours: 2.00. Continuation of EPCS courses (see EPCS 10100). The responsibilities of juniors include working with the seniors in the planning and organization of the project, contributing to the design process, problem-solving by contributing expertise from their discipline, meeting with the customer, and the mentorship of sophomores and freshmen. EPCS 30200 is offered for two credits. The EPICS procedures manual provides information on expected relative workload for EPCS 30100 and EPCS 30200 students. May not be taken concurrently with EPCS 30100. **Credits:** 2.00

EPCS 40100 - Senior Participation In EPICS

Credit Hours: 1.00. Continuation of EPCS courses (see EPCS 10100). Seniors are responsible for the management tasks of planning and organizing their team project activity. They are expected to contribute expertise from their discipline to the design of the team's projects throughout most of the design process phases of problem identification, specification development, design, production, and deployment. Seniors will also meet with the customer and mentor the freshman, sophomores and juniors. Seniors using EPCS 40100/EPCS 40200 to fulfill capstone or design requirements where approved for their major may be required to satisfy additional course requirements specified by their degree program. EPCS 40100 is offered for 1 credit. The EPICS procedures manual provides information on expected relative workload for EPCS 40100 and EPCS 40200 students. May not be taken concurrently with EPCS 40200. **Credits:** 1.00

EPCS 40200 - Senior Participation In EPICS

Credit Hours: 2.00. Continuation of EPCS courses (see EPCS 10100). Seniors are responsible for the management tasks of planning and organizing their team project activity. They are expected to contribute expertise from their discipline to the design of the team's projects throughout most of the design process phases of problem identification, specification development, design, production, and deployment. Seniors will also meet with the customer and mentor the freshman, sophomores and juniors. Seniors using EPCS 40100/40200 to fulfill capstone or design requirements where approved for their major may be required to satisfy additional course requirements specified by their degree program. EPCS 40200 is offered for 2 credits. The EPICS procedures manual provides information on expected relative workload for EPCS 40100 and EPCS 40200 students. May not be taken concurrently with EPCS 40100. **Credits:** 2.00

EPCS 41100 - Senior Design Participation In EPICS

Credit Hours: 1.00. Continuation of EPICS courses. Seniors using EPCS 41100 to fulfill capstone or design requirements where approved for their major may be required to satisfy additional course requirements specified by their degree program. EPCS 41100 is offered for 1 credit. The EPICS procedures manual provides information on expected relative workload for EPCS 41100 and EPCS 41200 students. Seniors are responsible for the management tasks of planning and organizing their team project activity. They are expected to contribute expertise from their discipline to the design of the team's projects throughout most of the design process phases of problem identification, specification development, design, production, and deployment. Seniors will also meet with the customer and mentor the first year, sophomores and juniors. May not be taken concurrently with EPCS 41200. **Credits:** 1.00

EPCS 41200 - Senior Design Participation In EPICS

Credit Hours: 2.00. Continuation of EPICS courses. Seniors using EPCS 41200 to fulfill capstone or design requirements where approved for their major may be required to satisfy additional course requirements specified by their degree program. EPCS 41200 is offered for 2 credits. The EPICS procedures manual provides information on expected relative workload for EPCS 41100 and EPCS 41200 students. Seniors are responsible for the management tasks of planning and organizing their team project activity. They are expected to contribute expertise from their discipline to the design of the team's projects throughout most of the design process phases of problem identification, specification development, design, production, and deployment. Seniors will also meet with the customer and mentor the first year, sophomores and juniors. May not be taken concurrently with EPCS 41100. **Credits:** 2.00

EPCS 49000 - EPICS Special Topics Course

Credit Hours: 1.00 to 3.00. Projects of special interest outside the scope and structure of the standard EPICS courses. Interested students seek a faculty advisor in their area of special interest and together prepare a brief description of the work to be undertaken. Permission of instructor required. **Credits:** 1.00 to 3.00

Engineering Technology

ECET 52400 - Applied Electromagnetics

Credit Hours: 1.00 or 3.00. This course provides an advanced treatment of electromagnetics and applications at the graduate level for engineering technology students. Electric and magnetic field theory is presented, including Maxwell's equations. Topics include vector analysis, electric and magnetic fields, Maxwell's equations, electromagnetic wave radiation, and propagation. A semester-long project based on applied electromagnetics is required for each student. Knowledge of RF measurement equipment, such as spectrum analyzers and vector network analyzers is required.**Credits:** 1.00 or 3.00

ENGT 10100 - Industrial Technology Biotechnical Studies

Credit Hours: 3.00. Students are introduced to the fields of biotechnology, bioengineering, biomedical engineering, and bio-molecular engineering. Students design, fabricate and evaluate devices that solve biotechnical problems. **Credits:** 3.00

ENGT 10200 - Industrial Technology Aerospace Studies

Credit Hours: 3.00. This course introduces students to the world of aeronautics, flight, and engineering. Students apply scientific and engineering concepts to design materials and processes that measure, repair, improves, and extend aeronautical systems. **Credits:** 3.00

ENGT 10300 - Industrial Technology Exploring Civil Engineering And Architecture

Credit Hours: 3.00. Students learn various aspects of civil engineering and architecture, apply their knowledge to designing and development of a commercial property. Students learn about documenting their project, problem-solving, and communications in the civil engineering community. **Credits:** 3.00

ENGT 10500 - Industrial Technology Introduction To Design

Credit Hours: 3.00. This course develops students' problem-solving skills, with emphasis placed upon the concept of developing a three-dimensional model of an object. Students focus on the application of visualization processes and tools currently used in the design and manufacturing environments. **Credits:** 3.00

ENGT 10600 - Industrial Technology Digital Electronics

Credit Hours: 3.00. This course is the study of applied digital logic. Students will study the application of electronic logic circuits and apply Boolean logic to the solution of problems. Students will design circuits, export their design to a printed program that generates printed circuit boards, and construct the design using electronic components. **Credits:** 3.00

ENGT 10700 - Industrial Technology Principles Of Engineering

Credit Hours: 3.00. This course explores various engineering systems and manufacturing processes. Students examine how the field of engineering technology addresses social and political consequences of technological change. **Credits:** 3.00

ENGT 10800 - Industrial Technology Computer-Integrated Manufacturing

Credit Hours: 3.00. This course builds on students' solid modeling skills to develop manufactured products. Students evaluate products using mass property analysis, make appropriate modifications, and use prototyping equipment to produce three-dimensional models of the solutions. **Credits:** 3.00

ENGT 10900 - Industrial Technology Engineering Design And Development

Credit Hours: 3.00. In this capstone course students work in teams to design and construct a solution to an engineering problem, applying the knowledge and skills previously developed. Students maintain a portfolio of their design and development activities. Teams are responsible for making final presentations of the solution to an engineering review panel. **Credits:** 3.00

ENGT 18000 - Engineering Technology Foundations

Credit Hours: 3.00. This course introduces School of Engineering Technology students to resources and skills that will help them to be successful in their studies and ultimately in their careers. The skills needed to define and solve technical problems in engineering technology are developed. Instruction is given in analytical and computational problem-solving techniques.

Application of software for analysis and communication is emphasized. Teamwork, global and societal concerns, and professional ethics are integrated into course projects. **Credits:** 3.00

ENGT 18100 - Engineering Technology Applications

Credit Hours: 1.00. Basic electrical, electronics, mechanical, and process laboratory skills are introduced, including simple troubleshooting techniques and safety practice. Relevant engineering technology projects are emphasized. **Credits:** 1.00

ENGT 18200 - Gateway To Engineering Technology

Credit Hours: 4.00. This course introduces School of Engineering Technology students to the resources and skills needed to define and solve technical problems, which will help them be successful in their studies and ultimately in their careers. Instruction is given in analytical and computational problem-solving techniques. The application of software for analysis and problem-solving is emphasized. Foundational principles for electrical, industrial, manufacturing, and mechanical engineering technology are studied. Teamwork, global and societal concerns, and professional ethics are integrated into course. **Credits:** 4.00

ENGT 22670 - Sustainable Energy Technologies: An International Perspective

Credit Hours: 3.00. This course is a survey of sustainable energy technologies taught at Ostfalia University in Wolfenbuttel, Germany during the two-week International Summer University Program. Wind, Solar, Hydro-electric, Hydrogen Fuel Cell, Biomass, and other technologies are studied along with the future of Nuclear and Coal powered generation. The economic aspects of shifting to renewable energy sources by Germany are presented. Field trips to energy-related industries and historic cities occur nearly every day. Permission of instructor required. **Credits:** 3.00

ENGT 29000 - Special Topics In ENGT

Credit Hours: 1.00 to 3.00. Group instruction in new or specialty areas of engineering technology is provided by SOET faculty, subject to SOET curriculum subcommittee approval. Hours, subject matter, and credit to be arranged by faculty. Permission of department required. **Credits:** 1.00 to 3.00

ENGT 29900 - Engineering Technology Project

Credit Hours: 1.00 to 3.00. Independent project or study of a special topics is conducted under the supervision of appropriate SOET faculty. Hours and subject matter must be arranged with the instructor and approved by the SOET curriculum subcommittee before enrolling in the course. Permission of department required. **Credits:** 1.00 to 3.00

ENGT 39000 - Special Topics In Engineering Technology

Credit Hours: 1.00 to 3.00. Group instruction in new or specialty areas of engineering technology is provided by SOET faculty, subject to SOET curriculum subcommittee approval. Hours, subject matter, and credit to be arranged by faculty. Permission of department required. **Credits:** 1.00 to 3.00

ENGT 39900 - Engineering Technology Project

Credit Hours: 1.00 to 6.00. Independent project or study of a special topic is conducted under the supervision of appropriate SOET faculty. Hours and subject matter must be arranged with the instructor and approved by the SOET curriculum subcommittee before enrolling in the course. Permission of department required. **Credits:** 1.00 to 6.00

ENGT 48000 - Engineering Technology Capstone I

Credit Hours: 3.00. This is the first course of a two-term senior capstone sequence. The skills needed to define, design and develop engineering technology solutions are introduced and developed. Planning and designing alternatives that meet cost, performance, and user-interface goals are emphasized. Project planning, scheduling, and management techniques are studied. Different design approaches are compared. Teamwork, global and societal concerns, and professional ethics are integrated into course projects.**Credits:** 3.00

ENGT 48100 - Engineering Technology Capstone II

Credit Hours: 3.00. This is the second course of two-term capstone sequence, addressing an industry-based problem. The focus of the course is on designing and implementing an acceptable solution. **Credits:** 3.00

ENGT 49000 - Special Topics In Engineering Technology

Credit Hours: 1.00 to 3.00. Group instruction in new or specialty areas of engineering technology is provided by SOET faculty, subject to SOET curriculum subcommittee approval. Hours, subject, matter, and credit to be arranged by faculty. Permission of department required. **Credits:** 1.00 to 3.00

ENGT 49900 - Engineering Technology Project

Credit Hours: 1.00 to 6.00. Independent project or study of a special topic is conducted under the supervision of appropriate SOET faculty. Hours and subject matter must be arranged with the instructor and approved by the SOET curriculum subcommittee before enrolling in the course. Permission of department required. **Credits:** 1.00 to 6.00

ENGT 50100 - Graduate Research Seminar

Credit Hours: 0.00 or 1.00. This course is intended to orient new graduate students to the Engineering Technology (ET) program and faculty. This includes PhD students and students pursuing a Master's degree through a thesis or directed project option. This does not include students pursuing a Master's degree with coursework only. Research activities within ET and throughout Purdue University are discussed. Student resources and opportunities are reviewed to give the students the tools they need to be successful. In addition, this course provides a way to develop a natural cohort of graduate students. This course is a graduate seminar course focused on the ET program. Graduate status or upper-division undergraduate. Permission of department required. **Credits:** 0.00 or 1.00

ENGT 50200 - Developmental Testing And Innovation Seminar

Credit Hours: 1.00. The course introduces Engineering Technology and the requirements to fulfill the master's and/or PhD Technology degrees. The seminar can include graduate faculty from the SoET, the NAVY, and other Engineering and Technology related disciplines from the Purdue Polytechnic, College of Engineering, and other STEM related disciplines across campus. **Credits:** 1.00

ENGT 50700 - Fundamentals Of Collaborative Leadership And Agile Strategy For Engineering Technology

Credit Hours: 3.00. This course will provide students with a foundation in collaborative leadership and agile strategy. The course brings together theories and insights from a variety of disciplines including engineering, management, psychology, and social science. Increasingly manufacturing management is being called upon to apply their technical skills in collaborative environments that cut across organizational units and inter-organizational boundaries. Understanding how to design and guide collaborations and apply agile approaches for meeting strategic objectives is an important skill set and knowledge base in the 21st-century economy, defined more by open networks than the ridged hierarchies of the past. **Credits:** 3.00

ENGT 50900 - Applied Computational Methods

Credit Hours: 1.00 to 3.00. This class covers the mathematics typically needed for research in engineering technology and is especially suited to the needs of ENGT student. The class includes basic calculus, introductory numerical methods, implemented in MATLAB, and elementary linear algebra. It uses relevant, practical problems to teach concepts and provides the students with actionable information. The starting point is graphical and numerical solutions of systems of non-linear algebraic equations. The class progresses to simple ordinary differential equations. Prerequisite: Six credits of undergraduate classes in technical mathematics, focusing on calculus.**Credits:** 1.00 to 3.00

ENGT 54000 - Change Management For Enterprise Sustainability

Credit Hours: 3.00. Change management is at the core of an engineering organization's processes and data, and it affects every member of the enterprise. Change management provides a method for identifying, analyzing, preparing, implementing, validating, and documenting engineering changes throughout a product's lifecycle, to ensure everyone in the organization is working from the same product record and changes are communicated in real-time. In this course, the core elements, data structures, stakeholders, and workflows of change management and their role as enablers of the digital thread and the digital enterprise are discussed. The application of the industry standard CM2 methodology is emphasized as a strategy to provide control, maintain data integrity, and improve visibility and traceability of changes.**Credits:** 3.00

ENGT 54200 - Cyber-Animal Systems I: Technology-Enhanced Animal Welfare

Credit Hours: 3.00. Cyber-Animal Systems is an interdisciplinary course involving hardware science, software science, and animal science students, who will study the interaction of animals and computer-controlled systems. The course addresses recent advances in robotics, data science, and animal husbandry that combine to create collaborative robots, wearable devices, and biological and environmental sensing systems that improve the practice of precision animal agriculture. Topics include case studies of technology adoption in animal agriculture, impacts of animal welfare on farm production and climate, and the importance of animal societies, confounding variables in animal studies, and animal anxiety on the design of experiments for technology integration. All students will learn mentoring techniques for tutoring other students from different disciplines so they develop skills in "lifelong teaching". **Credits:** 3.00

ENGT 55000 - Manufacturing System Design For Sustainability

Credit Hours: 3.00. This course prepares manufacturing and information technology leaders to design and analyze manufacturing processes to achieve manufacturing system objectives that meet internal and external customers quality, cost and delivery requirements within a safe environment. The course project covers major aspects of manufacturing system design and Industry 4.0 in the context of meeting customer needs. Technology leaders and entrepreneurs learn how to work with others to develop the design of manufacturing systems that are sustainable (business, ecological, social, technological) for the long term. When to use lean and six-sigma techniques in the context of the manufacturing enterprise system design to meet customer needs will be assessed from a system design perspective, through analytical and computer simulation techniques, and through the use of physical modeling tools. **Credits:** 3.00

ENGT 56100 - Metrology Concepts And Applications

Credit Hours: 3.00. Metrology is a fundamental concept required for obtaining scientific data and understanding instrumentation. This course introduces the concepts of metrology associated with measurement systems: sensors, signal conditioning, data acquisition and analysis, as well as the error propagation. System and environmental noise are investigated along with methods to mitigate influences of noise. Standards and calibration of instrumentation are also studied. Concepts of metrology for the seven basic units of measurements are described from the macro to nano-scale. **Credits:** 3.00

ENGT 57100 - Applied Nanotechnology

Credit Hours: 3.00. The emerging field of nanotechnology introduces new challenges and opportunities in a variety of career fields. This course introduces students to the concepts of nanotechnology including electronics/mechanics, materials, tools and applications. The experience allows students to move beyond the boundaries of standard application of mechanical and electrical systems into the next generation or dimension of their chosen fields. The course incorporates experiential instruction to reinforce the concepts learned in the lecture. Permission of department required. **Credits:** 3.00

ENGT 58100 - Workshop In Engineering Technology

Credit Hours: 1.00 to 21.00. This course number is used to pilot and develop new graduate-level courses. Each 58100 course number is followed by either a unique alphabetic suffix (e.g., ABC) or numeric suffix (e.g., 123) and is given a unique title and course description. These courses can be included in a graduate plan of study with the usual condition that they must be approved by the student's graduate committee. Accordingly, it is important to discuss these courses with your faculty advisor and committee prior to registration. Permission of instructor required. **Credits:** 1.00 to 21.00

ENGT 58300 - Applied Engineering Statistics For Industry

Credit Hours: 3.00. The purpose of this course is to teach the practitioner how to use and make better-informed decisions as a manager for making optimum process, business, or personnel decisions. Emphasis will be placed on Verification, Validation in R&D, Manufacturing, QA/QC, basic probability, Summarizing Data, Basic Tools (flowcharts, fishbone diagrams, Pareto charts), Process Capability - Cp/Cpk. Upper and lower control limits/charts, Use of Control Charts for Continual Improvement, Six Sigma, Design of Experiments, Taguchi Methodology and Data Analytics will also be covered. **Credits:** 3.00

ENGT 59000 - Special Problems In Engineering Technology

Credit Hours: 1.00 to 3.00. The ENGT 59000 course code is intended primarily for students to undertake targeted study or projects to develop depth in an area related to their area of research, where no other comparable course is available at Purdue or conveniently elsewhere. You may take up to 9 credits of ENGT 59000 as part of your Plan of Study. Requests to extend the number of credits must be decided within your graduate committee and documented with the Graduate Chair. Permission of instructor required. **Credits:** 1.00 to 3.00

ENGT 60500 - Engineering Technology Research Writing Strategies

Credit Hours: 3.00. The stated Master of Science in Engineering Technology graduate course teaches research literature mining and analysis found in Purdue licensed databases. Focuses on detail, a measurable topic, literature review, reporting, citation, data visualization using APA. Requires research paper writing aligned with ARWE specifications for in-depth research preparation and reporting. Students will research a topic relevant to a workplace problem in their industry. For example, a new technology, a process (Giga Casting for example), a material, supply chain, digitization, industry 4/5.0, sustainability, workforce diversity, aging workforce, ethics in the workplace, offshoring vs. onshoring, direct part marking, inventory/project management, cybersecurity risks, facility management, energy management, patents/intellectual property or environmental compliance. Keep in mind, Before You Start, that whichever topic you choose, the problem must be measurable. Measurable either from a quantitative or qualitative statistic perspective. Your topic will have to be tied to a global grand engineering challenge we face as a society and/or industry.**Credits:** 3.00

MET 37900 - Introduction To Aerospace Technology

Credit Hours: 3.00. An overview of flight vehicle design is introduced through designing and making radio controlled model flight vehicles. Aerodynamic forces, dynamics and longitudinal stability are studied. Students will make airframes, integrate the controls, and test fly the resulting vehicles.**Credits:** 3.00

English

ENGL 1080N - Reading, Writing, And Inquiry I

Credit Hours: 2.00 to 4.00. This course teaches skills of critical reading, thinking, and writing to help students meaningfully engage artifacts, events, and issues in our world. The course builds students' abilities to read written and cultural texts critically; to analyze those texts in ways that engage both students' own experiences and the perspectives of others; and to write about those texts for a range of audiences and purposes as a means of participating in broader conversations. Assignments emphasize the analysis and synthesis of sources in making and developing claims.**Credits:** 2.00 to 4.00

ENGL 10400 - English Composition I

Credit Hours: 3.00. Emphasis on the organization of the expository theme. Directed writings of themes based on personal experience, on the relationship between experience and language, and on the relationship between experience and ideas.**Credits:** 3.00

ENGL 10500 - English Composition II

Credit Hours: 3.00. The second half of the basic composition sequence. Extensive practice in writing clear and effective prose. Instruction in logic, structure, and style.**Credits:** 3.00

ENGL 10600 - First Year Composition With Conferences

Credit Hours: 4.00. This 4-credit hour composition course includes student-teacher conferences. Students in this course produce between 7,500-11,500 words of polished writing (or 15,000-22,000 total words, including drafts or the equivalent). Within the course, students will learn to write with a rhetorical awareness of diverse audiences, situations, and contexts; critically think about writing and rhetoric through reading, analysis, and reflection; provide constructive feedback and incorporate feedback into their own writing; perform research and evaluate sources to support claims; and engage multiple digital technologies for different purposes.**Credits:** 4.00

ENGL 10800 - First Year Composition

Credit Hours: 3.00. In this 3-credit hour composition course students should expect an emphasis on self-guided work. Students in this course produce between 7,500-11,500 words of polished writing (or 15,000-22,000 total words, including drafts or the equivalent). Within the course, students will learn to write with a rhetorical awareness of diverse audiences, situations, and contexts; critically think about writing and rhetoric through reading, analysis, and reflection; provide constructive feedback and incorporate feedback into their own writing; perform research and evaluate sources to support claims; and engage multiple digital technologies for different purposes.**Credits:** 3.00

ENGL 11000 - SHOULD BE SCLA

Credit Hours: 3.00. The course takes a social science-based approach to investigating the American university by examining contemporary college life, the history of the American academy, social and environmental issues on campus, and opportunities for engagement with the wider community. Students will improve their speaking, listening, reading, writing skills in English so that they can actively participate in social and academic communication. **Credits:** 3.00

ENGL 11100 - SHOULD BE SCLA

Credit Hours: 3.00. Students will continue to develop the foundational language skills and knowledge that they need to succeed in their other classes at Purdue and to prepare for further academic and professional opportunities. Students will also deepen their understanding of American culture and improve their ability to think about cultural differences in positive ways. In a sense, this class will be a bridge to help you transition to other language-intensive courses at Purdue where you need to read, write, and

speak frequently and/or work in groups (such as business, engineering, literature, public speaking, and social sciences). **Credits:** 3.00

ENGL 19500 - Introducing English

Credit Hours: 1.00. This introductory seminar familiarizes students with the different majors in English as well as potential career opportunities, introduces them to departmental and College of Liberal Arts resources, and promotes community through participation in English Department activities. These include visits to the Writing Lab (English) and the Career Center (CLA); common read book discussions; & more. **Credits:** 1.00

ENGL 20102 - Introduction To Digital Humanities

Credit Hours: 3.00. This is an interdisciplinary foundational course that combines theory and practice to teach students in and about digitally mediated culture. Accordingly, this course fosters a critical understanding of the digital and its implication for the development of a technologically driven society. Students will be introduced to digital inquiry and critical practice and explore the ways that the digital transforms knowledge acquisition and production across the humanities, social sciences and sciences. Students will engage in readings and activities that help them form substantive perspectives on the digital formulations and practice through digital technologies and tools. Students will also experiment with digital methods and tools by building a digital project. This course places an emphasis on engaged learning through online and in-class discussion, digital activities, and collaborative work.**Credits:** 3.00

ENGL 20200 - Engaging English

Credit Hours: 3.00. This theme-based course introduces students to the field of English, and provides foundational liberal arts skills. It teaches, for instance, critical and creative thinking, reading, and writing using a variety of genres, texts, and media. **Credits:** 3.00

ENGL 20300 - Introduction To Research For Professional Writers

Credit Hours: 3.00. Introduction to research sources and methods useful for professional writers, including electronic resources. Focus on collecting print and online information, interviewing, surveying, and conducting observations; and on evaluating, summarizing, analyzing, and reporting research. Typically offered Summer Fall Spring.**Credits:** 3.00

ENGL 20400 - Special Topics In Writing

Credit Hours: 3.00. A course in writing, with the special topic selected by the instructor. Typically offered Fall Spring.**Credits:** 3.00

ENGL 20500 - Introduction To Creative Writing

Credit Hours: 3.00. Practice in writing short prose narratives and poetry for students who have finished composition and wish to develop their skills further. Workshop criticism. CTL:IEL 1230 Introduction To Creative Writing**Credits:** 3.00

ENGL 21500 - Inventing Languages

Credit Hours: 3.00. "Invented languages" include linguistic systems created for fictional worlds, such as Dothraki (Game of Thrones), Na'vi (Avatar), Elvish (Lord of the Rings) and Klingon (Star Trek), as well as languages invented for international communication by real speakers, such as Esperanto. In this course, you will study these systems, learn the major properties of natural human languages, and construct your own rudimentary languages. **Credits:** 3.00

ENGL 21700 - Figures Of Myth And Legend I: Monsters

Credit Hours: 3.00. This course traces specific monster case studies across a variety of genres and media from the ancient to the modern period. It explores the way monsters define and police the boundaries of what it means to be human, and provide a common language for crystallizing specific social, ethnic, and national practices. **Credits:** 3.00

ENGL 21800 - Figures Of Myth And Legends II: Heroes And Villains

Credit Hours: 3.00. This class offers in-depth explorations of the larger-than-life leaders (on the side of good, and sometimes evil, too) who have become models for how we think of heroism, charisma, and what it means to seek and wield power over others. From the chivalric Knights of the Round Table to the frightening energy of the Viking comitatus bands, it will show that no models of mythic leadership come without their complications--or admirable qualities. **Credits:** 3.00

ENGL 21900 - Figures Of Myth And Legend III: Magic And Marvels

Credit Hours: 3.00. This course surveys stories of elves, fairies, wizards, witches, etc., and explores the allure of all things marvelous, strange, and magical. It considers how language itself constitutes a kind of magic; examines magic as technology and vice versa, since, as Arthur C. Clarke famously declared: "Any sufficiently advanced technology is indistinguishable from magic"; and seeks to understand how people across history have used stories of magic to reinforce (mystify) or upend (defamiliarize) the status quo. **Credits:** 3.00

ENGL 22002 - Technology And Play

Credit Hours: 3.00. This course introduces students to games, as well as investigating innovations and controversies in the gaming industry. It will explore theories of play, how technological innovations and business practices in both digital and analog gaming (through board games, video games, tabletop games, and esports) mediate or structure the experience of play. It will also survey the rise of myriad gaming subcultures, including celebrity streamers and esports.**Credits:** 3.00

ENGL 22300 - Literature And Technology

Credit Hours: 3.00. This class uses literature to explore how technological innovation both enables and constrains creativity. It also explores how technology has been represented in literature, and examines the relationship between literature and new media. **Credits:** 3.00

ENGL 22400 - Literature, Money, And Markets

Credit Hours: 3.00. This course explores the interconnections among markets, business and its management, and literature. It examines representations of traditional markets (industry, finance, and global trade) as well as alternative markets (the market in bodies, the black market, and the digital marketplace economy). The course will present a wide-ranging survey of canonical texts, orienting the reader as to how classics from Chaucer to Dickens are engaged in the business of thinking about business. But it will also engage with alternative viewpoints and contemporary concerns about business practices, literature, and individual consciousness in the techno-digital age. **Credits:** 3.00

ENGL 22500 - Literature, Inequality, And Injustice

Credit Hours: 3.00. This course introduces students to literature addressing inequality and social justice. Questions will include: What is social justice? How do literary works reproduce or resist dominant ideologies? How does literature provide tools to map social and economic formations? What role have literary works played in emancipatory and egalitarian political movements? Readings and comparison of these texts will help examine how literature maintains a variety of communities.**Credits:** 3.00

ENGL 22600 - Narrative Medicine

Credit Hours: 3.00. "Narrative Medicine" encompasses stories about the interior lives of doctors and medical professionals, the complexities of medicine past and present, and health-care for patients and their families. Ultimately, this course emphasizes the essential role of rhetoric and storytelling in the face of medical crisis and uses stories about illness and disability to explore the human condition. **Credits:** 3.00

ENGL 22700 - Elements Of Linguistics

Credit Hours: 3.00. A summary of what is known about human language, its structure, its universality, and its diversity; language in its social setting; language in relation to other aspects of human inquiry and knowledge. Typically offered Fall Spring Summer. CTL:IEL 1260 Introduction To Linguistics**Credits:** 3.00

ENGL 22800 - Language And Social Identity

Credit Hours: 3.00. This course introduces linguistic diversity, including regional, cultural, and stylistic variation within a single language, code-switching in bilingual communities, and colonial, immigrant, Creole, indigenous, and sign languages. It also explores the role of language in supporting various types of social identity (e.g., age, gender, social class, race, ethnicity) as well as power structures that enable discrimination against less powerful groups. **Credits:** 3.00

ENGL 22900 - Creole Languages And Cultures

Credit Hours: 3.00. This course introduces the concept of pidgin and creole languages across the world, with a focus on English-based pidgins and creoles. It addresses their geographical distribution and some of their cultural manifestations such as music, food and literature on both sides of the Atlantic. The course presents a general view of the historical events that led to the formation of creole languages and to the development of the African diaspora. We will consider different varieties of creole languages and (their) cultures including English-based creoles in West Africa such as Kru (Liberia and Sierra Leone), Nigerian Pidgin and Cameroonian Pidgin; in the Caribbean such as Jamaican, San Andreas, Nicaraguan and Limonense, contrasting them with the Spanish-based creole Palenquero; and the three most predominant creoles in the U.S. Louisiana Creole, Gullah and Hawaii Creole, to understand their characteristics and their history. We will explore the ways in which the languages manifest in the music and literature of the contexts where they are spoken. Finally, we will consider the African diaspora as a fundamental thread that ties (English-based) creole languages and peoples together. In exploring these issues, the course will draw on a variety of theoretical concepts and traditions from sociolinguistics, creole studies and African American studies. **Credits:** 3.00

ENGL 23000 - Great Narrative Works

Credit Hours: 3.00. Reading and discussion of great narratives from Homer's Odyssey to the present, considering works from a variety of cultures and time periods in order to develop an understanding of their ideas, structures, styles, and cultural values. Typically offered Fall Spring Summer.**Credits:** 3.00

ENGL 23100 - Introduction To Literature

Credit Hours: 3.00. Reading and discussion of great works of various types to develop an understanding of their ideas, structures, and styles. Includes poetry, drama, biography, essay, and prose fiction. Typically offered Fall Spring Summer. CTL:IEL 1270 Appreciation Of Literature**Credits:** 3.00

ENGL 23200 - Thematic Studies In Literature

Credit Hours: 3.00. Examination of a particular theme, such as the hero, death, or the city, and the techniques by which it is treated in various literary works, usually in more than one genre. Current offerings available from counselors. Typically offered Fall Spring Summer.**Credits:** 3.00

ENGL 23400 - Literature And The Environment

Credit Hours: 3.00. Literary study of nature writing; writing from the natural sciences; and canonical poetry, fiction, and essays through an ecological lens. Introduces students to ecocritical thought and environmental literary history. Typically offered Fall Spring Summer.**Credits:** 3.00

ENGL 23700 - Introduction To Poetry

Credit Hours: 3.00. Reading and discussion of poetry from different periods aimed at enhancing the student's understanding of genre, form, and style; how poetry grows out of and speaks to its historical moment; and how poetry addresses pressing social issues.**Credits:** 3.00

ENGL 23800 - Introduction To Fiction

Credit Hours: 3.00. Reading and discussion of fiction from different periods aimed at enhancing the student's understanding of genre, form, and style; how fiction grows out of and speaks to its historical moment; and how fiction addresses pressing social issues. **Credits:** 3.00

ENGL 24000 - British Literature Before 1789

Credit Hours: 3.00. A historically oriented survey of genres, authors, and texts from the medieval to the Romantic period. Typically offered Fall Spring Summer.**Credits:** 3.00

ENGL 24100 - British Literature After 1789

Credit Hours: 3.00. A historically oriented survey of genres, authors, and texts from the Romantic period on. Typically offered Fall Spring Summer.**Credits:** 3.00

ENGL 24900 - Great British Books

Credit Hours: 3.00. Why are British books so compelling? This course examines the dynamic history of British literature and explores how canonical and contemporary texts shaped the cultural landscape of Britain, the British Empire, and the world. **Credits:** 3.00

ENGL 25000 - Great American Books

Credit Hours: 3.00. What makes great American books so compelling? This course examines the dynamic history of American literature and explores how canonical and contemporary books have shaped the cultural landscape of the U.S. and the world. Typically offered Fall Spring Summer.**Credits:** 3.00

ENGL 25700 - Literature Of Black America

Credit Hours: 3.00. A survey of literature written by black American authors. Close attention is paid to the history of black literature and to the historical context in which it was written, as well as to the texts of major works by black writers. Typically offered Summer Fall Spring.**Credits:** 3.00

ENGL 26200 - Greek And Roman Classics In Translation

Credit Hours: 3.00. Study of important works of Greek and Roman literature, their intrinsic literary values, and their influence on later European and American writing and thinking. Typically offered Summer Fall Spring.**Credits:** 3.00

ENGL 26400 - The Bible As Literature

Credit Hours: 3.00. A literary study of selections from the Old and New Testaments as examples of Hebrew and early Christian literature.**Credits:** 3.00

ENGL 26600 - World Literature: From The Beginnings To 1700 A.D.

Credit Hours: 3.00. (CMPL 26600) World literature in translation. A comparative and chronological survey of the masterpieces of Eastern and Western literature. Typically offered Fall Spring Summer. CCN: IEL 1250 World Literature 1**Credits:** 3.00

ENGL 26700 - World Literature: From 1700 A.D. To The Present

Credit Hours: 3.00. (CMPL 26700) World literature in translation. A comparative and chronological survey of the masterpieces of Eastern and Western literature. Typically offered Summer Fall Spring. CCN: IEL 1251 World Literature 2**Credits:** 3.00

ENGL 27600 - Shakespeare On Film

Credit Hours: 3.00. Considers the relation of the written text of five or six Shakespeare plays to multiple film versions from a wide variety of times and cultures, e.g., the United States, England, France, Italy, Japan, Denmark, India, and Russia. Typically offered Fall Spring Summer.**Credits:** 3.00

ENGL 27900 - The American Short Story In Print And Film

Credit Hours: 3.00. Analysis of American short stories of the nineteenth and twentieth centuries, their filmed versions, their printed scenarios, and critical writings about the tales and their adaptations. Typically offered Summer Fall Spring.**Credits:** 3.00

ENGL 28000 - Games, Narrative, Culture

Credit Hours: 3.00. This is an introduction to the field of game studies, and to games as narrative and cultural media. We will look at the stories games tell; the way their narrative elements or plot devices intersect with the culture around the games and gaming itself; and how all these things come together to affect game design, meaning, and play. **Credits:** 3.00

ENGL 28600 - The Movies

Credit Hours: 3.00. Introduction to the movies from classic to contemporary films. Typically offered Fall Spring.**Credits:** 3.00

ENGL 30100 - Ways Of Reading

Credit Hours: 3.00. Introduction to literary theory and practice. Close reading of and significant writing about selected literary texts informed by a variety of critical and/or theoretical perspectives.**Credits:** 3.00

ENGL 30400 - Advanced Composition

Credit Hours: 3.00. Designed for students who wish additional training in composition beyond the basic requirements. Extensive practice in the writing of mature expository, critical, and argumentative prose. (The course satisfies the Indiana certification requirement of three hours of advanced composition.). Typically offered Fall Spring Summer.**Credits:** 3.00

ENGL 30600 - Introduction To Professional Writing

Credit Hours: 3.00. Development of skill in analyzing rhetorical situations in the workplace. Practice in planning, writing, evaluating, and revising a variety of documents typical of those used in the arts and industry. Typically offered Fall Spring Summer.**Credits:** 3.00

ENGL 30900 - Digital Design And Production

Credit Hours: 3.00. The development of the ability to write and design documents using electronic publishing technologies. Students will receive instruction in writing, graphics, and publishing software and will write, design, produce, and critique a number of publications.**Credits:** 3.00

ENGL 31600 - Craft Of Fiction From A Writer's Perspective

Credit Hours: 3.00. This course focuses on the craft of fiction with some consideration of its underlying principles from a writer's perspective. Topics of study may include works of fiction, statements of aesthetics and craft, and various fictional forms. Typically offered Fall Spring.**Credits:** 3.00

ENGL 31700 - Craft Of Poetry From A Writer's Perspective

Credit Hours: 3.00. This course focuses on the craft of poetry with some consideration of its underlying principles from a writer's perspective. Topics of study may include works of poetry, statements of aesthetics and craft, and various poetic forms.**Credits:** 3.00

ENGL 32200 - Word, Image, Media

Credit Hours: 3.00. This course introduces students to the study of images, their relationship to language, and their functions in media. From decoding advertising messages to analyzing digital journalism, students will learn how images and their viewers make meaning in a variety of media contexts. **Credits:** 3.00

ENGL 32700 - English Language I: History And Development

Credit Hours: 3.00. Introduction to the history of the English language, its sounds, inflections, words, and sentence structures. Cultural and historical events affecting this history, and the interplay between language and literature. Typically offered Fall Spring.**Credits:** 3.00

ENGL 32800 - English Language II: Structure And Meaning

Credit Hours: 3.00. The structure of American English and its dialects, with emphasis on syntax and semantics, including parts of speech, sentence structure, and meaning. Implications of recent theory for the teaching of English. Credit will not be given for both ENGL 32800 and LING 32100. Typically offered Fall Spring.**Credits:** 3.00

ENGL 32900 - English Language III: Sound And Form

Credit Hours: 3.00. The structure of American English and its dialects, with emphasis on phonology and morphology. Implications of recent theory to the teaching of English. Typically offered Fall Spring.**Credits:** 3.00

ENGL 33000 - Games And Diversity

Credit Hours: 3.00. This course looks critically at diversity in games, game development, and in the larger mainstream games community. Students will analyze and play games that related to women, minorities, members of the LGBTQ community, and/or those who lack access because of disability. **Credits:** 3.00

ENGL 33100 - Medieval English Literature

Credit Hours: 3.00. A survey of Saxon and Medieval English literature (700-1500 A.D.) through intensive reading of Old English heroic, elegiac, and religious poetry and Middle English romance, allegory, lyric, and drama, exclusive of Chaucer. **Credits:** 3.00

ENGL 33200 - Games And User Experience (UX)

Credit Hours: 3.00. This course connects gamers and their experiences with games by developing ways to harvest gaming experiences for the improvement of games. We aim to prepare you to better understand gaming experiences, use those understandings to improve games in development, and be able to think and write critically about those experiences. **Credits:** 3.00

ENGL 34100 - Topics In Science, Literature, And Culture

Credit Hours: 3.00. This course focuses on issues in and representation of science and technology in various texts, including literature, film, science, and theory. May be repeated for credit only under a different topic. Typically offered Fall Spring.**Credits:** 3.00

ENGL 34200 - Legal Fictions

Credit Hours: 3.00. This course explores legal conflicts through literature. It uses the narratives created by the cat-and-mouse of procedural dramas, emotionally charged trial scenes, and dramatic courtroom struggles, to introduce different schools of jurisprudence, and to critically examine the decisions made by those with social and legal governing power. **Credits:** 3.00

ENGL 34300 - Labor And Literature

Credit Hours: 3.00. This course introduces its students to the transformative synergy between the labor of literature and labor within literature. In contrast to accepting the marketplace as a societal monolith, the readings illustrate the role of labor in creation. This course will examine labor taken in its broadest sense, from the labor of self-fashioning to the labor of industries; the labor of life and the labor of destruction and the implications of the laboring body from market creation to market collapse. Diverse readings range from traditional literary staples to modern representations of the labor market. **Credits:** 3.00

ENGL 34400 - Environmental Ethics, Policy, And Sustainability

Credit Hours: 3.00. Environmental Ethics, Policy and Sustainability is an interdisciplinary course designed to open new pathways into ethical and eco-critical inquiry in the Anthropocene age. The course analyzes disciplinary differences in approaching the ethical, the human, and environmental problems such as sustainability, development, biodiversity, global security, and climate change. Students will explore what it means to be ethical in and through an interrogation of our contemporary conceptions of what it means to be human. These interrogations in turn will prompt us to reconsider human creations such as knowledge, culture, and technology, which will push us to genuinely think how humans as a species situate

their creations within the realm of what they call Nature. Students will be introduced to the history of environmental studies in the discipline, to the rise of what is now known as "postcolonial ecocriticism" to theoretical inquiry into modern technology, and to other recent developments in the fields of environmental studies. **Credits:** 3.00

ENGL 34500 - Games And World Building

Credit Hours: 3.00. Every game designer and gamer knows that there is more to narrative than just words on a page and more to worldbuilding than images on a screen. This course looks at the ways that narrative worlds get built-in games. We will begin by looking at the narrative elements in analog games that have been the foundation of many digital games and move on to look at the elements in digital games that come together to form the worlds. **Credits:** 3.00

ENGL 35000 - American Literature Before 1865

Credit Hours: 3.00. A historically oriented survey of genres, authors, and texts from European colonization to the U.S. Civil War. Typically offered Fall Spring Summer. CTL:IEL 1210 American Literature I**Credits:** 3.00

ENGL 35100 - American Literature After 1865

Credit Hours: 3.00. A survey of American literature from the Civil War to the present.Typically offered Spring Summer Fall. CTL:IEL 1211 American Literature II**Credits:** 3.00

ENGL 35200 - Native American Literature

Credit Hours: 3.00. Study of literature by Native American authors in a variety of genres-novels, short stories, poetry, autobiography--using literary analysis, as well as historical, legal, and ethnographic materials. Typically offered Spring Fall.**Credits:** 3.00

ENGL 35400 - Asian American Literature

Credit Hours: 3.00. Study of Asian American Literature covering issues such as immigration, identity, class, and gender. Typically offered Spring.**Credits:** 3.00

ENGL 35800 - Black Drama

Credit Hours: 3.00. A critical analysis and discussion of selected representative works by African American dramatists - from William Wells Brown to the moderns. Typically offered Summer Fall Spring.**Credits:** 3.00

ENGL 35900 - Black Women Writers

Credit Hours: 3.00. (AAS 35900) This course introduces students to the rich and varied literary texts produced by black women writers. Literary analysis, along with a consideration of historical, cultural, gender, and racial contexts will be emphasized. Typically offered Summer Fall Spring.**Credits:** 3.00

ENGL 36000 - Gender And Literature

Credit Hours: 3.00. An introduction to feminist approaches to the study of literature, including poetry, drama, fiction, and/or autobiography. Examines how gender intersects with race, ethnicity, sexual orientation, and class in shaping authorship, reading, and representation. Typically offered Summer Fall Spring.**Credits:** 3.00

ENGL 36500 - Literature And Imperialism

Credit Hours: 3.00. A study through cultural and theoretical works of the impact of imperialism on the ruling nations.**Credits:** 3.00

ENGL 36600 - Postcolonial Literatures

Credit Hours: 3.00. A study of Third World Literature, film, and theory that emerged during and after Western rule.**Credits:** 3.00

ENGL 36700 - Mystery And Detective Fiction

Credit Hours: 3.00. An introduction to the detective genre, examining its origins, its characteristics, and its intersections with empiricism, forensic science, race, class, gender, sex, and empire. **Credits:** 3.00

ENGL 37300 - Science Fiction And Fantasy

Credit Hours: 3.00. Representative works of science fiction and fantasy examined in relation to both mainstream and popular literature. Emphasis is on technique, theme, and form. Typically offered Summer Fall Spring.**Credits:** 3.00

ENGL 37401 - Studies In British Literary History

Credit Hours: 3.00. This class focuses on one of several important British literary-historical periods, ranging from medieval English to modern British literature. In it, students will examine individual authors and texts while also gaining a wider understanding of their historical context. Students will also engage with a variety of genres and practice numerous critical approaches to literature. **Credits:** 3.00

ENGL 37700 - Modern And Contemporary Poetry

Credit Hours: 3.00. A study of poetry in English from the twentieth century to the present. Typically offered Summer Fall Spring.**Credits:** 3.00

ENGL 37800 - Studies In American Literary History

Credit Hours: 3.00. This class focuses on one of several important American literary-historical periods: colonial, nineteenth-, or twentieth- and twenty-first-century literature. In it, students examine individual authors and texts while also gaining a wider understanding of their historical context. Students also will engage with a variety of genres and practice numerous critical approaches to literature. **Credits:** 3.00

ENGL 37900 - The Short Story

Credit Hours: 3.00. A study of the development and features of the short story genre. Typically offered Summer Fall Spring.**Credits:** 3.00

ENGL 38000 - Issues In Rhetoric And Public Life

Credit Hours: 3.00. Study of how language and media create belief and change. Examines ancient and contemporary rhetorical theory as it applies to public discourse, media, and technology. **Credits:** 3.00

ENGL 38100 - The British Novel

Credit Hours: 3.00. Survey of British novels ranging from the eighteenth- to the twenty-first centuries. Typically offered Fall Spring.**Credits:** 3.00

ENGL 38200 - The American Novel

Credit Hours: 3.00. A survey of American novels ranging from the eighteenth century to the twenty-first-centuries. Typically offered Fall Spring.**Credits:** 3.00

ENGL 38600 - History Of Film To 1950

Credit Hours: 3.00. This survey crosses the divide between the silent film era and the "talkies" to explore narrative, experimental, and documentary styles of feature films from the 1890s to 1950. Typically offered Fall Spring.**Credits:** 3.00

ENGL 38700 - History Of Film Since 1950

Credit Hours: 3.00. A survey of narrative, experimental, and documentary styles of feature films from the mid-twentieth century to the present. Typically offered Fall Spring.**Credits:** 3.00

ENGL 38900 - Literature For Children

Credit Hours: 3.00. This course surveys eighteenth, nineteenth-century, and early-twentieth-century literature for children, including the so-called "golden age" of children's myth, fairy tales, and fantasy, as well as domestic fiction for girls and adventure books for boys. **Credits:** 3.00

ENGL 39000 - Practicum In Tutoring Writing

Credit Hours: 1.00 to 3.00. A practicum to teach undergraduates to teach writing in the one-to-one setting of a writing lab. **Credits:** 1.00 to 3.00

ENGL 39100 - Composition For English Teachers

Credit Hours: 3.00. Exploration of the theory, research, and pedagogy of teaching writing at the secondary level. Topics include the development of writing assignments and related activities, the study of writing process models, and the evaluation of student work in a variety of genres. Typically offered Fall Spring.**Credits:** 3.00

ENGL 39200 - Young Adult Literature

Credit Hours: 3.00. This course examines the construct of Young Adult Literature as a genre crafted specifically for adolescents. Using both classic and contemporary novels, as well as relevant theoretical and research texts, this course explores how YA literature is defined, what it offers to adolescent readers, and how it is situated in the literary landscape. **Credits:** 3.00

ENGL 39300 - Interdisciplinary Approaches To Environmental And Sustainability Studies

Credit Hours: 3.00. (ANTH 39300) This course is the lynchpin of the undergraduate Certificate in Environmental and Sustainability Studies. It will present a series of case studies, core concepts, and problem questions that integrate the following three academic approaches: 1) Human Dimensions and Environment/Sustainability, 2) Engineering and Environment/Sustainability, and 3) Environmental/Sustainability Sciences. **Credits:** 3.00

ENGL 39600 - Studies In Literature And Language

Credit Hours: 1.00 to 3.00. A course in the study of a special topic directed by an instructor in whose particular field of specialization the content of the course falls. Typically offered Fall Spring Summer.**Credits:** 1.00 to 3.00

ENGL 39900 - Beyond English

Credit Hours: 3.00. This class is designed for third- and fourth-year English majors. It will help students translate the worth of English and the humanities to the world beyond the university, providing them with tools to articulate their achievements and prepare for their professional and adult lives. **Credits:** 3.00

ENGL 40600 - Review Writing

Credit Hours: 3.00. Intensive practice in the writing of book, film, and theatre criticism, as well as reviews of musical programs and art exhibits. Readings in critics to serve as possible models. Audience analysis of newspapers and periodicals that would be potential markets. Typically offered Fall Spring.**Credits:** 3.00

ENGL 40700 - Intermediate Poetry Writing

Credit Hours: 3.00. Study and practice of methods of composing poetry, with primary emphasis on the student's own work. Workshop criticism and discussion of published writing. Typically offered Summer Fall Spring.**Credits:** 3.00

ENGL 40800 - Creative Writing Capstone

Credit Hours: 3.00. This course will focus on the writing and revision of the capstone thesis in Creative Writing, consisting of a substantial portfolio of either fiction or poetry with an introductory essay. Workshop, discussion of published writing, and individual conferences will form the center of the course with readings, lecture, and discussion of various literary topics. Permission of instructor required. Typically offered Fall Spring.**Credits:** 3.00

ENGL 40900 - Intermediate Fiction Writing

Credit Hours: 3.00. Study and practice of methods of composing fiction, with a primary emphasis on the student's own work. Workshop criticism and discussion of published fiction. Typically offered Summer Fall Spring.**Credits:** 3.00

ENGL 41100 - Studies In Major Authors

Credit Hours: 3.00. A study of the literary, critical, or cinematic works of one or two influential authors or directors. A project-based capstone seminar containing a significant research component. May be repeated for credit only with a different topic.**Credits:** 3.00

ENGL 41200 - Studies In Genre

Credit Hours: 3.00. A study of literary or cinematic works that share distinctive formal features. A project-based capstone seminar containing a significant research component. May be repeated for credit only with a different topic.**Credits:** 3.00

ENGL 41300 - Studies In Literature And History

Credit Hours: 3.00. A study of literature or film produced during a well-defined historical period from the view of its social, political, religious, and economic contexts. A project-based capstone seminar containing a significant research component. May be repeated for credit only with a different topic.**Credits:** 3.00

ENGL 41400 - Studies In Literature And Culture

Credit Hours: 3.00. A study of literature or film from the perspective of the cultural norms and values it expresses, celebrates, and challenges. A project-based capstone seminar containing a significant research component. May be repeated for credit only with a different topic.**Credits:** 3.00

ENGL 41900 - Multimedia Writing

Credit Hours: 3.00. Multimedia writing for networked contexts. Emphasizes principles, and practices of multimedia design, implementation, and publishing. Typical genres include Web sites, interactive media, digital video, visual presentations, visual argument, and user documentation. **Credits:** 3.00

ENGL 42000 - Business Writing

Credit Hours: 3.00. Workplace writing in networked environments for management contexts. Emphasizes organizational context, project planning, document management, ethics, research, team writing. Typical genres include management memos, reports, letters, e-mail, resumes (print and online), oral presentations.**Credits:** 3.00

ENGL 42100 - Technical Writing

Credit Hours: 3.00. Workplace writing in networked environments for technical contexts. Emphasizes context and user analysis, data analysis/display, project planning, document management, usability, ethics, research, team writing. Typical genres include technical reports, memos, documentation, Web sites.**Credits:** 3.00

ENGL 42201 - Writing For The Health And Human Sciences

Credit Hours: 3.00. This course applies rhetorical principles to writing in health, hospitality, nutrition, nursing and related fields in the Health and Human Sciences. **Credits:** 3.00

ENGL 42400 - Writing For High Technology Industries

Credit Hours: 3.00. Applies principles of effective professional writing to the planning, production, and evaluation of computer user manuals and other writing tasks. **Credits:** 3.00

ENGL 43201 - Editing And Publishing

Credit Hours: 3.00. Editing and Publishing is a professional writing workshop that teaches students how to proofread, copyedit, substantive edit, and global edit documents. Students will learn how to navigate the publishing industry and work with authors on print, electronic, online, and multimedia documents. **Credits:** 3.00

ENGL 43300 - Writing Proposals And Grants

Credit Hours: 3.00. Writing Proposals and Grants is a professional writing workshop that teaches students to write workplace proposals and grants in for-profit and not-for-profit companies and organizations. Students will also learn how to write business plans, a specialized form of proposal.**Credits:** 3.00

ENGL 43400 - Science And Medical Writing

Credit Hours: 3.00. Science and Medical Writing is a professional writing workshop that teaches students how to write in medical and scientific fields. Students will learn the genres and conventions that are used by medical writers and science writers, as well as editors in these fields. **Credits:** 3.00

ENGL 43900 - Topics In Disability Studies

Credit Hours: 3.00. Explores cultural, social, and political meanings and effects of disability in relation to literature and/or rhetoric. Specific topics will vary. **Credits:** 3.00

ENGL 44100 - Chaucer's Canterbury Tales

Credit Hours: 3.00. Critical reading of The Canterbury Tales in Middle English, with attention to the literary and cultural background. **Credits:** 3.00

ENGL 44200 - Shakespeare

Credit Hours: 3.00. Shakespeare's dramatic craftsmanship, poetry, humor, characterization, psychology, and modern pertinence illustrated in representative tragedies, comedies, and history plays. **Credits:** 3.00

ENGL 46000 - Studies In Women's Literature

Credit Hours: 3.00. A study of literary works by women according to a specific theme, historical period, genre, or culture, e.g., Nineteenth-Century Women Novelists, Madness in Women's Writing, Caribbean Women Writers. May be repeated only with different topic. **Credits:** 3.00

ENGL 46200 - The Bible As Literature: The Old Testament

Credit Hours: 3.00. A study of the Old Testament - Pentateuch, Prophets, and other books such as Psalms, Proverbs, Job, and Ecclesiastes - with emphasis on its unique literary characteristics. **Credits:** 3.00

ENGL 46300 - The Bible As Literature: The New Testament

Credit Hours: 3.00. A study of the New Testament, with emphasis on its unique literary characteristics. **Credits:** 3.00

ENGL 47000 - Advanced Topics In Rhetorical Studies

Credit Hours: 3.00. Study of rhetorical theories and practices past and present. Includes readings in primary texts in the history and theory of rhetoric. May be repeated for credit with a different topic. **Credits:** 3.00

ENGL 48800 - Internship In Professional Writing

Credit Hours: 3.00 to 6.00. This course provides on-the-job experience in various kinds of professional writing, combined with a seminar in applied rhetoric. Students work in selected internship settings, participate in seminar discussions of their work, and read selections appropriate to their internship. Permission of instructor required. **Credits:** 3.00 to 6.00

ENGL 49000 - Worksite Internship Practicum

Credit Hours: 1.00 to 3.00. Course facilitates the transition between an English undergraduate degree and the workplace or professional life. The course has two components: a professor-guided component and a practicum component in a chosen area. Permission of instructor required. **Credits:** 1.00 to 3.00

ENGL 49200 - Literature In The Secondary Schools

Credit Hours: 3.00. Exploration of the theory, research and pedagogy supporting the teaching of literature at the secondary level. Topics include text selection, instructional strategies, adolescent literacy, student engagement and the use of alternative texts. **Credits:** 3.00

ENGL 49400 - Research Practicum For Undergraduates

Credit Hours: 2.00 or 3.00. This course introduces students to research techniques and trains them to participate in a research laboratory or a professor-sponsored research project. Permission of instructor required. **Credits:** 2.00 or 3.00

ENGL 50100 - Introduction To English Studies

Credit Hours: 3.00. Introduction to graduate studies in English with special emphasis on research and reference tools, methods of bibliography, and the writing of scholarly papers. Prerequisite: Fulfillment of the basic composition requirement and 6 credit hours in English. **Credits:** 3.00

ENGL 50200 - Practicum In Teaching College Composition

Credit Hours: 1.00. Reading professional literature, preparing syllabi; evaluating student papers, leading discussions. Required of all teaching assistants in their initial semesters. **Credits:** 1.00

ENGL 50500 - Approaches To Teaching College English

Credit Hours: 3.00. Reading professional literature on the teaching of writing, linguistics, and ESL. Studies of methodologies, issues of assessment, and the relationship between theory and pedagogy. This course is not part of the degree requirement. Open only to teaching assistants in the Department of English. Permission of instructor required. **Credits:** 3.00

ENGL 50600 - Introduction To English And General Linguistics

Credit Hours: 3.00. General study of language and linguistic theory with emphasis on English. Problems and methods in phonology, morphology, syntax, and semantics. Current techniques of linguistics analysis. **Credits:** 3.00

ENGL 50700 - Advanced Poetry Writing

Credit Hours: 3.00. Study and practice of advanced methods of composing poetry, with primary emphasis on the student's own work. Workshop criticism and discussion of published writing.**Credits:** 3.00

ENGL 50900 - Advanced Fiction Writing

Credit Hours: 3.00. Study and practice of advanced methods of composing fiction, with the primary emphasis on the student's own work. Workshop criticism and discussion of published writing. **Credits:** 3.00

ENGL 51000 - History Of The English Language

Credit Hours: 3.00. Introduction to theories of linguistic change and their application to the historical development of English from its beginnings. **Credits:** 3.00

ENGL 51100 - Semantics

Credit Hours: 3.00. An introduction to and survey of current semantic theories and methods with an emphasis on English. Basic concepts of linguistic semantics and its relation to the other semantics. Compositional (transformational), model-theoretical (truth-conditional), pragmatic, and contextual semantics. **Credits:** 3.00

ENGL 51200 - English Syntax And Syntactic Theory

Credit Hours: 3.00. Introduction to English syntactic structure, syntactic argumentation, and syntactic theory. Emphasis on one current theory as the primary theoretical framework, with other theories considered.**Credits:** 3.00

ENGL 51300 - English Phonology

Credit Hours: 3.00. Introduction to current phonological theory, with applications to descriptions of American and British English. Articulatory description of English phonological structure and contrastive analysis of phonetic variation across dialects. Evolution of the stress system of English and its utilization by poets writing metrical verse. **Credits:** 3.00

ENGL 51500 - Advanced Professional Writing

Credit Hours: 3.00. Production of documents and coordination of publishing projects for clients and users; application of advanced principles of document design, rhetoric, collaboration, and project management; and team writing in a computer-networked environment. **Credits:** 3.00

ENGL 51600 - Teaching English As A Second Language: Theoretical Foundations

Credit Hours: 3.00. Survey of theories of learning and teaching English as a second/foreign/international language. Focus is on current theories and their implications for practice. **Credits:** 3.00

ENGL 51800 - Teaching English As A Second Language: Principles And Practices

Credit Hours: 3.00. Studies of issues and principles in ESL/EFL program development. Emphasis is on practical application of theory in a variety of English learning and teaching contexts in the U.S. and abroad. **Credits:** 3.00

ENGL 52800 - Medieval English Literature

Credit Hours: 3.00. A survey of selected works of Medieval English literature (700-1500 C.E.), exclusive of Chaucer's writings. **Credits:** 3.00

ENGL 53100 - The Rise Of The Novel

Credit Hours: 3.00. A study of the history and theory of the emergent novel genre as it developed in 18th-century Britain and/or America. **Credits:** 3.00

ENGL 53200 - The English Novel In The Nineteenth Century

Credit Hours: 3.00. A survey of fiction up to about 1880, including such novelists as Scott, Dickens, Thackeray, the Brontes, Eliot, and Meredith. **Credits:** 3.00

ENGL 53400 - Seventeenth-Century Literature

Credit Hours: 3.00. Nondramatic literature from 1603 to 1660. Particular emphasis upon such figures as Jonson, Donne, Marvell, and Herbert, with representative prose from Bacon, Browne, Burton, and others. **Credits:** 3.00

ENGL 53500 - Restoration And Early Eighteenth-Century Literature

Credit Hours: 3.00. A survey of nondramatic literature from 1660 to 1744, from Clarendon through Thomson. Emphasizes Bunyan, Dryden, Pope, and Swift. **Credits:** 3.00

ENGL 53800 - English Drama From The Restoration To The Modern Period

Credit Hours: 3.00. A survey of English drama from Dryden and Wycherley through Robertson and Pinero. **Credits:** 3.00

ENGL 54100 - Studies In Chaucer's Canterbury Tales

Credit Hours: 3.00. Critical reading of The Canterbury Tales and related works in Middle English, with attention to the literary and cultural background and to secondary studies. **Credits:** 3.00

ENGL 54300 - Shakespeare In Critical Perspective

Credit Hours: 3.00. Shakespeare's plays read in context of historical and contemporary literary theory and criticism, considering such issues and approaches as structuralism, Marxism, deconstruction, new historicism, colonialism, sexuality, race, and gender. **Credits:** 3.00

ENGL 54400 - Milton

Credit Hours: 3.00. A study of Milton's poetry and prose, with particular emphasis on Paradise Lost, and some attention to the social, political, and literary background. **Credits:** 3.00

ENGL 54700 - British Romanticism

Credit Hours: 3.00. Readings from among the works of the High Romantics and other figures; discussion of historical, philosophical, cultural debates of the era, with attention to current critical and theoretical developments in the field. **Credits:** 3.00

ENGL 54800 - Victorian Literature

Credit Hours: 3.00. A study of selected English poetry and prose, largely nonfiction, from circa 1830-1900. Includes readings from such figures as Arnold, Barrett, Bronte, Browning, Carlyle, Mill, Rosetti, Ruskin, and Tennyson. **Credits:** 3.00

ENGL 55200 - Studies In Major American Authors

Credit Hours: 3.00. A study of the works of one or two influential American authors. **Credits:** 3.00

ENGL 55300 - Colonial And Early American Literature

Credit Hours: 3.00. A survey of American literature to about 1820. Texts of major and minor authors, such as Bradford, Bradstreet, Rowlandson, and Cooper, are viewed within their cultural context. **Credits:** 3.00

ENGL 55400 - American Literary Culture 1820-1860

Credit Hours: 3.00. Emphasizes cultural inventory, definition, and production in early nineteenth-century literary culture. The approach is intertextual, moving back and forth between the emerging culture and literary productions, and between one author and other authors. **Credits:** 3.00

ENGL 55700 - Nineteenth-Century African-American Narrative

Credit Hours: 3.00. This course focuses on both fiction and nonfiction by a range of African American authors dating from the pre-Civil War years through the turn of the twentieth century. Appropriate for M.A. students seeking to fulfill 19th-century breadth requirements and/or build a foundation for future study in the field. Appropriate for Ph.D. students preparing for qualifying exams and/or preparing to write a dissertation in the field. **Credits:** 3.00

ENGL 55800 - American Literature In The Later Nineteenth Century

Credit Hours: 3.00. Study of American literature from about 1865 to 1900. Addresses realism, regionalism, naturalism, and other related movements. Focuses on such writers as Whitman, Dickinson, Stowe, Davis, Stoddard, Alcott, Twain, Howells, James, Jewett, Chopin, Crane, Chesnutt, and Norris. **Credits:** 3.00

ENGL 56000 - Modern American Poetry

Credit Hours: 3.00. A survey of modern American poetry. Emphasis will be on major writers such as Eliot, Pound, Frost, Stevens, and Lowell, but attention will be paid to lesser figures. **Credits:** 3.00

ENGL 56100 - Modern British Poetry

Credit Hours: 3.00. Surveys modern British poetry from Hardy to Auden; relates it to the main currents of modern thought and feeling; introduces critical principles. **Credits:** 3.00

ENGL 56300 - Historical Linguistics

Credit Hours: 3.00. (ANTH 56300, LC 56300) A survey of mechanisms and motivations of linguistic change. Topics include: phonological, morphological, semantic and syntactic change, comparative and internal reconstruction, linguistic variation, language contact, and linguistic typology. **Credits:** 3.00

ENGL 56500 - Sociolinguistics

Credit Hours: 3.00. (ANTH 56500, COM 56500, LC 56500, LING 56500) An introduction to language in its social context, focusing on uses and users of language. Topics include social class, ethnic group, gender, language attitudes, and bilingualism. **Credits:** 3.00

ENGL 56900 - Contemporary Criticism And Theory

Credit Hours: 3.00. Study of contemporary criticism and theory generally focused on such schools and movements as structuralism, psychoanalysis, poststructuralism, feminism, new historicism, cultural studies, and gay and lesbian studies. **Credits:** 3.00

ENGL 57000 - Introduction To Semiotics

Credit Hours: 3.00. The study of languages, literatures, and other systems of human communication. Includes a wide range of phenomena which can be brought together by means of a general theory of signs. The course deals with three fundamental areas: 1) verbal communication, 2) nonverbal communication (iconic systems, gestures, body language, etc.), and 3) communication through art forms. **Credits:** 3.00

ENGL 57300 - Tragedy

Credit Hours: 3.00. The chief tragic views of life, as illustrated in Greek, Shakespearean, and modern drama, as well as in the novel and poetry, with selected reading on the theory of tragedy. **Credits:** 3.00

ENGL 57800 - Early Twentieth-Century American Fiction

Credit Hours: 3.00. Study of American fiction from about 1900 to 1945. Addresses naturalism, social realism, modernism, and related movements, and such writers as Dreiser, Wharton, Stein, Lewis, Toomer, Cather, Fitzgerald, Hemingway, Glasgow, Roth, Dos Passos, Miller, Faulkner, Hurston, Wright, and Welty. **Credits:** 3.00

ENGL 57900 - Modern British Fiction

Credit Hours: 3.00. Critical study of twentieth-century novels, mainly before World War II, by such writers as Conrad, Lawrence, Forster, Joyce, and Woolf. **Credits:** 3.00

ENGL 58000 - Theories Of Modernity And Postmodernity

Credit Hours: 3.00. Exploration of theories and models of modernity and postmodernity, with emphasis on cultural and critical issues. **Credits:** 3.00

ENGL 58300 - U S Ethnic/Multicultural Literature

Credit Hours: 3.00. A critical examination of multicultural literature or the literature of a particular ethnic group or groups, such as African American, Asian American, Jewish American, Latina/o, Native American. **Credits:** 3.00

ENGL 58500 - Creative Nonfiction Writing

Credit Hours: 3.00. Study and practice of advanced methods of composing creative nonfiction, with primary emphasis on the student's own work. Workshop criticism and discussion of published writing. **Credits:** 3.00

ENGL 58900 - Directed Writing

Credit Hours: 1.00 to 3.00. Writing (creative, popularly technical, biographical, historical, philosophical) on subjects of the student's choice. Individual conferences only; no class meetings. Permission of instructor required. **Credits:** 1.00 to 3.00

ENGL 59000 - Directed Reading

Credit Hours: 1.00 to 3.00. Directs the reading of students with special interests. Guides students in profitable reading in subjects of their own choice. Individual conferences; no class meetings. Permission of instructor required. **Credits:** 1.00 to 3.00

ENGL 59100 - Introduction To Composition Theory

Credit Hours: 3.00. A survey of major contemporary theories of invention and style, including such topics as heuristics; the aims and modes of discourse; stylistics; readability theories; sentence-combining; error analysis; audience; and evaluation. Applications to teaching will be made. **Credits:** 3.00

ENGL 59200 - Postcolonial Studies

Credit Hours: 3.00. Study of works from once colonized cultures in Africa, Asia, and the Caribbean, and/or postcolonial diasporas. Individual sections will focus on one or more of the following: literature, women's literature, film, or feminist and cultural theory. **Credits:** 3.00

ENGL 59300 - Contemporary British Fiction

Credit Hours: 3.00. Critical study of the British novel since World War II. Survey of scholarship and criticism. **Credits:** 3.00

ENGL 59400 - Contemporary Poetry

Credit Hours: 3.00. Study of poetry of the past two or three decades, both American and foreign, and their interaction. Attention to influences, "schools," and little magazines, as well as to conventional sources. **Credits:** 3.00

ENGL 59500 - Contemporary American Fiction

Credit Hours: 3.00. Intensive study of contemporary and postmodern American fiction within various formal, theoretical, and cultural contexts, including multiculturalism, poststructuralism, and gender analysis, among others. **Credits:** 3.00

ENGL 59600 - Advanced Studies In Literature Or Language

Credit Hours: 3.00. Advanced study of a topic within the instructor's fields of specialization. Emphasis on scholarly analysis and research. **Credits:** 3.00

ENGL 59700 - Contemporary Black Feminist Literature

Credit Hours: 3.00. An intense examination of recent literary works by black women along with various critical theories constructed about black women's literature, beginning with the premise that black feminism is a "sign to be interrogated, a locus of contradictions." **Credits:** 3.00

ENGL 59900 - Academic Language And Content Area Learning

Credit Hours: 3.00. (EDCI 55900) Course focuses on theoretical and practical knowledge for teachers about how second languages are learned, and on the educational and philosophical basis for second language teaching and learning. The course links English language development to teaching and learning strategies and is designed for undergraduate and graduate students in education and practicing teachers. **Credits:** 3.00

ENGL 60100 - Teaching Literature At The College Level

Credit Hours: 3.00. Focuses on the practical and theoretical issues related to teaching literature at the college level. Topics include course design, literary canons and text selection, teaching and learning styles, close reading, writing about literature, assessment, and professional ethics. Prerequisite: ENGL 50100 or consent of department. Restricted to graduate students in the Department of English. **Credits:** 3.00

ENGL 60111 - Introduction To Scientific, Technical, Medical, And Healthcare Writing

Credit Hours: 3.00. Introduction to Scientific, Technical, Medical, and Healthcare Writing offers an overview of the genres, conventions, and strategies that these professional fields have in common. This course is the gateway course into the online Professional Certificate and Masters in Scientific, Technical, and Medical Communication. Permission of department required. **Credits:** 3.00

ENGL 60211 - Science Writing

Credit Hours: 3.00. This course teaches students how to use the various writing styles and rhetorical strategies that are common in popular science and the scientific workplace. More specifically, they learn how to analyze, prepare, and edit technical and professional documents needed to effectively communicate within scientific professions, with specialized focus on reporting science news, conducting interviews with scientists, and identifying and explaining current debates in science. Permission of department required. **Credits:** 3.00

ENGL 60311 - Medical And Healthcare Writing

Credit Hours: 3.00. This course helps students master various genres, writing styles, and rhetorical strategies common in medical and healthcare contexts. More specifically, you will learn how to analyze, prepare, and edit documents that are used to communicate within and about the healthcare industry (i.e., protocols, patient educational materials, and proposals). Permission of department required. **Credits:** 3.00

ENGL 60400 - Introduction To Inquiry In Second Language Studies

Credit Hours: 3.00. Survey of a variety of approaches to inquiry (incl. hermeneutic, conceptual, historical, qualitative, and quantitative) available for second language studies to provide participants copies for design of their own research and scholarship. **Credits:** 3.00

ENGL 60411 - Writing Proposals And Grants

Credit Hours: 3.00. Writing Proposals and Grants teaches students how to analyze requests for proposals, analyze problems, devise project plans, and write proposals for for-profit corporations and non-profit organizations. Permission of department required. **Credits:** 3.00

ENGL 60500 - Computers In Language And Rhetoric

Credit Hours: 3.00. Seminar that investigates how computers figure in contemporary theories of text and text making. Typical topics: critiques of technology, hypertext, cyberspace, computer-mediated communication, Internet, electronic writing, online research, pedagogy, and publishing. **Credits:** 3.00

ENGL 60511 - Editing And Publishing

Credit Hours: 3.00. The purpose of this course is to show you how to use professional editing techniques to produce high-quality and publishable documents. Students learn how to work as a professional editor at four "levels of edit," which include proofreading, copyediting, substantive editing, and development editing. Permission of department required. **Credits:** 3.00

ENGL 60600 - Seminar In Poetry Writing

Credit Hours: 3.00. An advanced course in the writing of poetry. Workshop criticism. Study of the work of established writers. Prerequisite: admission to the MA program in creative writing. **Credits:** 3.00

ENGL 60611 - Technical Communication

Credit Hours: 3.00. The purpose of this course is to show students how to write technical documentation and produce high-quality and reader-centered documents. They learn to write documents in several modalities, including print, electronic, audio, and video. Permission of department required. **Credits:** 3.00

ENGL 60700 - The Theory And Craft Of Creative Writing

Credit Hours: 3.00. A study of the craft of poetry, fiction, or drama with some consideration of underlying theories. Prerequisite: admission to the MA program in creative writing. **Credits:** 3.00

ENGL 60711 - Designing Documents, Interfaces, And Graphics

Credit Hours: 3.00. The purpose of this course is to introduce students to visual rhetoric principles that are commonly used to design documents and interfaces, as well as show them how to use multimedia tools for designing visual texts. Students also learn how to create effective visuals, such as graphs, charts, and tables. Permission of department required. **Credits:** 3.00

ENGL 60811 - Entrepreneurship Communication

Credit Hours: 3.00. The purpose of this class is to teach students how to use design thinking and information experience (IX) strategies to be innovative and generate new ideas for products and services. Students will learn how to write a business model and pitch that business model to investors or their supervisors. Permission of department required. **Credits:** 3.00

ENGL 60900 - Seminar In Fiction Writing

Credit Hours: 3.00. An advanced course in the writing of fiction. Workshop critiques. Prerequisite: Admission to the creative writing program. **Credits:** 3.00

ENGL 60911 - User Experience And Design Thinking

Credit Hours: 3.00. The purpose of this courses is to show students how to employ User Experience (UX) principles to design documents, interfaces, and products for scientific, technical, healthcare, and medical situations, making those interactions intuitive, easy, and even pleasurable. Design thinking broadens out the focus, using design as a systematic way of understanding a company's customers, defining their problems and needs, ideating to create new solutions with emerging technologies, and prototyping those solutions. Permission of department required. **Credits:** 3.00

ENGL 61100 - Old English Language

Credit Hours: 3.00. A study of the principal prose and poetry from the beginnings to about 1100. Emphasis on the language. **Credits:** 3.00

ENGL 61200 - Old English Literature

Credit Hours: 3.00. A survey of Old English literary works, including heroic poetry, religious epic, elegiac poetry, homilies, and secular prose, illustrative of the early development of English literature and culture. Prerequisite: ENGL 61100. **Credits:** 3.00

ENGL 61300 - Middle English Language

Credit Hours: 3.00. A study of selected readings from the literature of about 1100 to about 1500. Emphasis on the language. **Credits:** 3.00

ENGL 61400 - Middle English Literature

Credit Hours: 3.00. Study of representative works in the major literary traditions and genres of Middle English literature (exclusive of Chaucer): lyric, romance, satire, and allegory. Detailed examination of major works, such as Sir Gawain and the Green Knight, Piers Plowman, and Pearl. Prerequisite: ENGL 61300. **Credits:** 3.00

ENGL 61500 - A Reading Of Beowulf

Credit Hours: 3.00. An intensive reading of Beowulf in the original with a consideration of background sources and interpretive theories. Prerequisite: ENGL 61100. **Credits:** 3.00

ENGL 61800 - Quantitative Research In Second Language Studies

Credit Hours: 3.00. A survey of quantitative research methods and designs associated with second language studies. Prerequisite: ENGL 51600. **Credits:** 3.00

ENGL 61900 - Qualitative Research In Second Language Studies

Credit Hours: 3.00. Introduces graduate students to the theoretical concepts and practical tools associated with situated approaches to research in second language studies. **Credits:** 3.00

ENGL 62000 - Classroom Communication In ESL For Teaching Assistants

Credit Hours: 5.00. Student must be enrolled in the Graduate School and a non-native speaker of English. Permission of department required. **Credits:** 5.00

ENGL 62100 - Written Communication For International Graduate Students

Credit Hours: 3.00. A course in English composition for non-native English-speaking graduate students. **Credits:** 3.00

ENGL 62200 - Issues In Composition Studies: Classical Period To The Renaissance

Credit Hours: 3.00. The course historicizes issues in composition studies from the sophists to the Renaissance. Prerequisite: ENGL 59100. **Credits:** 3.00

ENGL 62400 - Issues In Composition Studies: Modern Period

Credit Hours: 3.00. The course historicizes issues in composition studies from the eighteenth century to the mid-twentieth century. Prerequisite: ENGL 59100. **Credits:** 3.00

ENGL 62500 - Seminar On Empirical Research In Writing

Credit Hours: 3.00. An analysis and evaluation of empirical research concerned with composing processes, critical literacy, disciplinary writing, various writing cultures, and composition pedagogy. Students will study empirical research designs and develop a project in one of the above areas. Prerequisite: ENGL 59100. **Credits:** 3.00

ENGL 62600 - Postmodernism And Issues In Composition Studies

Credit Hours: 3.00. The course historicizes how various postmodern theories and practices (cultural, political, ethical, philosophical, technological, aesthetic) influence the study and teaching of written discourse. Prerequisite: ENGL 59100. **Credits:** 3.00

ENGL 62700 - Seminar In Linguistics

Credit Hours: 3.00. Investigation of a topic in advanced linguistics research. **Credits:** 3.00

ENGL 62800 - Natural Language Processing

Credit Hours: 3.00. (ECE 66900) This course focuses on keyword-driven question answering systems; transition networks; parsing procedures for context-free grammars; theory of transformational grammars; implementation of recursive transition networks; implementation of augmented transition networks; representation of conceptual dependencies; surface semantic conceptual analysis; conceptual dependency parsing; generating natural language from a conceptual base; scripts, plans, and goals; building conversationalist programs. Prerequisite: ENGL 50600 or ECE 57000. **Credits:** 3.00

ENGL 62900 - Seminar In English As A Second Language

Credit Hours: 3.00. In-depth study of variable subjects relating to the nature of English as a second/foreign/international language and its learning and teaching. Prerequisite: ENGL 51600. **Credits:** 3.00

ENGL 63000 - Seminar In Second Language Writing

Credit Hours: 3.00. An overview and examination of major issues in the theory, research, and practice of writing in English as a second language. Prerequisite: ENGL 51600 or ENGL 59100. **Credits:** 3.00

ENGL 63100 - World Englishes

Credit Hours: 3.00. Investigation of the use, spread, and development of English as an international language. Topics include: non-native varieties, language contact and change, new English literatures, and the teaching of English as an international language. Prerequisite: ENGL 50600. **Credits:** 3.00

ENGL 63300 - Seminar In English Literature Before 1660

Credit Hours: 3.00. Variable subjects (authors, themes, periods, movements) in English literature from Beowulf to Paradise Lost. **Credits:** 3.00

ENGL 63500 - Seminar In English Literature 1660-1783

Credit Hours: 3.00. Intensive consideration of one to three or four authors or of literary topics and genres, such as drama, fiction, literary criticism and literary history, the medieval revival, poetic and prose satire, the periodical essay, biography, etc. **Credits:** 3.00

ENGL 64200 - Seminar In Shakespeare

Credit Hours: 3.00. Special topics in Shakespeare criticism, concentrating on one or more plays. Topics such as women in Shakespeare's plays, performance theory and practice, and current theoretical approaches. Students investigate a single topic in depth. **Credits:** 3.00

ENGL 64700 - Seminar In The Romantic Movement

Credit Hours: 3.00. A close investigation of the works of one or more outstanding writers of English literature from 1783 to 1832, their place in the Romantic Movement, and their historical and cultural relations to the times. **Credits:** 3.00

ENGL 64800 - Seminar In Victorian Literature

Credit Hours: 3.00. A detailed study of the works of one or more figures of English literature from 1832 to 1880: their relation to the literary movements and historical and cultural backgrounds of the age. **Credits:** 3.00

ENGL 64900 - Seminar In English Literature 1880-1920

Credit Hours: 3.00. Subjects will range from individual authors and specific literary types to transitional literary movements. **Credits:** 3.00

ENGL 65700 - Seminar In American Literature 1630-1900

Credit Hours: 3.00. A variable content seminar on authors, themes, genres, movements, geographic regions, or cultural contexts. **Credits:** 3.00

ENGL 66500 - Seminar In Comparative Literature

Credit Hours: 3.00. (CMPL 65000 and LC 63900) Advanced study of international literary movements, influence thematology, literary theory, and genre development. See Comparative Literature Program. **Credits:** 3.00

ENGL 66700 - Seminar In Poetics And Aesthetics

Credit Hours: 3.00. Study of selected influential figures, concepts, and texts in the history of poetics and aesthetics from ancient times to the present. **Credits:** 3.00

ENGL 66800 - Seminar In Interpretation And Cultural Theory

Credit Hours: 3.00. Examination of selected developments in social, cultural, and hermeneutical theories from the eighteenth century to the present. **Credits:** 3.00

ENGL 66900 - Introduction To Visual Theory And Visual Culture

Credit Hours: 3.00. Visual studies is the multidisciplinary study of images, viewers, and vision. Students will be provided with an overview of the theories, practices, and histories of the visual from a variety of disciplinary perspectives and historical periods. The seminar will be organized around a series of basic questions (such as "What is an image?" "How do images produce meaning?" "What do images do?" "What is vision?") whose responses have come to constitute the field as well as its transdisciplinarity. Readings will be drawn from seminal works in visual theory, cultural semiotics, cultural theory, intermediality, art history, media studies as well as the psychology, philosophy, and science of vision. **Credits:** 3.00

ENGL 67200 - Seminar In Women's Literature And Feminist Theory

Credit Hours: 3.00. A variable topic course investigating gender as a category of analysis. Intensive study of one or two women authors, of a particular genre or period, or of a critical issue relevant to women's literature and/or feminist theory. **Credits:** 3.00

ENGL 67300 - Seminar In Postcolonial Studies

Credit Hours: 3.00. Advanced study of works from once-colonized cultures in Africa, Asia, the Caribbean, and/or postcolonial diasporas in the first world. Individual sections will focus on one or more of the following: literature, women's literature, film, and feminist and cultural theory. **Credits:** 3.00

ENGL 67400 - Seminar In Language Testing

Credit Hours: 3.00. An introduction to the techniques, practices, and history of language testing. Introduces the basic tenets of measurement and the issues and controversies related to the measurement of language ability. **Credits:** 3.00

ENGL 67700 - Seminar In Modern Literature

Credit Hours: 3.00. Developments in English, American, and European literature in modern times. Individual seminars will ordinarily be concerned with drama, poetry, or fiction, but may treat all three types together. **Credits:** 3.00

ENGL 67800 - Seminar In Modern American Literature

Credit Hours: 3.00. A variable content course, focusing on developments, movements, and authors in modern American literature and culture. Major research project required. **Credits:** 3.00

ENGL 67900 - Seminar In Modern British Fiction

Credit Hours: 3.00. Study in depth of one or two major novelists, a literary movement, a group of writers, or a form of modern fiction. Oral reports and research papers required. **Credits:** 3.00

ENGL 68000 - Seminar In Rhetoric And Composition

Credit Hours: 3.00. A variable content course dealing with topics such as cultural studies and composition, medieval rhetoric, renaissance rhetoric, literacy, historiographies of rhetoric, qualitative studies, and professional writing theory. Prerequisite: ENGL 59100. **Credits:** 3.00

ENGL 68100 - Hutton Lectures In Rhetoric And Composition

Credit Hours: 3.00. Reading and discussion of the work of contemporary scholarship in rhetoric and composition, accompanied by lectures by visiting scholars. **Credits:** 3.00

ENGL 69000 - Internship In Second Language Studies/ESL

Credit Hours: 1.00 to 3.00. Part-time or full-time practical work experience in selected situations related to the student's field of study. The internship must be located at an off-campus site unless a special exception is granted by the Graduate School. Permission of instructor required. **Credits:** 1.00 to 3.00

ENGL 69100 - Seminar In The English Language Arts

Credit Hours: 3.00. (EDCI 61300) Problems in the teaching of English: literature, language, rhetoric. Attention to recent scholarship and to its application in the public schools. **Credits:** 3.00

ENGL 69200 - Scholarly Writing And Publishing

Credit Hours: 3.00. Guides graduate students through preparing an essay for journal publication. Activities include selecting appropriate venues, daily revision, outlining, workshopping, and hearing guest speakers. At the end of the course, students will formally submit their essay publication. Prerequisites: ENGL 50100 or instructor permission. Students must have an essay draft in hand that they wish to work on revising. **Credits:** 3.00

ENGL 69600 - Seminar In Literature

Credit Hours: 3.00. Advanced study of special subjects. **Credits:** 3.00

ENGL 69800 - Research MA Or MFA Thesis

Credit Hours: 1.00 to 18.00. Research MA Or MFA Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

ENGL 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Entomology

ENTM 10100 - Insect Biology And Societal Grand Challenges

Credit Hours: 1.00. An introduction to the roles of insect biologists in addressing societal grand challenges. **Credits:** 1.00

ENTM 10200 - The Practice Of Science

Credit Hours: 2.00. A critical examination of science, best practices for conducting science, the contribution of research to knowledge accumulation, and the ethical obligations of scientists. **Credits:** 2.00

ENTM 10500 - Insects: Friend And Foe

Credit Hours: 3.00. A one-semester course for nonscience students who want to know more about insects - the most numerous organisms on earth. An introduction to insects and their relationship with humankind, including interesting aspects of insect biology; insects in music, decoration, history; use of insects in teaching at the elementary school level; their use in art, photography, and drawing; insects as human food. **Credits:** 3.00

ENTM 12800 - Investigating Forensic Science

Credit Hours: 3.00. Designed for both forensic science majors and non-majors, this course will provide an overview of the issues affecting the study and practice of forensic science as defined by the National Academy of Science 2009 report: "Strengthening Forensic Science". Using a mixture of popular media (film, television, news articles) as well as more conventional academic peer-reviewed articles, students will learn how the scientific method is applied to forensic investigations including; identifying pseudoscience, crime lab procedures, DNA evidence, errors in thinking and problem-solving, types of fraud, and the influence of the "CSI Effect". **Credits:** 3.00

ENTM 20100 - Scientific And Technical Communication

Credit Hours: 3.00. Students gain a foundation for communicating science and insect biology at multiple levels through study and practice. Prior completion of a college-level composition course is strongly recommended. **Credits:** 3.00

ENTM 20600 - General Entomology

Credit Hours: 2.00. A general course on insect structure, function, biology, ecology and population management. Coordinated with the ENTM 20700 laboratory as an introductory course in entomology. **Credits:** 2.00

ENTM 20700 - General Entomology Laboratory

Credit Hours: 1.00. Laboratory exercises parallel topics presented in ENTM 20600. Insect structures and function are studied as a basis for learning to identify insects and other arthropods. **Credits:** 1.00

ENTM 21000 - Introduction To Insect Behavior

Credit Hours: 3.00. Description and introductory analysis of innate and learned insect behavior, including basic orientations and movements, behavioral periodicity, communication, chemical and structural defenses, host selection and feeding, reproduction, and insect societies. General biology and introductory entomology are desirable, but not essential. **Credits:** 3.00

ENTM 22810 - Forensic Investigation

Credit Hours: 4.00. Forensic science investigation, crime scene management and field data collection techniques. Includes crime scene recognition and the documentation, collection, preservation, and processing of crime scene evidence. Emphasizes the place of field data collection as the first step in a sequence that takes evidence from scene to the lab for analysis and finally into the court of law. **Credits:** 4.00

ENTM 22820 - Forensic Analysis

Credit Hours: 4.00. Forensic science evidence analysis, crime lab evidence management and data analysis techniques. Focuses on the accuracy, precision and integrity in evidence analysis for a survey of forensic disciplines. Emphasizes the place of forensic analysis as a necessary second step in a sequence that takes evidence from scene, to the lab for analysis and finally into the court of law. **Credits:** 4.00

ENTM 22830 - Forensic Testimony And Ethics

Credit Hours: 3.00. The final course in the forensic science program core, focuses on the legal ramifications that arise when forensic science is applied at the crime scene, in the crime lab and in the courtroom. Students are introduced to ethical issues that form the basis of all scientific investigations and the role of scientists as expert witnesses in maintaining the moral integrity of our justice system. **Credits:** 3.00

ENTM 22840 - Forensic Entomology Principles

Credit Hours: 2.00. An overview to the four disciplines of forensic entomology. An introduction to stored products, urban, medical/veterinary, and medico-legal entomology. **Credits:** 2.00

ENTM 22841 - Forensic Entomology Principles Lab

Credit Hours: 1.00. An optional laboratory component to Principles of Forensic Entomology. Insects of importance in the fields of stored products, urban, medical/veterinary, and medico-legal will be covered, including morphological identifications and an assessment of their biology and damage. **Credits:** 1.00

ENTM 24200 - Data Science

Credit Hours: 3.00. Develop a data science skill set that complements coursework in mathematics, statistics, and experimental design. Data Science facilitates research by developing skills in data sourcing, formatting and using different types of data, and hypothesis generation. Mathematical communication skills are developed through data graphics, animation, and delivery of results through multiple platforms including interactive simulations on webpages. **Credits:** 3.00

ENTM 25300 - Insect Physiology And Biochemistry

Credit Hours: 4.00. Introductory course in insect cell biology, biochemistry, and physiology including structures and functions of insect internal and external tissues and organs. A year of college biology or equivalent knowledge is expected. **Credits:** 4.00

ENTM 27500 - Honors Course - Lower Division

Credit Hours: 1.00 to 4.00. Utilized to offer a new honors course for a maximum of three years. Variable title, credit, and instructional type. Course may be repeated for credit if content and titles are different. Offered primarily to first and second-year students. Courses offered must be approved by departmental or program faculty, and the College of Agriculture Honors Committee. Must be enrolled in an Honors program. Permission of department required. **Credits:** 1.00 to 4.00

ENTM 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in entomology. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ENTM 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in entomology. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ENTM 29400 - Topics In Forensic Sciences

Credit Hours: 1.00 to 4.00. This course will address the needs for our students to have current information about important emerging areas of Forensic Science and will provide a mechanism for recording such studies on their transcript. **Credits:** 1.00 to 4.00

ENTM 29410 - Laboratory Topics In Forensic Science

Credit Hours: 1.00 to 4.00. This course provides students with combined lecture and laboratory experience in important emerging areas of Forensic Science. **Credits:** 1.00 to 4.00

ENTM 29500 - Topics In Entomology

Credit Hours: 1.00 to 4.00. Special topics in entomology not available in other entomology courses. **Credits:** 1.00 to 4.00

ENTM 29510 - Laboratory Topics In Entomology

Credit Hours: 1.00 to 4.00. Special topics in entomology not available in other entomology courses that include laboratory. **Credits:** 1.00 to 4.00

ENTM 30100 - Experimentation And Analysis

Credit Hours: 3.00. Introduction to experimentation and quantitative data analysis in the life sciences with a focus on examples from insect biology. **Credits:** 3.00

ENTM 31100 - Insect Ecology

Credit Hours: 3.00. Insect ecology investigates the fundamental concepts of ecology as they relate to insects, including insect interactions, other insects and their environment. Topics include population and community ecology, plant-insect interactions, insect biodiversity and biogeography, and theoretical and applied ecology. Examples from current entomological and ecological studies are used. Completion of college biology or an introductory course in entomology is recommended. **Credits:** 3.00

ENTM 31200 - Plant-Insect Chemical Ecology

Credit Hours: 3.00. An overview of the structure and function of natural and synthetic chemical products in insect ecology. One year of college biology. One year of college chemistry strongly recommended. **Credits:** 3.00

ENTM 32810 - Practical Molecular Biology

Credit Hours: 3.00. Students explore molecular technology commonly used in population genetics and diagnostics and apply them to questions in Insect Biology and Forensics. **Credits:** 3.00

ENTM 32820 - Medico-Legal Entomology

Credit Hours: 3.00. This course explores the main topics covered under medico-legal entomology (MLE). Specifically, the course will focus on the role that insects play in abuse, neglect, and death investigations. Students will experience rearing and identifying the major forensically important insect groups associated with medico-legal investigations. Finally, students will gain an appreciation of the scope of MLE through the analysis of two mock cases. **Credits:** 3.00

ENTM 33500 - Introduction To Insect Identification

Credit Hours: 4.00. This class is designed for learning more about the collection and identification of adult insects. Emphasis will be placed on collection and sampling techniques, the preparation of specimens for future study, and identification. **Credits:** 4.00

ENTM 35300 - Insecticides And Environment

Credit Hours: 3.00. Insecticides, their interactions with biological organisms and the environment, regulatory policies, environmental and human health outcomes, and current controversies. A year of college biology and college chemistry or equivalent knowledge is expected. **Credits:** 3.00

ENTM 39000 - Professional Experience Programs In Entomology

Credit Hours: 0.00. Supervised professional experiences in entomology, integrated pest management, or urban/industrial pest control. Programs must be preplanned and conducted under the direction of the departmental coordinator with the cooperation of an employer. Students must submit a summary report. Permission of instructor required. **Credits:** 0.00

ENTM 39100 - Professional Experience Programs In Forensic Sciences

Credit Hours: 0.00 to 8.00. The course provides a mechanism for students to record unpaid internships and appropriate professional experiences in Forensic Science on their transcript. Permission of department required. **Credits:** 0.00 to 8.00

ENTM 39300 - Insect Biology Practicum

Credit Hours: 1.00. Imbedded programmatic experiences for undergraduate students in Insect Biology including focused reflection on the knowledge, skills, and values necessary for contributions in the discipline. Permission of instructor required. **Credits:** 1.00

ENTM 39310 - Insect Biology Practicum II

Credit Hours: 1.00. This course provides imbedded programmatic experiences for undergraduate students. It introduces students to the breadth of the discipline of entomology by engaging them at a programmatic level. This is accomplished by incorporating students into laboratory meetings, research, extension or teaching activities and through discussions with the faculty instructor about the goals and motivations driving their weekly research, extension or teaching activities and how these activities address societal grand challenges. All students enrolled in ENTM 39310 will be required at the end of each of the 8-week sessions and provide a recorded presentation overviewing some aspect of the mentor's program and its linkage to societal grand challenges. Permission of department required.**Credits:** 1.00

ENTM 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in entomology. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ENTM 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in entomology. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ENTM 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in entomology. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ENTM 40000 - Entomology Study Abroad

Credit Hours: 0.00 to 8.00. Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities. **Credits:** 0.00 to 8.00

ENTM 40100 - Addressing Grand Challenges Through Insect Biology

Credit Hours: 1.00. This course engages students in an examination of societal grand challenges by identifying the problems, understanding the current state of knowledge, identifying knowledge gaps, and implementing possible solutions. Permission of department required. **Credits:** 1.00

ENTM 41000 - Applied Insect Biology

Credit Hours: 2.00. Identification, biology and management of insects associated with global food and energy security and human and animal health and well-being. Students are expected to have a knowledge of college biology. **Credits:** 2.00

ENTM 41001 - Insects Of Urban Landscapes

Credit Hours: 1.00. Students focus on identification and biology of insects associated with turfgrass and ornamental plants. The role of experimentation in applied insect biology is examined. **Credits:** 1.00

ENTM 41002 - Insects Of Agricultural Crops

Credit Hours: 1.00. Students focus on identification, biology, and management of pests of agricultural crops, identification of natural enemies, and application of scientific method to applied insect biology. **Credits:** 1.00

ENTM 42820 - Carrion Ecology

Credit Hours: 3.00. This course explores how carrion interact with the environment and other organisms during the decomposition process. Focus will be given to an understanding of the process itself, how investigators collect information about the process, and how research is conducted into the process of decomposition. Students will carry out an experiment and write their results up in the format of a peer reviewed article. Typically offered Fall.**Credits:** 3.00

ENTM 42890 - Forensic Science Teaching

Credit Hours: 3.00. This course provides an opportunity for students who have completed forensic science courses to assist in that course previously taken, reinforcing the skills, expanding their mastery of the scientific method and how it pertains to forensic science as well as introducing basic pedagogical tools for instruction to the student. Permission of Instructor required. **Credits:** 3.00

ENTM 43100 - Human-Wildlife Conflicts

Credit Hours: 3.00. Exploration of conflicts between human interests and wildlife and the regulations policies and legislation used to minimize conflicts. Negative interactions may be real or perceived, economic or aesthetic, social or political, and may pose risks to human health and safety. Emphasis on the causes of conflict and resolutions that seek to balance protection or conservation of wildlife with protection of other public resources and individual property owners. Prior knowledge of college-level general biology and ecology is expected. **Credits:** 3.00

ENTM 47500 - Honors Course-Upper Division

Credit Hours: 1.00 to 4.00. Utilized to offer a new honors course for a maximum of three years. Variable title, credit, and instructional type. Course may be repeated for credit if content and titles are different. Offered primarily to third and fourth-year students. Courses offered must be approved by departmental or program faculty, and the College of Agriculture Honors Committee. Must be enrolled in an Honors program. Permission of department required. **Credits:** 1.00 to 4.00

ENTM 49310 - Insect Biology Capstone Experience

Credit Hours: 2.00 or 4.00. Insect Biology majors complete a capstone project under the guidance of a faculty mentor. Permission of instructor required. **Credits:** 2.00 or 4.00

ENTM 49320 - Insect Biology Capstone Experience II

Credit Hours: 2.00 to 4.00. This course is an experiential meant to familiarize students with the options and procedures associated with the Entomology capstone experience and provide students with an avenue for fulfilling their capstone requirement by conducting a capstone project. Students may use a research, extension or teaching project to meet this requirement. Although the capstone project may build on or extend a previously conducted undergraduate research project, independent study, or study abroad, students enrolled in ENTM 49320 must conduct their capstone project in a manner that is independent from any other project for which credit will be awarded or for which they will be paid as an employee. Students may enroll in ENTM 49320 and conduct the capstone project at any time during the last 2 years of study. Permission of department required.**Credits:** 2.00 to 4.00

ENTM 49390 - Insect Biology Capstone Forum

Credit Hours: 1.00. Students apply their accumulated knowledge to grand challenges and careers in insect biology. Permission of department required. **Credits:** 1.00

ENTM 49400 - Advanced Topics In Forensic Sciences

Credit Hours: 1.00 to 4.00. This course will provide an avenue for students to pursue knowledge in emerging advanced areas of Forensic Science. Permission of department required. **Credits:** 1.00 to 4.00

ENTM 49410 - Advanced Laboratory Topics In Forensic Science

Credit Hours: 1.00 to 4.00. This course will provide an avenue for students to pursue laboratory techniques in emerging advanced areas of Forensic Science. Permission of Department required. **Credits:** 1.00 to 4.00

ENTM 49500 - Advanced Topics In Entomology

Credit Hours: 1.00 to 4.00. Special topics in entomology at upper division level not available in other entomology courses. Permission of department required. **Credits:** 1.00 to 4.00

ENTM 49510 - Advanced Laboratories In Entomology

Credit Hours: 1.00 to 4.00. Special laboratories in entomology at upper division level not available in other entomology courses. Permission of department required. **Credits:** 1.00 to 4.00

ENTM 49700 - Special Problems In Forensic Science

Credit Hours: 1.00 to 4.00. This course will provide an opportunity for qualified sophomores, juniors and seniors to engage in the study of special Forensic Science problems not covered in regular coursework. It will also provide a mechanism for recording these independent studies on their transcript. Permission of department required. **Credits:** 1.00 to 4.00

ENTM 49800 - Special Problems In Entomology

Credit Hours: 1.00 to 4.00. Open to qualified sophomores, juniors, and seniors who want to study special problems in entomology not covered in regular coursework. Permission of instructor required. **Credits:** 1.00 to 4.00

ENTM 50800 - Integrative Insect Taxonomy

Credit Hours: 4.00. A multisource approach to understanding insect taxonomy, morphology, and evolution. We will compare traditional classification schemes with new hypotheses of insect evolutionary relationships based on an array of data sources. Students learn the importance of natural history collections and how to prepare insect specimens for permanent storage. We will explore insect diversity through hands-on laboratory exercises and field research. **Credits:** 4.00

ENTM 52500 - Medical And Veterinary Entomology

Credit Hours: 3.00. Introduction to the biology and control of arthropods of medical and veterinary importance, and coverage of the natural history and abatement of selected arthropod-related diseases, including arboviral encephalitis, filariasis, leishmaniasis, Lyme disease, malaria, plague, spotted fever, trypanosomiasis, and myasis. Offered in odd-numbered years. **Credits:** 3.00

ENTM 59500 - Special Topics

Credit Hours: 1.00 to 4.00. Specialized topics not covered in other courses. May be repeated for credit if the course topic is not repeated. The specific topic offered is indicated on the student's record. Permission of instructor required. **Credits:** 1.00 to 4.00

ENTM 60000 - Graduate Student Orientation

Credit Hours: 1.00. Introduction and orientation to the requirements and culture of the Department of Entomology, the College of Agriculture, and Purdue University. Intended for graduate students in their first year. **Credits:** 1.00

ENTM 60200 - Insect Biology

Credit Hours: 3.00. A comprehensive course in entomology, for graduate students with little entomological background, that introduces students broadly to insect structure, function, behavior, ecology, pest management, and systematics. Students apply broad knowledge in each of the topic areas to a specific insect and are expected to be able to read and critically evaluate primary literature and summarize it in written and oral presentations. One year of college biology is strongly recommended. **Credits:** 3.00

ENTM 60900 - Science Writing

Credit Hours: 1.00. This course is designed for graduate students (MS or PhD) at any stage in their professional career who are seeking formal training in manuscript and grant writing for a scientific audience. Students will be required to attend class and prepare for in-class group discussions and writing activities by reading assigned sections of the text or associated papers. Students will also be required to prepare a written assignment (manuscript or grant) over the course of the semester, which they will use to practice and hone newly acquired skills, as well as participating in peer evaluation of one another's writing. Permission of department required. **Credits:** 1.00

ENTM 61000 - Current Trends In Insect Pest Management

Credit Hours: 3.00. Concepts of pest management and dynamics of pest populations, with emphasis on population regulation in theory and practice. The principles of applied ecology that pertain to insects and agricultural crops and systems. Identification, biology, behavior, and relationships of pests of forage, fiber, and vegetable crops. A knowledge of introductory entomology is recommended. Offered in even-numbered years. **Credits:** 3.00

ENTM 61100 - Toxicology Of Insecticides

Credit Hours: 3.00. The chemistry, mode of action, and metabolism of insecticides and related compounds in both insect and vertebrate systems. Evaluation of toxic action, principles of selective toxicity, insecticide resistance, and environmental effects are also discussed. A minimal knowledge of entomology is required. Knowledge of biochemistry and neurobiology is useful. Offered in even-numbered years.**Credits:** 3.00

ENTM 64200 - Analysis Of Ecological Data

Credit Hours: 3.00. Intermediate course in analysis options for biological and ecological data. Topics include: univariate, multivariate, parametric and non-parametric analysis and their basis; advanced graphical techniques; basic mapping with and without geographical information systems; simulation modeling; associated coding for open source platforms. A previous graduate-level course in statistics is required. Working knowledge of ANOVA, t-tests, linear regression, and assumptions and distributions of test statistics for these is assumed. **Credits:** 3.00

ENTM 69100 - Special Problems

Credit Hours: 1.00 to 12.00. Special research topics of interest to graduate students and not included in assigned coursework. Permission of instructor required. **Credits:** 1.00 to 12.00

ENTM 69200 - Special Topics

Credit Hours: 1.00 to 4.00. Advanced topics in specialties of department members such as, but not limited to: biochemistry and physiology; biological control; insect pest management; veterinary entomology; nematode systematics; pathology; systematics. The field in which work is offered will appear on the student's record. Doctoral student standing. Permission of instructor required. **Credits:** 1.00 to 4.00

ENTM 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

ENTM 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Environmental and Ecological Engineering

EEE 23000 - Engineering Economics And Environment

Credit Hours: 3.00. This course introduces life cycle analysis concepts; every process and material involved in an object's life is accounted for in a system boundary to quantify the effect an item has on the world's environment. Students will become familiar with how materials are sourced from nature, how they are processed into components, how those components are assembled into consumer items, how the consumer item continues to require resources, and how the item is eventually disposed. Particular focus is given to how each of these topics impacts societies and environments at both local and global scales.**Credits:** 3.00

EEE 25000 - Environmental, Ecological, and Engineering Systems

Credit Hours: 3.00. An overview of systems thinking and examples, and applications to environmental, ecological, and engineering systems. Students will develop an understanding of complex and global systems, along with the tools and analysis methods required to deal with them. Basic environmental and ecological science concepts are also included. Typically offered Fall.**Credits:** 3.00

EEE 29000 - Introduction To Environmental And Ecological Engineering Seminar

Credit Hours: 1.00. Guest presenters, peer panelists, and small group discussions introduce students to the knowledge, skills, and abilities needed in order to exhibit the highest levels of professionalism and stewardship expected of an Environmental and Ecological Engineering graduate. Topics include planning a course of study; internship, research, study abroad opportunities; career planning and placement skills; professional responsibility and ethics; and functioning as a professional. **Credits:** 1.00

EEE 29001 - Introduction To Environmental & Ecological Engineering Seminar

Credit Hours: 2.00. Guest presenters, peer panelists, and small group discussions introduce students to the knowledge, skills, and abilities needed in order to exhibit the highest levels of professionalism & stewardship expected of an Environmental and Ecological Engineering graduate. Topics include planning a course of study; internship, research, study abroad opportunities; career planning and placement skills; professional responsibility and ethics; and functioning as a professional. **Credits:** 2.00

EEE 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in environmental and ecological engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

EEE 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in environmental and ecological engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

EEE 29500 - Experimental Course

Credit Hours: 0.00 to 6.00. Topics vary. Arrange hours and credit. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 0.00 to 6.00

EEE 30000 - Environmental And Ecological Systems Modeling

Credit Hours: 3.00. Introduction to computational methods for describing physical, chemical, and microbiological processes that occur in natural and engineered aqueous systems, including rivers and lakes, and within water and wastewater treatment systems. Emphases on understanding and conceptualizing important processes, data analysis, algorithm development, and competency in the use of programming tools.**Credits:** 3.00

EEE 35000 - Introduction To Environmental And Ecological Engineering

Credit Hours: 3.00. Introduction to water pollution, air pollution, noise, hazardous and solid wastes, and their control. Environmental impact statements and global pollution issues. Field trips required. Typically offered Fall Spring Summer.**Credits:** 3.00

EEE 35500 - Engineering Environmental Sustainability

Credit Hours: 3.00. (CE 35500) An introduction to the examination of global-scale resource utilization, food, energy and commodity production, population dynamics, and their ecosystem impacts. Typically offered Fall Spring.**Credits:** 3.00

EEE 36000 - Environmental And Ecological Engineering Laboratory

Credit Hours: 1.00 to 3.00. An introduction to laboratory methods of analysis of Environmental and Ecological Engineering systems. Topics will change from semester to semester and will be announced in advance. The list of possible topics includes experimental design, treatment of data, the analytical determination of chemical and biological constituents in water, soil, and air; analysis of environmental and ecological engineering processes; analysis of life-cycle characteristics and impacts of consumer products and commodities; methods of prevention and remediation of manufacturing waste streams. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

EEE 36001 - Water Quality And Treatment Laboratory

Credit Hours: 3.00. Laboratory procedures are described and performed that examine chemical, physical, and biological properties and constituent concentrations of natural waters. In addition, water treatment process experiments are performed to show how constituent concentrations can be altered during water treatment processes. Procedures include the analytical determination of several chemical and biological constituents in water by titrimetric, colorimetric, or chromatographic methods, whereas treatment processes include reactor design, pH adjustment, ion exchange, lime softening, coagulation, and disinfection.**Credits:** 3.00

EEE 36002 - Environmental Sustainability For Industry, Laboratory

Credit Hours: 3.00. This lab course provides an opportunity for students to gain hands-on experience with the physical and analytical tools of industrial sustainability. These include experimental methods for product testing and air quality measurement; design and planning of experiments; statistical interpretation of experimental data; design and environmental assessment of building energy use, combustion systems, and electrical circuits; and life-cycle management of electronic equipment and other household products. Students are encouraged to complete their statistics requirement.**Credits:** 3.00

EEE 38000 - Environmental Chemodynamics

Credit Hours: 3.00. Introduction to chemical thermodynamics and general equilibrium processes in environmental and ecological engineering systems. Introduction to the first and second laws of thermodynamics; properties of pure substances; ideal and real gases; thermodynamic cycles and processes; heat transfer and combustion; and chemical equilibrium in aquatic solutions, including equilibria between phases and reaction equilibria. Emphasis is on understanding and conceptualizing important processes, and competency in thermodynamic calculations. **Credits:** 3.00

EEE 38199 - Professional Practice Co-Op I

Credit Hours: 0.00. Professional experience in Environmental and Ecological Engineering. Program coordinated by EEE with cooperation of participating employers and the Office of Professional Practice. Students submit summary report and company evaluation. Permission of department required. Typically offered Fall Spring Summer.**Credits:** 0.00

EEE 38299 - Professional Practice Co-Op II

Credit Hours: 0.00. Professional experience in Environmental and Ecological Engineering. Program coordinated by EEE with cooperation of participating employers and the Office of Professional Practice. Students submit summary report and company evaluation. Permission of department required. Typically offered Fall Spring Summer.**Credits:** 0.00

EEE 38399 - Professional Practice Co-Op III

Credit Hours: 0.00. Professional experience in Environmental and Ecological Engineering. Program coordinated by EEE with cooperation of participating employers and the Office of Professional Practice. Students submit summary report and company evaluation. Permission of department required. Typically offered Fall Spring Summer.**Credits:** 0.00

EEE 38500 - Environmental Soil Chemistry

Credit Hours: 4.00. (AGRY 38500) Designed as an upper level introductory course covering environmental soil chemistry concepts in framework most applicable to inorganic and organic chemical contamination of soil and water resources and intended for students in environmental science fields that may not have a strong chemistry and/or math background. (el.5). Typically offered Fall.
Credits: 4.00

EEE 39000 - Environmental And Ecological Engineering Professional Practice Seminar

Credit Hours: 1.00. Seminar lectures and discussions to introduce students to aspects of professional practice within Environmental and Ecological Engineering. Topics include career planning and placement skills, professional responsibility and ethics, functioning as a professional, and other current important topics in the profession. Students will interact with several practicing Environmental and Ecological Engineers.**Credits:** 1.00

EEE 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in environmental and ecological engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

EEE 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in environmental and ecological engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

EEE 39500 - Experimental Course

Credit Hours: 0.00 to 6.00. Topics vary. Arrange hours and credits. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 0.00 to 6.00

EEE 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in environmental and ecological engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

EEE 39699 - Professional Practice Internship

Credit Hours: 0.00. One-session professional experience in environmental and ecological engineering. Program coordinated by EEE with cooperation of participating employers and the Office of Professional Practice. Students submit summary report and company evaluation. Permission of department required. Typically offered Fall Spring Summer.**Credits:** 0.00

EEE 43000 - Industrial Ecology And Life Cycle Analysis

Credit Hours: 3.00. The outputs and processes associated with industrial systems are examined, with special emphasis placed on interactions of these systems with environmental and ecological systems. A full product life cycle perspective is stresses, including energy and material flows, processes used to produce materials and realize products, and the management of end-of-life products. Typically offered Spring.**Credits:** 3.00

EEE 45600 - Wastewater Treatment Processes

Credit Hours: 3.00. (CE 45600) Fundamental design principles and practice of wastewater treatment to prepare students for designing wastewater treatment systems. The major topics include design and construction process, preliminary treatment of wastewater, primary treatment, wastewater microbiology, secondary treatment, nitrogen removal, phosphorus removal, attached microbial growth, secondary settling, disinfection and post-aeration, tertiary treatment, and wastewater plant residuals management. Typically offered Fall.**Credits:** 3.00

EEE 47200 - Community-Engaged Engineering & Design

Credit Hours: 3.00. Utilizing a transdisciplinary approach in a real-world, client-based service-learning design experience, students will lead the design and implementation of community-engaged sustainability projects integrating not only their discipline-specific knowledge, but community partner and stakeholder knowledge as well. This course will require travel outside of class to community partner sites to collaborate in the design process. Sustainability projects to improve the health and wellness of communities will be implemented at multiple sites. The complex and dynamic relationships between social, economic, environmental, and political sectors in such community-engaged projects will be investigated.**Credits:** 3.00

EEE 48000 - Environmental And Ecological Engineering Senior Design

Credit Hours: 1.00 to 3.00. Senior-level environmental and ecological engineering design projects. Projects will integrate knowledge and skills earlier in the degree program and stress the application of the design process to interdisciplinary environmental and/or ecological engineering systems. Permission of department required. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

EEE 48001 - Environmental And Ecological Engineering Senior Design

Credit Hours: 1.00. Senior-level environmental and ecological engineering design projects. Projects will integrate knowledge and skills earlier in the degree program and stress the application of the design process to interdisciplinary environmental and/or ecological engineering systems. Permission of department required.**Credits:** 1.00

EEE 48002 - Environmental And Ecological Engineering Senior Design II

Credit Hours: 2.00. Senior-level environmental and ecological engineering design projects. Projects will integrate knowledge and skills earlier in the degree program and stress the application of the design process to interdisciplinary environmental and/or ecological engineering systems.**Credits:** 2.00

EEE 48100 - Reflective Practitioner

Credit Hours: 1.00. Reflective practice is a term coined by Donald Schön in The Reflective Practitioner (1983). Reflective practice is the capacity to reflect on action to engage in a process of continuous learning. Reflective practice can be an important tool in practice-based professional learning settings where people learn from their own professional experiences, rather than from formal learning or knowledge transfer. It may be the most important source of personal professional development and improvement. It is also an important way to bring together theory and practice. A person who reflects throughout their practice is not just looking back on past actions and events, but is taking a conscious look at emotions, experiences, actions, and responses, and using that information to add to their existing knowledge base and reach a higher level of understanding. Critical reflection as part of experiential education generates, deepens, and documents learning. As a result of this course, you will be able to articulate

the value of your experiential education opportunities toward marketing yourself for potential job opportunities and develop the skills needed to become a reflective practitioner for promotional growth in your future career. Permission of department required.**Credits:** 1.00

EEE 49500 - Experimental Course

Credit Hours: 0.00 to 6.00. Topics Vary. Arrange hours and credit. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 0.00 to 6.00

EEE 49800 - Environmental And Ecological Engineering Projects

Credit Hours: 0.00 to 6.00. Topics vary. Arrange hours and credits. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 0.00 to 6.00

EEE 53000 - Life Cycle Assessment: Principles And Applications

Credit Hours: 3.00. This course covers the basic concept of life cycle thinking, framework and computational structure of process and economic input-output based life cycle assessment (LCA), state-of-the-art LCA software tools, industrial case studies, and recent advances in LCA methodology. Students are required to complete a group project that could potentially facilitate the adaptation of LCA tools in engineering research, education, or practice.**Credits:** 3.00

EEE 54400 - Environmental Organic Chemistry

Credit Hours: 3.00. (AGRY 54400) The fundamental properties and processes responsible for the fate of organic chemicals in the environment, with emphasis on soil and water chemistry. Areas to be addressed will include both conceptual and theoretical aspects of processes relevant to environmental fate of contaminants; measurement, estimation, correlation, and application of the parameters most commonly used to assess various chemodynamic properties in soil-water systems. Typically offered Spring.**Credits:** 3.00

EEE 55000 - Physico-Chemical Processes In Environmental Engineering I

Credit Hours: 3.00. Theory and principles of design for processes used in environmental engineering, with emphasis on water and wastewater treatment. Processes include: coagulation, flocculation, sedimentation, centrifugation, filtration, disinfection, adsorption, and gas/liquid transfer. **Credits:** 3.00

EEE 55201 - Environmental Biotechnology

Credit Hours: 3.00. This course focuses on fundamentals of molecular biology and biotechnology for environmental applications. The major topics include activated sludge processes, stoichiometry, kinetics, anaerobic digestion, biological nitrogen and phosphorus removal, emerging contaminants, molecular microbiology tools, biofouling, antibiotic resistance, and biofuels. **Credits:** 3.00

EEE 55401 - Water Chemistry For Environmental And Ecological Engineering

Credit Hours: 3.00. Principles of chemistry applied to the analysis and distribution of the chemical composition of natural waters and engineered water systems. Course topics include acid/base, complexation, precipitation/dissolution, sorption and redox reactions in the context of environmental and ecological engineering. Case studies focus on water chemistry in research and practice, such as lead in drinking water, recovery of valuable products from wastewater, chemistry of engineered carbon dioxide capture, and engineered treatment of surface waters. Case studies vary each year. **Credits:** 3.00

EEE 56000 - Environmental And Ecological Engineering In-Context

Credit Hours: 0.50 to 3.00. An introduction to current challenges and issues in Environmental and Ecological Engineering (EEE) applications. Topics will change from semester to semester and will be announced in advance. The list of possible topics includes current events, emerging challenges, adaptations to new regulations, innovative environmental and ecological engineering processes, life-cycle impacts of manufactured products, and sustainable management of industrial waste streams. Typically offered Fall Spring.**Credits:** 1.00 to 3.00

EEE 57000 - Solid And Hazardous Waste Management

Credit Hours: 3.00. Students will be introduced to the regulation of solid and hazardous wastes; engineering design, planning and analysis of solid and hazardous waste management facilities. **Credits:** 3.00

EEE 59500 - Environmental And Ecological Engineering Projects

Credit Hours: 0.00 to 6.00. Topics vary. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 0.00 to 6.00

EEE 59800 - Environmental And Ecological Engineering Projects

Credit Hours: 0.00 to 6.00. Topics vary. Arrange hours and credit. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 0.00 to 6.00

EEE 69000 - Environmental And Ecological Engineering Graduate Seminar

Credit Hours: 0.00. Combination of invited speakers (outside and inside Purdue) including graduate students. Topics will range across environmental and ecological engineering with an emphasis on current topics. Typically offered Fall Spring Summer.**Credits:** 0.00

EEE 69199 - Professional Practice Graduate Co-Op I

Credit Hours: 0.00. Professional experience in environmental and ecological engineering. Program coordinated by EEE with cooperation of participating employers and the Office of Professional Practice. Students submit summary report and company evaluation.
Credits: 0.00

EEE 69299 - Professional Practice Graduate Co-Op II

Credit Hours: 0.00. Professional experience in environmental and ecological engineering. Program coordinated by EEE with cooperation of participating employers and the Office of Professional Practice. Students submit summary report and company evaluation. Permission of department required. **Credits:** 0.00

EEE 69399 - Professional Practice Graduate Co-Op III

Credit Hours: 0.00. Professional experience in environmental and ecological engineering. Program coordinated by EEE with cooperation of participating employers and the Office of Professional Practice. Students submit summary report and company evaluation. Permission of department required. **Credits:** 0.00

EEE 69500 - Experimental Courses

Credit Hours: 0.00 to 6.00. Topics vary. Arrange hours and credit. Permission of instructor required. Typically offered Fall Spring.**Credits:** 0.00 to 6.00

EEE 69699 - Professional Practice Internship

Credit Hours: 0.00. One-session professional experience in environmental and ecological engineering. Program coordinated by EEE with cooperation of participating employers and the Office of Professional Practice. Students submit summary report and company evaluation. Permission of department required.**Credits:** 0.00

EEE 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 18.00

EEE 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Entrepreneurship

ENTR 20000 - Introduction To Entrepreneurship And Innovation

Credit Hours: 3.00. This course introduces students to the process of turning ideas, inventions, and innovations into new business ventures. It covers foundational entrepreneurial concepts and practices, as well as the leadership, teamwork, and communication skills required of individuals who choose to become entrepreneurs or to act entrepreneurially in established organizations. It serves as the first required core course for the Certificate in Entrepreneurship and Innovation. **Credits:** 3.00

ENTR 31000 - Marketing And Management For New Ventures

Credit Hours: 3.00. This course builds on the foundational skills developed in ENTR 20000 (prerequisite course) to bring students through the process of launching a new venture. Students work in teams to develop and validate business models for potential startups. This occurs through experiential activities including gathering feedback from potential customers, creating forecasts, developing a go-to-market strategy, and pitching to investors. Students can choose ENTR 31000, ENTR 31500, or ENTR 32500 to serve as the second required core course for the Certificate in Entrepreneurship and Innovation.**Credits:** 3.00

ENTR 31500 - Business Planning For Social Entrepreneurship

Credit Hours: 3.00. This course builds on entrepreneurship concepts and skills developed in ENTR 20000 (prerequisite course) to understand the differences, benefits, and opportunities associated with social impact business models. Students work in teams on experiential activities including gathering customer feedback, creating forecasts, developing a strategy, and pitching to stakeholders and investors. Students can choose ENTR 31000, ENTR 31500, or ENTR 32500 to serve as the second required core course for the Certificate in Entrepreneurship and Innovation.**Credits:** 3.00

ENTR 32500 - Global Entrepreneurship And Innovation

Credit Hours: 3.00. This course builds on the foundational skills developed in ENTR 20000 (prerequisite course), to provide students with a comprehensive understanding of entrepreneurship in a global context. It explores the differences, challenges, and opportunities associated with developing international ventures and expanding into overseas markets. Through topic lectures, case studies, and experiential team projects, students will gain insight into global trends, cultural nuances, business models,

strategies, and pitching to stakeholders and investors. Students can choose ENTR 31000, ENTR 31500, or ENTR 32500 to serve as the second required core course for the Certificate in Entrepreneurship and Innovation.**Credits:** 3.00

ENTR 39000 - Special Topics In Entrepreneurship And Innovation

Credit Hours: 1.00 to 3.00. The requested course will provide the opportunity to develop courses which fulfill the "option" course requirement for the Certificate in Entrepreneurship and Innovation Program. Option courses are designed to provide depth in certain disciplines related to entrepreneurship and innovation, and/or entrepreneurship and innovation in relation to specific industries or markets. **Credits:** 1.00 to 3.00

ENTR 39699 - Internship And Research Experiences

Credit Hours: 0.00. Interns for Indiana internships work experience with participating employers. Students submit a summary report and company evaluation. Through a mutual selection process, students may be placed as interns with entrepreneurial companies. Placements are determined through a screening process based upon students' skills and experiences gained through their major fields of study. Fulfills a capstone requirement for the Certificate in Entrepreneurship and Innovation Program. Contact the Office of Professional Practice. Permission of instructor required. Discovery Park Undergraduate Research Internships. Check the DURI website for further information. https://www.purdue.edu/discoverypark/duri/. **Credits:** 0.00

ENTR 46000 - Internship And Career Preparation Seminar

Credit Hours: 1.00. This course is a distance option course for the Certificate in Entrepreneurship and Innovation. It equips students with professional skills based on entrepreneurship competencies. Students develop resources to illustrate their skills, talents, abilities, and goals to increase career preparedness. They learn what it takes to successfully transfer academic skills to a workplace setting and develop an entrepreneurial mindset that sets them apart from other job seekers. **Credits:** 1.00

ENTR 47000 - Gender, Diversity And Leadership

Credit Hours: 3.00. This course serves as an option course for the Certificate in Entrepreneurship and Innovation. It provides a social and historical perspective of gender and diversity in leadership and entrepreneurship, as well as practical skills students can use to develop their own leadership abilities. This highly interactive course provides the opportunity for students to meet with diverse leaders from a variety of organizations. Topics of social, political, and economic interest are covered, as are discussions of current issues and research relevant to leadership success. **Credits:** 3.00

ENTR 48000 - Entrepreneurial Leadership And Careers

Credit Hours: 3.00. This course prepares students for entrepreneurial careers by requiring them to apply the knowledge and skills learned in prerequisite entrepreneurship courses to the development of their professional goals and networks. Students explore how they can use their entrepreneurial talents, skills, and interests in a variety of ways, including launching startups, joining family businesses, or being intrapreneurs in established organizations. The course serves as a capstone for the Certificate in Entrepreneurship and Innovation.**Credits:** 3.00

ENTR 48100 - Consulting For Emerging Enterprises

Credit Hours: 3.00. This course is an experiential course that requires students to apply the knowledge and skills learned in prerequisite entrepreneurship courses to a real-world consulting project for a startup, small business, or non-profit organization. Student teams use a three-stage consulting model to guide project contracting, data gathering, and value creation for the client. In-class time focuses on developing consulting knowledge and competencies that are applied directly to client interactions and project execution. The course serves as a capstone for the Certificate in Entrepreneurship and Innovation. Class size is limited. Permission of the instructor is required.**Credits:** 3.00

ENTR 48200 - Venture Planning Studio

Credit Hours: 3.00. This course is an experiential course that brings students through the process of creating a startup company as they would in a real-world business incubator or venture studio. They apply knowledge and methodologies related to design thinking, lean startup, financial planning, and fundraising to develop robust business models. Students can bring their own ideas to the course or contribute to one that will be identified. The purpose of this course is to develop in students the confidence and competence to transform a venture idea into a viable startup company. The course serves as a capstone for the Certificate in Entrepreneurship and Innovation.**Credits:** 3.00

ENTR 49000 - Senior Level Special Topics In Entrepreneurship And Innovation

Credit Hours: 1.00 to 3.00. The requested course will provide the opportunity to develop capstone courses for the Certificate in Entrepreneurship and Innovation Program. Capstone courses are designed to provide students with the opportunity to apply the knowledge acquired in Certificate Program "core" and "option" courses to hands-on, real world activities related to entrepreneurship and innovation. **Credits:** 1.00 to 3.00

ENTR 50000 - Technology Commercialization Seminar

Credit Hours: 2.00. This course is a seminar that focuses on topics related to technology realization, commercialization, and entrepreneurship. Topics pertaining to these areas are covered through readings, class discussion, and presentations by invited speakers. **Credits:** 2.00

ENTR 50100 - Technology Commercialization Practicum

Credit Hours: 2.00. This course introduces a variety of cross-disciplinary topics to develop the skills needed to realize technology. Each week, students learn specific methodologies and techniques and apply these through case studies and class projects. **Credits:** 2.00

ENTR 59000 - Graduate Level Special Topics In Entrepreneurship And Innovation

Credit Hours: 1.00 to 3.00. The requested course will provide the opportunity for graduate students to participate in entrepreneurship courses focused on the skills and knowledge necessary to launch and lead new business ventures, the examination of the feasibility and market potential of new technologies, and/or the development of business plans. **Credits:** 1.00 to 3.00

Film and Video

FLM 24100 - Foundations Of Cinema Production

Credit Hours: 3.00. The course introduces students to the principles and practice of professional video production. Through lectures, viewing, discussions, and laboratory exercises, students will acquire the tools necessary to transform their concepts, or those of their clients, into successful video productions. Film students have priority. **Credits:** 3.00

FLM 29100 - Special Topics In Film/Video Studies

Credit Hours: 1.00 to 4.00. Special topics or projects under the direction of an instructor in a particular field of specialization. **Credits:** 1.00 to 4.00

FLM 29102 - Special Topics In Live Production

Credit Hours: 1.00 to 4.00. Special topics or projects under the direction of an instructor in a particular field of specialization.**Credits:** 1.00 to 4.00

FLM 29103 - Special Topics In International Cinema

Credit Hours: 1.00 to 4.00. Special topics or projects under the direction of an instructor in a particular field of specialization.**Credits:** 1.00 to 4.00

FLM 29104 - Special Topics In Directing

Credit Hours: 1.00 to 4.00. Special topics or projects under the direction of an instructor in a particular field of specialization.**Credits:** 1.00 to 4.00

FLM 29105 - Special Topics In Screenwriting

Credit Hours: 1.00 to 4.00. Special topics or projects under the direction of an instructor in a particular field of specialization.**Credits:** 1.00 to 4.00

FLM 29106 - Special Topics In Cinematography

Credit Hours: 1.00 to 4.00. Special topics or projects under the direction of an instructor in a particular field of specialization.**Credits:** 1.00 to 4.00

FLM 29107 - Special Topics In Editing

Credit Hours: 1.00 to 4.00. Special topics or projects under the direction of an instructor in a particular field of specialization.**Credits:** 1.00 to 4.00

FLM 29108 - Special Topics In Cinema Studies

Credit Hours: 1.00 to 4.00. Special topics or projects under the direction of an instructor in a particular field of specialization.**Credits:** 1.00 to 4.00

FLM 32100 - Live Production I: Theater/Music/Arts

Credit Hours: 1.00 to 4.00. This experiential course furthers the students' understanding of live video production. Lecture combined with various production experiences increase the students' proficiency with professional technology and equipment as well as narrative development. **Credits:** 1.00 to 4.00

FLM 32200 - Live Production I: Fall/Winter Sports

Credit Hours: 1.00 to 4.00. This experiential course furthers the students' understanding of live sports video production. Lecture combined with various production experiences increase the students' proficiency with professional technology and equipment as well as the art and storytelling of the craft. Potential Men's and Women's Fall/Winter sports include Cross Country, Soccer, Volleyball, Football, Swimming & Diving, Wrestling, Basketball, or Track & Field. **Credits:** 1.00 to 4.00

FLM 32300 - Live Production I: Winter/Spring Sports

Credit Hours: 1.00 to 4.00. This experiential course furthers the students' understanding of live sports video production. Lecture combined with various production experiences increase the students' proficiency with professional technology and equipment as well as the art and storytelling of the craft. Potential Men's and Women's Winter/Spring sports include Swimming & Diving, Wrestling, Basketball, Baseball, Softball, Tennis, Golf, or Track & Field. **Credits:** 1.00 to 4.00

FLM 33000 - International Cinema

Credit Hours: 3.00. This course is designed to develop students' seeing, reading, speaking, writing, and critical thinking skills, and especially to improve visual competency, awareness of visual culture, and knowledge of selected international cinema. All films will be shown with English subtitles. **Credits:** 3.00

FLM 35100 - Screenwriting

Credit Hours: 3.00. Students will gain a working knowledge of basic narrative elements and how these elements work to form a story. Writing and re-writing a three act outline and an original screenplay will give you an understanding of script language and process. (Film and Video majors have priority.) **Credits:** 3.00

FLM 36100 - Cinematography

Credit Hours: 3.00. This intermediate course in Cinematography will further prepare the student to use the technology of the camera as a basis for the art and visual storytelling of motion pictures. The student will also receive the basic background needed for understanding the skills and processes of a single camera production environment. **Credits:** 3.00

FLM 37100 - Editing I

Credit Hours: 3.00. The course introduces students to the principles of film and video editing. Projects, discussions, demonstrations, and hands-on exercises expose students to the technical and artistic aspects of the editing process. Film & Film and Video majors have priority. **Credits:** 3.00

FLM 37200 - Editing II

Credit Hours: 3.00. This course instructs students in advanced principles of film and video editing and color grading. Projects, discussions, demonstrations, and hands-on exercises expose students to the technical and artistic aspects of the editing process. Film and Video majors have priority. **Credits:** 3.00

FLM 41000 - Internship In Film/Video/Media Production

Credit Hours: 1.00 to 4.00. Internships in one of the professional areas of film, video or media production. Internships are supervised by appropriate faculty in a particular field of specialization. Permission of instructor required. **Credits:** 1.00 to 4.00

FLM 42200 - Live Production II: Fall/Winter Sports

Credit Hours: 1.00 to 4.00. This experiential course furthers the students' understanding of Producing and Directing live sports video and television. Lecture combined with various production experiences increase the students' proficiency with professional technology and equipment as well as the art and storytelling of the craft. Potential Men's and Women's Fall/Winter sports include Cross Country, Soccer, Volleyball, Football, Swimming & Diving, Wrestling, Basketball, or Track & Field. Permission of instructor required.**Credits:** 1.00 to 4.00

FLM 42300 - Live Production II: Winter/Spring Sports

Credit Hours: 1.00 to 4.00. This experiential course furthers the students' understanding of Producing and Directing live sports video and television. Lecture combined with various production experiences increase the students' proficiency with professional technology and equipment as well as the art and storytelling of the craft. Potential Men's and Women's Winter/Spring sports include Swimming & Diving, Wrestling, Basketball, Baseball, Softball, Tennis, Golf, or Track & Field. Permission of instructor required.**Credits:** 1.00 to 4.00

FLM 44200 - Directing The Narrative Short Film

Credit Hours: 3.00. Students will gain knowledge of all phases of film production in the course of completing multiple short films. This class will emulate standard film industry practices and guidelines. **Credits:** 3.00

FLM 44600 - Producing Non-Fiction Video

Credit Hours: 3.00. This advanced course builds on previous knowledge and exposes students to the role of an independent video producer. By working with real world clients on real world projects, students will gain valuable experience in guiding productions from start to finish. Additionally, students will learn basic fundamentals of entrepreneurship and business skills designed to begin to prepare students to form their own video production business. **Credits:** 3.00

FLM 49000 - Directed Readings In Film/Video Studies

Credit Hours: 1.00 to 4.00. Readings under the direction of the instructor in a particular field of study.**Credits:** 1.00 to 4.00

FLM 49100 - Special Topics In Film/Video Studies

Credit Hours: 1.00 to 4.00. Special topics or projects under the direction of an instructor in a particular field of specialization. **Credits:** 1.00 to 4.00

FLM 49102 - Special Topics In Live Production

Credit Hours: 1.00 to 4.00. Special topics or projects under the direction of an instructor in a particular field of specialization.**Credits:** 1.00 to 4.00

FLM 49103 - Special Topics In International Cinema

Credit Hours: 1.00 to 4.00. Special topics or projects under the direction of an instructor in a particular field of specialization.**Credits:** 1.00 to 4.00

FLM 49104 - Special Topics In Directing

Credit Hours: 1.00 to 4.00. Special topics or projects under the direction of an instructor in a particular field of specialization.**Credits:** 1.00 to 4.00

FLM 49105 - Special Topics In Screenwriting

Credit Hours: 1.00 to 4.00. Special topics or projects under the direction of an instructor in a particular field of specialization.**Credits:** 1.00 to 4.00

FLM 49106 - Special Topics In Cinematography

Credit Hours: 1.00 to 4.00. Special topics or projects under the direction of an instructor in a particular field of specialization.**Credits:** 1.00 to 4.00

FLM 49107 - Special Topics In Editing

Credit Hours: 1.00 to 4.00. Special topics or projects under the direction of an instructor in a particular field of specialization.**Credits:** 1.00 to 4.00

FLM 49108 - Special Topics In Cinema Studies

Credit Hours: 1.00 to 4.00. Special topics or projects under the direction of an instructor in a particular field of specialization.**Credits:** 1.00 to 4.00

FLM 49900 - Capstone In Film/Video/Media Production

Credit Hours: 2.00 or 4.00. The Capstone in Film/Video/Media Production is intended to be the culminating experience of the Film/Video Studies or Film/Video and Theatre Production major. Each student Students will create a project of their own design. Students will pitch their project ideas to the program director and/or faculty and should develop a project based around their future career goals. Example areas include narrative/fiction cinema, documentary/non-fiction filmmaking, television production, live event production, etc. Students will fulfill the role of Writer/Producer/Director for their project (and potentially Director of Photography, Editor, etc.). This creative work will culminate in a presentation to an audience. Permission of instructor required. **Credits:** 2.00 or 4.00

Food Science

FS 16100 - Science Of Food

Credit Hours: 3.00. Chemical and physical properties of foods; issues pertaining to safety, food-diet-health relationship; government regulations pertaining to food safety, quality and additives; preservation techniques and transformation of agricultural commodities to food products; Food facts, myths, and practices that are important for making intelligent food decisions. Course may also be offered for dual credit with cooperating Indiana high schools upon documented approval by the Department of Food Science. **Credits:** 3.00

FS 16200 - Introduction To Food Processing

Credit Hours: 1.00. Application of introductory food science principles (e.g., food chemistry, food microbiology, and unit operations) to food processing; emphasis will be placed on food formulation, pilot-scale process design, and resulting food quality. May require class trips. **Credits:** 1.00

FS 16300 - Introduction To Fermentation Sciences

Credit Hours: 3.00. This course will provide an overview of the use of microorganisms in the food, pharmaceutical and chemical industries. The course will introduce fundamental concepts associated to the microbiological transformation of various substrates to produce desirable products such as foods, beverages, pharmaceuticals or chemical compounds. As an introductory course, the scientific principles of fermentation processes will be gradually introduced through the analysis of familiar fermented food products, such as bread, cheese, beer, wine, cocoa, coffee, etc. Once the fundamental concepts are learned, examples of advanced fermentation technology for production of pharmaceutical products and fine chemicals will be presented. **Credits:** 3.00

FS 24500 - Food Packaging

Credit Hours: 1.00. Elements of packaging science and technology applied to preservation, distribution, and marketing of food products; packaging materials; principles of diffusion and permeability; procedures for developing, evaluating, and testing food packages; packaging requirements for specific types of foods; other special topics of current interest. **Credits:** 1.00

FS 27500 - Honors Course - Lower Division

Credit Hours: 1.00 to 4.00. Utilized to offer a new honors course for a maximum of three years. Variable title, credit, and instructional type. Course may be repeated for credit if content and titles are different. Offered primarily to first- and second-year students. Courses offered must be approved by instructor and College of Agriculture Honors Committee. Permission of instructor required. **Credits:** 1.00 to 4.00

FS 29100 - Special Assignments

Credit Hours: 1.00 to 3.00. Open to primarily freshmen and sophomores who desire to study special problems in science not covered in regular coursework. May be repeated for credit with instructor permission. Permission of instructor required. **Credits:** 1.00 to 3.00

FS 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in food science. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

FS 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in food science. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

FS 29800 - Sophomore Seminar

Credit Hours: 1.00. Current food science issues will be discussed by students, staff, and guest speakers. Career planning and improvement of communication skills will be emphasized. **Credits:** 1.00

FS 34000 - Introduction To Food Law And Regulations

Credit Hours: 1.00. This course will cover basic knowledge and familiarity of the principal law and regulations governing raw and processed foods. Class meets during weeks 1-5. **Credits:** 1.00

FS 34100 - Food Processing I

Credit Hours: 2.00. Applications of the fundamentals of food engineering, microbiology, and chemistry to methods of food processing and preservation; emphasis will be on processing concepts, preparation for food processing, food formulation, and thermal processing. **Credits:** 2.00

FS 34200 - Food Processing I Laboratory

Credit Hours: 1.00. This laboratory course applies food engineering principles and thermal processing methods for production of safe and high-quality foods. The course will include applications of mathematics and physics principles in food processing

operations, engineering problem-solving exercises and laboratory demonstrations. Engineering concepts such as heat transfer, fluid flow, mass and energy balances applied to various food systems will be a major portion of this laboratory. **Credits:** 1.00

FS 36100 - Food Plant Sanitation

Credit Hours: 1.00. Relation of food-plant sanitation to good manufacturing practices and regulations affecting sanitation; organization of a food-plant sanitation program; sanitary building and equipment construction; selection of cleaning, sanitizing, and pesticidal compounds; water, air, and waste treatment; food storage and transportation. **Credits:** 1.00

FS 36200 - Food Microbiology

Credit Hours: 3.00. Microbiology of foods, with emphasis on the conditions for growth of microorganisms and degradation of food components, preservation methods, use of Hazard Analysis and Critical Control Point (HACCP) concepts, and microorganisms associated with foodborne illness, and modern detection methods. **Credits:** 3.00

FS 36300 - Food Microbiology Laboratory

Credit Hours: 2.00. Classic and molecular methods for enumerating, isolating, and identifying spoilage, fermentative, and pathogenic food microorganisms in food systems. **Credits:** 2.00

FS 36800 - Dairy Products

Credit Hours: 2.00. Scientific and technical aspects of procurement, processing, packaging, and quality control of milk products and frozen dairy foods. Emphasis is placed on process unit operations. **Credits:** 2.00

FS 36900 - Dairy Products Laboratory

Credit Hours: 1.00. Practical laboratory applications of processing, packaging, and quality control of fluid milk products and frozen dairy foods. May require field trips. Students are responsible for providing their own laboratory coats. Permission of instructor required. **Credits:** 1.00

FS 37200 - Fermentation Microbiology

Credit Hours: 3.00. This course explores the principles underlying the design of microbes for their use in biotechnological applications. This project-based course will teach students fundamental molecular biology techniques, important parameters for strain selection and genetic engineering, and reactor design and operation in bioprocessing. Additionally, this course will cover today's diverse bioengineering goals and tools and the role of microbial biotechnology in society. **Credits:** 3.00

FS 37300 - Fermentation Microbiology Laboratory

Credit Hours: 1.00. The course provides a laboratory-based experiential learning experience with the learning of fundamental aspects of genetic, physiological and substrate manipulation to achieve product formation in industrial microbes. **Credits:** 1.00

FS 38000 - Fermented Food Products

Credit Hours: 1.00. This course will allow students to learn and integrate concepts from microbiology, biochemistry, and processing used in the production of representative fermented food products. Students will learn how to design and make specific fermented foods. **Credits:** 1.00

FS 38100 - Industrial Fermentation Products

Credit Hours: 1.00. Industrial Fermentation Products introduces students to microbial fermentations employed in the biofuels and fine chemicals industry and their role in the larger bioeconomy. Students will be introduced to diverse final products, technical challenges in the sector, and the individuals and companies working to solve them. We end our five-week module with a field trip to a local biorefinery plant. **Credits:** 1.00

FS 38300 - Fermented Beverage Products

Credit Hours: 1.00. This course will allow students to learn and integrate concepts from microbiology, biochemistry, and processing used in the production of representative fermented beverages. Students will learn how to design and make specific fermented beverages. Must be 21 years of age or older. Permission of department required. **Credits:** 1.00

FS 39000 - Food Science Cooperative Work Experience

Credit Hours: 0.00. Supervised professional experiences in the food science industry. Programs must be preplanned and conducted under the direction of the departmental coordinator with the cooperation of an employer. Students must submit a summary report. Permission of department required. **Credits:** 0.00

FS 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in food science. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required.**Credits:** 0.00

FS 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in food science. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

FS 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in food science. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

FS 40000 - Food Science Study Abroad

Credit Hours: 0.00 to 8.00. Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities. **Credits:** 0.00 to 8.00

FS 40100 - Fermentation Processing

Credit Hours: 2.00. The Integration of fermentation core concepts; the application of bioprocess engineering principles to biological systems; topics covering enzyme kinetics, fermentation, downstream processing, and integrated bioprocesses important to industries. **Credits:** 2.00

FS 40200 - Fermentation Processing Laboratory

Credit Hours: 1.00. The essential concepts of industrial bioprocessing with a focus on the physiology of fermentation; a series of laboratory experiments that follow value-adding processes from conception to completion. **Credits:** 1.00

FS 43500 - Sensory Science

Credit Hours: 1.00. Introduction to the fundamental concepts and practices of sensory analysis of food products. Technical aspects of planning and conducting human sensory panels on food products including analysis and interpretation of collected data. Course meets weeks 1-8. **Credits:** 1.00

FS 44200 - Food Processing II

Credit Hours: 2.00. Study of food processing and preservation methods based on the integrated knowledge of microbiology, chemistry, and food engineering; emphasis will be on temperature reduction, water activity, concentration, dehydration, irradiation, and extrusion. **Credits:** 2.00

FS 44300 - Food Product Design (Capstone)

Credit Hours: 3.00. Teams develop a new product from concept through marketing. Final case study defense is presented to faculty and peers. Classes include guest lectures from the food industry. **Credits:** 3.00

FS 44400 - Statistical Process Control

Credit Hours: 1.00. Basic concepts and techniques of solving quality problems and assuring the quality of production processes; emphasis is on quality improvement programs, problem-solving tools, control charts for variables and attributes, process capability analysis, and sampling methods. Course meets during weeks 6-10. **Credits:** 1.00

FS 44700 - Food Processing II Laboratory

Credit Hours: 1.00. This lab is designed to build upon fundamental concepts associated with the preservation and processing of various food products. Concepts to be covered include water activity, dehydration (drum, spray and freeze drying), frying, high pressure, microwave and ohmic heating. The focus of this lab will be hands-on production of various food products and the demonstration of fundamental food processing unit operations and calculations related to each preservation method. **Credits:** 1.00

FS 45300 - Food Chemistry

Credit Hours: 3.00. Application of fundamental laws and concepts of chemistry, physics, and biology to the properties, composition, and storage of foods. **Credits:** 3.00

FS 45400 - Food Chemistry Laboratory

Credit Hours: 1.00. Laboratory to demonstrate application of fundamental laws and concepts of chemistry, physics, and biology to the properties, composition, and storage of foods. **Credits:** 1.00

FS 45500 - Cereal Chemistry And Processing

Credit Hours: 1.00. Cereal grain structure, chemical and functional properties, and nutritional aspects related to grain milling and processing. Cereal processing covers dry and wet milling, brewing, baked products, pasta, breakfast cereals, snack foods, and traditional cereal foods from other countries. (Offered in even-numbered years.) **Credits:** 1.00

FS 46700 - Food Analysis

Credit Hours: 3.00. Application of quantitative and qualitative physical, chemical, and instrumental methods of analysis to the examination of food products; evaluation of methods for specific applications. **Credits:** 3.00

FS 46900 - Food Analysis Laboratory

Credit Hours: 2.00. Practical laboratory applications of food analysis, including relevant calculations using data gathered and interpretation of data. (Intended for upper-division students.) **Credits:** 2.00

FS 47000 - Wine Appreciation

Credit Hours: 3.00. A study of wine production and marketing principles with an emphasis upon consumption responsibility. Historical perspectives form the foundations for wine classification systems and traditional serving procedures. Cardinal scale sensory evaluations are conducted in relationship to various food pairings. Must be 21 years of age or older to register for this course. Permission of department required. **Credits:** 3.00

FS 47500 - Honors Course - Upper Division

Credit Hours: 1.00 to 4.00. Utilized to offer a new honors course for a maximum of three years. Variable title, credit, and instructional type. Course may be repeated for credit if content and titles are different. Offered primarily to third- and fourth-year students. Courses offered must be approved by instructor and College of Agriculture Honors Committee. Permission of instructor required. **Credits:** 1.00 to 4.00

FS 48200 - Food Science Senior Seminar

Credit Hours: 1.00. Oral and written reports on selected food science topics. **Credits:** 1.00

FS 48300 - Fermentation Capstone

Credit Hours: 3.00. The development of value-added fermentation processes requires a complex blend of technoeconomic and market awareness, resource gathering, strain selection and engineering, reactor optimization and operation, product recovery, and project management skills. Keeping these diverse aspects in balance while managing project timelines is essential to a successful fermentation process - that is, one that is both technically and economically successful. This course is organized to develop your knowledge of the diverse inputs into design of microbial fermentation and your ability to apply concepts learned in prior fermentation classes to the design of a fermentation process, integrating microbiology, chemistry, and processing with basic marketing and business concepts. Students will be organized into project teams for the semester and challenged to design, market, develop, prototype, and scale up a new fermentation. Classes will include guest lectures from experts in the fermentation industry and academia. Project teams will be organized and project leaders selected to manage communication between individual groups and the instructors. Final product concepts will be presented to faculty and peers for evaluation. **Credits:** 3.00

FS 49100 - Special Assignments In Food Science

Credit Hours: 1.00 to 3.00. Open primarily to qualified seniors who desire to study special problems in science not covered in regular coursework. Permission of instructor required. **Credits:** 1.00 to 3.00

FS 49900 - Thesis Research

Credit Hours: 1.00 to 6.00. For honors students doing independent research. Permission of instructor required. **Credits:** 1.00 to 6.00

FS 53000 - Food Ingredient Technology

Credit Hours: 1.00. Identifies functions of ingredients listed on ingredient labels of food products and discusses alternative ingredient choices for food products. **Credits:** 1.00

FS 53100 - Science Of Experimental Cuisine

Credit Hours: 3.00. This course brings together culinary arts and the application of food chemistry and ingredient technology principles. Emphasis will be placed on food construction and deconstruction, using common food preparation and molecular gastronomy techniques. **Credits:** 3.00

FS 53500 - Aseptic Processing Technologies

Credit Hours: 1.00. Overview of aseptic processing and packaging systems; thermal processing and fluid flow in continuous heat exchangers; food microbiology, chemistry, and packaging as applied to aseptic processing. Establishing processes for aseptic processing of liquid and particulate foods. **Credits:** 1.00

FS 54100 - Postharvest Technology Of Fruits And Vegetables

Credit Hours: 1.00. (HORT 54100) Theoretical and applied aspects of methods being used for enhancing the quality and shelf life of harvested fruits and vegetables. Factors that affect the longevity of produce and technology used to control these factors and reduce deterioration of produce between harvest and consumption/processing will be emphasized. Meets during weeks 11-15. **Credits:** 1.00

FS 55001 - Food Chemistry

Credit Hours: 1.00. Principles and concepts of the effects of heat, light, oxygen, and water activity on chemical reactions and physical events involved in processing, storage, and preparation of food products and their relationships to nutritional quality, organoleptic quality, stability, and safety. Class meets for 5 weeks. **Credits:** 1.00

FS 55101 - Food Analysis

Credit Hours: 1.00. Principles and applications of chemical, physical, and sensory techniques to analyze foods. Class meets for 5 weeks. **Credits:** 1.00

FS 55201 - Nutritional Sciences

Credit Hours: 1.00. Study of perspectives on established nutrition knowledge, concepts, and principles pertinent to the field of food science. Contemporary information about diet as it relates to health and safety issues. Controversies regarding nutrients and functional foods. Class meets 5 weeks. **Credits:** 1.00

FS 55301 - Food Microbiology

Credit Hours: 1.00. Principles and applications of the microbiology of foods. Focuses on many of the important conditions that may lead to foodborne illness and food spoilage. Structured in three main sections related to foodborne hazards: 1) identification, 2) control and prevention, and 3) detection. Class meets weeks 1-5. **Credits:** 1.00

FS 55401 - Food Processing And Packaging

Credit Hours: 2.00. Covers relevant basic engineering concepts and their applications to solve food processing and packaging problems. Key unit operations and regulations or recommended practices for manufacture of a variety of foods also will be covered. Students work in teams on a project and present their findings to the entire class. Class meets weeks 6-15. **Credits:** 2.00

FS 55402 - Food Processing

Credit Hours: 1.00. The Food Processing course will present an overview of the basic food engineering concepts and unit operations involved in the manufacture of various food products. Students will be able to understand the food processing literature and to effectively communicate with food technologists and engineers. Topics to be covered include: physical properties of foods, unit operations commonly found in the food industry, and processing equipment. Permission of department required. **Credits:** 1.00

FS 55501 - Case Study

Credit Hours: 1.00. A brief overview of problem-solving and teamwork concepts will be presented in class. A problem will be given by an industrial sponsor, and work groups (teams) will be assigned to solve the problem and present the findings. **Credits:** 1.00

FS 56000 - Food Science Graduate Cooperative Work Experience

Credit Hours: 0.00. Supervised professional experiences in the food science industry. Programs must be preplanned and conducted under the direction of the departmental coordinator with the cooperation of an employer. Students must submit a summary report. Permission of department required. **Credits:** 0.00

FS 56400 - Commercial Food And Beverage Fermentations

Credit Hours: 2.00. This course will provide a study of the principles and practices of international food and beverage fermentations with emphasis on the microbiology, biochemistry and processing techniques used in commercial fermentations that utilize fruits, vegetables, grains, dairy, and meats. Instructional Format: This is a two-credit lecture that can be linked to a separate optional one credit hour laboratory combination. Students must be 21 years of age with ID check for proof of age. Permission of department required. **Credits:** 2.00

FS 56500 - Microbial Foodborne Pathogens

Credit Hours: 3.00. The primary focus is to study the microbial pathogens involved with foodborne diseases. Course emphasis is on molecular and genetic basis of virulence of foodborne pathogens and host-parasite interactions. Topics include incidence and source of pathogens, immune response to infection, virulence factors, and mechanism of pathogenesis of specific infectious and intoxicating foodborne bacteria, mycotoxins, viruses and parasites. Typically offered odd years. **Credits:** 3.00

FS 56600 - Microbial Techniques For Food Pathogens

Credit Hours: 2.00. Molecular biology, immunochemistry and tissue culture-based rapid and automated techniques currently used for detection and identification of foodborne pathogens. The techniques include metabolic fingerprinting identification system, enzyme immunoassay and dot blotting, lateral flow assay, polymerase chain reaction, genomic fingerprinting, cytotoxicity assays, and selected biosensor tools. Laboratory experiments are scheduled for four hours, with up to two additional hours of arranged time. Offered in even-numbered years. (Weeks 6-16). **Credits:** 2.00

FS 58000 - Food And The Environment

Credit Hours: 1.00. This course is to provide information for students to understand the radical increase in food production and the associated environmental issues it has created. This course gives theoretical coverage of Life Cycle Assessment (LCA) methodology that will assist students in finding ways to evaluate the environmental sustainability of different food systems throughout their entire supply chains at local, national and global levels.**Credits:** 1.00

FS 58100 - Microbial Genomics And Metabolism

Credit Hours: 3.00. Microbial genomics and metabolism will introduce students to how genomes are assembled, how microbial functional predictions are made, and how systems biology techniques are used to query microbial function in diverse ecosystems. Students will participate in activities including classroom lecture, group discussion, reading of primary literature, hands-on computational assignments, exams, and student projects. Basic knowledge of microbiology and molecular biology is expected. Permission of department required. **Credits:** 3.00

FS 58200 - Emerging Food Technologies

Credit Hours: 1.00. This online multi-institutional course provides a broad perspective of innovation as applied to food engineering. The course constitutes weekly presentations from 12 speakers on topics in three thematic areas selected using a student survey (from 18 institutions), aiming to develop a student-centered course. This course (1) provides a broad perspective of innovation as applied to food engineering; (2) provides a general overview and case studies of current and emerging research areas in food and agricultural engineering and processing by different research groups in the nation; and (3) demonstrates the efforts among food engineers and scientists in the nation to advance engineering knowledge and technologies for the purpose of improving food safety, quality and security, and enhance health benefits of food products through extensive research in focused areas. Permission of department required. **Credits:** 1.00

FS 59000 - Special Problems

Credit Hours: 1.00 to 5.00. Specialized study in research laboratories, libraries, or computer laboratories for problems related to food science that are not taught in regular courses. Permission of instructor required. **Credits:** 1.00 to 5.00

FS 59100 - Special Topics

Credit Hours: 1.00 to 3.00. Specialized topics not covered in other courses will be offered as one-credit minicourses. Topics, requirements, and credits will be determined yearly. Permission of instructor required. **Credits:** 1.00 to 3.00

FS 60900 - Food Lipids

Credit Hours: 1.00 to 3.00. (NUTR 60900) Importance of lipids in the diet and food systems with emphasis on changes occurring during processing, preparation, and storage. Nomenclature, physical attributes, and oxidation of lipids as well as properties and characteristics of antioxidants will be major components of the course. Offered in alternate years. Prerequisite: BCHM 56100 and FS 65000 or FS 45300/NUTR 45300. **Credits:** 1.00 to 3.00

FS 61000 - Food Proteins

Credit Hours: 3.00. (NUTR 61000) Chemical and physical properties, distribution and function, and alteration of proteins in food. Protein toxicology and nutritional quality. Offered in alternate years. Prerequisite: BCHM 56100 and FS 65000. **Credits:** 3.00

FS 62000 - Scientific Writing In Food Science

Credit Hours: 2.00. This course covers the essential elements of publishing original research at professional meetings (oral presentations and papers) and in peer-reviewed journals (original research manuscripts). Topics include: ethics in writing, effective reading of the literature, organizing research data, choosing a journal, writing the manuscript (results, materials and methods, introduction, discussion, title, abstract, references), publication process, revising and reviewing, poster presentation, and short oral presentations. Each student will write a paper, prepare a 12-minute oral presentation, and prepare a poster, based on data from his/her graduate research project. Permission of instructor required. **Credits:** 2.00

FS 63000 - Carbohydrates

Credit Hours: 3.00. (NUTR 63000) Carbohydrates with an emphasis on those of low molecular weight in foods. Structures, reactions, and properties of mono- and oligosaccharides. Introduction to polysaccharides and food gums. Offered in alternate years. Prerequisite: 6 credit hours in Organic Chemistry. Prerequisite: Nine credits of chemistry. **Credits:** 3.00

FS 66000 - Intestinal Microbiology And Immunology

Credit Hours: 1.00. (ANSC 66000) Discussion and critique of recent journal articles related to intestinal microbiology/immunology. The specific areas covered under this forum are: (1) intestinal microbiology, (2) food microbiology as it relates to gastrointestinal diseases, (3) probiotics and prebiotics-related to intestinal health or pathogen control, and (4) mucosal immunity with major emphasis on intestinal immunology. **Credits:** 1.00

FS 68400 - Food Science Seminar

Credit Hours: 1.00. Current topics in food science. **Credits:** 1.00

FS 69000 - Special Topics In Food Science

Credit Hours: 1.00 to 3.00. Individual study of specialized materials. Permission of instructor required. **Credits:** 1.00 to 3.00

FS 69700 - Supervised University Teaching In Food Science

Credit Hours: 1.00. Students assist a faculty member in teaching a food science course to obtain training and experience in various aspects of classroom and laboratory teaching. Permission of instructor required. **Credits:** 1.00

FS 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

FS 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Forestry and Natural Resources

FNR 12500 - Environmental Science And Conservation

Credit Hours: 3.00. (AGRY 12500, EAPS 12500, NRES 12500) Introduction to environmental science and conservation includes topics in ecological principles, conservation and natural resource management, human impacts on the environment, toxic waste disposal, climate change, energy, air and water pollution, environmental geology and geologic hazards. **Credits:** 3.00

FNR 15000 - The Nature Of Wild Things

Credit Hours: 1.00. This is the core course for "The Nature of Wild Things" learning community. The course focuses on the majors offered in the Department of Forestry and Natural Resources (FNR), and new student integration into the University and department. This course expands knowledge of academic programs and career options in FNR, and resources available on campus to facilitate student success in the first year. Permission of department required. **Credits:** 1.00

FNR 19800 - Introductory Topics In Forestry And Natural Resources

Credit Hours: 1.00 to 3.00. Subjects and problems of interest to the student. Permission of instructor required. **Credits:** 1.00 to 3.00

FNR 20100 - Marine Biology

Credit Hours: 3.00. An introduction to the major groups of marine organisms and their habitats. Emphasis on application of ecological principles to the conservation of important marine species. Offered in even-numbered years. **Credits:** 3.00

FNR 21000 - Natural Resource Information Management

Credit Hours: 3.00. Introduction to natural resource and land information systems and data management technologies. Principles of data storage, organization, and retrieval for both textual and spatial data (geographic information systems), data acquisition, accuracy assessment, mapping, and use of this data in natural resource management are presented. **Credits:** 3.00

FNR 22310 - Introduction To Environmental Policy

Credit Hours: 3.00. (POL 22300) Study of decision making as modern societies attempt to cope with environmental and natural resources problems. Focuses on the American political system, with some attention to the international dimension. Current policies and issues will be examined. **Credits:** 3.00

FNR 22500 - Dendrology

Credit Hours: 3.00. Field identification, taxonomy, and ecological characteristics of trees, shrubs, and herbs found in forests, prairies, old fields, and wetlands. **Credits:** 3.00

FNR 23000 - The World's Forests And Society

Credit Hours: 3.00. Examination of structure, function, and environmental and cultural significance of forest ecosystems throughout the world. **Credits:** 3.00

FNR 24000 - Wildlife In America

Credit Hours: 3.00. History of the occurrence, exploitation, and management of North America's wildlife resources. Life histories, habitat relationships, and human impacts on selected species. Current conservation practices and future prospects. **Credits:** 3.00

FNR 24150 - Ecology And Systematics Of Fishes, Amphibians And Reptiles

Credit Hours: 3.00. Introduction to the ecology and systematics of Fish, Amphibians and Reptiles. Discuss the evolutionary adaptations and ecological processes of these vertebrate groups at the individual, population, and community levels. Examine the

roles of phylogeny, physiology, morphology, and behavior in influencing organismal responses to the environment. Assess issues related to the conservation of fish, amphibians and reptiles. **Credits:** 3.00

FNR 24250 - Laboratory In Ecology And Systematics Of Fishes, Amphibians And Reptiles

Credit Hours: 1.00. Basic anatomy, classification, and identification of fishes, amphibians and reptiles. Identification deals with representative species from selected phylogenetic and geographic groupings in North America. **Credits:** 1.00

FNR 25150 - Ecology And Systematics Of Mammals And Birds

Credit Hours: 3.00. Introduction to the ecology and systematics of mammals and birds. Discuss the evolutionary adaptations and ecological processes of these vertebrate groups at the individual, population, and community levels. Examine the roles of phylogeny, physiology, morphology, and behavior in influencing organismal responses to the environment. Assess issues related to the conservation of mammals and birds. **Credits:** 3.00

FNR 25250 - Laboratory In Ecology And Systematics Of Mammals And Birds

Credit Hours: 1.00. Basic anatomy, classification, and identification of mammals and birds. Identification deals with representative species from selected phylogenetic and geographic groupings in North America. **Credits:** 1.00

FNR 27000 - Landscape-Level Planning

Credit Hours: 1.00. The main objective of this course is to teach students about natural resources planning with an emphasis on critical skills for developing landscape-level management plans. This one credit course uses guest speakers, lectures, in-class activities, group presentations and take-home assignments to facilitate student learning. **Credits:** 1.00

FNR 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in forestry & natural resources. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

FNR 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in forestry & natural resources. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

FNR 29800 - Topical Problems In Forestry And Natural Resources

Credit Hours: 0.00 to 4.00. The class will be used primarily for lower-level undergraduate research projects and for the development of new and/or temporary courses for lower-division students. The course also offered for 0 credit for training opportunities (e.g., first aid for undergraduates attending summer practicum). **Credits:** 0.00 to 4.00

FNR 30110 - Sustainable Wood Products Manufacturing

Credit Hours: 3.00. Sustainable wood processing methods for hardwood and softwood sawmilling; veneering; plywood; pallets; lumber drying; reconstituted products including particleboard, medium density fiberboard, and oriented strand board; wood preservation including lumber, crossties, poles, and piling; secondary products including furniture, cabinets, millwork; and

others; wood residues, woody biomass and others as appropriate will be covered. In addition to processing methods, the grading of material, including logs, hardwood and softwood lumber and consideration of applicable standards, and sustainability initiatives will be covered. **Credits:** 3.00

FNR 30200 - Global Sustainability Issues

Credit Hours: 2.00. This course explores global sustainability issues in natural resources with emphasis on forestry, wood products manufacturing, conservation, water management, energy and their impact on the targeted geographic location (such as Central America, Eastern Europe) and the rest of the world. The purpose of this course is to present students, regardless of their disciplinary background, with an overview of the interdisciplinary aspects of sustainable natural resource management. This colloquium course will examine global sustainable natural resources and related issues (including population, poverty, pollution, climate change, deforestation, invasive species, urbanization, habitat loss, cultural traditions, water management, energy, education, technology, and international collaboration). **Credits:** 2.00

FNR 30500 - Conservation Genetics

Credit Hours: 3.00. Fundamentals and principles of genetics, including Mendelian inheritance, genetic mapping & linkage, DNA fingerprinting, phylogeography, and speciation. Topics cover the theoretical and empirical evidence illustrating how mutation, migration, drift, and natural selection influence the evolution of genes in natural populations. Designed for ecologists and natural resource professionals. **Credits:** 3.00

FNR 31110 - Identification And Basic Properties Of Wood

Credit Hours: 3.00. The identification of macro characteristics of North American wood species and discussion of their availability, distribution, and unique characteristics. Basic physical, mechanical and working properties of wood, including orthotropic nature of wood, grain, texture, moisture content, shrinking, specific gravity, machining, thermal properties, electrical properties, strength prosperities, natural characteristics affecting mechanical properties, also the effect of manufacturing and service environment on mechanical properties through laboratory exercises and field trips. Students will study the cellular structure and arrangement of woody biomaterials, their manufacturing characteristics and uses. **Credits:** 3.00

FNR 31300 - Aquaponics

Credit Hours: 1.00. (SFS 31100) (HORT 31110) There has been a significant renewed interest in the investigation of integrated fish-food plant systems. Such systems have a long and rich history, particularly in Asia; and our impending food crisis has kindled an interest in developing aquaponics systems in Western countries. Many growers are turning to controlled environment and hydroponic production methods to produce high-value crops in tight quarters. The waste disposal problem of the fish can become the nutrient supply to the plants. **Credits:** 1.00

FNR 33100 - Forest Ecosystems

Credit Hours: 3.00. Introduction to ecosystem processes, with emphasis on structural dynamics, energy flows, nutrient cycling, spatial patterns, classification and interaction of plant and animal populations. Processes will be related to human activities. **Credits:** 3.00

FNR 33300 - Fire Effects In Forest Environments

Credit Hours: 1.00. Use of natural and set prescribed fire as a tool in management of forest and prairie ecosystems. Requires class trips. Students will pay individual lodging or meal expenses when necessary.**Credits:** 1.00

FNR 33350 - Applied Fire Ecology

Credit Hours: 3.00. Fire, either as a natural disturbance or anthropogenically mediated disturbance, has been a feature of almost every major terrestrial ecosystem in North America. In this era of climate change, land management agencies are increasingly using fire both to manage terrestrial ecosystems and to actively contain wildfire. This class will provide basic understanding to both fire behavior and its ecological impacts on terrestrial ecosystems, focusing on systems common to the Central Hardwood Region. Students will get experience conducting prescribed fire and take Firefighter Type II (FFT2) online training modules, in partial fulfillment of requirements of an Incident Qualification Card (i.e., "red card"). Students will learn how to develop a burn plan for a given property, including assessment of risks, prediction of fire behavior (i.e., BEHAVE model), and estimation of burn effects.**Credits:** 3.00

FNR 33800 - Introduction To Silviculture

Credit Hours: 3.00. This course introduces the common silvicultural systems used in North American forests for forestry and wildlife habitat management objectives. Topics range from stand dynamics to thinning practices and regenerative harvest systems in naturally-regenerated forests. Lectures present theoretical concepts in order to allow students to understand forest management practices, while the recitation portion of this course reviews these concepts in light of wildlife habitat management, biodiversity, and other non-timber resources. The recitation is writing-intensive requiring several reflection papers on assigned readings and a semester-ending term paper on a subject of the student's choosing. Credit cannot be earned for both FNR 33800 and FNR 43900. Permission of department required. **Credits:** 3.00

FNR 33900 - Principles Of Silviculture

Credit Hours: 3.00. Silviculture systems; establishment of stands; control of stand composition, growth, and quality.**Credits:** 3.00

FNR 34100 - Wildlife Habitat Management

Credit Hours: 3.00. Principles, practices, and justification of the habitat management approach to the manipulation of wildlife populations. **Credits:** 3.00

FNR 34800 - Wildlife Investigational Techniques

Credit Hours: 3.00. An introduction to current wildlife research techniques that are used in managing populations and habitats. Laboratory and field exercises are used to gather and analyze data; basic data analysis and written dissemination of results is emphasized. **Credits:** 3.00

FNR 35100 - Aquatic Sampling Techniques

Credit Hours: 3.00. An introduction to laboratory and field sampling methods in aquaculture, limnology, and fisheries biology. Emphasis will be placed on the proper use of laboratory equipment and sampling gears, as well as the development of sampling protocols for collecting representative, non-biased fisheries and aquatic sciences data. **Credits:** 3.00

FNR 35110 - Aquatic Sampling Techniques I

Credit Hours: 2.00. This course presents an introduction to field sampling methods used in aquaculture, aquatic ecology, and fisheries biology. The course emphasizes the proper care and use of field sampling gears, as well as the development of sampling protocols for collecting representative, non-biased fisheries and aquatic sciences data.**Credits:** 2.00

FNR 35150 - Aquatic Sampling Techniques II

Credit Hours: 2.00. This course presents an introduction to laboratory and field sampling methods used in aquaculture, limnology, and fisheries biology. The course emphasizes the proper care and use of laboratory equipment and field sampling gears, as well as the analyses and reporting of fisheries and aquatic sciences data.**Credits:** 2.00

FNR 35300 - Natural Resources Measurement

Credit Hours: 3.00. An introduction to sampling techniques and fundamental principles for measuring natural resources. **Credits:** 3.00

FNR 35500 - Quantitative Methods For Resource Management

Credit Hours: 3.00. Application of analytical and computational techniques for the purpose of making decisions regarding the management of forests.**Credits:** 3.00

FNR 35700 - Fundamental Remote Sensing

Credit Hours: 3.00. Introduction to the principles of remote sensing, aerial photo interpretation, photogrammetry, geographic information systems, and global positioning systems. Primary applications of geospatial science and technology in forestry and natural resources. **Credits:** 3.00

FNR 35900 - Spatial Ecology And GIS

Credit Hours: 3.00. Introduction to the principles of landscape ecology and biogeography with a laboratory devoted to the analysis of spatial data using geographic information systems.**Credits:** 3.00

FNR 35910 - Spatial Ecology

Credit Hours: 2.00. Introduction to the principles of landscape ecology and biogeography. Landscape ecology focuses on the important relationships of landscape structure (pattern, heterogeneity) and ecological processes (movement of animals, hydrologic dynamics) and how this information is used for natural resource management. Biogeography examines ecological patterns and processes at larger scales (generally at subcontinental to global) for the purposes of managing plants and animals of global importance.**Credits:** 2.00

FNR 35950 - Spatial Ecology Laboratory

Credit Hours: 1.00. The lab will focus on the use and application of spatial databases that are common in natural resource management settings. Introduction to the principles of landscape ecology and biogeography with a laboratory devoted to the analysis of spatial data using geographic information systems and other database tools. Landscape ecology focuses on the important relationships of landscape structure (pattern, heterogeneity) and ecological processes (movement of animals, hydrologic dynamics) and how this information is used for natural resource management. Biogeography examines ecological patterns and processes at larger scales (generally at subcontinental to global) for the purposes of managing plants and animals of global importance. In the last 15 years, tremendous efforts have been made to create spatial databases that help support research and management of natural resources at various scales.**Credits:** 1.00

FNR 37010 - Natural Resources Practicum

Credit Hours: 1.00. Specific field instruction in forestry, fisheries and aquatic sciences and wildlife. Students pay university tuition plus a fee for living facilities and subsistence.**Credits:** 1.00

FNR 37050 - Forest Habitats And Communities Practicum

Credit Hours: 1.00. Specific field instruction in forestry and wildlife. Students pay university tuition plus a fee for living facilities and subsistence. **Credits:** 1.00

FNR 37100 - Fisheries And Aquatic Sciences Practicum

Credit Hours: 5.00. Specific field instruction in fisheries and aquatic sciences. Students pay university tuition plus a fee for living facilities and subsistence. **Credits:** 5.00

FNR 37200 - Forestry Practicum

Credit Hours: 4.00. Specific field instruction in forestry. Students pay university tuition plus a fee for living facilities and subsistence. **Credits:** 4.00

FNR 37300 - Wildlife Practicum

Credit Hours: 4.00. Specific field instruction in wildlife science and management. Students pay university tuition plus a fee for living facilities and subsistence. **Credits:** 4.00

FNR 37500 - Human Dimensions of Natural Resource Management

Credit Hours: 3.00. An introduction to the human dimensions of forestry, wildlife, and recreation; students will learn how values, attitudes, community, and behavior relate to natural resource management and decision-making; various natural resource management stakeholders such as private landowners, natural resource agencies, the judiciary, and environmental and natural resource interest groups will be discussed; course will utilize case studies specific to Indiana and the Midwest; course includes weekly discussions during recitations. **Credits:** 3.00

FNR 37700 - Optimize Student Conference Attendance

Credit Hours: 1.00. Participation in this course will formalize the experience of attending a professional conference by training students to optimize their experience. Students will then attend a professional conference with mentoring from the course instructors. Permission of instructor required. **Credits:** 1.00

FNR 37800 - Marine Biology Practicum

Credit Hours: 3.00. This course presents students with expanded opportunities to use field techniques to sample and report on marine habitats and organisms. The course emphasizes the proper care and use of field sampling gear and identification of fish and invertebrates samples from exposed shore, lagoon, and estuary habitats. A trip to the coast of either the Atlantic Ocean or Gulf of Mexico is a central component of this course; a course fee is required to cover the expenses of the trip. **Credits:** 3.00

FNR 38400 - Statistics For Natural Resources

Credit Hours: 3.00. Methods of statistical analysis and modeling for data and problems encountered in natural resources conservation, science and management. Emphasis is on application of methods and interpretation of results in the context of natural resource problems. Topics include introductory sampling design, exploratory analyses, general linear models, generalized linear models, introduction to resampling methods, likelihood-based model selection, and model goodness-of-fit. **Credits:** 3.00

FNR 38500 - Fish Biology And Ecology

Credit Hours: 4.00. Advanced study of the biology and ecology of fishes. In particular, the course covers aspects of the morphology, physiology, development, behavior, evolution, and diversity of fishes throughout the world. The relationship of fishes to the physical, chemical, and biological features of the environment in both natural and perturbed aquatic ecosystems will be explored. An emphasis will be placed on diversity in morphology, behavior, feeding, and reproductive strategies as they relate to individual, population, community structure, and anthropogenic effects. **Credits:** 4.00

FNR 39000 - Cooperative Professional Program

Credit Hours: 0.00. Supervised professional experience in forestry. Programs must be preplanned and conducted under the direction of a forestry faculty coordinator with the cooperation of an employer. Students must submit a summary report. Admission to forestry Co-op program. **Credits:** 0.00

FNR 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in forestry & natural resources. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

FNR 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in forestry & natural resources. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

FNR 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in forestry & natural resources. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

FNR 40000 - Forestry And Natural Resources Study Abroad

Credit Hours: 0.00 to 8.00. Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities. **Credits:** 0.00 to 8.00

FNR 40100 - Limnology

Credit Hours: 3.00. Limnology is the study of the chemical, physical, geological, biological, and ecological processes that influence the structure and function of freshwater ecosystems. The course will focus on developing the understanding of key terms and mechanisms related to the basic understanding of limnological processes. Moreover, various applications and management considerations related to freshwater ecosystems will be presented. **Credits:** 3.00

FNR 40600 - Natural Resource And Environmental Economics

Credit Hours: 3.00. (AGEC 40600) Introduction to economic models of renewable and nonrenewable natural resources and the use of these models in the analysis of current resource use and environmental issues. **Credits:** 3.00

FNR 40700 - Forest Economics

Credit Hours: 3.00. Implications of unique economic characteristics of forest resources, including a tree as both capital and output, high capital-to-output ratio, location utility of in-forest uses, long investment periods, and non-market outputs. **Credits:** 3.00

FNR 40910 - Forest Resources Management

Credit Hours: 3.00. This course focuses on the long-term sustainable management of forests for the production of wood fiber, ecological services, and other market and non-market goods and services.**Credits:** 3.00

FNR 41800 - Properties Of Wood Related To Manufacturing

Credit Hours: 3.00. Orthotopic nature of wood, grain, texture, moisture content, shrinking, swelling, specific gravity, machining, thermal properties, electrical properties, elastic properties, strength properties, vibration properties, bending, natural characteristics affecting mechanical properties, effect of manufacturing and service environment on mechanical properties, changing quality of available resources and implications of wood quality changes for manufacturing. **Credits:** 3.00

FNR 41910 - Furniture Product Development And Strength Design

Credit Hours: 3.00. Qualitative and quantitative principles of furniture construction, product development methodology and strength design principles, furniture performance testing, product sustainability and end of life options (LCA, computer-based applications and solutions). Course features laboratory evaluating, furniture joints and furniture structures. **Credits:** 3.00

FNR 42500 - Secondary Wood Products Manufacturing

Credit Hours: 3.00. Secondary wood products manufacturing; structure of the industry, organization of a furniture factory, raw materials, rough mill, finish mill, assembly, finishing, machinery, wood machining, plant layout, production methods, modern industrial engineering concepts; includes visits to manufacturing operations. Requires class trips. Students will pay individual lodging or meal expenses when necessary. **Credits:** 3.00

FNR 43200 - Human-Wildlife Conflicts

Credit Hours: 3.00. Exploration of conflicts between human interests and wildlife and the regulations policies and legislation used to minimize conflicts. Negative interactions may be real or perceived, economic or aesthetic, social or political, and may pose risks to human health and safety. Emphasis on the causes of conflict and resolutions that seek to balance protection or conservation of wildlife with protection of other public resources and individual property owners. Prior knowledge of college-level general biology and ecology is expected. **Credits:** 3.00

FNR 43300 - Grand Challenges In Forest Management

Credit Hours: 3.00. This course will guide students through readings, discussions, and presentations of the grand challenges that face the field of forest management. These topics will vary with each iteration of the class but may include topics such as climate change, invasive species, pressure on forest lands from a growing population, altered disturbance regimes, development of new silvicultural techniques, economic pressure at multiple scales, and shifting public perceptions on the management of forests. Students will examine and discuss these challenges from the vantage points of multiple stakeholders to gain insight into their complexity and importance. Students will read and discuss on average 2-4 research or review articles, book chapters, or other sources per week. **Credits:** 3.00

FNR 43400 - Tree Physiology

Credit Hours: 3.00. Study of physiology of growth and development of woody plants. Emphasis on the structure and function of trees and their physiological response to environmental factors. **Credits:** 3.00

FNR 43900 - Silviculture

Credit Hours: 3.00. This course details common silvicultural systems used in North America for establishment and tending of forest stands for a variety of objectives. Topics range from stand dynamics to thinning practices and regenerative harvest systems in naturally-regenerated forests. Lectures focus is on theoretical concepts in order to allow students to apply their knowledge to North American forest ecosystems, while the laboratory portion of this course includes practical experience in marking silvicultural prescriptions and conducting silvicultural treatments. Lab projects emphasize critical thinking, data-driven decision-making (using growth and yield models), technical writing and oral communication. Permission of department required. Credit cannot be earned for both FNR 33800 and FNR 43900. **Credits:** 3.00

FNR 44400 - Arboricultural Practices

Credit Hours: 4.00. Course covers a broad spectrum of arboriculture principles and techniques, including pruning, transplanting, fertilization, climbing, rigging, removal, cabling, bracing, lightning protection, hazard tree evaluation, tree appraisal, and street tree inventory. **Credits:** 4.00

FNR 44500 - Urban Forest Issues

Credit Hours: 3.00. This course presents an array of topics germane to the management of trees in the urban environment. This includes the benefits of trees and general tree care, tree appraisal, tree ordinances, tree inventory and management plans, and tree preservation and construction. **Credits:** 3.00

FNR 44700 - Vertebrate Population Dynamics

Credit Hours: 4.00. Estimation and analysis of populations; computer modeling of sampling methods, population dynamics, population and habitat management. Knowledge of computer programming not required. **Credits:** 4.00

FNR 45200 - Aquaculture

Credit Hours: 3.00. Historical perspectives and current practices in aquaculture, including production systems, feeds, water quality requirements, and diseases of commercially important species. **Credits:** 3.00

FNR 45300 - Fish Physiology

Credit Hours: 3.00. Presentation and discussion of physiological mechanisms exhibited by freshwater and marine invertebrates and vertebrates. Primary materials used for class presentation and discussions will be examples from primary research literature. Topics include respiration, osmoregulation, stress physiology, absorption and metabolism of compounds, and hormonal control of selected physiological mechanisms. Offered in odd-numbered years. **Credits:** 3.00

FNR 45500 - Fish Ecology

Credit Hours: 3.00. The relationship of fishes to the physical, chemical, and biological features of the environment in both natural and perturbed aquatic ecosystems. An emphasis will be placed on diversity in morphology, behavior, feeding, and reproductive strategies as they relate to individual and population adaptation, community structure, and anthropogenic effects. Offered in even-numbered years. **Credits:** 3.00

FNR 45600 - Fish And Marine Population Dynamics

Credit Hours: 4.00. Theory of population dynamics of animal populations in freshwater and marine environments. Application of quantitative methodologies for the assessment and manipulation of aquatic habitats, marine and freshwater invertebrates, sport and commercial fish populations, and aquatic communities. Human resource users and non-users are considered. **Credits:** 4.00

FNR 45700 - Practical Fisheries Management

Credit Hours: 2.00. Theory and practice of fisheries management, with emphasis on strategies utilized for the management of freshwater and marine fisheries. Course content will include hands-on assessment of fish populations, as well as development of management plans and the setting of appropriate goals and objectives for effective, science-based management. **Credits:** 2.00

FNR 45800 - Advanced Marine Biology

Credit Hours: 3.00. Focus is placed on the structure and function of major marine ecosystems, including estuarine, mangrove, coastal, coral reef, open ocean, and deep ocean environments. Course content will include rigorous treatment of the biogeochemical processes that support these ecosystems, as well as the biology and ecology of characteristic flora and fauna. **Credits:** 3.00

FNR 46000 - International Natural Resources Summer Program

Credit Hours: 3.00. A four-week, intensive program examining the management and conservation of natural resources in Europe and the United States. Jointly taught with faculty and students from the Swedish University of Agricultural Sciences. The program topic and venue change each year, but emphasis is placed on student interaction and internationalization as well as on cross-cultural communication skills within a natural resources framework. Offered in even-numbered years at Purdue University and in odd-numbered years at the Swedish University of Agricultural Sciences in Sweden. **Credits:** 3.00

FNR 46500 - History And Role Of Hunting In North American Wildlife Conservation

Credit Hours: 1.00. Introduction to the social, economic and wildlife management importance of hunting and how it relates to North American wildlife conservation. History of hunting and the North American Model of wildlife conservation, contrasted with those of European nations. Students will be required to participate in or observe hunting-related activities outside of class. This exercise is conducted off-campus on local Purdue-maintained properties. **Credits:** 1.00

FNR 48410 - Sustainable Wood Products, Furniture Design And Manufacturing

Credit Hours: 3.00. This project-based course explains principles of product development, furniture construction, strength design, performance testing, and product sustainability (life cycle analysis and end-of-life options). The course familiarizes students with methods such as Computer-Aided Design (CAD), Computer-Aided Manufacturing (CAM), Computer Numerical Control (CNC) router operation, rapid prototyping, and basics of secondary wood products manufacturing, to build an actual product. **Credits:** 3.00

FNR 49000 - Sustainable Product/Process Design Guided Research

Credit Hours: 1.00 to 3.00. Students will be involved in efforts to solve many complex natural resource utilization issues on the local and global scale. Projects engaging with important industrial forest products stakeholders will be encouraged to allow students to demonstrate proficiency in a sustainable product development or application of sustainable manufacturing practices and communication of their ideas. Permission of Instructor required. **Credits:** 1.00 to 3.00

FNR 49800 - Special Assignments

Credit Hours: 1.00 to 3.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 3.00

FNR 49900 - Thesis

Credit Hours: 1.00 to 6.00. Thesis. Permission of instructor required.**Credits:** 1.00 to 6.00

FNR 50600 - Theory And Application Of Natural Resource Extension Programming

Credit Hours: 1.00. This course will provide an opportunity for students to develop and implement extension activities based on their research interests. The course will focus on important natural resources issues, identify common target audiences, provide examples of extension programming, discuss outputs developed from various extension programs, and outline metrics used to evaluate program impact. **Credits:** 1.00

FNR 52700 - Ecotoxicology

Credit Hours: 2.00. This course covers theoretical and applied approaches to the science of ecotoxicology, including application of the tools and procedures used to understand toxicant fate and effects in free-ranging animals and ecosystems. Students are expected to be knowledgeable in chemistry, biology, and animal physiology. **Credits:** 2.00

FNR 52800 - Wildlife And Environmental Forensics

Credit Hours: 2.00. Theoretical and applied approaches to the science of wildlife and environmental forensics. General introduction on environmental forensics followed by discussion of different types of investigations. Includes application of tools and procedures used to solve crimes, including morphological, chemical and biological analysis of evidence. All material will be discussed in relation to criminal investigation. (Offered in even-numbered years) **Credits:** 2.00

FNR 52900 - Disease Ecology

Credit Hours: 3.00. Study of the ecological and evolutionary complexity inherent to host-pathogen interactions. Includes case studies from a diverse array of systems, including plants, animals, aquatic and terrestrial systems. Emphasis is on the interactions between multiple hosts and pathogens within complex, dynamic environments. Introduction to parasite and pathogen diversity, host-pathogen coevolution, community ecology and the importance of pathogens in conservation and management. **Credits:** 3.00

FNR 53500 - Forest Regeneration And Restoration

Credit Hours: 3.00. An overview of the dynamics associated with the regeneration of forestlands in North America. Topics include: seed collection and handling, forest tree nursery operations, seedling quality, managing for environmental stresses, planting operations, early stand management, and natural regeneration. Permission of instructor required. Offered in odd-numbered years. **Credits:** 3.00

FNR 53600 - Ecology Of Disturbance

Credit Hours: 2.00. Advanced lecture- and discussion-based class examining how disturbance shapes the composition and structure of communities and landscapes across major terrestrial biomes. Students will examine and discuss the relationships between disturbance intensity, frequency, and spatial extent and how these characteristics affect ecological processes and ecologically-based management of forest and grassland ecosystems. The class will also examine the synergistic effects of multiple disturbances and the restoration of endemic disturbance regimes in contemporary ecosystems. Course is reading intensive; students will read and discuss on average 3-8 journal articles per week. Typically offered in even years. **Credits:** 2.00

FNR 53601 - Ecology Of Disturbance Practicum

Credit Hours: 1.00. This course is the practicum for FNR 53600, hence enrollment is contingent upon enrollment in FNR 53600. Course consists of a one or two-week long field trip to a remote site; prior trips have been taken to the Great Smokey National Park over spring break. Course requires an additional travel fee, depending on location visited. Typically offered in even years. **Credits:** 1.00

FNR 54300 - Conservation Biology I

Credit Hours: 3.00. Introduction to conservation biology, including population dynamics and genetic structure of rare organisms. Recovery planning, restoration ecology, environmental policy making, and sustainable developments are considered, as is ethics in conservation of biological diversity. Offered in odd-numbered years. Permission of instructor required. **Credits:** 3.00

FNR 55800 - Remote Sensing Analysis And Applications

Credit Hours: 3.00. Advanced course in the use of remote sensing techniques emphasizing the physical principles behind the remote sensing of vegetative features, present-day instrument technology, spatial data processing and analysis algorithms, error analysis and accuracy assessment procedures, and multi-source data integration. Provides hands-on experience with forest canopy modeling, atmospheric modeling, image processing, and GIS software on microcomputer and workstation platforms. **Credits:** 3.00

FNR 56700 - Advanced Mammalogy

Credit Hours: 3.00. The class explores approaches to mammalian research and wildlife management through readings, discussions, field, and laboratory exercises. Topics such as mammalian behavior, ecology, phylogeny, taxonomy, and conservation are emphasized. The intention of this class is to help students who have a sincere interest in mammalian research and management to progress beyond identification in their understanding of mammals. **Credits:** 3.00

FNR 57000 - Amphibian Ecology And Conservation

Credit Hours: 3.00. This course will address the ecology and conservation of amphibians at the global scale. Lectures will cover diversity and natural history, phylogenetic relationships, basic biology and ecology, and conservation concerns and strategies. Class materials come from a text and primary literature. Labs will focus on important characteristics of species, families and orders of amphibians, including both North American and non-North American species. Class will also discuss and debate conservation issues. Course will include guest lectures, potential field trips or a class project. Permission of department required. **Credits:** 3.00

FNR 57100 - Advanced Ornithology

Credit Hours: 3.00. Study of current avian research topics and techniques. Class discussion of recent scientific literature; field and laboratory exercises to illustrate approaches to ornithological research. One weekend field trip is offered. (Offered in even-numbered years.) **Credits:** 3.00

FNR 57400 - Big Data, AI, And Forests

Credit Hours: 3.00. This course is focused on introductory big data analysis, artificial intelligence, and associated applications in large-scale forest research. The lecture will cover the challenges we encounter in big data ecological research, and the approaches to overcome these challenges. Real-time forest inventory and wildlife survey data at national and continental levels will be utilized in this course, and actual high-impact research projects will be introduced as case studies to inform students of the state-of-the-art in this subject area. High-performance computing clusters will be utilized for big data analysis. This course is also open to non-forestry majors. We will introduce basic machine learning techniques that are applicable to other subject areas. Guest lectures may cover big data analyses in different fields, internet-of-things, and/or data management and optimization/decimation for collaborative Virtual Reality experiences. The class will be evaluated through a final project, for which students will work

independently or in a group setting to develop a 'mini' research manuscript with a title of their own selection. All the groups are encouraged to submit their manuscript for publication at peer-reviewed journals, and those whose manuscripts have passed the initial journal screening will get extra bonus points. **Credits:** 3.00

FNR 58000 - Research Methods For Natural Resource Social Science

Credit Hours: 3.00. This class covers basic elements of research design for social scientists, with an emphasis on issues pertinent to natural resource management. Topics to be covered include the role of theories and paradigms in designing sound research, writing research questions and hypotheses, and the importance of validity and reliability in research design. Qualitative, quantitative, and mixed methods designs are presented and discussed. **Credits:** 3.00

FNR 58600 - Urban Ecology

Credit Hours: 3.00. Urbanization is on the rise, transforming natural ecosystems into coupled human-natural ecosystems that encompass complex, novel functional and structural characteristics shaped by people and the inherent environment. Through local field trips and readings of the primary scientific literature, we examine the unique characteristics of coupled human-natural ecosystems. The course is designed to be broadly accessible to students from a variety of backgrounds, interests, and majors who are interested in environmental science and engineering and emphasizes the importance of incorporating an ecological perspective in environmental engineering and natural resource management. This course covers fundamental principles of ecology as applied in urban and other coupled human-natural systems with emphasis on the impacts of modern industrial society on ecosystem structure and function. Organizing themes addressed in this class include macroscale processes, systems thinking, and topics related to urban systems. **Credits:** 3.00

FNR 58700 - Advanced Spatial Ecology And GIS

Credit Hours: 3.00. Introduction to the principles of landscape ecology and biogeography with a laboratory devoted to the analysis of spatial data using geographic information systems and other database tools. Landscape ecology focuses on the important relationships of landscape structure (pattern, heterogeneity) and ecological processes (movement of animals, hydrologic dynamics) and how this information is used for natural resource management. Biogeography examines ecological patterns and processes at larger scales (generally at subcontinental to global) for the purposes of managing plants and animals of global importance. In the last 15 years, tremendous efforts have been made to create spatial databases that help support research and management of natural resources at various scales. The lab will focus on the use and application of these databases that are common in natural resource management settings. **Credits:** 3.00

FNR 59000 - Introduction To Teaching In Natural Resources

Credit Hours: 1.00. This applied course introduces topics related to teaching science courses to facilitate and support the success of teaching assistants in Forestry and Natural Resources. Students will read and review assigned readings and then participate in a discussion at a weekly class meeting. Students also will have an opportunity to practice and apply concepts through development and presentation of a lesson plan. Permission of instructor required. **Credits:** 1.00

FNR 59100 - Teaching In Natural Resources Practicum

Credit Hours: 1.00 or 2.00. This practicum course provides students with an opportunity to gain teaching experience in natural resource courses. This course is only open to students that are not being paid as teaching assistants. Permission of Instructor required. **Credits:** 1.00 or 2.00

FNR 59800 - Topical Problems In Forestry And Natural Resources

Credit Hours: 1.00 to 3.00. Subjects and problems of interest to the student. Permission of instructor required. **Credits:** 1.00 to 3.00

FNR 64700 - Quantitative Methods For Ecologists

Credit Hours: 3.00. Examines the assumptions and utility of statistical and other data analytic techniques that are encountered commonly or increasingly being used in ecological research. Emphasis is placed on the potential applications of these quantitative methods in an ecological context. Topics include traditional multivariate methods (cluster analysis, principal components, factor analysis, discriminant analysis, multidimensional scaling, correspondence analysis), generalized linear models (logistic Poisson, and ordinal regression and derivatives), randomization methods, information-theoretic model selection and inference, and hierarchical models. An introduction to Bayesian analysis is provided for generalized linear (and mixed) models, with applications to (meta) population and (meta) community ecology. Prerequisite: BIOL 58210 or ENTM 64200 or STAT 51200, or consent of instructor. Knowledge of linear algebra and experience with R is desirable but not essential. **Credits:** 3.00

FNR 65000 - Individual-Based Ecology And Modelling

Credit Hours: 3.00. This course will provide graduate students with the opportunity to learn about the techniques and approaches used for individual-based modeling in ecological studies. Students will find relevant supplementary literature and lead class discussions on those topics as well as chapters from the course textbook and present case study examples of existing individual-based models (IBM) to the class. Students will develop individual-based models based on their own research project(s). **Credits:** 3.00

FNR 67900 - Forest Resources Seminar

Credit Hours: 0.00 or 1.00. Required for graduate students in forestry and natural resources. Topics vary. Prerequisite: Required of graduate students in forestry, natural resources. **Credits:** 0.00 or 1.00

FNR 69100 - Topical Problems In Forestry

Credit Hours: 1.00 to 3.00. Subjects and problems of interest to the student. Permission of instructor required. **Credits:** 1.00 to 3.00

FNR 69300 - Topical Problems In Wildlife Biology

Credit Hours: 1.00 to 3.00. Subjects and problems of interest to the student. Permission of instructor required. **Credits:** 1.00 to 3.00

FNR 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

FNR 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

French

FR 1010N - First-Year French I

Credit Hours: 3.00 to 5.00. Introductory French language course. Emphasis on developing basic speaking, writing, listening and reading skills as well as awareness of Francophone cultures.**Credits:** 3.00 to 5.00

FR 10100 - French Level I

Credit Hours: 3.00. A beginning French course with emphasis on communicative skills (listening and speaking), literacy skills (reading and writing) and culture. Permission of department required. CTL:IWL 1901 French Level I **Credits:** 3.00

FR 10200 - French Level II

Credit Hours: 3.00. Continuation of FR 10100. CTL:IWL 1902 French Level II **Credits:** 3.00

FR 10500 - Accelerated Basic French

Credit Hours: 4.00. This is an accelerated beginning-level course designed to develop language proficiency in French. The course will help students progress toward competence in speaking, listening, reading, and writing, as well as toward knowledge of French and Francophone cultures. The course focuses on active language use. Students will interact meaningfully with classmates and develop communicative strategies. Course will be taught in French. Permission of Department required. **Credits:** 4.00

FR 11200 - Elementary French Conversation

Credit Hours: 1.00. Development of oral skills for self-expression. Guided practice to enhance communicative competence. Small group discussions in French on practical topics. **Credits:** 1.00

FR 20100 - French Level III

Credit Hours: 3.00. A lower intermediate French course with emphasis on communicative skills (listening and speaking), literacy skills (reading and writing) and culture. CTL:IWL 1903 French Level III **Credits:** 3.00

FR 20200 - French Level IV

Credit Hours: 3.00. Continuation of FR 20100. CTL:IWL 1904 French Level IV **Credits:** 3.00

FR 20500 - Accelerated Intermediate French

Credit Hours: 4.00. This course is an accelerated intermediate-level course designed to develop language proficiency in French. The course will help students progress toward competence in speaking, listening, reading and writing, as well as toward knowledge of French and Francophone cultures. The course focuses on active language use. Students will interact meaningfully with classmates and develop communicative strategies. Course will be taught in French. **Credits:** 4.00

FR 21200 - Intermediate French Conversation

Credit Hours: 1.00. Development of oral skills for self-expression. Guided practice in conversation to enhance communicative competence. Small group discussions in French on practical topics. Not open to students enrolled in or having credit for FR 30100 or above. **Credits:** 1.00

FR 22400 - Professional French I

Credit Hours: 3.00. Practical reading, writing, speaking, and listening comprehension skills will be developed toward use of French for business purposes. Course materials cover daily business dealings as well as national and international trade. **Credits:** 3.00

FR 23000 - French Literature In Translation

Credit Hours: 3.00. Reading and analysis of selected French writers and their works, with particular emphasis on the social, political, and intellectual climate of their times. The course content will change from semester to semester. Knowledge of French not required. **Credits:** 3.00

FR 24100 - Introduction To The Study Of French Literature

Credit Hours: 3.00. Reading and discussion of selected poetry, prose, and theatre from France and the Francophone world; introduction to critical discourse and basic concepts of literary theory. Texts, discussion, and written assignments in French. **Credits:** 3.00

FR 28000 - Second-Year French: Special Topics

Credit Hours: 3.00. Selected topics on the civilization, culture, and literature of France. Lectures and readings primarily in English, but knowledge of French at the first-year level necessary. **Credits:** 3.00

FR 30100 - French Level V

Credit Hours: 3.00. Continued development of French speaking, listening, reading, and writing abilities, using materials dealing primarily with everyday life and civilization in France and the other French-speaking countries from various sources (e.g., newspapers, magazines, TV, recent literature, etc.). Conducted primarily in French. **Credits:** 3.00

FR 30200 - French Level VI

Credit Hours: 3.00. Further work to develop speaking, listening, reading, and writing abilities in French on the basis of materials dealing with the ideas and events that have shaped present-day France and the other French-speaking countries. Conducted primarily in French. **Credits:** 3.00

FR 31200 - Advanced French Conversation

Credit Hours: 1.00. One credit hour advanced French conversation focused on the development of oral and aural skills for self-expression. Course provides students with guided practice in conversation to enhance communicative competence. Discussions in French on various topics. Course may be taken concurrently with FR 30100, 30200, 40100 or 40200. **Credits:** 1.00

FR 32300 - French For Engineering

Credit Hours: 3.00. This course is an intermediate/advanced French course emphasizing vocabulary and structures necessary for communication within the context of the working world. In this course, students will further develop their speaking, listening, reading, and writing abilities through the study of specialized vocabulary from the engineering and technology sciences. Conducted in French.**Credits:** 3.00

FR 32400 - Professional French II

Credit Hours: 3.00. Practical reading, writing, speaking, and listening comprehension skills at an intermediate level will be developed toward the use of French for business purposes. Course materials cover daily business dealing as well as national and international trade. **Credits:** 3.00

FR 33000 - French Cinema

Credit Hours: 3.00. A general survey of major French cinematic trends from the earliest examples (Melies, Lumiere) to the New Wave (Chabrol, Truffaut, Resnais, Godard, etc.), with a discussion of the historical, social, political, aesthetic, and literary contexts. The French film in relation to world cinema. The relationship between the French cinema and French literature. Reading and analysis of scripts and historical and critical materials. Knowledge of French not required. **Credits:** 3.00

FR 34100 - French Literature I: From The Middle Ages To The Enlightenment

Credit Hours: 3.00. Reading of selected poetry, prose, and theatre of France from the Middle Ages through the Enlightenment in historical and cultural context. Readings, discussion, and papers in French. **Credits:** 3.00

FR 34200 - French Literature II: The 19th And 20th Centuries

Credit Hours: 3.00. Reading of selected French poetry, novels, theatre, and short fiction of the 19th and 20th centuries in historical and cultural context. Readings, discussion, and papers in French. **Credits:** 3.00

FR 38000 - Special Topics In French Culture And Civilization

Credit Hours: 3.00. Selected topics on the contemporary civilization of the French-speaking world and on the development of its culture throughout history. Explores trends in society, daily life, the arts, ideas, and technology. Conducted in French. **Credits:** 3.00

FR 39400 - Special Topics In French Literature

Credit Hours: 3.00. Studies a particular aspect in French literature (e.g., theme, device, character type, motif, place) by reading a varied selection of works of different genres, styles and/or periods. Readings, discussion, and papers in French. **Credits:** 3.00

FR 39600 - Special Topics In French Language Science

Credit Hours: 3.00. Examines a particular aspect entailed in the study of French language, e.g., language acquisition and teaching, language in society, regional dialects of France, French around the world, French creoles. Conducted in French. **Credits:** 3.00

FR 39900 - Special Study Abroad Credit In French

Credit Hours: 1.00 to 4.00. This course number is for assignment after the fact of credits in French earned while enrolled at a foreign university on a Study Abroad program which cannot be appropriately accommodated under an established Purdue course number. It is not for use for courses offered at or conducted by Purdue. **Credits:** 1.00 to 4.00

FR 40100 - French Level VII

Credit Hours: 3.00. Advanced work on development of French speaking, listening, reading, and writing abilities, focusing on materials dealing primarily with culture and the arts in France and the other French-speaking countries. Conducted primarily in French. **Credits:** 3.00

FR 40200 - French Level VIII

Credit Hours: 3.00. Further advanced work on speaking, listening, reading, and writing abilities in French. Course materials will cover a variety of topics illustrated by film and other media, both print and nonprint. Conducted primarily in French. **Credits:** 3.00

FR 42400 - Professional French III

Credit Hours: 3.00. A study of the terminology and techniques used in commercial transactions, including the interpretation and writing of business materials. Development of the four language skills, with emphasis on writing and speaking. **Credits:** 3.00

FR 44300 - Introduction To Francophone Literature

Credit Hours: 3.00. The study of the most representative Francophone poets, playwrights, and novelists from various countries, such as Leopold Senghor, Aime Cesaire, Jacques Romain, Gabrielle Roy, Michel Tremblay, Mohamed Dib. **Credits:** 3.00

FR 48000 - French Civilization

Credit Hours: 3.00. The study of modern French life, with special emphasis on the customs and daily life of the people. Lectures in French. **Credits:** 3.00

FR 49100 - Special Topics In French

Credit Hours: 1.00 to 4.00. This course will be offered as a guided reading or independent study course on a topic of mutual interest in French or Francophone literature, culture, film, or linguistics, to the student and faculty. Permission of instructor required.**Credits:** 1.00 to 4.00

FR 51900 - Teaching College French

Credit Hours: 3.00. A course designed to provide a forum for ideas connecting theory and research to teaching practice. Explores issues related to how learning and teaching can be enhanced and presents practical ideas that can be implemented in the classroom. Permission of department required. **Credits:** 3.00

FR 52700 - Etudes de Style

Credit Hours: 3.00. Study of the expression of affective and artistic values in literary French. Detailed grammatical analyses and study of stylistic procedures. Comparison with English usage. Introduction to explication de texte as an approach to literature. Permission of department required. **Credits:** 3.00

FR 54100 - Renaissance French Literature

Credit Hours: 3.00. Major works in verse and prose of the sixteenth century. Marot, du Bellay, Ronsard, Rabelais, Montaigne. Permission of department required. **Credits:** 3.00

FR 54900 - French Literature And Film

Credit Hours: 3.00. An examination of the interrelationships of contemporary French literature and film. Discussion of the potential of each medium as an art form, problems of visual transposition of literary works, and extension of literary concepts such as Dadaism and Surrealism into cinema. Permission of department required. **Credits:** 3.00

FR 55800 - French Novel Of The Twentieth Century

Credit Hours: 3.00. Consideration of the character, aesthetics, and evolution of the twentieth-century French novel. Readings from such representative novelists as Proust, Gide, Bernanos, Giono, Malraux, Camus, Robbe-Grillet, Saporta. Permission of department required. **Credits:** 3.00

FR 56100 - The Structure Of French I: Phonetics And Phonology

Credit Hours: 3.00. This course presents the sound system of French by examining descriptive and theoretical issues in the patterning of segments on various levels (phonetics, phonemics, morphology, etc.). Students will study current phonological and phonetic issues in recent literature. Credit will not be given for both FR 35100 and 56100. **Credits:** 3.00

FR 56200 - The Structure Of French II: Syntax And Morphosyntax

Credit Hours: 3.00. This course presents descriptive and theoretical issues concerning the grammatical structure of French, dealing both with word-level phenomena (inflectional and derivational morphology, etc.) and with phrase-, sentence-, and discourse-level phenomena (syntactic structure, sentence constituents, word order, etc.). Credit will not be given for both FR 36200 and 56200. **Credits:** 3.00

FR 56300 - History Of The French Language

Credit Hours: 3.00. A survey of the historical development of the French language from Vulgar Latin to the present and of the French language of today as a reflection of past cultural and socio-political conditions. Knowledge of a Romance language or of Latin is recommended but not required. **Credits:** 3.00

FR 56400 - Introduction To Old French

Credit Hours: 3.00. Introduction to the study of Old French. Phonetic, syntactic, and stylistic questions will be addressed through the analysis of original texts. **Credits:** 3.00

FR 58100 - French Culture

Credit Hours: 3.00. Development of the cultural life of the French people as reflected in architecture, art, history, literature, music, and philosophy. Lectures in French. **Credits:** 3.00

FR 58200 - Francophone Cultures

Credit Hours: 3.00. Examines at least three French-speaking regions outside of France (e.g., Caribbean, Maghreb, Quebec, West Africa), including contemporary civilization and the development of cultures throughout history. Explores trends in society, daily life, the arts, and the ideas. Lectures in French. **Credits:** 3.00

FR 59000 - Directed Reading In French

Credit Hours: 1.00 to 4.00. Directed readings in French. Permission of instructor required. **Credits:** 1.00 to 4.00

FR 59400 - Special Topics In French Literature

Credit Hours: 1.00 to 4.00. Special topics in French Literature. Permission of instructor required. **Credits:** 1.00 to 4.00

FR 59600 - Special Topics In French Linguistics

Credit Hours: 1.00 to 4.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 4.00

FR 60100 - First Course To Establish Reading Knowledge

Credit Hours: 3.00. First Course To Establish Reading Knowledge. **Credits:** 3.00

FR 63000 - Bibliography And Literary Criticism

Credit Hours: 3.00. The use of general and specific reference materials and bibliographical aids in literary research: the basic concepts and terminology of literary criticism. Required of all MA candidates in French. **Credits:** 3.00

FR 65900 - Seminar In French Literature

Credit Hours: 3.00. Advanced study of special subjects. Topics to be announced in advance. Permission of instructor required. **Credits:** 3.00

FR 67900 - Seminar In French Linguistics

Credit Hours: 3.00. Advanced study and research on a significant topic in French linguistics. Topic to be announced in advance. Permission of instructor required. **Credits:** 3.00

FR 69800 - Research MA Thesis

Credit Hours: 1.00 to 18.00. Research MA Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

FR 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Global Engineering Program

GEP 10000 - Global Design Team I

Credit Hours: 1.00. Global Design Team (GDT) brings together undergraduate and graduate students from different disciplines inside and outside of the College of Engineering, to design solutions to solve real-world problems over the course of one academic semester. Depending on the size and scope of the project, teams may range from one to twenty students under the advisement of a faculty member. GDTs partner student teams with non-governmental organizations, businesses, and/or other research institutions in international development projects. Approval for registration is granted based on an application process that takes into consideration previous design experience, level of interest in the topic, and GPA. Department approval required. **Credits:** 1.00

GEP 20000 - Global Design Team II

Credit Hours: 1.00 or 2.00. Global Design Team (GDT) brings together undergraduate and graduate students from different disciplines inside and outside of the College of Engineering, to design solutions to solve real-world problems over the course of one academic semester. Depending on the size and scope of the project, teams may range from one to twenty students under the advisement of a faculty member. GDTs partner student teams with non-governmental organizations, businesses, and/or other research institutions in international development projects. Approval for registration is granted based on an application process that takes into consideration previous design experience, level of interest in the topic, and GPA. Department approval required. **Credits:** 1.00 or 2.00

GEP 30000 - Global Design Team III

Credit Hours: 1.00 to 3.00. Global Design Team (GDT) brings together undergraduate and graduate students from different disciplines inside and outside of the College of Engineering, to design solutions to solve real-world problems over the course of one academic semester. Depending on the size and scope of the project, teams may range from one to twenty students under the advisement of a faculty member. GDTs partner student teams with non-governmental organizations, businesses, and/or other research institutions in international development projects. Approval for registration is granted based on an application process that takes into consideration previous design experience, level of interest in the topic, and GPA. Department approval required. **Credits:** 1.00 to 3.00

GEP 40000 - Global Design Team IV

Credit Hours: 1.00 to 3.00. Global design Team (GDT) brings together undergraduate and graduate students from different disciplines inside and outside of the College of Engineering, to design solutions to solve real-world problems over the course of one academic semester. Depending on the size and scope of the project, teams may range from one to twenty students under the advisement of a faculty member. GDTs partner student teams with non-governmental organizations, businesses, and/or other research institutions in international development projects. Approval for registration is granted based on an application process that takes into consideration previous design experience, level of interest in the topic, and GPA. Department approval required. **Credits:** 1.00 to 3.00

German

GER 10100 - German Level I

Credit Hours: 3.00. A beginning course in German reserved exclusively for students who have had less than two years of German at the ninth-grade level or above. Students with two years or more of previous German study may not take this course for credit. Permission of department required. CTL:IWL 1920 German Level I **Credits:** 3.00

GER 10200 - German Level II

Credit Hours: 3.00. Continuation of GER 10100. CTL:IWL 1921 German Level II **Credits:** 3.00

GER 10500 - Accelerated Basic German

Credit Hours: 4.00. This course is a first-year course in German, which covers two semesters in one. The course is appropriate for students who would like to accelerate the process of learning German, including GEARE students, graduate students, and others. The course will be conducted primarily in German and will use all modes of communication: interpersonal, presentational, and interpretive. The course book facilitates learning in context through the use of an integrated video program. The students are trained in the audio-visual interpretive mode of communication that is essential to carry out daily activities in Germany, and to be able to read and react to a variety of German texts. **Credits:** 4.00

GER 11200 - Elementary German Conversation

Credit Hours: 1.00. Development of oral skills for self-expression. Guided practice in conversation to enhance communicative competence. Small group discussions in German on various topics. **Credits:** 1.00

GER 20100 - German Level III

Credit Hours: 3.00. Readings from the works of nineteenth-century and contemporary German writers; practice in speaking and writing German. CTL:IWL 1922 German Level III **Credits:** 3.00

GER 20200 - German Level IV

Credit Hours: 3.00. Continuation of GER 20100. CTL:IWL 1923 German Level IV **Credits:** 3.00

GER 20500 - Accelerated Intermediate German

Credit Hours: 4.00. An accelerated intermediate level course in German designed to achieve second year language proficiency in German. The course is appropriate for students who would like to accelerate the process of learning German. **Credits:** 4.00

GER 21200 - Intermediate German Conversation

Credit Hours: 1.00. Development of oral skills for self-expression. Guided practice in German conversation to enhance communicative competence. Small group discussions in German on various topics. Not open to students enrolled in or having credit for GER 30100 or above. **Credits:** 1.00

GER 22300 - German Level IV: Science And Engineering

Credit Hours: 3.00. Practical reading, writing, speaking, and listening comprehension skills, directed toward use of German in science and technology. Work on grammar as needed. Use of materials from recent publications in science and technology. Introduction to general and technical vocabulary. Conducted primarily in German. Credit will not be given for both GER 20200 and 22300. **Credits:** 3.00

GER 22400 - German Level IV: Business German

Credit Hours: 3.00. Practical reading, writing, speaking, and listening comprehension skills directed toward use of German for business purposes. Work on grammar as needed. Course materials cover daily business dealings as well as national and international trade, living conditions, environmental and social problems. **Credits:** 3.00

GER 23000 - German Literature In Translation

Credit Hours: 3.00. Reading and analysis of selected German writers and their works, with particular emphasis on the social, political, and intellectual climate of the times. The course content will change from semester to semester. Knowledge of German not required. **Credits:** 3.00

GER 24100 - Introduction To The Study Of German Literature

Credit Hours: 3.00. An introduction to the study of German literature based on an overview of the formal elements of poetry, fiction, and drama as well as basic concepts of literary theory. Texts in German; conducted primarily in German. **Credits:** 3.00

GER 28000 - German Special Topics

Credit Hours: 3.00. Selected topics on the civilization and culture of German speaking countries. Lectures and readings all in English. No knowledge of German necessary. **Credits:** 3.00

GER 30100 - German Level V

Credit Hours: 3.00. Continued development of German speaking, listening, reading, and writing abilities, using materials dealing primarily with everyday life and civilization in Germany from a variety of sources (e.g., newspapers, magazines, TV, recent literature, etc.). Conducted primarily in German. **Credits:** 3.00

GER 30200 - German Level VI

Credit Hours: 3.00. Further work to develop speaking, listening, reading, and writing abilities in German on the basis of materials dealing with the ideas and events that have shaped present-day Germany. Conducted primarily in German. **Credits:** 3.00

GER 31200 - Advanced German Conversation

Credit Hours: 1.00. One credit hour advanced German conversation course focused on the development of oral and aural skills for self-expression. Course provides students with guided practice in conversation to enhance communicative competence. Discussions in German on various topics. Course may be taken concurrently with GER 30100, 30200, 40100 or 40200. **Credits:** 1.00

GER 32300 - German Level VI: Science And Engineering

Credit Hours: 3.00. This is an alternative course to GER 30200. Continued development of German speaking, listening, reading, and writing abilities, using materials from recent publications in science and technology. Building of general and technical vocabulary. Conducted in German. **Credits:** 3.00

GER 33000 - German Cinema

Credit Hours: 3.00. Viewing and analysis of major German contributions to the cinema from the earliest period to the present. Emphasis on relevant aesthetic theories and on the schools of literature and painting that served as sources. Evaluation of the German film on the basis of social, artistic, and political criteria. Knowledge of German not required. **Credits:** 3.00

GER 34100 - German Literature I: From The Middle Ages To The 18th Century

Credit Hours: 3.00. Reading and discussion of selected texts (poetry, prose, dramatic texts, cultural documents, and artworks) in German from the Middle Ages to the Eighteenth Century. **Credits:** 3.00

GER 34200 - German Literature II: From The 18th Century To The 21st Century

Credit Hours: 3.00. Reading and discussion of selected texts in German with the dual context of literary movements and historical developments between the 18th and 21st centuries. **Credits:** 3.00

GER 39900 - Special Study Abroad Credit In German

Credit Hours: 1.00 to 4.00. This course number is for assignment after the fact of credits in German earned while enrolled at a foreign university on a Study Abroad program which cannot be appropriately accommodated under an established Purdue course number. It is not for use for courses offered at or conducted by Purdue. **Credits:** 1.00 to 4.00

GER 40100 - German Level VII

Credit Hours: 3.00. Advanced work on development of German speaking, listening, reading, and writing abilities, focusing on materials dealing primarily with culture and the arts in Germany. Conducted in German. **Credits:** 3.00

GER 40200 - German Level VIII

Credit Hours: 3.00. Further advanced work on speaking, listening, reading, and writing abilities in German. Course materials will cover a variety of topics illustrated by film and other media, both print and nonprint. Conducted in German. **Credits:** 3.00

GER 42400 - Business German

Credit Hours: 3.00. A study of the terminology and techniques used in commercial transactions, including the interpretation and writing of business materials. Development of the four language skills, with emphasis on writing and speaking. **Credits:** 3.00

GER 48000 - German Civilization

Credit Hours: 3.00. The study of modern German life, with special emphasis on the daily life and customs of the people. Lectures in German. **Credits:** 3.00

GER 49800 - Advanced Topics In German

Credit Hours: 3.00. Special topics on literature, linguistics and culture of contemporary German-speaking countries. Conducted in German. **Credits:** 3.00

GER 51900 - Teaching College German

Credit Hours: 3.00. A course designed to provide a forum for ideas connecting theory and research to teaching practice. Explores issues related to how learning and teaching can be enhanced and presents practical ideas that can be implemented in the classroom. Permission of instructor required. **Credits:** 3.00

GER 52400 - German For International Trade

Credit Hours: 3.00. A broad spectrum of business and cultural materials to prepare students for work in international firms. Intensive study of technical terminology used in business transactions; stylistics in business correspondence and report writing; training for accurate oral expression in business negotiations. **Credits:** 3.00

GER 54200 - German Classicism

Credit Hours: 3.00. The study of the classical period in German literature as revealed in the works of Goethe and Schiller. **Credits:** 3.00

GER 54300 - The Age Of Enlightenment And The Storm And Stress Movement

Credit Hours: 3.00. A study of the literature of the Age of Enlightenment, the cult of feeling, and the Storm and Stress works of Goethe and Schiller. **Credits:** 3.00

GER 54400 - German Romanticism

Credit Hours: 3.00. A study of the rise and degeneration of the romantic ideal in German literature. Particular attention is paid to aesthetics, literary criticism, and the revival of a national heritage. **Credits:** 3.00

GER 54500 - German Prose From Naturalism To The Present

Credit Hours: 3.00. Development of the novel and short story of the period, with special emphasis on the major authors. **Credits:** 3.00

GER 54600 - German Literature Since 1945

Credit Hours: 3.00. Major literary movements and tendencies in East and West Germany, Austria, and Switzerland since 1945. Involves the close reading of literary texts, investigation of major problems addressed by literary criticism, and discussion of historical context. **Credits:** 3.00

GER 55100 - Lyric Poetry From Romanticism To The Present

Credit Hours: 3.00. A study of the German lyric from Romanticism to the present. The study of motif, form, and style as reflections of the aesthetic ideals of their age. **Credits:** 3.00

GER 55400 - German Drama Before Naturalism

Credit Hours: 3.00. German drama from its beginnings up to the advent of Naturalism. A study of the most significant German dramatists of the first part of the nineteenth century and earlier periods. **Credits:** 3.00

GER 55500 - German Drama From Naturalism To The Present

Credit Hours: 3.00. Developments of the drama through the various literary movements of the period, including consideration of the underlying social and ideological forces. **Credits:** 3.00

GER 56100 - The Structure Of German I: Phonology And Derivational Morphology

Credit Hours: 3.00. Linguistic analysis of German, focusing on phonetics, phonology, and word structure. The course will treat various problems of pronunciation, structural sound patterns, and word derivation. One weekly class is devoted to theoretical issues affecting German phonology and morphology. Credit will not be given for both GER 36100 and 56100. **Credits:** 3.00

GER 56200 - The Structure Of German II: Inflectional Morphology And Syntax

Credit Hours: 3.00. Linguistic analysis of German, focusing on inflectional morphology, syntax, and semantics. The course will present the grammatical structure of German, dealing with word-level phenomena (inflectional morphology), and phrase- and sentence-level phenomena (constituents, word order, syntactic structure, etc.). Credit will not be given for both GER 36200 and 56200. **Credits:** 3.00

GER 56300 - History Of The German Language

Credit Hours: 3.00. A survey of the development of the German language, with emphasis on the factors and events that brought about the ultimate unification of the major German dialects into the standard form of the present. The German language of today as a reflection of past cultural and sociopolitical conditions. **Credits:** 3.00

GER 57500 - Theories Of German Language Acquisition

Credit Hours: 3.00. Advanced course designed to provide an overview of major theoretical issues in German language acquisition research. Permission of instructor required. **Credits:** 3.00

GER 58100 - German Culture

Credit Hours: 3.00. The development of the cultural life in German-speaking lands as reflected in architecture, art, history, literature, music, and philosophy. Lectures in German. **Credits:** 3.00

GER 59000 - Directed Reading In German

Credit Hours: 1.00 to 4.00. Directed readings in German. Permission of instructor required. **Credits:** 1.00 to 4.00

GER 59400 - Special Topics In German Literature

Credit Hours: 1.00 to 4.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 4.00

GER 59600 - Special Topics In German Linguistics

Credit Hours: 1.00 to 4.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 4.00

GER 60100 - First Course To Establish Reading Knowledge

Credit Hours: 3.00. First Course To Establish Reading Knowledge. **Credits:** 3.00

GER 60300 - Second Course To Establish Reading Knowledge

Credit Hours: 3.00. Second Course To Establish Reading Knowledge. For those in the physical sciences, mathematics, and engineering. Prerequisite: GER 60100. **Credits:** 3.00

GER 60500 - Second Course To Establish Reading Knowledge

Credit Hours: 3.00. Second Course To Establish Reading Knowledge. For those in the humanities and social sciences. Prerequisite: GER 60100. **Credits:** 3.00

GER 63000 - Bibliography And Literary Criticism

Credit Hours: 3.00. The use of general and specific reference materials and bibliographical aids in literary research; the basic concepts and terminology of literary criticism. Required of all MA candidates in German. **Credits:** 3.00

GER 64400 - Seminar In German Expressionism

Credit Hours: 3.00. The prose, drama, and poetry from 1910-1925. Will also examine selected political-literary essays as they relate to this artistic avant-garde generation. **Credits:** 3.00

GER 65900 - Seminar In German Literature

Credit Hours: 3.00. Advanced study of special subjects. Topics to be announced in advance. Permission of instructor required. **Credits:** 3.00

GER 66400 - Middle High German

Credit Hours: 3.00. This course introduces students to the Middle High German language, the language of medieval literary texts written in German between 1050 and 1350. The language of this period is significantly different in spelling, vocabulary, and grammar when compared to Modern Standard German. The course also provides an introduction to various genres of medieval German literary texts from this period. Many of the foundational works in the German tradition come from this period, including those of the so-called "golden age" of medieval German literature from 1170 to 1230. **Credits:** 3.00

GER 67900 - Seminar In German Linguistics

Credit Hours: 3.00. Advanced study and research on a significant topic in German linguistics. Topic to be announced in advance. Permission of instructor required. **Credits:** 3.00

GER 69800 - Research MA Thesis

Credit Hours: 1.00 to 18.00. Research MA Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

GER 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

General Science

SCI 120IN - Windows On Science

Credit Hours: 1.00. Designed for new and prospective science majors, the course covers an integrative overview of science, examining science and society, the scientific method and community of scientists, undergraduate research, professional ethics, an exploration of science-based careers, and strategies for success as a science major.**Credits:** 1.00

SCI 10000 - Multicultural Leadership Seminar

Credit Hours: 1.00. Exposes students to career opportunities via presentations from corporate and academic representatives; provides an opportunity for minority science students to share concerns and to become aware of existing academic and non-academic support systems on campus. Provides an overview of the significant contributions to the sciences by minority groups; reinforces good study habits for academic success. **Credits:** 1.00

SCI 19100 - Part-Time Curricular Practical Training

Credit Hours: 0.00. A part-time scientific work experience for Science majors. This internship experience is intended to complement the student's academic plan of study and help prepare for a future role as a practicing scientist. A letter from the prospective employer stating the period of employment, hours per week, job title, job qualifications, and job description must be provided to the Dean of Science's office for approval before registration will be permitted. A minimum period of employment is required. Permission of department required. **Credits:** 0.00

SCI 19500 - Special Topics In Science

Credit Hours: 0.00 to 3.00. This is a special projects course that will be used for special circumstances with individual study or for experimental courses, pointed toward students who are first- or second-year students. **Credits:** 0.00 to 3.00

SCI 20100 - Special Topics: Integrated Science And Engineering Learning Community

Credit Hours: 1.00. This course will expose students to interdisciplinary problems scientists and engineers routinely need to solve. Students will gain an appreciation for working with individuals from diverse disciplines and backgrounds. Participation in hands-on activities is a key component of the course. **Credits:** 1.00

SCI 21000 - Teaming Principles

Credit Hours: 1.00. College of Science students will learn the principles and concepts involved in teaming, such as recognizing different learning styles, developing shared goals, addressing conflict, utilizing collaborative problem solving and utilizing

strengths of team members. These foundations will allow students to enter collaborative situations, such as lab groups and study sections, fully prepared to maximize the value of their educational experiences as well as develop positive working relationships with their fellow students. **Credits:** 1.00

SCI 29000 - Special Topics In Science

Credit Hours: 3.00. Introductory, integrated science course for engineering and science students. Beginning lectures will cover the basic chemistry of life, the organization of cells. This will be followed by more advanced topics such as photosynthesis. Each topic will emphasize how understanding the biological system requires concepts and tools from other disciplines such as chemistry and physics. Permission of instructor required. **Credits:** 3.00

SCI 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in general sciences. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

SCI 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in general sciences. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

SCI 29500 - Intercultural Leadership Seminar

Credit Hours: 0.00 to 3.00. This is a special projects course that will be used for special circumstances with individual study or for experimental courses, pointed toward students who are first- or second-year students. Permission of instructor required.**Credits:** 0.00 to 3.00

SCI 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in general sciences. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

SCI 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in general sciences. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

SCI 39500 - Special Topics In Science

Credit Hours: 0.00 to 3.00. This is a special topics course that will be used for special circumstances with individual study or for experimental courses. **Credits:** 0.00 to 3.00

SCI 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in general sciences. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

SCI 49000 - Topics In Science For Undergraduates

Credit Hours: 1.00 to 5.00. Selected interdisciplinary topics. Offered as a scheduled course when appropriate. Also available for supervised reading and reports of an interdisciplinary nature. Permission of instructor required. **Credits:** 1.00 to 5.00

General Studies

GS 11900 - Introduction To Academic Programs At Purdue

Credit Hours: 1.00. To provide a comprehensive program describing each of the baccalaureate degree-granting schools at Purdue. The course is designed to assist students in the clarification of their degree objectives. Not open to students who have completed GS 115. **Credits:** 1.00

GS 12000 - Summer Beginners Seminar I

Credit Hours: 1.00. Summer Start students, as incoming freshmen, will learn the ins and outs of higher education - more specifically of Purdue University - and how to effectively manage their time and create successful personal habits. Whether it is learning the university course management system, understanding the bus routes, or navigating the world of financial aid, this seminar will prepare incoming students for success at Purdue's campus. Additionally, students will go through a series of lectures focused on creating successful habits, including, but not limited to: time management, study skills, cultural awareness, goal setting, and interpersonal communication.**Credits:** 1.00

GS 12001 - Summer Beginners Seminar II

Credit Hours: 1.00. This seminar course is designed for students to reflect on the hopes, assumptions, and questions they bring with them as they begin their college experience at Purdue University. The class will support student success by introducing students to campus resources, establishing connections with the campus community, expanding study skills learned during high school, and implementing appropriate time management strategies.**Credits:** 1.00

GS 17500 - Information Strategies

Credit Hours: 0.00 or 1.00. Designed to build and sharpen students' information-gathering skills. Guides students in developing systematic methods for finding, evaluating, and presenting information. Organization and use of electronic and print tools will be explained through discussion, hands-on exercises, and homework assignments. **Credits:** 0.00 or 1.00

GS 19501 - Preparing For Your Undergraduate Research Experience

Credit Hours: 1.00. This course is for prospective Purdue undergraduate researchers who are interested in conducting undergraduate research or creative endeavors. Purdue students who have not already started an independent research project with a research mentor will learn valuable skills to market themselves to individuals and research programs. Throughout the course, students will develop components for a final application packet to submit to a research team or program they choose. **Credits:** 1.00

GS 19505 - Introduction Of Research Essentials - Getting Started

Credit Hours: 1.00. This course is for prospective Purdue undergraduate researchers who are within their first two years at Purdue who are interested in conducting undergraduate research or creative endeavors. New Purdue Boilermakers who have not already started an independent research project with a research mentor will learn valuable skills to market themselves to individuals and research programs to prepare for a project in the following semester. Throughout the course, students will develop components for a final application packet to submit to a research team or program they choose while focusing on the transition to college expectations regarding research-related topics. Must be a first-year or second-year student. Permission of instructor required. **Credits:** 1.00

GS 19700 - Purdue Promise First-Year Experience Course

Credit Hours: 1.00. A combined lecture and experiential seminar course for new Purdue Opportunity Awards scholars. The course will focus on the transition issues for these first-year students. Permission of instructor required. **Credits:** 1.00

GS 19900 - Strategies For A Successful First Year

Credit Hours: 3.00. This course focuses on student adjustment to university life and development skills. Content includes testing to determine skills, attitudes, and interests; group activities to foster student adjustment; and training in computer usage, time management, and University policies. Open to Horizons students only. **Credits:** 3.00

GS 20000 - Preparing Tomorrow's Leaders: Purpose And Connection

Credit Hours: 1.00. A one-credit course designed to provide Purdue Promise students with skills and connections to be successful at Purdue and post graduation. This course will provide Purdue Promise students in their second year with a foundation in leadership and career development skills. **Credits:** 1.00

GS 21000 - Leadership Development Seminar

Credit Hours: 1.00. A one-credit course designed to provide Student Access, Transition and Success programs students with skills and connections to be successful student leaders at Purdue. This course will provide students a foundation I leadership skills. Permission of instructor required. **Credits:** 1.00

GS 22000 - Summer Session Special Topics

Credit Hours: 1.00 to 6.00. This course is designated for a wide range of topics that stress interdisciplinary understanding, creative thought, and group discussion. Topics vary by semester. Permission of instructor required. **Credits:** 1.00 to 6.00

GS 29000 - Study Skills Seminar

Credit Hours: 2.00 or 3.00. Designed to help students improve their college grades by learning to study more efficiently and effectively. Deals with improving study habits, such as time scheduling, attitudes, and specific study skills, such as note-taking, listening, test-taking, memory techniques, and reading skills. **Credits:** 2.00 or 3.00

GS 29001 - Academics Success Skills

Credit Hours: 1.00. Designed to help students improve their college grades by learning to study more effectively. **Credits:** 1.00

GS 29501 - Understanding Your Undergraduate Research Experience I

Credit Hours: 1.00. This course is for Purdue undergraduates who are part of an active research project and/or creative endeavor. Students will hone skills necessary for reflecting on and completing these experiences. During this course, students will utilize their research experience to apply skills including but not limited to: managing time with a research project, communicating research findings, using Purdue Libraries' resources, and providing constructive feedback to peer researchers. Students will deliver elevator pitches on their own research projects and critique pitches from their peers. **Credits:** 1.00

GS 39501 - Understanding Your Undergraduate Research Experience II

Credit Hours: 1.00. This course is for current Purdue undergraduate researchers to build upon the previous course and focus on research data collection, analysis, and communication for current Purdue undergraduate researchers. During this course, students will learn and discuss various forms of data and collection practices. Students will develop their own academic poster to present their research project's data and implications. **Credits:** 1.00

GS 39505 - Research Peer Mentoring Training

Credit Hours: 1.00. This course is for current or past Purdue undergraduate researchers who want to learn how to serve as peer mentors to undergraduate researchers early in their careers. This course will train students on how to create mutually beneficial and productive mentorships. This course will provide research-based best practices for mentoring newer student researchers while developing as a cohort of new research mentors. This course is especially useful for those students who enjoy supporting peer researchers or plan to continue into more formal mentorship roles as a senior undergraduate researcher, graduate student, or research supervisor in academia or industry. Permission of instructor required. **Credits:** 1.00

GS 40400 - Horizons Advanced Career Preparation

Credit Hours: 1.00. Horizons Advanced Career Preparation is designed to assist students in beginning their transition from college to the workforce or graduate school. The emphasis of the course is placed on self-exploration, career search skills, graduate school preparation, professional conduct, and financial planning. **Credits:** 1.00

GS 40500 - Advancing Tomorrow's Leaders: Preparing For Employment And Life After College

Credit Hours: 1.00. A one-credit course designed to prepare Purdue Promise students for the next chapter of their professional journey through the reflection of past experiences and the acquisition of new knowledge, expectations, and skills necessary to be successful citizens and employees post-graduation. This course is only for students in the Purdue Promise program. Permission of instructor required. **Credits:** 1.00

GS 41000 - Advancing Tomorrow's Scholars: Graduate And Professional School Preparation

Credit Hours: 1.00. A one-credit course designed to prepare Purdue Promise students for a smooth transition into graduate or professional school. This course will inform Purdue Promise students of the necessary preparation, required paperwork, and skills needed to be successful in post-baccalaureate education. This course is only for students participating in the Purdue Promise program. Permission of instructor required. **Credits:** 1.00

GS 49000 - Directed Reading In General Studies

Credit Hours: 1.00 to 4.00. Reading to be done under the direction of the instructor in the particular field of specialization. Permission of instructor required. **Credits:** 1.00 to 4.00

GS 49501 - Beyond Undergraduate Research

Credit Hours: 1.00. This course is for current Purdue undergraduate researchers to build on the previous courses (GS 29501, 39501) and focus on continuing their education in graduate or professional school. During this course, students will learn and discuss the various phases of identifying, selecting, applying to and funding graduate or professional school programs. Students will also gain a deeper comprehension of the qualities and skills that make research mentors effective while developing skills they will need to be successful mentees and peer mentors. Students will conduct research to identify potential programs of interest and develop a statement of purpose. **Credits:** 1.00

Global Studies Liberal Arts

GSLA 10100 - Global Awareness

Credit Hours: 3.00. This course surveys a range of global issues to develop an understanding and appreciation of the major geographical and cultural areas of the world and the issues that both unite and divide such areas and their people. The course will examine key political, economic, social, historical and cultural patterns that define our modern world. It encourages students to raise 'big' questions about what processes and institutions helped constitute the modern moment, as well as about the dynamic interactions between our social world and the natural one. This is a gateway course for prospective Global Studies Majors and Minors. **Credits:** 3.00

GSLA 30100 - Theories Of Global Studies

Credit Hours: 3.00. The course is designed to introduce students to the major schools of thought in Global and International Studies. It provides students with critical tools to explore the interconnectedness of our world from multiple perspectives. The course will expose students to a variety of international scholars who have understood Global Studies to be more than globalization. Instead, it introduces contested issues and contradictory positions concerning the meaning and significance of globalization. **Credits:** 3.00

GSLA 39100 - Special Topics In Global Studies

Credit Hours: 3.00. This variable title course deals with topics that explore a range of experiences and analytical perspectives clustered around the contemporary global experience. The course will vary in subject matter but focus on the challenges and rewards of a globalized world as articulated through topics such as cross-border histories, music, gender, racial formations, film, and economic development. Content will vary with the instructors teaching the course. **Credits:** 3.00

GSLA 48000 - Senior Interdisciplinary Capstone Project In Global Studies I

Credit Hours: 3.00. The senior capstone course for Global Studies majors is designed to give students the chance to define and complete a research project of personal interest, and to integrate the interdisciplinary aspects of their entire curricula into one project. Students must complete GSLA 48000 and GSLA 48001. The capstone courses are offered to students in their senior year to be completed the final two semesters of their major. Students will assemble a committee of two or more faculty members willing to direct their work. The Director of Global Studies will be an ex-officio member of the committee. Students will incorporate their prior coursework (including foreign language training), study abroad, and/or internships into their final project. The capstone may be, but is not limited to, a senior honors project, a multimedia project, service learning, or directed research. Timeline for a successful capstone project: Spring of Sophomore year: After three semesters of coursework, the student will start defining an area of interest or passion that will form the basis of their capstone research. Junior Year: The student will select courses in their interest area. They will also start speaking to faculty members in the field in order to assemble their committee. Spring of Junior Year: Students will finalize their faculty committee to direct their research. Fall of Senior Year: Research Semester, as directed by the committee. GSLA 48000. Spring of Senior Year: Complete project. GSLA 48001. **Credits:** 3.00

GSLA 48001 - Senior Interdisciplinary Capstone Project In Global Studies II

Credit Hours: 3.00. The senior capstone is a year-long course for which Global Studies majors enroll in consecutive semesters. Its primary goal is for students to define and complete a research project of personal, academic, and/or professional interest, as they integrate the interdisciplinary aspects of their entire curricula into one project. Students must complete GSLA 48000 and GSLA 48001 in order to complete the Global Studies major. **Credits:** 3.00

Graduate Studies

GCIC 60000 - CIC Traveling Scholar

Credit Hours: 0.00 to 18.00. Topics vary. **Credits:** 0.00 to 18.00

GRAD 505GN - The Responsible Conduct Of Research

Credit Hours: 1.00. An overview of the rules and standards required for Graduate Students, Research Technicians and Post-doctoral Fellows conducting responsible scientific research.**Credits:** 1.00

GRAD 817GN - Molecular Basis Of Cell Structure Function

Credit Hours: 2.00. Organization and function of subcellular structures. Intracellular coordination of cell activities including protein and RNA processing/trafficking/quality control, chromatin dynamics, and cell division.**Credits:** 2.00

GRAD 50100 - PULSe Scientific Communications

Credit Hours: 1.00. To begin to create an atmosphere in which students learn to communicate across disciplinary lines by providing the opportunity to develop skills in presenting and evaluating research results. Students will develop short scientific presentations, an abstract, and a poster and learn to present their findings to others and to ask and answer questions from their peers. Permission of department required. **Credits:** 1.00

GRAD 50200 - Interdisciplinary AI Fundamentals: Bridging Knowledge

Credit Hours: 1.00. This course provides foundational concepts for AI for those in both MSAI majors. This course covers the history of AI, the foundations of artificial reasoning and knowledge, and practical skills for communicating about AI technology, projects, and workflow. This graduate course, designed to be accessible to learners with diverse backgrounds, serves as a foundational introduction to the field of AI. Whether you come from a technical or non-technical background, this course will provide you with a solid grasp of AI concepts, principles, and their real-world applications. To be successful in this course, we encourage students to know math (e.g., algebra and calculus) and a basic understanding of programming (e.g., R, Python, or Java).**Credits:** 1.00

GRAD 50300 - AI Essentials: A Non-Technical Introduction

Credit Hours: 2.00. This course provides students on the translator track a foundation in the principles and methodologies of Artificial Intelligence (AI) to empower them to actively engage in interdisciplinary collaborations. With a focus on the essentials of AI, machine learning, and natural language processing, students will gain the knowledge and skills needed to bridge the gap between language and technology. Students will leverage AI tools and techniques to enhance translation efficiency, accuracy, and engagement in the ever-evolving digital landscape. Students will have a foundation in the methodology so they can effectively participate in interdisciplinary collaborations, serving as a valuable resource for industries where language and technology converge.**Credits:** 2.00

GRAD 50400 - Advanced AI Fundamentals For Technical Professional

Credit Hours: 2.00. Artificial Intelligence (AI) is the driving force behind the transformation of industries, research, and technology. For students with a highly technical background, this 2-credit hour graduate course offers a deep dive into the fundamental principles, theories, and applications of AI. Specifically, this course will introduce students to the field of data mining and machine learning, which sits at the interface between statistics and computer science. Data mining and machine learning focus on developing algorithms to automatically discover patterns and learn models of large datasets. This course introduces students to the process and main techniques in data mining and machine learning, including exploratory data analysis, predictive modeling, descriptive modeling, and evaluation. To be successful in this course students should have experience with programming such as Python and R and have a background that includes calculus, linear algebra, algorithms, and probability theory.**Credits:** 2.00

GRAD 50600 - Big Data Tools And Technologies

Credit Hours: 3.00. This course is designed to equip students with the essential skills to handle big data effectively. It covers proficiency in big data technologies, scalable data processing techniques, and the integration of big data tools into data science workflows.**Credits:** 3.00

GRAD 50700 - Cross Domain Data Communication And Visualization

Credit Hours: 3.00. This course focuses on the proficient use of data communication strategies and competencies. The course will focus on identifying data narratives, generating stories from data, illustrating with powerful and self-explanatory visualization, and basic principles of ethical use of non-data narrative frames for data communication. Designed for students with a technical background pursuing a Master of Science in Data Science, this course aims to enhance students' ability to extract and communicate meaning and narratives from raw data and visually represent it.**Credits:** 3.00

GRAD 50800 - Data Analytics

Credit Hours: 3.00. This course provides an in-depth exploration of advanced data analysis techniques, predictive modeling, ensemble methods, and proficiency in data manipulation and transformation. It is designed for students with a technical background pursuing a Master of Science in Data Science.**Credits:** 3.00

GRAD 50900 - Applied Machine Learning: From Foundations To Latest Advances

Credit Hours: 3.00. This course provides an in-depth exploration of machine learning algorithms and data mining techniques, building on the foundational concepts introduced in the Foundations of Data Science course. Students will develop a comprehensive understanding of various machine learning algorithms, focusing on practical applications and hands-on experience. Additionally, the course will cover data mining techniques for dimension reduction and pattern discovery.**Credits:** 3.00

GRAD 55000 - Fellowship And Grant Application Writing

Credit Hours: 2.00. Fellowship Application Writing is open to any graduate student who is interested in applying for fellowships and other grant opportunities. Graduate students will be taught how to write personal statements, research statements, and extended research plans that they can submit for fellowship applications. Organization of research background, methods, and significance will be emphasized. Writing mechanics and addressing grant agency requirements and procedures will also be covered. Additionally, fellowship and grant opportunities will be discussed along with professional communication skills. **Credits:** 2.00

GRAD 58800 - Online Master Of Science In Data Science-Capstone

Credit Hours: 3.00. The capstone course aims to provide students with an opportunity to integrate their accumulated knowledge, technical, and social skills to identify and solve a real-world data science problem, with an emphasis on the application domain.

The capstone course for the OMSDS provides students with practical experience applying the collective set of skills developed through the OMSDS program to complete a professional project in support of a private, public, or non-profit partner. Students, in teams of 3-5 students each, will work with a product owner to scope out the project via a project charter that will include a timeline, milestones, and metrics that will yield benefits and a strategy for measuring the outcome of the project compared to a baseline.**Credits:** 3.00

GRAD 58900 - Master Of Science In Artificial Intelligence Capstone

Credit Hours: 3.00. The capstone course aims to provide students with an opportunity to integrate their accumulated knowledge, technical, and social skills to identify and solve a realistic or real-world artificial intelligence problem, with an emphasis on the application domain. The capstone course for the MSAI provides students with practical experience applying the collective set of skills developed through the MSAI program to complete a professional project in support of a private, public, or non-profit partner. Students, in teams, will select a target beneficiary, arrange a consultation, develop a problem statement, a project plan that will yield benefits, and a strategy for measuring the outcome of the project compared to a baseline. **Credits:** 3.00

GRAD 59000 - Special Topics

Credit Hours: 1.00 to 3.00. Hours and credits to be arranged. For the use of interdisciplinary programs and in other situations when appropriate departmental courses are not available or general Graduate School identification is desirable. To be used only with the consent of the dean of the Graduate School. **Credits:** 1.00 to 3.00

GRAD 59500 - Independent Study

Credit Hours: 1.00 to 6.00. This course provides a means of independent study of a special problem or research topic. Although not required, it is likely that a major result of the course will be a conference or journal publication. This course does not substitute for master's research credit on the plan of study. Permission of instructor required. **Credits:** 1.00 to 6.00

GRAD 59800 - MS Non-Thesis Research

Credit Hours: 1.00 to 18.00. A formal investigation of a particular problem under the guidance of the advisory committee. Not applicable to a thesis option plan of study. Permission of instructor required. **Credits:** 1.00 to 18.00

GRAD 60200 - Peer To Peer Mentoring For ESE IGP Students

Credit Hours: 1.00. This Peer-to-Peer (P2P) mentor experience is geared to enhance the professional development of our ESE students and foster enhanced success and professional development for our first year students. The P2P mentors meet once a week with Independent of GRAD 59000 and also meet with GRAD 59000. P2P mentors have to shape the syllabus for each semester including identifying readings; develop, lead, and facilitate classroom activities through both traditional and innovative and creative strategies; and provide verbal and written input on weekly student critiques. Permission of instructor required. **Credits:** 1.00

GRAD 61000 - Grant Training Program I

Credit Hours: 1.00 to 3.00. This variable topic course is designed to be used by any department at WL needing to offer a training program associated with research grants such as those required by certain NIH, NSF or other grant agencies or programs. Permission of instructor required. **Credits:** 1.00 to 3.00

GRAD 61100 - Grant Training Program II

Credit Hours: 1.00. This variable topic course is designed to be used by any department at WL needing to offer a training program associated with research grants such as those required by certain NIH, NSF or other grant agencies or programs. Instructor permission required. Prerequisite: GRAD 61000. **Credits:** 1.00

GRAD 61200 - Responsible Conduct Of Research

Credit Hours: 1.00. Overview of values, professional standards, and regulations that define responsible conduct in research. Students learn the values and standards of responsible research through readings and lecture/discussion and practice application of these values and standards to research situations through class discussion of case studies from life sciences research. Students must be registered for M.S. or Ph.D. thesis research in their home department. **Credits:** 1.00

GRAD 68900 - Special Seminars

Credit Hours: 0.00 to 18.00. Hours and credits to be arranged. For use in interdisciplinary seminars and in other cases where general Graduate School identification is desirable. To be used only with the consent of the dean of the Graduate School. **Credits:** 0.00 to 18.00

GRAD 69000 - Special Topics

Credit Hours: 1.00 to 8.00. This variable topic course focuses on advanced study of technical and professional research topics, primarily for doctoral students. **Credits:** 1.00 to 8.00

GRAD 69300 - Interdisciplinary Internship/Practicum

Credit Hours: 0.00 to 18.00. For the use of interdisciplinary programs and in other situations when appropriate departmental courses are not available or general Graduate School identification is desirable. To be used only with the consent of the dean of the Graduate School. **Credits:** 0.00 to 18.00

GRAD 69500 - Doctoral Independent Study

Credit Hours: 1.00 to 6.00. This course provides a means of independent study of a special problem under the guidance of a graduate faculty member who holds a terminal degree. It is assumed that projects in this course are research projects independent of one's doctoral research. Although not required, it is likely that a major result of the course will be a conference or journal publication. This course does not substitute for dissertation research credit on the plan of study. Permission of instructor required. **Credits:** 1.00 to 6.00

GRAD 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

GRAD 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Greek

GREK 10100 - Ancient Greek Level I

Credit Hours: 3.00. Introduction to the grammar of Attic Greek of the Classical period, and first forays into the reading of connected prose. Emphasis on accidence, syntax, and vocabulary building. **Credits:** 3.00

GREK 10200 - Ancient Greek Level II

Credit Hours: 3.00. Continuation of the study of Attic Greek grammar and reading of connected prose of the Classical period. **Credits:** 3.00

GREK 10500 - Accelerated Introductory Ancient Greek

Credit Hours: 4.00. This course is an accelerated beginning-level course designed to develop language proficiency in Ancient Greek. The course will help students progress toward competence in reading and writing, as well as toward knowledge of Ancient Greek culture. The course focuses on developing deep understanding of Greek syntax and morphology and building strategies for fluent and accurate reading of ancient texts. Primary language of instruction is English. **Credits:** 4.00

GREK 20100 - Ancient Greek Level III

Credit Hours: 3.00. Intermediate reading course in New Testament Greek, designed to strengthen students' grasp of grammar and syntax, broaden vocabulary, and develop skills in reading and translation. **Credits:** 3.00

GREK 20200 - Ancient Greek Level IV

Credit Hours: 3.00. Upper intermediate reading course in ancient Greek, designed to consolidate students' knowledge of grammar and syntax, broaden vocabulary, and develop precision and confidence in reading and translation. **Credits:** 3.00

GREK 34300 - Greek Oratory

Credit Hours: 3.00. A study of ancient Greek (Attic) orators from textual, historical, and social perspectives. **Credits:** 3.00

GREK 34400 - Greek Epic

Credit Hours: 3.00. Readings and discussion of the Greek epic, including selected passages from Homer and Hesiod. **Credits:** 3.00

GREK 35300 - Greek Tragedy

Credit Hours: 3.00. Reading and discussion of selected Greek tragedies of the 5th century BCE. **Credits:** 3.00

GREK 35400 - Greek Comedy

Credit Hours: 3.00. Readings and discussion of selected Greek comedies of the 4th and 5th centuries BCE. **Credits:** 3.00

GREK 44600 - Greek Historians

Credit Hours: 3.00. A study of the writings of the classical historians in the original Greek. **Credits:** 3.00

GREK 49000 - Directed Reading In Classical Greek

Credit Hours: 1.00 to 3.00. Directs the reading of students with special interests. Guides students in profitable reading in subjects of their own choice. Permission of instructor required. **Credits:** 1.00 to 3.00

GREK 59000 - Directed Reading In Classical Greek

Credit Hours: 1.00 to 4.00. Directed Reading In Classical Greek. Permission of instructor required. **Credits:** 1.00 to 4.00

Health and Kinesiology

HK 10000 - Foundations Of Kinesiology

Credit Hours: 3.00. This course will provide an introduction to the physical and behavioral sciences underlying kinesiology, the study of human movement. The course will cover foundational concepts in exercise physiology, biomechanics, motor behavior, sport and exercise psychology, and sociology and history of physical activity. The course will take an interdisciplinary perspective, exploring both key concepts in each of these sub-areas of kinesiology, and how they are integrated to understand problems in human movement, exercise, physical activity, sport, and healthy lifestyles. **Credits:** 3.00

HK 10100 - Clinical Practice in Athletic Training - Orientation

Credit Hours: 1.00. Under supervision of the certified athletic trainer, students will undertake observation of training room operations and duties of the athletic trainer. Acquisition of basic skills and knowledge is expected. **Credits:** 1.00

HK 13500 - Introduction To Health And Kinesiology

Credit Hours: 1.00. Overviews the disciplines of health and kinesiology. Students explore skills and academic interests in theses areas. Describes career opportunities and options for graduate study. Provides strategies for professional and portfolio development. Students complete five hours of community service per semester. Permission of instructor required. **Credits:** 1.00

HK 20100 - Clinical Practice In Athletic Training - Assist

Credit Hours: 2.00. Under supervision of the certified athletic trainer, students will be provided the opportunity to practice those skills required of the athletic trainer. The student will assist the staff and upperclass students. **Credits:** 2.00

HK 20800 - Prevention And Treatment Of Athletic Injuries

Credit Hours: 3.00. Provides the physical educator, coach, and athletic training student with an introduction to the prevention, recognition, and treatment of common athletic injuries, and response to common emergency situations. American Red Cross Community First Aid and CPR certification is included. PE teaching majors and minors, athletic training majors, and coaching endorsement students only. **Credits:** 3.00

HK 21000 - History And Philosophy Of Physical Education

Credit Hours: 2.00. Introduction to the history and philosophy of physical education to prospective teachers. Emphasis is placed on the impact of societal history on physical education and the role of philosophic thinking in curricular activities. For majors and minors only. **Credits:** 2.00

HK 21300 - Clinical Field Experience In Health And Fitness

Credit Hours: 3.00. This course is a coordinated clinical/professional experience designed to expose students to various positions within the wellness community and how clinical interactions are embedded within fitness centers. In addition to weekly in-person class meetings, students will observe and practice professional and foundational skills at different clinical sites. Professional communication, interdisciplinary interactions, and self-reflection are key skills developed in this practicum. **Credits:** 3.00

HK 22100 - Foundations For The Fitness Professional

Credit Hours: 2.00. Designed to teach the emerging Exercise and Health professional effective hands-on methodology for use in small and large group physical activity sessions. Students will be able to: identify the role of a personal trainer and group fitness coach; create and lead effective training programs or teaching progressions; and choreograph exercise programs with and without music. Students will examine the psychological effects of music to exercise adherence. Designed to prepare students for future clinical practice and certification. **Credits:** 2.00

HK 22200 - Foundations For The Health And Fitness Professional

Credit Hours: 3.00. Designed to introduce the emerging Health and Fitness professional to current trends in health and physical activity and provide effective hands-on methodology for implementation of physical activity and exercise in different settings. Students will be able to identify the role of a clinician, coach, trainer, etc. Students will obtain skills in client consultation, program design and strategies for implementing programs to the general population. Students will also be introduced to the skills and knowledge required for working with clinical populations. This course is designed to help students prepare for future clinical practice and certification. **Credits:** 3.00

HK 25300 - Principles Of Motor Development

Credit Hours: 3.00. This course provides an introduction to motor development from a life-span perspective. Students will learn how infants develop from mainly reflexive beings into children and adults that are capable of interacting with the world in a goal-directed manner. This course specifically examines how changes in physical growth, aging, and maturation of the central nervous system influence motor performance. Finally, the decline of motor skills associated with advanced age is discussed. **Credits:** 3.00

HK 25800 - Foundations Of Motor Skill Learning

Credit Hours: 3.00. Concepts and principles of motor skill learning, with emphasis on the acquisition and retention of gross movement and sport skills. **Credits:** 3.00

HK 26100 - Applied Anatomy And Kinesiology

Credit Hours: 3.00. The study of how muscles, bones, and joint structure produce human motion. Kinesiological analysis of full body, upper and lower extremity skills. **Credits:** 3.00

HK 26300 - Biomechanical Foundations Of Motor Skills

Credit Hours: 3.00. Fundamental anatomical and mechanical concepts and procedures for analyzing motor skills, with particular reference to sport, dance, and aquatic activities. **Credits:** 3.00

HK 26400 - Principles Of Motor Learning, Development, And Biomechanics

Credit Hours: 3.00. This course surveys the fundamental processes and variables related to motor development, motor learning, and biomechanics. Students will be exposed to concepts relevant to teaching motor skills and critical issues to increase knowledge of human movement. **Credits:** 3.00

HK 26900 - Career Development And Preparation For The Health And Fitness Fields

Credit Hours: 1.00. Provides students with basic professional skills and materials for subsequent practicum experience and future employment search. Students will have secured a viable practicum site, complete with written job description/responsibilities, at the completion of the course. **Credits:** 1.00

HK 28500 - Fieldwork In Athletic Training - Collegiate

Credit Hours: 1.00. Students will learn about and explore the athletic training profession through classroom and experiential learning in an intercollegiate setting. Under supervision of the certified athletic trainer, students will observe facility operations and duties of the athletic trainer. Topics of instruction include history of athletic training, governance, and professional foundation and ethics. **Credits:** 1.00

HK 28600 - Fieldwork In Athletic Training - Secondary School

Credit Hours: 1.00. Students will learn about and explore the athletic training profession through classroom and experiential learning in secondary school setting. Under supervision of the certified athletic trainer, students will observe facility operations and duties of the athletic trainer. Topics of instruction include basics of wound care, setup and operation of therapeutic modalities, and basic rehabilitation principles. **Credits:** 1.00

HK 28700 - Fieldwork In Athletic Training - Clinic/Industry

Credit Hours: 1.00. Students will learn about and explore the athletic training profession through classroom and experiential learning in an emerging athletic training setting. Under supervision of the certified athletic trainer, students will observe facility operation and duties of the athletic trainer. Topics of instruction include basics of taping and wrapping, selection and fitting of protective equipment, and principles of risk management. **Credits:** 1.00

HK 30100 - Clinical Practice In Athletic Training - Associate

Credit Hours: 2.00. Under the supervision of a certified athletic trainer, students will be provided the opportunity to practice those skills required of an athletic trainer. Independent practice as an athletic trainer. **Credits:** 2.00

HK 30200 - Applied Clinical Anatomy

Credit Hours: 3.00. An introduction to the regional anatomical study of the human body for undergraduate allied health students. Lectures will be supplemented by observation and demonstration of prosected cadaver material, radiographs, osteology, and surface anatomy. **Credits:** 3.00

HK 30300 - Athletic Training Modalities

Credit Hours: 4.00. Theory and practice in the use of physical agents used in the management and promotion of healing of physically active injuries. **Credits:** 4.00

HK 30400 - Therapeutic Exercise

Credit Hours: 4.00. This course will introduce the athletic training student to the planning and implementation of a comprehensive reconditioning program for injuries and conditions sustained by physically active individuals. Techniques of therapeutic exercise as they apply to athletic training will be examined. **Credits:** 4.00

HK 30500 - Injury Assessment I

Credit Hours: 4.00. A guided lecture and laboratory experience designed to teach the student injury assessment techniques normally required of an athletic trainer. Topics include splinting and transportation, equipment fitting and fabrication, lower extremity injury evaluation, taping and bracing. **Credits:** 4.00

HK 30600 - Injury Assessment II

Credit Hours: 4.00. A continuation of HK 30500. A guided lecture and laboratory experience designed to teach the student injury assessment techniques of the upper extremity, head, neck, abdomen, and thorax, along with associated taping, padding, and bracing. **Credits:** 4.00

HK 30700 - Injury Assessment III

Credit Hours: 3.00. A continuation of HK 30600. A guided lecture and laboratory experience designed to teach the student injury assessment techniques of common illnesses and disease most often encountered by allied health professionals. Students will learn common prescription and over-the-counter medications, including indications, contraindications, record-keeping procedures, drug classifications, side effects, and regulations related to the use of medication with the physically active. **Credits:** 3.00

HK 30800 - Athletic Health Care

Credit Hours: 3.00. Provides students with foundational knowledge and skills for the prevention, recognition, and management of common athletic injuries and illnesses, as well as emergency conditions encountered by sports medicine professionals. **Credits:** 3.00

HK 31300 - Clinical Field Experience In Healthcare

Credit Hours: 3.00. This course will provide students with observation in various clinical settings. Students will establish a mentor with at least 1 site. Students may choose to pursue observations in various patient care environments, such as, physical therapy, occupational therapy, physician clinics, cardiac rehab, etc. Permission of department required. **Credits:** 3.00

HK 31500 - Group Fitness Leadership

Credit Hours: 2.00. This course is designed to provide students with an overview of the educational concepts, program design, and instruction/leadership skills needed to design and teach instructor-led exercise programs for small (2-3 individuals) and large (10+) groups with and without music. The course will include basic analysis and application of safe and effective exercise procedures for all fitness levels. Students will be expected to lead group classes throughout the semester as assigned by the course instructor. Preparedness and ability to execute will be assessed. This course is designed to help students prepare of future clinical practice and certification as an ACSM Certified Clinical Exercise Physiologist. **Credits:** 2.00

HK 31600 - Foundations Of Strength And Conditioning

Credit Hours: 2.00. This course will provide students with an in-depth analysis of strength and conditioning principles, and application strategies to cardiorespiratory conditioning, strength training, and flexible exercise. Students will assess the foundational application of anatomy, physiology, and biomechanics to various forms of exercise training based on standards of the American College of Sports Medicine, National Strength and Conditioning Association, and the National Academy of Sports Medicine. A major focus of this class will also prepare students to instruct and coach on an individual level to ensure proper mechanics, engagement, and execution of exercise movement. This course is designed to help students prepare for future clinical practice and certification as an ACSM Certified Clinical Exercise Physiologist. **Credits:** 2.00

HK 31800 - Strength And Conditioning And Exercise Instruction Across The Lifespan

Credit Hours: 3.00. This course is designed to provide students with an overview of educational concepts, program design and instructional/leadership skills for designing and instructing exercise programs. Students will obtain hands-on experience conducting exercise programs for strength and conditioning, cardiorespiratory fitness, and flexibility throughout the semester. Students will learn to work with a variety of populations throughout the semester. Students will be evaluated on their effectiveness in designing and instruction exercise sessions for both individual and group-led scenarios. This course is designed to help students prepare for future clinical practice and certifications, such as the ACSM Certified Clinical Exercise Physiologist. Must have CPR/AED, First Aid certifications. **Credits:** 3.00

HK 32500 - Instructional Skills For Kinesiology

Credit Hours: 3.00. Some form of instruction is part of most careers in kinesiology. In this course, students will learn about and practice using a variety of instructional skills within different movement and classroom settings. **Credits:** 3.00

HK 32600 - Foundations Of Adapted Physical Education

Credit Hours: 3.00. Lecture and physical education practicum in teaching children with disabilities. An introduction to the basic concepts and techniques of adapted physical education. Laboratory experience in carrying out adapted physical education programs for children is provided. **Credits:** 3.00

HK 32700 - Introduction To Sports Management

Credit Hours: 3.00. This course introduces the foundations and principles of sport management, focusing on the leadership, administration, business practices, and operation of sport organizations at all levels. This course offers students the opportunity to gain information and an understanding of the various practices and procedures associated with sport management and the sport industry. Students are presented with an overview of the business of sport, including a variety of different career opportunities in a multitude of sport settings as they explore the value of professional management within sport organizations. Finally, this course uses a semester-long major project that allows students to use the skills and knowledge gained from lectures, readings, and discussions to develop a comprehensive business plan integrating the various modules and topics from the semester into a cohesive administrative plan. **Credits:** 3.00

HK 32800 - Business Of Professional Sports

Credit Hours: 3.00. This course examines the rise and growth of professional sport into a multibillion-dollar industry worldwide that is both an economic giant as well as a pop cultural phenomenon. The course takes a look at the historical development of professional sport while also examining current trends that continue to shape the industry. Students learn the basics of how pro leagues and teams operate by participating in an interactive and engaging fantasy sports simulation that sees them create their own league and manage and operate their own team. In the simulation, students deal with issues real-life pro sports managers have to address every day, including roster construction and management, pricing their product, and marketing and branding their franchise and league overall. **Credits:** 3.00

HK 33100 - Developmentally Appropriate Physical Activity For Children

Credit Hours: 3.00. Introduction to the developmental stages of locomotor, non-locomotor, and manipulative skills in children. Includes the assessment of children's motor skills and physical fitness levels, and designing developmentally appropriate physical activities for children. **Credits:** 3.00

HK 34500 - The Coaching Of Interscholastic Sports

Credit Hours: 2.00. Discussion and practical experience in organizing, training, and coaching interscholastic athletes in a selected sport. A partial list of sports that may be selected: baseball, basketball, football, gymnastics, soccer, swimming, track/field/cross country, volleyball, and wrestling. **Credits:** 2.00

HK 34600 - Field Experience In Coaching

Credit Hours: 2.00. Students will be assigned to assist in coaching a team in a public-, parochial-, or selected university-sponsored program. A partial list of sports available: baseball, basketball, football, gymnastics, soccer, swimming, track/field/cross country, volleyball, and wrestling. Permission of instructor required. **Credits:** 2.00

HK 36800 - Exercise Physiology I

Credit Hours: 3.00. Physiological concepts and principles underlying human responses and adaptations to exercise stress. Included are selected methods and techniques of assessing physiological function in the laboratory setting. **Credits:** 3.00

HK 37200 - Sport And Exercise Psychology I

Credit Hours: 3.00. This course focuses on social and psychological factors related to participation in sport, exercise, and physical activity. The class explores both (a) how social and psychological factors influence participation and performance in physical activity, and (b) how sport, exercise, and physical activity participation affects psychological well-being. Topics include personality, socialization, learning and feedback, stress and coping, self-perceptions, motivation, and psychological methods for enhancing personal development and physical performance. **Credits:** 3.00

HK 37600 - History Of Sport

Credit Hours: 3.00. A prior course in American or world history is recommended but not required. A survey of historical events that have shaped classical and modern sport, with a focus on recent history of American sport. **Credits:** 3.00

HK 39900 - Internship In Athletic Training

Credit Hours: 0.00 to 3.00. Under supervision of a certified athletic trainer, students will be provided the opportunity to practice those skills required of an athletic trainer through the course of a clinical internship experience. Permission of instructor required. **Credits:** 0.00 to 3.00

HK 40100 - Clinical Practice In Athletic Training - Lead

Credit Hours: 2.00. Under the supervision of the certified athletic trainer, the student will be provided the opportunity to practice those skills acquired. The student is expected to take a leadership role in the clinical setting. **Credits:** 2.00

HK 40500 - Administration Of Athletic Training Programs

Credit Hours: 3.00. Advanced theory in the more complex injuries associated with athletics. Organization of athletic training programs, nontraumatic medical problems, pharmacology, and athletic nutrition also will be studied. **Credits:** 3.00

HK 40900 - Seminar In Sports Medicine

Credit Hours: 3.00. A review of selected medical aspects of sports. Liberal use of guest medical professionals. A broad look at the field of sports medicine. **Credits:** 3.00

HK 41100 - Clinical Applications Of Health/Fitness Concepts III

Credit Hours: 2.00. Under the supervision of the program coordinator, students will demonstrate the ability to apply specific skills, competencies, and applications of basic/advanced exercise principles in a professional setting. Required to be taken fall and spring. Permission of department required. **Credits:** 2.00

HK 41500 - Exercise As Medicine

Credit Hours: 3.00. Provide students with the concepts, techniques, and skills to investigate the scientific evidence on physical activity and health; and to design and implement interventions to make physical activity a part of daily campus culture. Permission of instructor required. **Credits:** 3.00

HK 42100 - Health Screening And Fitness Evaluation And Design

Credit Hours: 3.00. This course provides the learner with the knowledge and skills to successfully administer and interpret the results of health evaluations and fitness assessments for the purposes of analysis and the development of individualized exercise programs. **Credits:** 3.00

HK 42200 - Basic Concepts In Exercise Program Design

Credit Hours: 3.00. Introduces basic program design concepts and rationale to design fitness programs for healthy adults emphasizing cardiovascular training, strength training, flexibility training, and balance. **Credits:** 3.00

HK 42400 - Health And Fitness Program Management

Credit Hours: 3.00. Overviews major principles, competencies, and challenges involved in managing health, fitness, and sports organizations. Students will develop an understanding of the key considerations and skills needed to organize and manage human resources and facilities in health, fitness, and sport settings. **Credits:** 3.00

HK 42700 - Sports Marketing

Credit Hours: 3.00. This course introduces and examines marketing within various levels of the sport industry, with an emphasis on consumer behavior, branding, and sponsorship. This course first introduces students to the marketing of sport services, sport teams, and sport programs by examining basic marketing strategies as they relate specifically to sport settings. Second, the course examines key consumer behaviors regarding sport fans and sport fan communities. Finally, the course enables students to formulate original and creative sport marketing mixes to provide students with the hands-on practice necessary to become an effective sport marketer. **Credits:** 3.00

HK 42800 - Sports Facility And Event Management

Credit Hours: 3.00. This course is meant to introduce students to the foundations and principles of effective facility and event management. Sport facilities and the types of events they can host are essential components to understanding the field of sport management. In this course, we will explore the concepts of facility design, planning, systems, risk management, marketing, and ownership. In terms of event management, we will explore the concepts of event creation, impact on hosts, marketing/sponsorship, and the potential positive and negative outcomes of sport events. **Credits:** 3.00

HK 43500 - Student Teaching Seminar

Credit Hours: 1.00. Development and implementation of selected teaching units and plans for a specified student teaching setting. **Credits:** 1.00

HK 44300 - Neuroscience Of Movement

Credit Hours: 3.00. In this course students will learn about the neuroscience behind the control, sensation and perception of human movement. The course is divided into five sections. In the first section, students learn about the sensory systems with human movement. In the second section, students learn about the basic CNS building blocks underlying movement control and perception. In the third section, the control of balance and locomotion is the central topic. In the fourth section, students learn about the higher brain functions involved in cognition. The final section of the class examines issues regarding learning, development, and brain plasticity. **Credits:** 3.00

HK 44400 - Balance Rehab In Older Adults

Credit Hours: 3.00. In this course, students learn about the decline in motor function that occurs in older adults and techniques to improve motor function in an older population. Topics include decreased balance control, loss of muscle strength, and declines in adaptive locomotion as a function of age. Students enrolled in this class also participate in an off-campus lab. In the lab, students are paired with an older adult and use the knowledge gained in lecture to improve the motor function of the older adult. This class provides students with a unique opportunity to gain hands-on experience working with an older population. Permission of instructor required. **Credits:** 3.00

HK 45300 - Motor Coordination And Development

Credit Hours: 3.00. An advanced undergraduate motor development course that examines the processes and coordination principles related to motor behavior development across the life span. Material and concepts are concentrated around specific skills areas and SPAN a broad range of ages and theoretical approaches. **Credits:** 3.00

HK 45800 - Principles Of Motor Control And Learning

Credit Hours: 3.00. Discussion of the principles of motor learning and control. Relevant research literature will be surveyed with an historical perspective. Students will be expected to design and/or conduct a mini research project. **Credits:** 3.00

HK 46300 - Analysis Of Human Motion

Credit Hours: 3.00. An analytic approach to the mechanical analysis of human motion, including modeling procedures and computer-generated display techniques. **Credits:** 3.00

HK 46500 - Research Methods

Credit Hours: 3.00. This course will be conducted in a lecture/lab format. The lectures will introduce the basic knowledge necessary to understanding the entire research process as it is found in health and kinesiology. The laboratories will be designed to give students practice in discovering research questions, preparing research proposals, evaluating existing research, and applying research to practical problems. **Credits:** 3.00

HK 46800 - Advanced Exercise Physiology II

Credit Hours: 3.00. An advanced undergraduate course in the area of exercise and human performance. Further examination of the physiological mechanisms and theories involved in the exercise response. **Credits:** 3.00

HK 46900 - Exercise Testing And Prescription In Special Populations

Credit Hours: 3.00. Examines responses to exercise testing and prescription in healthy adults compared to exercise responses and special considerations for individuals with chronic diseases and conditions and issues of concern to pregnant women, children, and older adults, among others. **Credits:** 3.00

HK 47200 - Sport And Exercise Psychology II

Credit Hours: 3.00. Course presents topics not covered in PE 37200 and emphasizes application of psychological principles in sport and exercise settings. Topics include group dynamics, psychological benefits of exercise; exercise addiction; body image; leadership and communication; and performance enhancement principles and techniques. **Credits:** 3.00

HK 47400 - Youth Physical Activity Behavior

Credit Hours: 3.00. This course addresses developmental, psychological, social, and contextual factors associated with physical activity behavior and sedentary behavior of young people. Students will consider fundamental questions and assumptions that frame the study of youth physical behavior, be exposed to a breadth of empirical literature on youth physical activity and sedentary behavior, and learn how the existing knowledge base has been translated into physical activity promotion efforts. **Credits:** 3.00

HK 47500 - Practicum In Kinesiology

Credit Hours: 6.00. Supervised field work in university, community, hospital, business, or clinical settings where structured exercise programs or rehabilitative services are conducted. Supervisory conferences and written reports are required. **Credits:** 6.00

HK 47600 - Olympic Games: Ancient And Modern

Credit Hours: 3.00. A historical study of the nature and significance of the ancient and modern Olympic Games. Topics include genesis of the games; evolution of events; the amateur ideal; social, economic, and commercial influences; politics; modern controversies; and various reform movements. **Credits:** 3.00

HK 48500 - Electrocardiography, Cardiovascular Disease And Exercise

Credit Hours: 3.00. This course is designed to provide students with a basic understanding of electrocardiography interpretation, diagnostic testing, and exercise with cardiovascular disease. The course is designed to help students prepare for future clinical practice and certifications, such as, the ACSM Certified Clinical Exercise Physiologist. **Credits:** 3.00

HK 49000 - Special Topics In Health And Kinesiology

Credit Hours: 1.00 to 3.00. Individualized readings, topics, or projects in health and kinesiology appropriate for undergraduate students. Permission of instructor required. **Credits:** 1.00 to 3.00

HK 49100 - Research Experience In Health & Kinesiology

Credit Hours: 1.00 to 3.00. Individualized activities related to a faculty member's research in health and kinesiology appropriate for undergraduate students; no project presentation required. Permission of instructor required. **Credits:** 1.00 to 3.00

HK 49200 - Professional Work Experience IV

Credit Hours: 1.00. Practical experience in professional employment. Programs must be preplanned and conducted under direction of the departmental coordinator and agency supervisor. Students will submit documentation of practical experiences. Permission of instructor required. **Credits:** 1.00

HK 49201 - Internship For Exercise And Health

Credit Hours: 9.00. The internship experience is a valuable opportunity for students to apply the procedures, theories, skills, and techniques they have mastered in the classroom to a professional work experience in the field. The Department of Health & Kinesiology requires that each student in the Clinical Exercise Physiology concentration in the Kinesiology major at Purdue University perform a 400-hour internship experience that meets the expectations of the student, the internship/practicum site, and the University. The internship is to be a culminating experience representative of the degree program and clinical work that provides students the opportunity to acquire invaluable work experience in the field outside of the academic setting. Permission of instructor required. **Credits:** 9.00

HK 49500 - International Special Topics

Credit Hours: 1.00 to 3.00. Course taken during an international experience that is recognized by the university. Permission of department required. **Credits:** 1.00 to 3.00

HK 49600 - Mentored Research In Kinesiology

Credit Hours: 1.00 to 3.00. Students are engaged in a research project under the guidance of a faculty member in one of the areas of inquiry in the kinesiology major. Permission of instructor required. **Credits:** 1.00 to 3.00

HK 49800 - Directed Research For Undergraduates

Credit Hours: 3.00. Student designs, conducts, and writes an individual research project under the guidance of a member of the faculty. Permission of instructor required. **Credits:** 3.00

HK 50000 - Introduction To Athletic Training Practice

Credit Hours: 3.00. This course covering the roles and responsibilities of an athletic trainer as well as the history, governance structure, and regulation of the athletic training profession. Instruction and practical application of taping, wrapping, bracing techniques, and protective equipment is also included. Permission of department required. **Credits:** 3.00

HK 50600 - Evidence Based Practice In Athletic Training

Credit Hours: 2.00. Introduction to research methodology, and qualitative and quantitative data analysis as related to evidence-based practice of athletic training. The course addresses formulating clinical questions; searching, reading and appraising research; understanding levels of evidence; and citing and referencing works to become consumers of and designers of evidence. The course introduces students to the selection, application, and interpretation of basic descriptive, correlational, and interferential statistics. Permission of department required. **Credits:** 2.00

HK 51100 - Electrocardiogram And Exercise Testing

Credit Hours: 3.00. This course is designed to provide students with competencies related to electrocardiogram and exercise testing. Students will develop skills to interpret a 12-lead ECG, prep and execute a resting 12-lead ECG, complete appropriate pre-screening for graded exercise testing and develop an understanding and initial skills for administering a diagnostic exercise test. Additionally, students will explore various cardiac, pulmonary and/or metabolic testing common to the clinical exercise

testing setting. The course is designed to help students prepare for future clinical practice and certifications, such as the ACSM clinical exercise physiologist certification.**Credits:** 3.00

HK 51500 - Emergency Medical Management In Athletic Training

Credit Hours: 4.00. This course is designed to teach management concepts and skills used by athletic trainers in emergency situations. Topics addressing prevention, recognition, and management of life-threatening and/or severe injury and illness are included. Application of skills that include the environment, CPR/AED, airway management, immobilization, bleeding control and sudden illness management are also addressed. Students will become certified in CPR/AED. Permission of department required. **Credits:** 4.00

HK 52000 - Evaluation And Management Of The Lower Quarter

Credit Hours: 3.00. Course covering an in-depth study of the normal anatomical structures in the lower extremities, including joint structure and musculoskeletal/nervous systems. Also discussed are common risk factors and causes of injuries as identified by contemporary epidemiological studies, common injuries to each body part, typical symptoms, and common clinical signs associated with injuries and illnesses with the physically active. A lab covering the assessment and management techniques for injuries commonly seen will be included. Permission of department required. **Credits:** 3.00

HK 52400 - Managing Health, Fitness, And Sports Organizations

Credit Hours: 3.00. An overview of the major principles, considerations, and techniques involved in managing health, fitness, and sports (HFS) organizations. Emphasizes the skills and competencies involved in the planning, organization, and control of opportunities, resources, and facilities in HFS settings. Permission of instructor required. **Credits:** 3.00

HK 52500 - Marketing And Promotion In Health, Fitness, And Sports Organizations

Credit Hours: 3.00. An overview of marketing and promotion in health, fitness, and sports organizations. Emphasizes the skills necessary to develop marketing and promotion plans and to develop materials and approaches for carrying out these plans in health, fitness, and sports settings. Permission of instructor required. **Credits:** 3.00

HK 53000 - Evaluation And Management Of The Upper Quarter

Credit Hours: 3.00. Course covering an in-depth study of the normal anatomical structures in the upper extremities, including joint structure and musculoskeletal/nervous systems. Also discussed are common risk factors and causes of injuries as identified by contemporary epidemiological studies, common injuries to each body part, typical symptoms, and common clinical signs associated with injuries and illnesses with the physically active. A lab covering the assessment and management techniques for injuries commonly seen will be included. Permission of department required. **Credits:** 3.00

HK 53200 - Musculoskeletal Adaptations

Credit Hours: 3.00. This course will utilize traditional lecture combined with small group, student-lead learning to study the impact of acute and chronic exercise on skeletal muscle and tendon. Topics covered will include muscle growth, muscle metabolism, structural and functional changes in skeletal muscle and tendon, the impact of age and sex on exercise adaptations, and the impact of exogenous agents on skeletal muscle and tendon adaptations to exercise. Other topics may include the impact of unloading (e.g., bedrest) and spinal injury on skeletal muscle and tendon. This course will be relevant to those interested in exercise physiology, athletic training, physical therapy, occupational therapy, medical school, nutrition science, engineering, and similar programs of study. Permission of department required. **Credits:** 3.00

HK 53500 - Athletic Training Interventions

Credit Hours: 3.00. This course is designed to provide the student with the foundational theory and techniques related to injury and illness intervention. Included are topics addressing tissue healing, theories of pain and pain control, concepts of kinetic chain stability and mobility, as well as principles related to the use of therapeutic medications. Students will discover how to plan and implement a comprehensive reconditioning program for injuries and conditions sustained by physically active individuals. Permission of department required. **Credits:** 3.00

HK 53600 - Cardiopulmonary Physiology

Credit Hours: 3.00. This course will provide a comprehensive overview of the characteristics and regulatory mechanisms underlying the cardiorespiratory adjustments to exercise. The effects of chronic diseases, including chronic obstructive pulmonary disease, peripheral artery disease and chronic heart failure, on the cardiovascular and respiratory responses to exercise will also be discussed in detail. Permission of department required. **Credits:** 3.00

HK 54000 - Evaluation And Management Of The Spine And Head

Credit Hours: 3.00. Course covering an in-depth study of the normal anatomical structures in the spine and head, including joint structure and musculoskeletal/nervous systems. Also discussed are common risk factors and causes of injuries as identified by contemporary epidemiological studies, common injuries to each body part, typical symptoms, and common clinical signs associated with injuries and illnesses with the physically active. A lab covering the assessment and management techniques for injuries commonly seen will be included. Permission of department required. **Credits:** 3.00

HK 54100 - Athletic Training Practicum I

Credit Hours: 2.00. Fieldwork experiences designed to integrate acquired knowledge and skills through live or scenario-based applications. Students will gain clinical experiences under the direct supervision of an athletic training preceptor either on or off campus. Emphasis will be placed on professional and ethical conduct, patient-centered care, interprofessional collaborative practice, evidence-based practice, quality improvement, and healthcare informatics. Permission of department required. **Credits:** 2.00

HK 54200 - Athletic Training Practicum II

Credit Hours: 2.00. Fieldwork experiences designed to integrate acquired knowledge and skills through live or scenario-based applications. Students will gain clinical experiences under the direct supervision of an athletic training preceptor either on or off campus. Emphasis will be placed on professional and ethical conduct, patient-centered care, interprofessional collaborative practice, evidence-based practice, quality improvement, and healthcare informatics. Permission of department required. **Credits:** 2.00

HK 54300 - Athletic Training Practicum III

Credit Hours: 2.00. Fieldwork experiences designed to integrate acquired knowledge and skills through live or scenario-based applications. Students will gain clinical experiences under the direct supervision of an athletic training preceptor either on or off campus. Emphasis will be placed on professional and ethical conduct, patient-centered care, interprofessional collaborative practice, evidence-based practice, quality improvement, and healthcare informatics. Permission of department required. **Credits:** 2.00

HK 54500 - Therapeutic Modalities

Credit Hours: 3.00. Course covering the physiological effects, indications, contraindications, and precautions of contemporary therapeutic modalities. Students will design and plan therapeutic interventions. Focus will be on the application of therapeutic modalities according to evidence-based protocols. Included in this course will be the role of equipment safety and maintenance of therapeutic modalities. Permission of department required. **Credits:** 3.00

HK 55000 - Evaluation And Management Of Medical Conditions

Credit Hours: 3.00. Course covering an in-depth study of the normal anatomical structures in the thorax and abdomen, including the cardiovascular, digestive, urinary, reproductive, endocrine, and lymphatic systems. Also discussed are common risk factors and causes of injuries as identified by contemporary epidemiological studies, common injuries to each body part, typical symptoms, and common clinical signs associated with injuries and illnesses with the physically active. A lab covering injury assessment techniques of common illnesses and disease most often encountered by allied healthcare professionals will be included. Permission of department required. **Credits:** 3.00

HK 55500 - Principles Of Manual Medicine

Credit Hours: 2.00. This course will provide students with the theory, skills, and clinical application of manual medicine. The emphasis will be placed on passive and dynamic joint mobilizations, connective tissue massage, deep friction massage, lymphatic massage, myofascial release, passive range of motion exercises, muscle energy techniques, and nerve mobilization. All skills will be introduced through onsite demonstration and hands-on practice. Permission of department required. **Credits:** 2.00

HK 56000 - Advanced Procedures In Athletic Training

Credit Hours: 2.00. This course aims to provide students with advanced psychomotor skills in athletic training, such as wound closure, orthopedic casting, orthotic fabrication, biometrics and other emerging techniques and technologies. Skill integration into practice will be considered and practice act concerns will be discussed. Permission of department required. **Credits:** 2.00

HK 56700 - Epidemiology For Public Health Practice

Credit Hours: 3.00. This course presents the fundamental principles, methods, and applications of epidemiology, including the quantification of morbidity, mortality, and disease risk. Epidemiologic study designs and the use of public health vital statistics, disease transmission evidence, and risk assessment data are explored. Historically significant epidemiological cases provide a framework for the application of ethical principles to epidemiologic research. This course meets the epidemiology core competency requirement for the Master's in Public Health (MPH) degree. **Credits:** 3.00

HK 56800 - Advanced Exercise Physiology

Credit Hours: 3.00. The study of selected concepts and principles of physiology as they relate to the exercising human. **Credits:** 3.00

HK 57400 - Advanced Exercise Psychology

Credit Hours: 3.00. This course is designed to examine psychological issues and theories related to exercise, the promotion of regular physical activity and active lifestyles. Emphasis is placed on the factors related to physical activity, health behavior theories, and the psychological and emotional consequences of exercise and physical activity. Key methodological considerations in behavioral health research will also be highlighted. **Credits:** 3.00

HK 57600 - Diversity And Health

Credit Hours: 3.00. This course is designed to examine the health status and the politics of representation of the U.S. ethnic minorities (e.g., African Americans, Latinos, Asian Americans, Native Americans, Alaskans, etc.). Emphasis is placed on factors that influence health and health-related behaviors. The course is intended to provide students with an overview of historical, political, social, and cultural factors related to the health behavior and status of minority groups in American society. **Credits:** 3.00

HK 58300 - Patient Care Simulation In Athletic Training I

Credit Hours: 2.00. This course is designed to refine psychomotor skills and apply specific athletic training proficiencies integrating cognitive concepts and skills into progressively higher-level practical application. Skill integration will be achieved through successful completion and evaluation of patient care scenarios with emphasis placed on clinical reasoning skills of the student while making point-of-care decisions. Permission of department required. **Credits:** 2.00

HK 59000 - Special Topics In Health And Kinesiology

Credit Hours: 1.00 to 3.00. Individualized readings, topics, or projects in health and kinesiology appropriate for graduate students. Permission of instructor required. **Credits:** 1.00 to 3.00

HK 60000 - Individual Research And Study

Credit Hours: 1.00 to 3.00. Each student studies a problem of interest related to physical education, health, or recreation. Permission of instructor required. **Credits:** 1.00 to 3.00

HK 60100 - HK PhD Seminar

Credit Hours: 2.00. This course is the first of a required two-course sequence for first-year health and kinesiology doctoral students. The course is designed to socialize students into the worlds of science, graduate education, and health and kinesiology research and practice. Particular emphasis is placed on the responsible conduct of research, shared and unique expectations of graduate students and mentors across various health and kinesiology subdisciplines, professional development, and the nurturing of academic community. Prerequisite: Incoming health and kinesiology doctoral students qualify for and are required to complete this course. Permission of department required. **Credits:** 2.00

HK 60200 - HK PhD Seminar II

Credit Hours: 2.00. This course is the second of a required two-course sequence for first-year health and kinesiology doctoral students. The course is designed to expose students to classic works in health and kinesiology subdisciplines, address professional development issues, and help students formulate a curricular and research program to structure the doctoral experience. Particular emphasis is placed on the interdisciplinary nature of health and kinesiology and becoming an active member of the research community. Permission of department required. **Credits:** 2.00

HK 61000 - Research Methods In Health, Physical Education, And Recreation

Credit Hours: 3.00. Application of research methodology to problems in health, physical education, and recreation. Prerequisite: 3 credit hours in Statistics. Permission of instructor required. **Credits:** 3.00

HK 61100 - Data Analysis In Health And Kinesiology

Credit Hours: 3.00. This student-driven course addresses a variety of data analysis issues in health, kinesiology, and related fields (e.g., education, psychology). The course will overview the types of data prominent in health and kinesiology research, how these data are obtained and handled by researchers, measurement/evaluation issues, and ways to present and analyze data. Heavy emphasis is placed on matching research questions and conceptualization with data analysis techniques, obtaining familiarity with widely-used data analysis software, analyzing multivariate data sets, and constructing high-quality results sections in journal manuscript format. Prerequisites: STAT 50100, STAT 50200 and access to a data set pertaining to one's area of research are expected. Permission of instructor required. **Credits:** 3.00

HK 63000 - Administration Of Athletic Training Programs

Credit Hours: 2.00. Course covering management and supervision of personnel, financial resources, as well as the preparation in planning, designing, developing, organizing, implementing, directing, and evaluating an athletic training health care program and facility. Legal concerns, risk management, insurance, and reimbursement will be discussed. Prerequisites: Completion of HK 50000 with a grade of B- or better. Permission of department required. **Credits:** 2.00

HK 63500 - Injury Prevention And Health Promotion

Credit Hours: 3.00. This course emphasizes theory and strategies for behavioral change relating to healthy lifestyles and specific health conditions. Analyses of major injury problems affecting patients in the workplace, community, at home, and in activity along with basic principles of nutrition and exercise as they pertain to individual health and activity are included. Prerequisite: HK 53500 with a grade of B- or better. Permission of department required. **Credits:** 3.00

HK 64000 - Leadership In Athletic Training

Credit Hours: 2.00. This course is designed to prepare students to embark on paths of personal leadership development. The course will examine leadership theory and research and emphasize the development of leadership and interpersonal skills. Understanding various methods of bringing about change will be provided and researched by learners, and then discussed in our time together. Students in this course will apply foundational business concepts in athletic training through self-assessment case studies and professional experiential exercises. Permission of department required. Prerequisite: HK 63000 with B- or better. **Credits:** 2.00

HK 64100 - Athletic Training Practicum IV

Credit Hours: 8.00. Fieldwork experiences designed to integrate acquired knowledge and skills through live or scenario-based applications. Students will gain clinical experiences under the direct supervision of an athletic training preceptor either on or off campus. Emphasis will be placed on professional and ethical conduct, patient-centered care, interprofessional collaborative practice, evidence-based practice, quality improvement, and healthcare informatics. Permission of department required. Prerequisite: HK 54300. **Credits:** 8.00

HK 64200 - Athletic Training Practicum V

Credit Hours: 6.00. Fieldwork experiences designed to integrate acquired knowledge and skills through live or scenario-based applications. Students will gain clinical experiences under the direct supervision of an athletic training preceptor either on or off campus. Emphasis will be placed on professional and ethical conduct, patient-centered care, interprofessional collaborative practice, evidence-based practice, quality improvement, and healthcare informatics. Permission of department required. **Credits:** 6.00

HK 64500 - Psychosocial Interventions In Athletic Training

Credit Hours: 2.00. The focus of this course is on identification, referral, and treatment options for patients with organic and non-organic mental health conditions commonly seen in athletic training. The course will also address cultural competence in patient care and the role of various mental healthcare providers that comprise the mental health referral network. Permission of department required. Prerequisite: HK 535 with B- or better. **Credits:** 2.00

HK 65000 - Seminar In Athletic Training

Credit Hours: 3.00. This course is a culminating experience in athletic training that will provide the student with a comprehensive review of athletic training foundational and specific knowledge regarding the Domains of Athletic Training. This course will help the student to prepare for athletic training practice. Permission of department required. Prerequisite: HK 53000 with B- or better. **Credits:** 3.00

HK 66000 - Diagnostic Imaging In Athletic Training

Credit Hours: 1.00. This course provides students with an intensive study of radiology. Students will understand the types of diagnostic images commonly used in sports medicine, as well as basic interpretive techniques used in radiology. The course will emphasize the systematic approach for diagnostic images and interpretation of various diagnostic reports. Permission of department required. Prerequisite: HK 58000 with B- or better. **Credits:** 1.00

HK 66800 - Seminar In Exercise Physiology

Credit Hours: 3.00. Review of literature; design and conduct of research in an area of current interest in exercise physiology. Permission of instructor required. **Credits:** 3.00

HK 66900 - Exercise Metabolism And Biochemistry

Credit Hours: 3.00. This course is designed to provide students with practice using basic laboratory skills which can then be applied to more sophisticated techniques in biochemical analysis. The course is a laboratory-based class and will provide considerable "hands-on" experience. Lectures will focus on laboratory procedures, calculations, common lab problems and solutions, and laboratory safety procedures. Most of these measures will be made using an exercise context, i.e., standard exercise physiology tests (VO2 max, Wingate tests, etc.) will be performed to allow us to acquire blood samples for analysis. Prerequisites: HK 56800 or permission of the instructor. **Credits:** 3.00

HK 67000 - Advanced Topics In Motor Control

Credit Hours: 3.00. Selected topics in motor control. The subject matter will be data-based and drawn from research literature encompassing behavioral and physiological experimental paradigms. Students will critically evaluate and synthesize research to better understand the integration of individual systems in sensorimotor processing. Permission of instructor required. **Credits:** 3.00

HK 67200 - Stress And Coping In Sport, Exercise And Physical Activity

Credit Hours: 3.00. This course examines stress, coping, and emotional processes as they relate to sport, exercise, physical activity, and the physical self. We will explore theoretical perspectives on stress and coping processes, examine the empirical evidence related to sport/exercise/physical activity/rehabilitation/physical self, and discuss applications of this knowledge. Course readings will cover topics including the history and conceptual issues of psychosocial stress, conceptual and methodological issues of coping, individual differences in stress and coping, the influence of sociocultural and contextual factors, and vulnerability and resilience. Prerequisite: HK 57400. **Credits:** 3.00

HK 67400 - Special Topics In Sport And Exercise Psychology

Credit Hours: 3.00. An in-depth analysis of specific areas of theoretical and empirical work in sport or exercise psychology. Emphasis is placed on the critique, integration, and application of the literature reviewed. Rotating topics. Prerequisite: HK 57400. **Credits:** 3.00

HK 67800 - Motivational Processes In Sport And Exercise

Credit Hours: 3.00. Seminar focused on motivation in sport and exercise settings. Antecedents and consequences of motivated behavior are examined from theoretical, research, and application perspectives. Topics include participation motivation in sport, intrinsic/extrinsic orientations, achievement goals, causal attributions, group processes, and exercise motivation. Prerequisite: HK 57400. **Credits:** 3.00

HK 68300 - Patient Care Simulation In Athletic Training II

Credit Hours: 3.00. This course is designed to refine psychomotor skills and apply specific athletic training proficiencies integrating cognitive concepts and skills into progressively higher-level practical application. Skill integration will be achieved through successful completion and evaluation of patient care scenarios with emphasis placed on clinical reasoning skills of the student while making point-of-care decisions. Permission of department required. Prerequisite: HK 56300 with a B- or higher. **Credits:** 3.00

HK 68600 - Theories And Concepts Of Stress Management

Credit Hours: 3.00. Development of a conceptual understanding of stress and stress management. A seminar focused on the review of literature regarding psychophysiology of stress, relationship between stress and disease, and methods of preventing/relieving stress, models of stress research, and issues surrounding stress research methodology. Prerequisite: BIOL 20300, BIOL 20400. Permission of instructor required. **Credits:** 3.00

HK 69000 - Advanced Studies

Credit Hours: 1.00 to 6.00. Topic and credit to be arranged. Individual study for the doctoral student. Permission of instructor required. **Credits:** 1.00 to 6.00

HK 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

HK 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Health Sciences

HSCI 10100 - Introduction To The Health Sciences Professions

Credit Hours: 2.00. This course will present an overview of the fields in both the preventive, Public Health, as well as the clinical, Private Health, sides of the Allied Health Science Professions as it presents the holistic nature of health maintenance. Students will have the opportunity to hear from health professionals practicing in the allied health and preprofessional concentrations as well as from School of Health Sciences faculty in their areas of expertise in the fields of industrial hygiene, ergonomics, radiological sciences, toxicology and environmental health science. **Credits:** 2.00

HSCI 11000 - Careers And Research In Occupational And Environmental Health

Credit Hours: 1.00. The goal of this course is to familiarize students to the variety of research and careers available within the broad field of environmental and occupational health. The course will focus on two areas: current research in occupational and environmental health and careers in occupational and environmental health. This content will be delivered through interactive lectures and discussions with a variety of guest speakers as well as HSCI faculty. Advice and guidance on applying for internships/jobs in the field will also be provided. A highlight of the event is a student/professional networking event which will be coordinated towards the end of the program. **Credits:** 1.00

HSCI 13000 - Introduction To Medical Laboratory Science

Credit Hours: 1.00. An introduction to career opportunities in medical technology. Preprofessional and professional requirements. A survey of the major clinical laboratory departments and their applications to patient care and management. Discussion and interpretation of some of the major diagnostic tests, i.e., for cardiac enzymes, cholesterol, blood cells, diabetes, and drug monitoring. **Credits:** 1.00

HSCI 13100 - Introduction To Medical Terminology

Credit Hours: 3.00. This self-paced learning course is designed to familiarize the student with terms used in medicine. Each body system will be studied individually. Word roots, prefixes, and suffixes will be used to build words relating to the system. Diagnostic and symptomatic terms will be introduced. CTL:IPO 1820 Medical Terminology **Credits:** 3.00

HSCI 19000 - Special Topics

Credit Hours: 1.00 to 8.00. Special topics, projects, or readings in selected areas of health sciences at a level appropriate for freshmen students. Permission of instructor required. **Credits:** 1.00 to 8.00

HSCI 19501 - School Of Health Sciences Freshman Honors Seminar

Credit Hours: 1.00. This course is for Freshman students in the School of Health Sciences Honors Program. This course consists of a 50-minute weekly seminar meeting designed to orient and familiarize Freshman HSCI Honors students with the School of Health Sciences including research areas and current topics in public health and biomedical research. Students will interact with guest speakers and expand their knowledge base in health science research. In addition to the seminar, students will be matched to a faculty mentor in a research area of their interest during the fall semester. Students will develop and design a research project with their faculty mentor (to be conducted in HSCI 19601 during the spring semester). In the spring semester, students will enroll in the seminar series (HSCI 19501) and in the research project course (HSCI 19601) to complete their project. Each student will be responsible for presenting and reporting on their research project during the spring seminar series. Permission of departmental required. **Credits:** 1.00

HSCI 19601 - School Of Health Sciences Freshman Honors Project

Credit Hours: 1.00. This course is for Freshman students in the School of Health Sciences Honors Program. In this course students will earn credit for work completed on their Honors Project under supervision of their faculty mentor. Students enroll in this course during the spring semester concurrently with HSCI 19501. During the fall semester in HSCI 19501, students will be matched to a faculty mentor in the research area of their choice and complete a Project Description Form based upon the work to be completed during this course. Course meeting times and frequency are to be set by the student and faculty mentor with an estimated commitment of 3-4 hours per week. Hours are to be arranged between the student and the faculty mentor, with at least weekly or biweekly meetings set aside for a one-on-one session between the student and faculty mentor. Some students may also be matched to professional mentors off campus depending on their interests and future goals. The regular meeting times should be set during the first week of class. Working hours must not conflict with other course obligations or consume too much of students' study time. Permission of department required. **Credits:** 1.00

HSCI 20100 - Principles Of Public Health Science

Credit Hours: 3.00. This course begins with a definition of public health and a review of its history and its role in disease prevention. The basic tools of public health practice, vital statistics and epidemiology, are then presented. After gaining an understanding of how these tools are used in assessing the health status of a community, the etiology and control of infectious and non-infectious threats to our health will be examined. The course concludes with risk analysis as a basis for public health policy determination. **Credits:** 3.00

HSCI 20200 - Essentials Of Environmental, Occupational, And Radiological Health Sciences

Credit Hours: 3.00. This course is designed to introduce the essential concepts of Environmental, Occupational, and Radiological Health Science. The principles of these three fields including the environmental impacts on human health and disease, environmental toxicology, occupational health concerns, contemporary occupational health issues, radioactivity, and the human health effects of exposure to ionizing radiation will be discussed. **Credits:** 3.00

HSCI 22500 - Healthcare Leadership And Safety

Credit Hours: 3.00. This course will present topics related to effective leadership and management strategies within an organization. The course will focus on implementation of these strategies from a health and safety perspective. Specific leadership and management topics to be discussed include communication strategies, motivation, conflict management, negotiation, ethics, and professional development. In addition, important safety topics, such as fire & life safety, workplace violence, terrorism, hazard communication, and slip & fall hazards will also be addressed. **Credits:** 3.00

HSCI 26000 - Clinical Urinalysis And Body Fluid

Credit Hours: 1.00 to 10.00. Clinical Urinalysis And Body Fluid. **Credits:** 1.00 to 10.00

HSCI 29000 - Special Topics

Credit Hours: 1.00 to 8.00. Special topics, projects, or readings in selected areas of health sciences at a level appropriate for sophomore students. Permission of instructor required.**Credits:** 1.00 to 8.00

HSCI 29501 - School Of Health Sciences Sophomore Honors Seminar

Credit Hours: 1.00. This course is for sophomore students in the School of Health Sciences Honors Program. This course consists of a 50-minute weekly seminar meeting to discuss current topics in health science, public health, and biomedical research. Students will interact with guest speakers and expand their knowledge base in health sciences research. In addition, each student will be responsible for presenting and reporting on their ongoing honors research project. Permission of department required. **Credits:** 1.00

HSCI 29601 - School Of Health Sciences Sophomore Honors Project

Credit Hours: 1.00. This course is for Sophomore students in the School of Health Sciences Honors Program. In this course, students will earn credit for work completed on their Honors Project under supervision of their faculty mentor. Students enroll in this course in both fall and spring semesters (concurrently with HSCI 29501 in the spring semester). An updated Project Description Form will be due at the beginning of each semester based on the progress and any changes to the research plan. Course meeting times and frequency are to be set by the student and faculty mentor with an estimated commitment of 3-4 hours per week. Hours are to be arranged between the student and the faculty mentor, with at least weekly or biweekly meetings set aside for a one-on-one session between the student and faculty mentor. Some students may also be matched to professional mentors off campus depending on their interests and future goals. The regular meeting times should be set during the first week of class. Working hours must not conflict with other course obligations or consume too much of students' study time. Permission of department required. **Credits:** 1.00

HSCI 30500 - Basics Of Oncology

Credit Hours: 3.00. This course will introduce the student to the biology of cancer and some basics of oncology. Focus will be placed on what makes cancer different from normal tissues and how those differences can be leveraged for diagnostic and treatment purposes. This course will touch on topics of epidemiology, cancer biology, common therapeutic and diagnostic approaches, and other considerations of cancer care. **Credits:** 3.00

HSCI 31000 - Imaging In Medicine

Credit Hours: 3.00. This course will introduce students to develop essential understandings of all primary medical imaging techniques utilized in hospitals such as Computer tomography, X-ray imaging, MRI, Ultrasound and Nuclear medicine imaging modalities. The course will cover basic scientific principles of each modality and introduce their underlying clinical requirements and applications. In addition, this course introduces the student to human anatomy as seen in the transverse, coronal, and sagittal planes. Anatomy of the brain, thorax, abdomen, and pelvis will be studies using CT and MRI images. Normal anatomy, anatomic variants, and selected pathologies will be discussed in the various body regions. **Credits:** 3.00

HSCI 31200 - Radiation Science Fundamentals

Credit Hours: 3.00. This course introduces principles and concepts related to nuclear energetics, radioactive decay, the interactions of ionizing radiation with matter, and the human health effects of exposure to ionizing radiation. Fundamental concepts related to atomic and sub-atomic physical processes as well as relevant aspects of modern physics are briefly reviewed. Students gain practical experience and enhance their understanding of radiation protection by participating in a radiological emergency response exercise (RERE). **Credits:** 3.00

HSCI 31300 - Principles Of Radiation Detection And Measurement

Credit Hours: 2.00. Course presents an introduction to the principles of radiation detection and measurement, including statistical models, counting statistics, error analysis, detection limits, ionization chambers, proportional counters, GM counters, scintillation counters, gamma-ray spectroscopy, solid-state detectors, TLDs, track-etch and bubble detectors. **Credits:** 2.00

HSCI 33300 - Introduction To Immunology

Credit Hours: 3.00. Introduction to Immunology will meet twice weekly and provide an overview of this evolving field of science with an emphasis on the clinical implications and application of learned knowledge. The immunologic mechanisms associated with the normal and abnormal immune response will be discussed and students will put this knowledge into practice by directing their own case study. In addition, a number of common clinical concerns with respect to immunity will be reviewed. Furthermore, we will explore the critical role our knowledge of this branch of science plays in patient diagnosis, treatment and care both now and in the future. **Credits:** 3.00

HSCI 33400 - Lung Physiology And Medicine

Credit Hours: 2.00. This course will explore the normal functioning of the respiratory system, along with a variety of diseases and disorders affecting this system. Special emphasis will be placed upon diseases which result from, or are aggravated by, environmental pollutants. The course will begin with discussing the anatomy and physiology of the respiratory system. Individual lung disorders will then be discussed with consideration of the sources of air pollution contaminants and the interaction of those contaminants with normal lung tissue. **Credits:** 2.00

HSCI 33500 - Heart Physiology And Medicine

Credit Hours: 2.00. This course will provide a discussion about diseases affecting the heart and cardiovascular system. The normal anatomy and physiology of the heart and blood vessels will be discussed. Various diseases of the heart and vasculature, including atherosclerosis, cardiomyopathies, valvular heart disease, hypertension, and stroke will be explored. Included in the discussion of each disease process will be environmental agents, which are associated with disease development and progression. **Credits:** 2.00

HSCI 33600 - Eye Physiology And Disease

Credit Hours: 2.00. This course will cover the fundamental structure and function of the eye and visual nervous system. Brief review lectures will be provided on basic cell biology and neuroscience to provide a strong foundation for topics such as phototransduction, retinal neural circuit function, and disease etiology. The first half of the course will be focused on the normal and healthy anatomy and physiology of the eye. The second half the course will be focused on eye and visual diseases and their associated pathophysiology and clinical manifestations. This part of the course will include lessons on eye imaging techniques and cutting-edge treatments used for detection and treatment of eye diseases. This course will be beneficial for any student interest in clinical or medical research, and highly recommended for those interested in optometry, ophthalmology, and visual research careers. Permission of department required.**Credits:** 2.00

HSCI 34500 - Introduction To Occupational And Environmental Health Sciences

Credit Hours: 3.00. Principles of occupational health (industrial hygiene) and environmental health as related to anticipation, recognition, evaluation, and control of hazards in the workplace and the surrounding community. Emphasis is on hazards of chemicals and their role in occupationally and environmentally related diseases. Historical basis and current legislation are discussed. In addition, the principles of epidemiology, toxicology, exposure standards, and respiratory protection are addressed. **Credits:** 3.00

HSCI 34600 - Industrial Hygiene Engineering Control

Credit Hours: 4.00. Study of the various techniques needed to control hazards in the workplace. Major emphasis is placed on developing a working understanding of industrial ventilation, including basic principles of fluid flow, hood and duct design, and system balancing. Effects and control of the physical hazards of noise, vibration, and heat stress are addressed. A field trip to a major industry summarizes the course material. **Credits:** 4.00

HSCI 34800 - Industrial Hygiene Instrumentation Techniques

Credit Hours: 3.00. Sophisticated field and laboratory instrumentation and techniques, sampling methodology for organic vapors, dust, fibers, noise, and heat; calibration and validation techniques; emphasis on critical analysis of data. **Credits:** 3.00

HSCI 35300 - Occupational Safety Management And Culture

Credit Hours: 3.00. The Occupational Health and Safety Manager assumes a critical role within an organization - protecting the employees from suffering work-related injuries, illnesses, and fatalities. This job requires a number of approaches to achieve this aim, including employee training, hazard identification and abatement, safety policy development, and incident investigation. The health and safety manager often forms a bridge between upper management and frontline employees. As such, the successful health and safety manager needs skill sets which transfer across organizational levels. This course will explore strategies managing an effective health and safety program within an organization. Management strategies will be viewed from multiple perspectives. In relation to the frontline employee, topics will be explored to help engage employees in safe behaviors and dealing with situations in which failures occur, resulting in accidents. The upper management perspective will focus on the establishment of a safety management system and effective techniques for measuring and reporting safety performance. A final perspective will consider both the frontline employee and upper management. This perspective will explore strategies to establish a positive safety culture within an organization to bring the frontline employees and upper management together in their vision of a safe and healthy workplace. **Credits:** 3.00

HSCI 36000 - Everyday Toxicology: Poisonings From Clinics To Courtrooms

Credit Hours: 2.00. Exposure to chemicals happens every day in human life through the living environment and diet; yet the health impact and toxicological consequences of these exposures are often unknown to general populations. This 300-level course examines basic concepts of toxicology in human health as they apply to the exposure of environmental agents, e.g., chemicals, metals, and poisons in daily life and attempted poisoning in criminal cases and political assassins. With an emphasis on historical accounts of poisonings and cases analyses, the course describes commonly encountered chemicals and poisons, their

symptoms, clinical diagnosis, basic toxicological mechanisms, and medical interventions. Students will also learn some of the large-scale environmental and occupational incidents that have led to legal actions, and the role of toxicology in forensic investigation of purposed poisoning. The course is ideal to students who are inspired to become a future healthcare professional in any of the health-oriented pre-professional programs or students with majors in biomedical health sciences, environmental and occupational health sciences, medical laboratory science, and/or public health. **Credits:** 2.00

HSCI 39000 - Special Topics

Credit Hours: 1.00 to 8.00. Special topics, projects, or readings in selected areas of health sciences at a level appropriate for junior students. Permission of instructor required. **Credits:** 1.00 to 8.00

HSCI 39501 - School Of Health Sciences Junior Honors Seminar

Credit Hours: 1.00. This course is for Junior students in the School of Health Sciences Honors Program. This course consists of a 50-minute weekly seminar meeting to discuss current topics in health science, public health, and biomedical research. Students will interact with guest speakers and expand their knowledge base in health sciences research. In addition, each student will be responsible for presenting and reporting on their ongoing honors research project. Permission of department required. **Credits:** 1.00

HSCI 39601 - School Of Health Sciences Junior Honors Project

Credit Hours: 1.00. This course is for Junior students in the School of Health Sciences Honors Program. In this course, students will earn credit for work completed on their Honors Project under supervision of their faculty mentor. Students enroll in this course in both the fall and spring semesters (and concurrently with HSCI 39501 in the spring semester). An updated Project Description Form will be due at the beginning of each semester based on the progress and any changes to the research plan. Course meeting times and frequency are to be set by the student and faculty mentor with an estimated commitment of 3-4 hours per week. Hours are to be arranged between the student and the faculty mentor, with at least biweekly meetings set aside for a one-on-one session between the student and faculty mentor. Some students may also be matched to professional mentors off campus depending on their interests and future goals. The regular meeting times should be set during the first week of class. Working hours must not conflict with other course obligations or consume too much of students' study time. Permission of departmental required. **Credits:** 1.00

HSCI 40000 - International Special Topics

Credit Hours: 1.00 to 8.00. Courses taken during an International experience that is recognized by the University. Permission of Department required. **Credits:** 1.00 to 8.00

HSCI 41500 - Introduction To Nuclear And Radiological Source Security

Credit Hours: 3.00. The course focuses on the basic elements of nuclear and radiological source security. It examines methods for planning and evaluating nuclear security activities at the state and facility level, establishing nuclear security culture in different types of nuclear and radiological installations, and examines nuclear cyber and information security measures. Issues and approaches for nuclear security concerns, both state-level (e.g., nonproliferation and deterrence) and asymmetric concerns (e.g., nuclear smuggling and nuclear terrorism) will be addressed. Group exercises and simulations in applied nuclear security scenarios will complement lectures. This course is designed for both "technical" (engineering and science) and "non-technical" (policy) students and the interaction between students of different backgrounds is encouraged. **Credits:** 3.00

HSCI 42000 - Applied Anatomy For Medicine

Credit Hours: 4.00. With a focus on preparing students to be practitioners of health sciences, Applied Anatomy for Medicine (HSCI 42000) will build upon the foundational knowledge of form and function obtained in prerequisite courses through

enhancement of the relationship between bony structures, musculature, innervation, vascular perfusion, and interconnectedness with respect to human health. The significance of regional anatomy and important anatomical landmarks from a clinical perspective will be learned. The incorporation of student-driven dissection will promote a more comprehensive understanding of the correlation between structure, function, dysfunction and disease signalments. The integration of clinical application and case study investigation will facilitate the transition from learner to practitioner. **Credits:** 4.00

HSCI 44400 - Exposure Assessment In OEHS

Credit Hours: 3.00. Exposure assessment is an essential component of Environmental Health Science and industrial hygiene. This course provides students basic scientific knowledge of exposure assessment, with emphasis on practical aspects of exposure science, including study design, data and measurement collection, data analysis, and results interpretation and presentation. Course topics include major exposure media and pathways (air, water, food, soil, etc.) and important exposure routes (inhalation, ingestion, dermal absorption); exposure measurement and assessment; strengths and weaknesses of various exposure assessment techniques, how to link exposure assessment with environmental health, and human subject research in exposure studies. The course includes case studies and group projects. Students are expected to develop entry-level skills for designing exposure studies applicable to human exposure monitoring, epidemiologic investigations and health risk assessment. **Credits:** 3.00

HSCI 44500 - Industrial Hygiene Internship

Credit Hours: 2.00. Discussion class based on applied work experience as an industrial hygiene assistant or technician at an industrial, consulting, hospital, government, or education and research institution. Topics covered also include professional and ethical aspects derived from students' work experiences. Written and oral reports as well as other classroom assignments. Restricted to industrial hygiene majors who have completed an acceptable industrial hygiene work experience. **Credits:** 2.00

HSCI 44600 - Applied Industrial Hygiene

Credit Hours: 3.00. This course allows the student to synthesize his or her basic industrial hygiene fundamentals to understand how they apply in the real world. Issues faced by industrial hygienists will be addressed by a variety of guest speakers. Class projects add to the diversity of this senior capstone course. **Credits:** 3.00

HSCI 44700 - Global Workplace Health

Credit Hours: 2.00. This course will examine health and safety issues, particularly those which occur in the work setting, in various countries around the world. A particular focus will be toward developing countries in which the regulatory environment and resources to control hazards are less than those of more developed countries. Students will participate through an established professional organization. They will virtually work on specific projects in various countries, with the goal of improving the health and safety environment. **Credits:** 2.00

HSCI 45100 - Clinical Biochemistry

Credit Hours: 1.00 to 10.00. This course is designed to provide principles of biochemistry for clinical application for medical technologists. The course encompasses an introduction to carbohydrate, amino acid, and lipid metabolism. Also included are lectures on basic endocrinology, enzymes, and biosynthesis of steroid hormones. Physiological principles are stressed with respect to liver, lung, and kidney function. Special emphasis is placed on correlation of the theoretical and clinical areas. **Credits:** 1.00 to 10.00

HSCI 45200 - Clinical Chemistry

Credit Hours: 1.00 to 10.00. This course is designed to provide the medical technologist with the principles and application of clinical chemistry. Methods of instrumental analysis include a variety of automated procedures, electrophoresis, immunoelectrophoresis, immunodiffusion, radioisotopes, steroids, hormone assay, and toxicology. Quality control for clinical

chemistry is included. Supervised clinical laboratory experience is offered, with students rotating through the various areas of clinical chemistry on a sequential rotational basis. **Credits:** 1.00 to 10.00

HSCI 45300 - Clinical Hematology

Credit Hours: 1.00 to 10.00. Study of the functions, maturation, and morphology of blood cells. Blood cells, platelets, and reticulocyte counting procedure. Experiences in the study of cellular content of other body fluids are offered. Lectures and laboratory are designed to teach techniques of sedimentation rates, hematocrits, corpuscular indices, hemoglobin red cell fragility, and special staining procedures. Also, routine and special coagulation studies are taught. Supervised experience in clinical hematology offers opportunities for study in routine and special hematology and coagulation procedures. **Credits:** 1.00 to 10.00

HSCI 45400 - Clinical Immunohematology

Credit Hours: 1.00 to 10.00. A review of serologic principles and technical fundamentals of transfusion practice; a comprehensive consideration of all blood groups, with emphasis on ABO and Rh-Hr blood group systems. Extensive practice is gained in pre-transfusion techniques and antibody identification in the laboratory. Other blood types and antigen-antibody relationships are taught in laboratory and lectures. Also included are blood donor room procedures; preparation of blood components; correlation of blood component therapy with disease states; quality control of all reagents, procedures, and equipment used; and laboratory safety measures, all of which offer the best patient care and protection of laboratory personnel. **Credits:** 1.00 to 10.00

HSCI 45500 - Clinical Microbiology

Credit Hours: 1.00 to 10.00. Lectures and clinical laboratory experience in diagnostic procedures as aids to the diagnosis of human disease. Proper selection of techniques for the isolation and identification of medically important bacteria. Special emphasis is placed on newer methods for anaerobic bacteria identification. Also includes lectures and laboratory identification in the fields of mycology and microbacteriology, with emphasis on isolation and identification. Practical applications of fluorescent antibody tests are performed. **Credits:** 1.00 to 10.00

HSCI 45700 - Clinical Parasitology

Credit Hours: 1.00 to 10.00. Techniques of specimen examination, identification of cysts and ova, life cycles of parasites. **Credits:** 1.00 to 10.00

HSCI 45800 - Clinical Serology

Credit Hours: 1.00 to 10.00. Lectures and a laboratory experience in serology, including the preparation of antigen, flocculation tests for syphilis, heterophile antibody tests, creative proteins, RA test, FTA, rubella testing. Also included are lectures in immunology that include classifications of immunoglobulins; mechanism of antibody formation; immune response; types of antigen-antibody reactions; and theories of radioimmunoassay. **Credits:** 1.00 to 10.00

HSCI 46000 - Clinical Urinalysis

Credit Hours: 1.00 to 10.00. Routine analysis, chemical tests, sediment identification, renal function tests, pregnancy tests. **Credits:** 1.00 to 10.00

HSCI 46500 - Introduction To Laboratory Education And Management

Credit Hours: 1.00 to 3.00. A study of the principles and techniques of clinical instruction, and inservice and continuing education as well as administration and supervision. **Credits:** 1.00 to 3.00

HSCI 48500 - Health Physics Internship

Credit Hours: 1.00 to 8.00. Applied work experience as a health physics assistant or technician at a nuclear power generating station, government laboratory, hospital, or education and research institution. Permission of instructor required. **Credits:** 1.00 to 8.00

HSCI 49000 - Special Topics

Credit Hours: 1.00 to 8.00. Special topics, projects, or readings in selected areas of health sciences at a level appropriate for senior students. Permission of instructor required. **Credits:** 1.00 to 8.00

HSCI 49200 - Professional Experience In Health Sciences Internship

Credit Hours: 0.00 to 3.00. Professional experience in Health Sciences. This experiential offering is coordinated by Health Sciences in cooperation with participating employers. Students will submit company evaluations related to the experience or summary reports and assignments related to professional development in Occupational, Environmental or other Health Sciences areas. Permission of department is required. **Credits:** 0.00 to 3.00

HSCI 49501 - School Of Health Sciences Senior Honors Seminar

Credit Hours: 1.00. This course is for Senior students in the School of Health Sciences Program. This course consists of a 50-minute weekly seminar meeting to discuss current topics in health science, public health, and biomedical research. Students will interact with guest speakers and expand their knowledge base in health sciences research. In addition, each student will be responsible for presenting and reporting on their ongoing honors research project. Permission of department required. **Credits:** 1.00

HSCI 49601 - School Of Health Sciences Senior Honors Project

Credit Hours: 1.00. This course is for Senior students in the School of Health Sciences Honors Program. In this course, students will earn credit for work completed on their Honors Project under supervision of their faculty mentor. Students will enroll in this course in both fall and spring semesters (and concurrently with HSCI 49501 in the spring semester). An updated Project Description Form will be at the beginning of each semester based on the progress and any changes to the research plan. Course meeting times and frequency are to be set by the student and faculty mentor with an estimated commitment of 3-4 hours per week. Hours are to be arranged between the student and the faculty mentor, with at least weekly or biweekly meetings set aside for a one-on-one session between the student and faculty mentor. Students may also be matched to professional mentors off campus depending on their interests and future goals. The regular meeting times should be set during the first week of class. Working hours must not conflict with other course obligations or consume too much of students' study time. Permission of department required. **Credits:** 1.00

HSCI 51400 - Radiation Instrumentation Laboratory

Credit Hours: 2.00. Laboratory techniques required for the application of radiation and radionuclides. **Credits:** 2.00

HSCI 51500 - Introduction To Nuclear And Radiological Source Security

Credit Hours: 3.00. This course focuses on the basic elements of nuclear and radiological source security. It examines methods for planning and evaluating nuclear security activities at the State and facility level, establishing nuclear security culture in

different types of nuclear and radiological installations, and examines nuclear cyber and information security measures. Issues and approaches for nuclear security concerns, both state-level (e.g., nonproliferation and deterrence) and asymmetric concerns (e.g., nuclear smuggling and nuclear terrorism) will be addressed. The integration of safety and security and the use of alternative technologies will also be covered. Group exercises and simulations in applied nuclear security scenarios will complement lectures given by a number of national and international experts. This course is designed for both "technical" (engineering and science) and "non-technical" (policy) students and the interaction between students of different backgrounds is encouraged. **Credits:** 3.00

HSCI 51600 - Molecular Imaging-Nuclear Medicine

Credit Hours: 2.00. This course is related to molecular imaging by SPECT (single-photon emission computed tomography) and/or PET (positron emission tomography). This course is particularly useful for graduate and senior undergraduate students in the medical physics programs. It has been offered to MP and HP graduate students over the last 4 years (2014 - 2018) as a part of the 3-credit molecular imaging course with magnetic resonance spectroscopy (MRS: 1-credit) taught by Dr. Ulrike Dydak, computed tomography (CT: 1-credit) taught by Dr. Keith Stantz, and nuclear medicine (NM: 1-credit) taught by Dr. Shuang Liu. In the future, it will be expanded the "Nuclear Medicine" section as a 2-credit course on the basis on the previous lectures. This course focuses on recent development in nuclear medicine techniques for noninvasive imaging of brain diseases, cancer, and heart diseases. This course is delivered as 50-min lectures twice a week. Students are expected to spend more time for homework and literature reading. **Credits:** 2.00

HSCI 52000 - Risk Assessment In Environmental Health

Credit Hours: 3.00. Risk assessment as used in environmental health is the scientific process used to determine the extent of human exposure to an environmental hazard, and the type and quantify of health effects that are likely to result from these exposures. Information derived from risk assessments are used as the basis for setting regulatory guidelines, determinations of whether a given situation is "safe" or "hazardous" throughout government and industry. This course will cover the process and steps needed to performing a risk assessment, how risk communication can be used to discuss results of a risk assessment, and the use of risk management as a tool to translate results of a risk assessment into policy. **Credits:** 3.00

HSCI 52500 - Introduction To Statistical And Computational Approaches For Health Sciences

Credit Hours: 3.00. Statistical methods are important for data analysis and understanding the trends in the dataset. This course will provide an introduction to the analysis of biological data in a statistical framework using standard computational methods. The course will have a lecture and hands-on component to introduce students to topics and then utilize them to solve typical problems in Health Sciences. In addition to learning the statistical concepts, the students will also be introduced to computational approaches for data analysis. The combination of statistical and computational concepts along with the hands-on experience will help students in their research projects. The topics covered include data representation, sample statistics, probability, common discrete and continuous distribution, confidence interval estimation, experimental design, analysis of variance, statistical methods for hypothesis testing, linear and logistic regression, correlation, power analysis, graph theory, network analysis, omics-based analysis, and data visualization. The course is ideal for Health Sciences students who perform data analysis and are interested in implementing these approaches in their research. Permission of department required.**Credits:** 3.00

HSCI 52600 - Principles Of Health Physics And Dosimetry

Credit Hours: 3.00. Principles of health physics, radiation dosimetry, and radiation shielding. Topics covered include natural and man-made radiation environments, operational radiation quantities and units, radiation protection philosophy, risk and dose limits, dose-response models, mortality estimates and risk calculations. **Credits:** 3.00

HSCI 53400 - Applied Health Physics

Credit Hours: 3.00. Lecture and case studies related to the application of radiation dosimetry and shielding principles to the practice of health physics, including environmental and in-plant monitoring, emergency response, decommissioning and decontamination, operational criteria for meeting ALARA exposure limits, and the transport, disposal and treatment of radioactive waste. Epidemiological studies related to radiological accidents and nuclear power are also examined. **Credits:** 3.00

HSCI 54000 - Radiation Biology

Credit Hours: 3.00. Effects of ionizing radiation on living systems at the molecular, cellular and tissue levels. Biological basis for radiation therapy treatment planning and radiation protection. **Credits:** 3.00

HSCI 54400 - Advanced Topics In Exposure Assessment

Credit Hours: 2.00. The course will prepare students to use techniques of exposure assessment as it relates to environmental and occupational epidemiological studies as well as regulatory compliance at workplace and in community settings, risk science, and susceptibility factors. It will include exposure assessment study design, the strengths and weaknesses of various exposure assessment techniques, and how to link exposure assessment with occupational and environmental health. Core concepts to be covered include exposure variability and its implications for reconstructing historical exposures, the choice of exposure metric, surrogate measures and measurement errors, exposure modeling, and biomarkers of exposure. The course emphasizes critical and analytical discussions of seminal exposure assessment literature. Students are required to critically evaluate exposure assessment strategies in selected epidemiological studies from the peer-reviewed literature. Students participate in the class through presentations, class discussions, and a semester project. **Credits:** 2.00

HSCI 54600 - Advanced Industrial Hygiene Control Technology

Credit Hours: 4.00. Study of the various techniques needed to control hazards in the workplace. Engineering controls are placed in effort to reduce or remove the hazard at the source by isolating the worker from the hazard. Major emphasis is placed on developing a working understanding of industrial ventilation, including basic principles of fluid flow, hood and duct design, and system balancing. Effects and control of the physical hazards of noise, vibration, and heat stress are addressed. A field trip to a major industry summarizes the course material. **Credits:** 4.00

HSCI 54601 - Advanced Industrial Hygiene Control Technology Project

Credit Hours: 1.00. Students study the various techniques needed to control hazards in the workplace. Engineering controls are placed in effort to reduce or remove the hazard at the source by isolating the worker from the hazard. Permission of instructor required. **Credits:** 1.00

HSCI 54700 - Fundamentals Of Epidemiology

Credit Hours: 3.00. This course is an introduction to epidemiology, which is the study of the patterns, causes, and impact of disease in populations. Epidemiology is increasingly important for public health and clinical medicine research and policy. This course will discuss the basic principles and methods of epidemiology, including measurements of disease occurrence and association, study designs, and determination of causality. Contemporary examples will be used to illustrate the application of these concepts, with an emphasis on environmental causes of disease. **Credits:** 3.00

HSCI 54800 - Advanced Industrial Hygiene Instrumentation Techniques

Credit Hours: 3.00. This course covers sophisticated field and laboratory instrumentation and techniques, sampling methodology for organic vapors, dust, fibers, noise, and heat; calibration and validation techniques; emphasis on critical analysis of data. **Credits:** 3.00

HSCI 54801 - Advanced Industrial Hygiene Instrumentation Techniques Project

Credit Hours: 1.00. This course covers sophisticated field and laboratory instrumentation and techniques, sampling methodology for organic vapors, dust, fibers, noise, and heat; calibration and validation techniques; emphasis on critical analysis of data. Permission of instructor required. **Credits:** 1.00

HSCI 55100 - Physical Agents In Environmental Health

Credit Hours: 3.00. Physical characterization and biological interactions of non-ionizing radiation with emphasis on the adverse effects of human exposure. Topics include source characterization, environmental exposure assessment, measurement instrumentation, toxicological and epidemiological findings, control strategies. **Credits:** 3.00

HSCI 55200 - Introduction To Aerosol Science

Credit Hours: 3.00. The principles of aerosol behavior and sampling, with particular emphasis on applications in the health sciences. Topics include aerosol aerodynamics, aerosol filtration, pulmonary deposition of aerosols, methods of environmental sampling, and generation of laboratory aerosols. **Credits:** 3.00

HSCI 55300 - Advanced Occupational Safety Management And Culture

Credit Hours: 3.00. The Occupational Health and Safety Manager assumes a critical role within an organization, protecting the employees from suffering work-related injuries, illnesses, and fatalities. This job requires a number of approaches to achieve this aim, including employee training, hazard identification and abatement, safety policy development, and incident investigation. The health and safety manager often forms a bridge between upper management and front line employees. As such, the successful health and safety manager needs to skill sets which transfer across organizational levels. This course will explore strategies managing an effective health and safety program within an organization. Management strategies will be viewed from multiple perspectives. In relation to the front line employee, topics will be explored to help engage employees in safe behaviors and dealing with situations in which failures occur, resulting in accidents. The upper management perspective will focus on the establishment of a safety management system and effective techniques for measuring and reporting safety performance. A final perspective will consider both the front line employee and upper management. This perspective will explore strategies to establish a positive safety culture within an organization to bring the front line employees and upper management together in their vision of a safe and health workplace. **Credits:** 3.00

HSCI 55301 - Advanced Occupational Safety Management And Culture Project

Credit Hours: 1.00. The Occupational Health and Safety Manager assumes a critical role within an organization - protecting the employees from suffering work-related injuries, illnesses, and fatalities. This job requires a number of approaches to achieve this aim, including employee training, hazard identification and abatement, safety policy development, and incident investigation. The health and safety manager often forms a bridge between upper management and front-line employees. As such, the successful health and safety manager needs skill sets which transfer across organizational levels. Permission of instructor required. **Credits:** 1.00

HSCI 56000 - Toxicology

Credit Hours: 3.00. (MCMP 56000) Introduction to general principles of toxicology, target organ toxicity, and safety evaluation. Covers toxicity of metals, solvents, pesticides, gases, dusts, and food additives.**Credits:** 3.00

HSCI 56200 - Analytical Toxicology And Pathology

Credit Hours: 3.00. Historically, toxicology has been defined as the study of the adverse effects of xenobiotics. Today, toxicology encompasses much broader areas, including the study of endogenous compounds, physical agents, and even using toxicants as research tools. Basic and introductory toxicology courses cover the principles of toxicant metabolism and target organ toxicity. This course, Analytical Toxicology and Toxicologic Pathology is focused on the research and clinical applications of these principles. Two major areas will be covered: (1) principles of toxicant detection in biological matrices and (2) the assessment of pathological effects caused by toxicant exposure in biological systems. Laboratory sessions associated with each major topic allow students to have hands-on experience in these advanced analytical and pathological technologies. This course provides a unique opportunity for students to learn techniques that research and clinical toxicologists use daily in scientific or clinical laboratories. The course is suitable to both graduate and upper-class undergraduate students who are interested in toxicology, forensic science, veterinary medicine, environmental and occupational health, food toxicity, pharmaceutical drug testing, medical laboratory science, and general human and children's health. **Credits:** 3.00

HSCI 57000 - Introduction To Medical Diagnostic Imaging

Credit Hours: 3.00. This course teaches the fundamentals of medical imaging, including the basic physics and engineering associated with each imaging modality (CT, MRI, PET, and ultrasound), as well as mathematics and computational tools associated with image reconstruction and image processing. The course is intended for students in health sciences, biomedical engineering, physics, and life sciences. **Credits:** 3.00

HSCI 57200 - Radiation Oncology Physics

Credit Hours: 3.00. An introductory course to the physical principles, equipment, processes, imaging guidance, and clinical techniques involved in the treatment of cancer patients with external radiation beams and radioactive sources. Various external radiation beam types and their energy deposition characteristics are described. Treatment planning dose calculation algorithms and point dose calculations are discussed. The use of international dosimetry protocols for radiation beam calibration are covered in detail. **Credits:** 3.00

HSCI 57400 - Medical Health Physics

Credit Hours: 2.00. This course introduces the legislation and international and national recommendations relevant to the practice of radiation protection in medicine. Principles for the design of radiation use monitoring programs and shielding for radiation facilities is covered. Radiation risk avoidance and management for staff, patients and their families, and members of the public are discussed. **Credits:** 2.00

HSCI 57500 - Introduction To Environmental Health

Credit Hours: 3.00. An introduction to chemical, physical and biological factors in the environment that affect the health of the community. This course examines health issues, scientific understanding of causes and approaches to the control of major environmental health problems in industrialized and developed countries. This is a core course for the Masters in Public Health (MPH) degree at Purdue. **Credits:** 3.00

HSCI 58000 - Occupational Biomechanics And Ergonomics

Credit Hours: 2.00. Occupational safety is a cross-disciplinary area concerned with protecting the safety, health and welfare of people engaged in work. Occupational ergonomics is a branch of science that focuses on optimizing the relationships between workers and their work environment. This course focuses on the principles and applications of safety and ergonomics as it applies to workers. The first part of the course will consist of lectures on the fundamentals of safety standards and liability and the development of work-related musculoskeletal disorders, ergonomic risk factors including work practices, tools and workstation design. The last part will consist of identification and use of safety and ergonomic controls to reduce and prevent work-related fatalities, injuries, and musculoskeletal disorders. **Credits:** 2.00

HSCI 58001 - Occupational Biomechanics And Ergonomics Laboratory

Credit Hours: 1.00. This course will be the laboratory component for HSCI 58000. Occupational Biomechanics and Ergonomics. Laboratory exercises will accompany and illustrate each topic discussed during the lecture course. An ergonomic project will allow the students to evaluate an individual performing a job and provide ergonomic recommendations to improve the work situation. The course will also emphasize report writing, teamwork, and communication skills. **Credits:** 1.00

HSCI 59000 - Special Topics

Credit Hours: 1.00 to 8.00. Special topics, projects, or readings in selected areas of health sciences at a level appropriate for seniors and graduate students. Permission of instructor required. **Credits:** 1.00 to 8.00

HSCI 61300 - Professionalism And Professional Development In Health Sciences

Credit Hours: 1.00. Professionalism is a skill set necessary for graduate student success and future career development. Professionalism consists of multiple attributes allowing for the development of effective and productive careers while also contributing to positive workplace environments. Specifically, these skill sets benefit all disciplines and career paths. This course will provide students with an overview of career development, soft skills, responsible conduct of research, and diversity, equity, and inclusion. This 1-credit course is specifically designed to supplement initial RCR training students receive in GRAD61200. The course is designed to support additional RCR training to meet expectations for best practices by NIH and other funding agencies. It will focus on professionalism and professional development for new students in their MS and Ph.D. programs across the Health Sciences. It will be delivered as a 50-min. combined lecture and class discussion once a week. All Ph.D. and thesis-based MS students in the School of Health Sciences are expected to take this course, typically in the Spring of their second or third year. Permission from department required. Prerequisite: GRAD 61200. **Credits:** 1.00

HSCI 62500 - Grant Writing For Health Sciences

Credit Hours: 1.00. The ability to clearly communicate research concepts, ideas, and hypotheses is an essential skill for all researchers. Specifically, concise expression of complex research rationale, experimental design, and innovation through the grant application process benefits all disciplines and career paths. This course will provide students with an overview of the entire grant writing process through expert lectures, active discussion, writing activities, and peer-review processes. **Credits:** 1.00

HSCI 67100 - Biochemical Toxicology

Credit Hours: 2.00. Toxicologists in all fields are concerned with mechanism of action or how a specific toxicant or class of toxicants produces toxicity. Introductory toxicology courses typically focus on the adverse effects exerted by a specific compound, with some examination of mechanisms. The entire focus of this upper-level graduate course is on the "how" and the "why", or a detailed examination of biochemical mechanism of toxicity. There will be some lectures, but the majority of the course will consist of student-led discussions on specific mechanisms of action. Further, students will write a review-style article on a chosen mechanism of action. Prerequisite: HSCI 56000. **Credits:** 2.00

HSCI 67200 - MRI Quality Assurance Internship I

Credit Hours: 3.00. This internship course provides didactic training and practical experience in clinical diagnostic medical physics. Students will spend 3-4 hours per week learning the responsibilities of a medical physicist in MRI quality assurance (QA) such as MRI system performance testing, setting up weekly MRI QA procedures, analysis of MRI QA data, and annual clinical system evaluations. In Part I students will observe and review the weekly MRI QA tests performed by the MR Technologists on clinical MRI scanners and be involved with data analysis of these tests (image quality assessment, reporting). Annual MRI system performance evaluations of different clinical scanners will be observed and discussed. This includes assessing magnetic field homogeneity, slice position accuracy and slice thickness accuracy, and performance of radio frequency coil tests on the various coils available at different clinical MRI sites in the Indianapolis area. Students will also work as a team

with the instructors on a course project to develop and evaluate advanced MR QA methods and procedures. Prerequisites: HSCI 57000. Having documented experience in running an MRI scanner, e.g., having primary operator status on one of the research scanners at Purdue or IU. Level II MRI Safety Training: http://www.indiana.edu/~mri/safety_nonIU/safety.html. Permission of instructor required. **Credits:** 3.00

HSCI 67300 - MRI Quality Assurance Internship II

Credit Hours: 3.00. This internship course provides didactic training and practical experience in clinical diagnostic medical physics. Students will spend 3-4 hours per week learning the responsibilities of a medical physicist in MRI quality assurance (QA) such as MRI system performance testing, setting up weekly MRI QA procedures, analysis of MRI QA data, and annual clinical system evaluations. In Part II of the course, MRI system performance evaluations of different clinical scanners will be performed by the students independently following the ACR guidelines. This includes assessing magnetic field homogeneity, slice position accuracy and slice thickness accuracy, and performance of radio frequency coil tests on the various coils available at different clinical MRI sites in the Indianapolis area. Students will also work as a team with the instructors on a course project to develop and evaluate advanced MR QA methods and procedures. Prerequisites: HSCI 67200. (This course provides the theoretical basis and opportunity to observe MRI QA on clinical scanners, and forms the basis for this course, Part II). Permission of instructor required. **Credits:** 3.00

HSCI 67400 - Radiological Diagnostic Imaging Internship

Credit Hours: 3.00. This internship course provides the student with hands-on experience with clinical imaging equipment, lectures on the fundamental operation of the equipment, and quality assurance/control methods/assessment of this equipment. Students will learn the safety and imaging performance of flat panel digital x-ray system, fluoroscopy, CT scanner, Ultrasound system, and MRI scanner. Lectures will provide fundamental physics and operation of each system, perform quality assurance methods employed by board certified Medical Physics, and subsequent analysis of these methods. This course is to be delivered as a 50-minute lecture, a 150-minute lab, which includes additional time for image analysis (computational lab). The goal of this course is to provide the necessary information as part of CAMPEP/ABR and ACVR. Prerequisite: HSCI 570 Introduction to Medical Imaging. **Credits:** 3.00

HSCI 67600 - Radiation Therapy Clinical Competencies I

Credit Hours: 3.00. The course is a clinical practicum course for Medical Physics graduate students enrolled in the Purdue-Indiana University School of Medicine joint CAMPEP accredited program. Students will spend approximately 4 hours in the clinic on a weekly basis for 10 weeks. Prerequisite: HSCI 57200.**Credits:** 3.00

HSCI 67700 - Radiation Therapy Clinical Competencies II

Credit Hours: 3.00. This is a clinical practicum course for Medical Physics graduate students enrolled in the Purdue CAMPEP accredited program. Students enrolled in this course will participate in the Radiation Oncology clinic, which will provide similar experiences as junior medical physicists in training. Students will meet with the course instructor prior to spending time in the clinic to be assigned mentors and to arrange schedules. Students will spend approximately 3 hours in the clinic on a weekly basis. Absences/vacations are allowed but must be arranged with approved by the mentor with sufficient notice. Prerequisite: HSCI 67600.**Credits:** 3.00

HSCI 69000 - Special Topics

Credit Hours: 1.00 to 8.00. Special topics, projects, or readings in selected areas of health sciences at a level appropriate for graduate students. Permission of instructor required. **Credits:** 1.00 to 8.00

HSCI 69600 - Seminar In Health Science

Credit Hours: 0.00 or 1.00. Selected topics in health sciences presented by staff, students, and invited speakers. **Credits:** 0.00 or 1.00

HSCI 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

HSCI 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Health, Services, Outcomes & Policy

HSOP 45200 - Social Aspects Of Pharmacy Practice

Credit Hours: 2.00. A survey of selected social and behavioral models and related issues that affect the contemporary practice of pharmacy. Special emphasis is given to the interdependent roles of the patient, the pharmacist, and the physician. **Credits:** 2.00

HSOP 46800 - Community Pharmacy Management

Credit Hours: 3.00. Principles, practices, and case studies related to the organization, operation, and control of community pharmacies. **Credits:** 3.00

HSOP 48200 - Marketing Pharmaceutical Products

Credit Hours: 2.00. Examination of the channels of distribution for pharmaceutical products, including research-intensive and generic manufacturers, drug wholesalers, independent and chain community pharmacies, non-pharmacy retailers, prescription benefit managers, and third-party payers. Areas of special emphasis include new product development, product distribution, advertising and promotion, Rx-to-OTC switching, and product pricing and payment policies. **Credits:** 2.00

HSOP 49000 - Special Topics

Credit Hours: 1.00 to 3.00. An honors course for superior students to be used in relation to, and to supplement, an existing course; an in-depth approach to topics of current interest utilizing the original literature as prime source material. A laboratory project may be included. Permission of instructor required. **Credits:** 1.00 to 3.00

HSOP 50100 - Food And Drug Law I

Credit Hours: 3.00. A systematic study of the structure and function of the major federal (USA) laws and regulations governing the manufacturing, distribution, and marketing of foods, drugs, cosmetics, and devices. Permission of instructor required. **Credits:** 3.00

HSOP 50200 - Food And Drug Law II

Credit Hours: 3.00. Detailed study of statutes and regulations applied to discovery, development, and marketing pharmaceutical and devices in the United States. **Credits:** 3.00

HSOP 55600 - Healthcare Economics And Public Policy

Credit Hours: 3.00. Principles and theories of healthcare economics applied in analysis of the U.S. healthcare system. Perspectives are presented on the differential roles of economic analysis and policy analysis. Topics include medical care as an input to health, pharmaceutical service market, adequacy of health manpower supply, health associations and demand for legislation. Healthcare reform, the pharmaceutical industry, and social values that guide policy are explored. **Credits:** 3.00

HSOP 69000 - Special Problems

Credit Hours: 0.50 to 3.00. Individual investigations in pharmacy marketing, retailing, and management. Permission of instructor required. **Credits:** 0.50 to 3.00

HSOP 69600 - Seminar In Pharmacy Administration

Credit Hours: 1.00. Selected topics on current research, teaching methods, and contemporary problems in management and marketing. **Credits:** 1.00

Hebrew

HEBR 10100 - Modern Hebrew Level I

Credit Hours: 3.00. Introduction to Modern Hebrew: the writing and sound systems, and systematic presentation of basic structures. All language skills - reading, writing, speaking, and comprehension - are emphasized. No previous knowledge of Hebrew required. **Credits:** 3.00

HEBR 10200 - Modern Hebrew II

Credit Hours: 3.00. Continuation and extension of the first semester. The course aims to develop fluency in reading, comprehension, and spoken language. Knowledge of grammar and vocabulary is expanded. **Credits:** 3.00

HEBR 12100 - Biblical Hebrew Level I

Credit Hours: 3.00. The first semester of biblical Hebrew will present the basic elements of the language, including alphabet, vocabulary, and grammar. No previous knowledge of Hebrew required. **Credits:** 3.00

HEBR 12200 - Biblical Hebrew Level II

Credit Hours: 3.00. The second semester of biblical Hebrew will continue the study of reading, vocabulary and grammar, based on selections from the Hebrew Bible. **Credits:** 3.00

HEBR 20100 - Modern Hebrew Level III

Credit Hours: 3.00. Extensive practice in reading, speaking, and writing Hebrew, based on a variety of subjects from daily life and literature. Continued study of grammar and reading both in the modern language. **Credits:** 3.00

HEBR 20200 - Modern Hebrew Level IV

Credit Hours: 3.00. Extensive practice in reading, speaking, and writing Hebrew, based on a variety of subjects from daily life and literature. Continued study of grammar and reading in the modern language. **Credits:** 3.00

HEBR 22100 - Biblical Hebrew Level III

Credit Hours: 3.00. The third semester of biblical Hebrew focuses on reading and translation of extended passages form the Pentateuch and the use of textual criticism. **Credits:** 3.00

HEBR 22200 - Biblical Hebrew Level IV

Credit Hours: 3.00. The fourth semester of biblical Hebrew exposes the student to both narrative and poetic sections of the Bible. **Credits:** 3.00

HEBR 28400 - Ancient Near Eastern History And Culture

Credit Hours: 3.00. This course is a survey of the development of the ancient Near East, from its pre-history to Alexander the Great. It emphasizes the evolutions of various Near Eastern cultures in their many manifestations; art, government, agriculture, economics, philosophy, religion, ethics, and science. Taught in English. **Credits:** 3.00

HEBR 38000 - Israel And The Modern World: Cinema, Literature, History And Politics

Credit Hours: 3.00. Critical survey/exploration of major traits of Israeli culture through a variety of media: literature, film and music, in the larger context of Judaism, Zionism, as well as the creation of a new state and culture. Conducted in English; no knowledge of Hebrew is necessary. **Credits:** 3.00

HEBR 38300 - Kabbalah And Jewish Mysticism: Secret Knowledge In Judaism

Credit Hours: 3.00. This course critically explores the roots, history, symbolism and major characteristics of the Jewish mystical tradition known as Kabbalah. **Credits:** 3.00

HEBR 38500 - The Holocaust In Modern Hebrew Literature

Credit Hours: 3.00. This course critically examines the Holocaust and the ways in which it has influenced modern Hebrew literature, the role it plays, and how it is represented in modern Hebrew literature. Conducted in English; no knowledge of Hebrew is necessary. **Credits:** 3.00

College Health and Human Sciences

HHS 10100 - Introduction To Health And Human Sciences

Credit Hours: 1.00. This course is intended to introduce the various programs, majors and academic units within the College of Health and Human Sciences (HHS). In addition to providing an overview of each academic unit and the majors contained within, the course content is also structured to introduce students to career pathways within each respective unit.**Credits:** 1.00

HHS 30000 - Peer Mentoring In The Health And Human Sciences

Credit Hours: 1.00. This course will explore mentoring through training, practice, and reflection. Sophomores, juniors, and seniors in the College of Health and Human Sciences must be selected as HHS mentors prior to taking this course. Student mentors will actively participate in peer mentoring in one-on-one and group settings, use knowledge and skills gained in training and reflect on their experiences. Permission of instructor required. **Credits:** 1.00

HHS 30100 - Peer Mentoring Leadership In The Health And Human Sciences

Credit Hours: 2.00. This course will explore mentoring and leadership through training, practice, and reflection. Juniors and seniors in the College of Health and Human Sciences must be selected as HHS Core Leadership Team mentors prior to taking this course. Student mentors will actively participate in peer mentoring in one-on-one and group settings, develop activities for their peers, use knowledge and skills gained in training, and reflect on their experiences. Permission of instructor required. **Credits:** 2.00

HHS 40000 - Intercultural Learning In Health And Human Sciences - Lived Experiences

Credit Hours: 1.00 to 6.00. This course focuses on intercultural learning in health and human sciences through direct experiences in a foreign country, whose culture is unique as a whole yet diverse across its different regions. Students will be guided in cognitive and affective learning through observing the destination's culture and society and interacting with its people. By direct exposure to the local customs, health conditions, history, human relations, lifestyle, and religion as they travel across the foreign destination, students are expected to develop a deeper appreciation and empathy for cultural values and traditions that are different from their own. The course will emphasize the students' understanding of how individuals and communities can benefit from learning about others in improving their quality of life. Permission of instructor required. **Credits:** 1.00 to 6.00

HHS 59000 - Special Topics In Health And Human Sciences

Credit Hours: 0.00 to 9.00. Various public health topics that may change from semester to semester. **Credits:** 0.00 to 9.00

History

HIST 10001 - Issues In African-American History

Credit Hours: 3.00. Study and analysis of selected historical issues and problems of general import. Topics will vary from semester to semester but will usually be broad subjects that cut across fields, regions, and periods. May be repeated with different topics for a maximum of 9 credit hours. **Credits:** 3.00

HIST 10300 - Introduction To The Medieval World

Credit Hours: 3.00. Barbarians, kings, queens, peasants, witches, saints, teachers, students, heretics, Moslems, Jews, Christians, love, death, monks, farm life, city life, ordinary men, women, and children as Europe develops from A.D. 500 to 1500. **Credits:** 3.00

HIST 10400 - Introduction To The Modern World

Credit Hours: 3.00. Traces the expansion of Europe into the Americas, Africa, and Asia. The French Revolution, nationalism, and the development of western European states from the era of the Reformation to the present are studied. **Credits:** 3.00

HIST 10500 - Survey Of Global History

Credit Hours: 3.00. A survey of the interaction between the civilizations of Asia, Africa, Europe, and the Americas since 1500, with attention to cultural comparisons over time, and to the implications of global interdependence for the environment, health, economy, and geopolitics. **Credits:** 3.00

HIST 12300 - History At Work

Credit Hours: 1.00. Students will learn how history majors' distinctive skills and expertise can help them achieve success in many different careers. Participants will explore the value of historical thinking in daily life, including causality, contingency,

and contextualization, and will refine practical reading, thinking, and communication skills crucial to career success. Permission of department required. **Credits:** 1.00

HIST 12500 - Historically Speaking: Introduction To Historical Communication

Credit Hours: 3.00. Understanding effective oral communication is a vital part of the historian's job. This course introduces a variety of speaking practices and exercises for teaching students about the best oral communication practices. Students will deliver informational and argumentative speeches, engage in oral discussion, and will consider the best means of receiving and interpreting oral messages. **Credits:** 3.00

HIST 15100 - American History To 1877

Credit Hours: 3.00. A study of the development of American political, economic, and social institutions from the early explorations and colonial settlements through Reconstruction. CTL:ISH 1010 American History I **Credits:** 3.00

HIST 15200 - United States Since 1877

Credit Hours: 3.00. A study of the growth of the United States from 1877 to the present. The new industrialism, agrarian problems, depression, the New Deal, the two world wars, the cold war, and similar topics are analyzed. CTL:ISH 1011 American History II **Credits:** 3.00

HIST 20100 - Special Topics In History

Credit Hours: 3.00. This variable title course deals with broad historical topics that transcend and telescope traditional analytical, chronological, and geographical boundaries. Content will vary with the instructors teaching the class. **Credits:** 3.00

HIST 21000 - The Making Of Modern Africa

Credit Hours: 3.00. This course provides students with a comprehensive introduction to modern African history from 1800 to the present. Using a variety of films, novels and scholarly resources, we will examine the major historical forces that have shaped African lives over the last two centuries. Emphasis will be placed on African experiences of slavery, colonialism, liberation struggles, and post-independence national building. Students will also learn to analyze contemporary African issues within a larger historical context. **Credits:** 3.00

HIST 21100 - The Global Field: World Soccer And Global History

Credit Hours: 3.00. This is an introductory course to the history of soccer, on and off of the pitch. It studies the history of the game itself as well as the international economic, political, social, and cultural trends that shaped it. **Credits:** 3.00

HIST 22100 - History Behind The Headlines

Credit Hours: 3.00. This course introduces undergraduate students to the study of history and provides an overview of the various ways history is communicated outside the academy in narrative nonfiction, journalism, museum exhibitions, policy documents, political speeches, advertising, podcasts, television, film, and social media. **Credits:** 3.00

HIST 22800 - English History To 1688

Credit Hours: 3.00. This course is designed to survey the growth and development of English society from its beginning through the seventeenth century. Emphasis is put upon those institutions and events that influenced the establishments of the English legal system. **Credits:** 3.00

HIST 22900 - English History Since 1688

Credit Hours: 3.00. A continuation of HIST 22800. Emphasis is placed upon Great Britain as a world and imperial power. Attention is given particularly to the industrial revolution, the growth and achievements of democratic institutions, and the role Britain has played in Western civilization in recent times. **Credits:** 3.00

HIST 23005 - Hitler's Europe

Credit Hours: 3.00. This course will examine the rise, seizure, and consolidation of power by the Nazi Party and will trace the development of Adolf Hitler from a provincial Austrian to dictator of Nazi Germany. **Credits:** 3.00

HIST 23800 - History Of Russia From Medieval Times To 1861

Credit Hours: 3.00. This course explores the main characteristics of early Russian society, culture and politics. Topics include: the Kievan principalities, Orthodox Christianity, the Mongols, the rise of Moscow, the Petrine reforms, peasant and national rebellions, revolutionary movements, and the Tsarist empire to the Crimean War. **Credits:** 3.00

HIST 23900 - History Of Russia From 1861 To The Present

Credit Hours: 3.00. This course surveys the paths of the Russian empire through economic modernization, social transformation, and World War I; the revolutionary regimes of Bolshevism, Leninism, and Stalinism; World War II and the Cold War; the collapse of the USSR; and the new Eurasian states. **Credits:** 3.00

HIST 24000 - East Asia And Its Historic Tradition

Credit Hours: 3.00. Survey of the great historic traditions of China, Japan, and Korea from earliest times to approximately 1600, with special attention to state formation, society, intellectual, philosophical, and religious developments, and the visual, musical, and literary arts. **Credits:** 3.00

HIST 24100 - East Asia In The Modern World

Credit Hours: 3.00. The response of China, Japan, and Korea to the coming of the West in modern times, with special stress on the effect of Western ideas and machines. Approximately 1600 to the present. **Credits:** 3.00

HIST 24300 - South Asian History And Civilizations

Credit Hours: 3.00. Survey history of India, Pakistan, and Bangladesh, from the origins of South Asian civilization to the present. Topics include ancient India, the Mughal Empire, the colonial experience, the independence movement, and conflict and popular culture. **Credits:** 3.00

HIST 24600 - Modern Middle East And North Africa

Credit Hours: 3.00. This course explores the political, social, and cultural factors that have contributed to the formation of the modern Middle East. Course includes short stories and a selection of documentary films from the region. **Credits:** 3.00

HIST 25000 - United States Relations With The Middle East And North Africa

Credit Hours: 3.00. This course examines US relations with the Middle East and North Africa since World War II. **Credits:** 3.00

HIST 27100 - Introduction To Colonial Latin American History (1492-1810)

Credit Hours: 3.00. The purpose of this general survey course is to introduce students to the principle historical themes of Latin America during the colonial period (roughly, from 1492 to 1810). No prior knowledge of Latin American history is required. **Credits:** 3.00

HIST 27200 - Introduction To Modern Latin American History (1810 To The Present)

Credit Hours: 3.00. The purpose of this general survey course is to introduce students to the study of the major economic, political, social, and cultural processes that shaped modern Latin American nations since independence. No prior knowledge of Latin American history is required. **Credits:** 3.00

HIST 27800 - Money, Trade, And Power: The History Of Capitalism

Credit Hours: 3.00. This course examines the origins of capitalist institutions and their changes over time, including banks, joint-stock companies, and modern corporations -- all viewed with respect to their impact on industrialization, colonial expansion, business cycles, and the emergence of a global economy. **Credits:** 3.00

HIST 28400 - The Computer Age From Babbage To The Blockchain

Credit Hours: 3.00. In this course we will explore the history of computing-from the pre-electronic days through the computer's ascent in the twentieth century to the various electronic computing and communications technologies that surround us today. This course will investigate why there was a desire to create computing machines in the first place, the economic and political arrangements that brought computers into existence, the debates over what computers could (and should) be used for, the development of the IT profession, and the gradual shift from computers being room-sized specialty machines to everyday objects that people carry around in their pockets.**Credits:** 3.00

HIST 30000 - Eve Of Destruction: Global Crises And World Organization In The 20th Century

Credit Hours: 3.00. Using a variety of case studies, this course considers 20th-century turning points -- often violent and disastrous ones -- in an emerging global conversation about urgent world problems and their possible solutions. **Credits:** 3.00

HIST 30105 - Big History: Time And Scale

Credit Hours: 3.00. This course explores Big History, a new form of world / global history. Like all forms of world history, Big History transcends the limitations of nation-centered perspectives. Drawing on the history of science and environmental history, Big History considers the many forces (physical, biological, environmental, social, and political) that drive change across time. **Credits:** 3.00

HIST 30200 - Historical Topics

Credit Hours: 3.00. This variable-title course deals with broad historical topics that transcend and collapse traditional analytical, chronological, and geographic boundaries. Content will vary with faculty member teaching the class. **Credits:** 3.00

HIST 30305 - Food In Modern America

Credit Hours: 3.00. This course examines the kitchen as an architectural space, a place of labor and food production, and an arena for technological innovation in modern American history. Cooking and eating reflect cultural sentiments about modernity, progress, ethnicity, and family, and the politics of how society nourishes bodies. **Credits:** 3.00

HIST 30400 - America In The 1960s

Credit Hours: 3.00. Surveys the turbulent history of the 1960s America. Topics include: the Kennedy, Johnson, and Nixon presidencies; postwar liberalism and conservatism; insurgent political and social movements; the counterculture; the sexual revolution; rock 'n roll; and the Vietnam War. **Credits:** 3.00

HIST 30505 - The United States In The World 1898-Present

Credit Hours: 3.00. This course explores the central issues and themes of American foreign relations during the twentieth century with a primary focus on the expansion of American political military, economic, and cultural power. **Credits:** 3.00

HIST 30605 - Technology And War In U.S. History

Credit Hours: 3.00. War has been a central component of U.S. statecraft from the war of independence through the war on terror. This lecture class examines the complicated relationship between technology and war from the colonial period through the present day. **Credits:** 3.00

HIST 30701 - History Of Artificial Intelligence: Minds And Machines

Credit Hours: 3.00. This course examines the long history of efforts in automating human cognition. Historically, the attempts to automate human cognitive functions - from the mere reckoning of numbers to complex decision-making have been entangled with heated debates about what counts as good, proper, and desirable thinking; whose thinking machines should emulate; and whether the thinking of some humans is inferior to that of machines. In this course, we will examine how the invention of calculating machines - analogue and then digital - has developed in tandem with philosophical and scientific theories of human thinking and intelligence. In their turn, the latter developed as a response to changing social, political, and economic currents. **Credits:** 3.00

HIST 30705 - History Of Data: How Data Became Big

Credit Hours: 3.00. This course offers a long history of Big Data. The first module focuses on how states collected data from the 16th to 19th centuries. Here we will focus on mortality bills, census, statistics, and accounting tables. In the second model, we will pay special attention to data collection and privacy in the 20th century. In the third module, students will explore how previous developments in data collection were applied to the new developments in analog and digital computing. The final weeks of the course will focus on present-day artificial intelligence, big data, their technical limitations, and the ways they often amplify, exploit, and contribute to a wide array of social problems. **Credits:** 3.00

HIST 30801 - American Eugenics

Credit Hours: 3.00. This course explores the pre-history and history of American eugenics, as well as its afterlives. It analyzes how Americans have used scientific ideas to grapple with questions of heredity and human worth from the Early Republic to the present. We will explore the social and political uses of phrenology, physiognomy, and eugenics, and consider how those scientifically discredited ideas do and do not shape modern studies in demography, genetics, social work, and genetic engineering.**Credits:** 3.00

HIST 30805 - History Of Life Sciences

Credit Hours: 3.00. This course will examine the development of life sciences from 1750 to the present, introducing students to critical problems related to biology and society through the study of primary and secondary sources. The "life sciences" include all the sciences that deal with life as an organic entity. A prominent theme in this historical treatment is the impact of social and political ideas on the life sciences. Topics will include theories of life, the origin of life, taxonomy and classification, theories of development, natural selection, genetics, eugenics, science and religion, the evolutionary synthesis, biodiversity, ecology and environmentalism, sociobiology, the discovery of DNA, cognition and the brain, and gender in science. Students will develop crucial skills in the interpretation of primary and secondary sources, research, analysis, and presentation. **Credits:** 3.00

HIST 30902 - History Of Biotechnology

Credit Hours: 3.00. This class examines historical intersections between engineering and biology in the Western world. The course begins by considering several possible meanings of "biotechnology." It examines how and why different biotechnologies from the life sciences, biology, and medicine have arisen in specific historical contexts, changed over time, and affected society from the late 19th century to the present. We will study vaccines and beer-making in the 19th century, cell culture, birth control pills, and DNA sequencing in the 20th century, and 21st-century genome editing and synthetic biology, for example. Overall, this course argues that biotechnologies have always forced human beings to consider whether living and non-living entities are made up of the same fundamental "stuff," the implications of manipulating living things, and the nature of life itself. **Credits:** 3.00

HIST 30905 - History Of Environmental Science

Credit Hours: 3.00. This course introduces students to various approaches to environmental science through time. It considers critical problems related to the environment and society. The "environmental sciences" include all the sciences that deal with the Earth's physical and organic environments. **Credits:** 3.00

HIST 31000 - Historical Geography

Credit Hours: 3.00. Survey of historical geography. Typically offered Fall Spring Summer.**Credits:** 3.00

HIST 31005 - The Civil War And Reconstruction, 1850 To 1877

Credit Hours: 3.00. A survey of the American Civil War and Reconstruction, covering the intense sectional conflict of the 1850s; the military, social, economic, and political aspects of the war; and the political and economic reconstruction that followed. Typically offered Fall Spring.**Credits:** 3.00

HIST 31205 - The Arab-Israeli Conflict

Credit Hours: 3.00. This class traces the emergence of political fault lines in Ottoman Palestine, the immigration of European Jews in the Interwar Era and after World War II, the divisive policies of the British Mandate, the establishment of a Jewish state and the subsequent wars between Israel and surrounding Arab countries. In the end, students study religion as one part of a complex struggle for control over regional resources. **Credits:** 3.00

HIST 31305 - Medical Devices And Innovation

Credit Hours: 3.00. This course examines the history of material cultures of health care in the United States. The class will analyze how technological innovation has become central to medicine over the last two centuries and how we are coping with the consequences, both intended and unintended, of our reliance upon such medical devices. We will look at identities associated with medical devices, the ways in which disease is constructed, how technologies contribute to the naming of maladies, and implications for emergent bioengineering and biotechnologies. **Credits:** 3.00

HIST 31405 - Science, Technology, Engineering And Mathematics (STEM) And Gender

Credit Hours: 3.00. Scientific and technological innovation has been a cornerstone of American identity. How science and technology matters to gender, and gender matters to science and technology, will be explored through studying amateur and professional scientists and engineers, industrialization, education, sexual division of labor, and home and work spaces in twentieth-century America. Examining technological, scientific, and engineering innovation through the lens of gender reveals changing relationships between men and women in modern America. **Credits:** 3.00

HIST 31505 - American Beauty

Credit Hours: 3.00. This course explores twentieth-century gender history in the United States through the concept of beauty. Ideals about beauty intersect with politics, economics, technological developments, medical innovations, and nation building. A critical examination of beauty as seen through advertising, pageants, and material culture, yields insight about modern womanhood, everyday life, and identify formation in the twentieth-century United States. **Credits:** 3.00

HIST 31700 - A History Of The Christian Church And The Expansion Of Christianity I

Credit Hours: 3.00. A history of the emergence of Christianity, the development of the Christian church, and the impact of Christian thought and institutions upon western Europe prior to the Reformation. **Credits:** 3.00

HIST 31905 - Christianity In The Global Age

Credit Hours: 3.00. This course examines the social, cultural, economic, legal, and religious dynamics of global Christianity in its emerging centers of Latin America, Asia, and Africa during the 20th and 21st centuries. **Credits:** 3.00

HIST 32105 - Spain: The First Global Empire, 1469-1713

Credit Hours: 3.00. This course examines the history of Spain's global empire from the unification of the kingdoms of Castile and Aragon to the War of the Spanish Succession. Topics include Spain's European possessions, overseas empire, ruling dynasty, society, and culture. **Credits:** 3.00

HIST 32300 - German History

Credit Hours: 3.00. A survey of German history from the earliest times until the present. After a brief description of the medieval empire, we will turn to the Germany of Bismarck and Hitler and its successor states. A recurring theme will be the struggle between forces of liberalism and democracy and those of authoritarianism and militarism. **Credits:** 3.00

HIST 32400 - Modern France

Credit Hours: 3.00. A survey of modern France since 1789, including political, social, industrial, and institutional development. Emphasis is also placed upon the colonial and international aspects of French history. **Credits:** 3.00

HIST 32501 - Twentieth Century Europe Through Autobiography

Credit Hours: 3.00. Merits and limitations of autobiographies as sources for 20th-century European history. **Credits:** 3.00

HIST 32900 - History Of Women In Modern Europe

Credit Hours: 3.00. This course examines women's experiences and constructions of femininity in Europe from 1789 to the present, including women in revolutions, state intervention in the family, changing ideas of sexuality, women's movements, women in socialism and fascism, and women in war. **Credits:** 3.00

HIST 33205 - The Nuclear Age

Credit Hours: 3.00. Once seen as a revolutionary and exceptional, nuclear technologies have become central to many aspects of life in the U.S. This course uses the history of nuclear technologies to trace how American society has grappled with technological change. **Credits:** 3.00

HIST 33300 - Science And Society In Western Civilization I

Credit Hours: 3.00. A survey of the main lines in the development of science and society in Western civilization from earliest times to Newton's discovery of gravitation. Beginning with prehistory and Egyptian and Mesopotamian civilizations, the course treats in more detail the Greeks and Romans. The course then considers science during the Middle Ages, examining the transmissions of ancient science and its incorporation into the body of Christian doctrines. The course concludes with the new efforts of physicians and astronomers to free their studies from the influence of the Church and antiquity, and the new accommodations between science and society during the Scientific Revolution. **Credits:** 3.00

HIST 33400 - Science And Society In Western Civilization II

Credit Hours: 3.00. This course considers Western science and society from the time of Newton to the present. Beginning with Copernicus to Newton, topics next include biological classification, modern chemistry, and the onset of the industrial revolution. For the nineteenth century the course stresses the maturation of biology. Darwinian evolution, the dynamic synthesis and electromagnetic studies, and the second industrial revolution. In the twentieth century, the course covers modern physics, the life sciences, the understanding of the universe, and the interaction between pure and applied science. The course concludes with some of the modern social and political problems which science caused by its success. **Credits:** 3.00

HIST 33505 - Nationalism And Socialism In East Central Europe

Credit Hours: 3.00. This course examines how the peoples of East Central Europe engaged and coped with the most influential ideologies of the 20th century; with special attention to the weaknesses of the interwar and postwar regimes, strategies of modernization, survival, and dissent. **Credits:** 3.00

HIST 33605 - Global LGBTQ History

Credit Hours: 3.00. This course will examine sexual and gender diversity during the last two centuries of accelerating global interconnectivity. Although the US-derived framework of LGBTQ+ identities has become increasingly popular, people around the world have and continue to understand themselves in a multitude of ways that extend beyond this current acronym. This course will discuss the rich complexity of sexual cultures across the world as well as how they connect through global processes, such as colonialism, warfare, and migration, that have defined the nineteenth and twentieth centuries.**Credits:** 3.00

HIST 33700 - Europe Since 1945

Credit Hours: 3.00. This course traces the history of Europe, west and east, from 1945 to the present. Once viewed as a success story, culminating in the collapse of eastern European communism, developments after 1990 - such as the breakup of Yugoslavia, the European debt crisis, and the War in Ukraine - call this simplistic narrative into question. This course will consider Cold War division, decolonization, and political protest alongside democratization and economic recovery.**Credits:** 3.00

HIST 33805 - History Of Human Rights

Credit Hours: 3.00. This course explores human rights' genealogy and uneven historical development from Atlantic Revolutionary articulations through the late 20th Century and experience of globalization. **Credits:** 3.00

HIST 33900 - Traditional China

Credit Hours: 3.00. Chinese civilization from its origins to the end of the Ming Dynasty. Attention is divided equally between political and cultural history, giving emphasis to the development of traditional institutions in Chinese society as well as to art, literature, religion, and philosophy. **Credits:** 3.00

HIST 34000 - Modern China

Credit Hours: 3.00. Chinese history from the Qing Dynasty (1644) to the present, with emphasis on the period since 1800. Attention given to internal developments and China's response to Western thought and material accomplishments. Nationalism and communism in the twentieth century are examined. **Credits:** 3.00

HIST 34300 - Traditional Japan

Credit Hours: 3.00. The course considers Japanese civilization from its origins to the establishment of the Tokugawa Shogun (1603). Divided between political and cultural history, it will emphasize the development of traditional institutions in Japanese society, religion, philosophy, art, and literature. **Credits:** 3.00

HIST 34400 - History Of Modern Japan

Credit Hours: 3.00. A survey of Japanese history from the nineteenth century to the present, including Japan's response to Western expansionism, the formation of the modern state, political parties, industrialization, the Pacific War, the American Occupation, the postwar "economic miracle," and Japan today. **Credits:** 3.00

HIST 34505 - Arabs in American Eyes

Credit Hours: 3.00. This course explores Arab-American relations over the past 300 years, using American writings on the Middle East and North Africa as a prism for viewing evolving conceptions of national identity and global power in the United States. **Credits:** 3.00

HIST 34705 - History Of Religion In America

Credit Hours: 3.00. This course examines the history of religion in the United States from the colonial period to the present. It traces the evolution of religious life in America and religion's influence on American politics, society, and culture. **Credits:** 3.00

HIST 34901 - The First World War

Credit Hours: 3.00. This course is designed to explore the origins, course, meaning, and lasting legacy of World War I. **Credits:** 3.00

HIST 35000 - Science And Society In The Twentieth Century World

Credit Hours: 3.00. An introductory survey emphasizing cultural contexts, relationships with other institutions, and the lives of major figures. Covering selected major achievements as well as the problems these generate. Neither science nor engineering background is required. **Credits:** 3.00

HIST 35100 - The Second World War

Credit Hours: 3.00. A study of the diplomacy, economic mobilization, and military operations of World War II, 1939-1945. **Credits:** 3.00

HIST 35205 - Death, Disease And Medicine In Twentieth Century American History

Credit Hours: 3.00. This course examines the history of disease, dying, and medicine in the United States in the 20th century. **Credits:** 3.00

HIST 35305 - Sports In America

Credit Hours: 3.00. Today sports virtually dominate American culture. From fantasy leagues and 24-hour a day news shows to business decisions and off-the-field troubles to the games themselves, sports entertain Americans at the same time as they define American culture and social norms. This course will look at the growth of the sport industry in the 20th Century. It will examine the lives and importance of Babe Ruth, Joe Louis, Jackie Robinson, Muhammad Ali, and other athletes, as well as the economic, social, and medical impact of the games we watch. **Credits:** 3.00

HIST 35400 - Women In America To 1870

Credit Hours: 3.00. A survey of the history of women in America from the colonial period to 1870. **Credits:** 3.00

HIST 35500 - History Of American Military Affairs

Credit Hours: 3.00. Surveys American military policy from the colonial militia to the atomic age. Covers major wars and limited wars. The course also investigates the peacetime military functions, i.e., the Navy's role in diplomacy and the Army's involvement in Indian affairs. **Credits:** 3.00

HIST 35900 - Gender In East Asian History

Credit Hours: 3.00. Examination of the construction of tradition and modernity in East Asia through the lens of gender. Topics include the influence of "Confucian" ethics; gender and imperialism, nationalism and revolution; and social change in the aftermath of war and decolonization. **Credits:** 3.00

HIST 36105 - History Of Science, Technology, And Environment In Pre-Modern East Asia

Credit Hours: 3.00. This course explores developments in scientific, technological, and ecological history specifically in Pre-modern East Asia. In this class, we will read basic theories and methods in the history of science and technology, as well as basic debates and questions that challenge scholars studying the history of science, technology, and the environment in a non-western pre-modern context. We will explore how society, culture, and politics affect knowledge production and people's engagement with nature, and how these interactions, in turn, shaped society, culture, and politics. All readings are in English. No prior knowledge of East Asia is necessary. **Credits:** 3.00

HIST 36305 - The History Of Medicine And Public Health

Credit Hours: 3.00. The purpose of this course is to provide students with a historical understanding of the role public health and medicine has played in American history during the 19th and 20th centuries. How does the health status of Americans reflect and shape the U.S. **Credits:** 3.00

HIST 36405 - Patient Voices In The History Of Medicine

Credit Hours: 3.00. This course examines the history of medicine in the United States from the early twentieth century to the present by starting with patient voices, which provide a glimpse into the experience of illness. Using patient reflections as the primary lens through which to examine the history of medicine, topics covered include historical changes and historical decision making related to the diagnostic process, therapeutic interventions, access to care, and medical institutions. The course also examines how assumptions about gender, race, and class have shaped differential health outcomes such as mortality rates, time to diagnosis, and determination of treatment approach and efficacy.**Credits:** 3.00

HIST 36600 - Hispanic Heritage Of The United States

Credit Hours: 3.00. Despite their numerical prominence, Hispanics have received relatively little attention in traditional U.S. history. Focusing primarily on Mexican-Americans, Cuban-Americans, and Puerto Ricans, this course offers a historical perspective on the Hispanic experience from colonial times to the present. **Credits:** 3.00

HIST 37005 - Queens And Empresses In Early Modern Europe

Credit Hours: 3.00. This course explores the lives and legacies of queens and empresses in early modern Europe within the wider context of gender, political authority, culture, and monarchy. Students will be introduced to new scholarly approaches to the study of female rulership. **Credits:** 3.00

HIST 37100 - Society, Culture, And Rock And Roll

Credit Hours: 3.00. Surveys American society and culture through the prism of rock and roll music. Looks at politics, gender, race, and class in the postwar era to examine and explain the social, economic, and technological forces that shaped rock and roll. **Credits:** 3.00

HIST 37200 - History Of The American West

Credit Hours: 3.00. This course explores the history of the trans-Mississippi and Pacific west from the early 17th century to the late 19th century. The diverse experiences of the inhabitants and the environmental transformations are the central themes of the course. **Credits:** 3.00

HIST 37500 - Women In America Since 1870

Credit Hours: 3.00. A survey of the history of women in the United States from 1870 to the present. **Credits:** 3.00

HIST 37600 - History Of Indiana

Credit Hours: 3.00. Economic, political, and social history of Indiana from the state's earliest beginnings as a part of the old Northwest Territory to the present. **Credits:** 3.00

HIST 37700 - History And Culture Of Native America

Credit Hours: 3.00. This course explores the societies of Native North America in a historical context, from pre-historic times to the present, examining Native world views and belief systems to understand their historical relations with each other, and with Europeans and their descendants. **Credits:** 3.00

HIST 38001 - History Of United States Agriculture

Credit Hours: 3.00. This course surveys the main development in North American agricultural history, emphasizing the continental United States. Topics include early American agriculture, the plantation system, land policy, scientific and technological change, agrarian politics, water rights, migrant labor, and agricultural policy. **Credits:** 3.00

HIST 38105 - American Indians And Film

Credit Hours: 3.00. This course investigates ways that Hollywood filmmakers influenced public perceptions of Native American history and culture through feature films. Students explore issues of race, gender, class, ethnicity, ideology, and nature, as well as the work of indigenous filmmakers. **Credits:** 3.00

HIST 38200 - American Constitutional History

Credit Hours: 3.00. Survey of the fundamental principles of American constitutionalism and dominant trends in judicial interpretation, from the creation of the Constitution to the period of the New Deal. **Credits:** 3.00

HIST 38300 - Recent American Constitutional History

Credit Hours: 3.00. Intensive study of constitutional questions and Supreme Court answers from the period of the Warren Court to present. Particularly emphasized are the areas of segregation, civil rights, and civil liberties and guarantees for personal rights. **Credits:** 3.00

HIST 38400 - History Of Aviation

Credit Hours: 3.00. A comparative history of human flight and air power (in Europe, the Americas, and Asia) from its origin in the early inventors and pilots, through its reflection in the popular media, to the global development of civil and military aviation. **Credits:** 3.00

HIST 38505 - Media, Politics And Popular Culture

Credit Hours: 3.00. This class examines the relationship of media, politics, and popular culture over the course of the twentieth century in American history. Students trace how new media shaped political institutions and practices and afforded opportunities for political change. **Credits:** 3.00

HIST 38605 - Land Of The Indians: Native Americans In Indiana

Credit Hours: 3.00. This course offers a survey of Native American and Indigenous history and culture in the historic region encompassing the modern state of Indiana. The course opens in the pre-Columbian era and is organized chronologically to the present day. **Credits:** 3.00

HIST 38700 - History Of The Space Age

Credit Hours: 3.00. The historical interaction between human values and space exploration in the contemporary age, focusing on issues of global interdependence. Topics include the international competition in rocketry, the Cold War in space, the moon missions, space disasters, and satellite technology. **Credits:** 3.00

HIST 39400 - Environmental History Of The United States

Credit Hours: 3.00. This is a mid-level survey designed to provide students of environmental science with historical background and students of history with the unique perspective of environmental history. **Credits:** 3.00

HIST 39500 - Junior Research Seminar

Credit Hours: 3.00. Variable title seminar for history majors in their junior year intended to teach historical skills, including research in primary sources, analytical skills, and forming historical arguments. It is a writing-intensive course and counts as one of the major requirements. **Credits:** 3.00

HIST 39600 - African American History To 1877

Credit Hours: 3.00. This course covers major themes in African American history to 1877 that emphasizes Black Americans' African origins and their experiences in the transatlantic slave trade, American slavery, Colonial America and the early United States as well as their fight for abolition and freedom during the Civil War and Reconstruction. **Credits:** 3.00

HIST 39800 - African American History Since 1877

Credit Hours: 3.00. This course covers major themes in African American history from 1877 that focus on Black Americans' struggle to overcome social, economic, and political oppression and to win basic civil and human rights while making valuable contributions to American society. **Credits:** 3.00

HIST 40000 - Great Books And The Search For Meaning

Credit Hours: 3.00. This intellectual-history course discusses the meanings of the Great Books within their particular historical contexts and the universal quest for self-understanding, focusing on good and evil; mystery and reason; the nature of power; and what it means to be human. **Credits:** 3.00

HIST 40300 - Europe In The Reformation

Credit Hours: 3.00. A study of decay and renewal in European society, 1300 to 1650. Concentrates on the Protestant and Catholic Reformation and religious wars, but also covers the Northern Renaissance, the New Monarchies, and the discovery and exploration of the New World. **Credits:** 3.00

HIST 40500 - The French Revolution And Napoleon

Credit Hours: 3.00. A study of revolutionary France from the fall of the ancient regime to the Congress of Vienna. Divided in emphasis between the period of the revolution and the era of Napoleon, the course stresses social, political, ideological, and institutional developments. **Credits:** 3.00

HIST 40600 - Rebels And Romantics: Europe 1815-1870

Credit Hours: 3.00. Examines the dramatic social, cultural, and political developments in Europe following the defeat of Napoleon through various rebellious and romantic personalities, as well as figures who supported conservative or reformist solutions to the upheavals of industrialization, revolution, and nationalism. **Credits:** 3.00

HIST 40700 - Road To World War I: Europe 1870-1919

Credit Hours: 3.00. Studies the increase in Europe's wealth and power through conquest, industrialization, and nation-state rivalries, along with the social stress and cultural anxiety that culminated in World War I; examines the war from the perspectives of both combatants and civilians. **Credits:** 3.00

HIST 40800 - Dictatorship And Democracy: Europe 1919-1945

Credit Hours: 3.00. This course examines the fleeting triumph of democracy across Europe. Followed by the rise of fascism, communism, and Nazism. Emphasis will be placed on broad economic, social, and cultural transformations as well as individual choices to resist or conform. **Credits:** 3.00

HIST 41005 - History Of The American Presidency

Credit Hours: 3.00. Using a historical perspective, examines the shifting role of the presidency in the American imagination and the cultural, social, and economic changes that have wrought political developments in public functions and expectations of the modern presidency. Typically offered Fall Spring Summer.**Credits:** 3.00

HIST 41300 - Modern European Imperialism: Repression And Resistance

Credit Hours: 3.00. This course examines the expansion, transformation and collapse of 19th and 20th-century European empires, focusing on colonial encounters and relationships. Students should come to the course familiar with major developments, events and themes in modern European and/or global history. **Credits:** 3.00

HIST 41505 - Gender And Politics In Early Modern Europe

Credit Hours: 3.00. This course explores the role of gender (its discourse as well as its practice) in the emergence, consolidation, and centralization of European political systems from the Renaissance to the French Revolution, such as princely courts, republics and monarchies. **Credits:** 3.00

HIST 42100 - Honors Historical Methods

Credit Hours: 3.00. Designed as a prequel to Honors Thesis; this course introduces the Honors students to various advanced interpretative approaches to history and methods of historical research. Students also choose their topic for their Honors Thesis and begin research. **Credits:** 3.00

HIST 42200 - Honors Thesis In Historical Research

Credit Hours: 3.00. Designed as a sequel to HIST 42100 (Honors Historical Methods); this course is intended as the culminating academic experience for students in the Department of History Honors Program. It will require the completion of an undergraduate thesis in history. Permission of instructor required. **Credits:** 3.00

HIST 42300 - Advanced Topics In Modern Germany

Credit Hours: 3.00. This course offers a reading-intensive study of a specific period or theme in modern German history. Semester-long topics might include Imperial Germany; Weimar Germany; Divided Germany (1945-1990); or thematic studies on culture, religion, or military affairs. **Credits:** 3.00

HIST 43900 - Communist China

Credit Hours: 3.00. The evolution of the Communist movement (1921-1949) and the development of the Communist government (since 1949) in China. Attention is given to political, economic, social, and cultural changes. **Credits:** 3.00

HIST 44100 - Africa In The Twentieth Century

Credit Hours: 3.00. A problem-oriented course in the modern history of Africa from 1880 to 1975. It analyzes origins of African nationalism, European colonialism, racial conflict, and war leading to the independence revolution of the 1960s and 1970s. **Credits:** 3.00

HIST 45000 - The English Landscape:Integrating History, Horticulture & Landscape Architect

Credit Hours: 3.00. Intensive four weeks in residence in Corsham, UK with visits to significant sites to examine the intersections between human culture and the natural environment that results in the developed landscape. Permission of instructor required. **Credits:** 3.00

HIST 46000 - American Colonial History

Credit Hours: 3.00. An investigation of the foundation of the American colonies, their place in the British imperial structure, and the eventual conflict of imperial exigencies with colonial self-interest and national feeling. **Credits:** 3.00

HIST 46100 - The Revolutionary Era, 1763 To 1800

Credit Hours: 3.00. An analysis of the origins, nature, and consequences of the American Revolution; of the achievements and difficulties of the new nation under the Articles of Confederation; of the drafting and adoption of the Constitution; and of the initial political, economic, and social progress of the United States under the Federalists. **Credits:** 3.00

HIST 46700 - The Emergence Of Modern America

Credit Hours: 3.00. Examines the changes in American society between 1877 and 1932. The course covers such issues as the rise of industry, the growth of consumerism, the shift to a multi-ethnic society, imperialism, Populism, Progressivism, World War I, and the 1920s. **Credits:** 3.00

HIST 46800 - Recent American History

Credit Hours: 3.00. Examines the issues that shaped American society, politics, foreign policy, and culture from 1932 to the present. Covers the Great Depression, World War II, the Cold War, and the Vietnam War as well as the social, cultural, and economic impact of those events. **Credits:** 3.00

HIST 46900 - Black Civil Rights Movement

Credit Hours: 3.00. This course will examine the origins, dynamics, and consequences of the modern black civil rights movement by exploring how struggles for racial equality and full citizenship worked to dismantle entrenched systems of segregation, repression, and discrimination within American society and culture. **Credits:** 3.00

HIST 47005 - Women And Health In America

Credit Hours: 3.00. This course examines the historical relationship between women and health by exploring a number of critical themes that have affected women's health in the United States. **Credits:** 3.00

HIST 47300 - History Of The South

Credit Hours: 3.00. Geographic, economic, cultural, social, and political aspects of the South. The significance of such figures as Jefferson, Jackson, Calhoun, Jefferson Davis, and Woodrow Wilson. The emphasis is on the evolution of the intellectual climate. **Credits:** 3.00

HIST 47600 - The Civil War In Myth And Memory

Credit Hours: 3.00. This seminar will explore how the Civil War has been celebrated and/or remembered from 1865-present. **Credits:** 3.00

HIST 47700 - Native American Women's History

Credit Hours: 3.00. This course studies the history of indigenous women in North America from pre-contact to the present era, examining their roles through the experience of colonization and decolonization underscoring issues of sovereignty, identity, activism, kinship, public images, and stereotypes. **Credits:** 3.00

HIST 48005 - Madness And The Asylum In The United States

Credit Hours: 3.00. This course explores how Americans have understood insanity and asylums. We analyze historical concepts of insanity, the evolution of asylums, how psychiatrists have debated therapeutics, and how ordinary people have experienced treatments and diagnoses. **Credits:** 3.00

HIST 48500 - Topics In American Political History

Credit Hours: 3.00. This course deals with broad thematic and chronologically defined topics in American political history from the Revolutionary Era to the late twentieth century. Content will vary with the faculty member teaching the class. **Credits:** 3.00

HIST 48800 - History Of Sexual Regulation In The United States

Credit Hours: 3.00. This course will illuminate broad themes in the historical regulation of sexual violence, consensual sex, and homosexuality. Student will understand and analyze how cultural, social, religious, and moral ideologies have influenced conceptions of deviant and normative sexuality in the United States. **Credits:** 3.00

HIST 49200 - Seminar In Historical Topics

Credit Hours: 3.00. Course description will vary according to specific topic proposed to study. **Credits:** 3.00

HIST 49400 - Science And Society In American Civilization

Credit Hours: 3.00. This course examines the development of science in the United States from colonial times to the present. Emphasis in the earlier periods is placed on comparison and contrast of the American scene with that of Europe. Subsequent treatment deals with industrialization, and maturation of the American scientific community, and the increasing social effects of science. Among those considered are the forces making for urbanization, for greater interdependence among science, industry and government, and for repercussions in intellectual affairs. **Credits:** 3.00

HIST 49500 - Research Seminar In Historical Topics

Credit Hours: 3.00. This course is designed to train history majors in the fundamentals of historical research and writing. Course descriptions vary according to specific topics proposed for study by instructors. **Credits:** 3.00

HIST 49900 - History Internship

Credit Hours: 1.00 to 3.00. This course allows students to earn credit for internships. Examples of qualified internships would include work with museums, historical societies, and various units of government. Credit and course requirements arranged with the instructor. Permission of instructor required.**Credits:** 1.00 to 3.00

HIST 51200 - England Under The Stuarts

Credit Hours: 3.00. This intensive study of seventeenth-century England focuses on the political, religious, and economic tensions under the early Stuarts; the Civil War; Cromwell's Protectorate; and The Glorious Revolution. Topics discussed include parliament, puritanism, radicalism, the Restoration, and the Whig Oligarchy. **Credits:** 3.00

HIST 57600 - Problems In Latin American History

Credit Hours: 3.00. A detailed examination of specific topics in Latin American history. Topics offered vary between colonial and national periods. **Credits:** 3.00

HIST 57700 - Contemporary Latin America

Credit Hours: 3.00. A topical and regional approach to recent political, social, and economic movements in Latin America. **Credits:** 3.00

HIST 59000 - Directed Reading In History

Credit Hours: 1.00 to 3.00. A reading course directed by the instructor in whose field of specialization the content of the reading falls. Approval of each reading project must be secured from the department. Permission of instructor required. **Credits:** 1.00 to 3.00

HIST 59500 - The Holocaust And Genocide

Credit Hours: 3.00. (POL 59500) History and analysis of the Nazi attempt to destroy the European Jews, with comparisons to other instances of genocide. **Credits:** 3.00

HIST 60100 - Reading Seminar In European History

Credit Hours: 1.00 to 3.00. Bibliography and historiography of selected fields of topics in European history; may vary in subject matter from semester to semester. Prerequisite: Master's student standing. **Credits:** 1.00 to 3.00

HIST 60200 - Seminar In European History

Credit Hours: 3.00. Individual and group study of topics in European history from the medieval period to the modern era. Topics reflect the research, teaching, or historiographical specialties of the faculty offering the course. Subtitles indicate the focus of the research seminar. Prerequisite: Master's student standing. **Credits:** 3.00

HIST 61000 - History: Theory And Methods

Credit Hours: 3.00. This is the first part of an introductory two-course sequence for new graduate students intended to acquaint them with some important issues regarding the modern professional practice of history. This semester concentrates on historiography, theoretical questions, and methodological debates that today's working historians inevitably encounter. Students

read about the practice of historical scholarship and read several important example texts representing different approaches to the discipline over the past 200 years. Students write several short book reviews, position papers, and a mock grant proposal during this semester. The course is required of incoming graduate students in history. It usually will be followed by HIST 61100, Research Practicum. **Credits:** 3.00

HIST 61100 - History: Research Practicum

Credit Hours: 3.00. The second half of a two-semester sequence for new graduate students intended to acquaint them with important issues regarding the modern practice of historical scholarship. This course is a research seminar in which students shape and execute their own research projects resulting in original article-length historical essays. In addition, matters relating to ethical conduct of research and problems of historical writing and argumentation are discussed. Prerequisites: HIST 61000 or 59800. Permission of instructor required. **Credits:** 3.00

HIST 64100 - Reading Seminar In Global History

Credit Hours: 3.00. Individual and group study of topics in global history. Topics reflect the research, teaching, or historiographic specialties of the faculty offering the course. Subtitles indicate the focus of the research seminar. Prerequisite: Master's student standing. **Credits:** 3.00

HIST 64200 - Seminar In Global History

Credit Hours: 3.00. Individual and group study of topics in global history. Topics reflect the research, teaching, or historiographic specialties of the faculty offering the course. Subtitles indicate the focus of the research seminar. Prerequisite: Master's student standing. **Credits:** 3.00

HIST 65000 - Teaching The History Survey Course

Credit Hours: 3.00. This course provides an introduction to the literature on teaching history at the college level, especially the literature on pedagogy, theory, and conceptualization needed for the undergraduate survey course. Students will become familiar with the professional literature, develop their own syllabus for the survey course, and produce an extensive historiographical essay supporting and justifying the contents of the syllabus. Class discussions will expose students to a number of teaching strategies, concepts, and exercises. Prerequisite: Master's student standing. Permission of instructor required. **Credits:** 3.00

HIST 65100 - Reading Seminar In American History

Credit Hours: 1.00 to 3.00. Bibliography and historiography of selected fields or topics in American history; may vary in subject matter from semester to semester. Prerequisite: Master's student standing. **Credits:** 1.00 to 3.00

HIST 65200 - Seminar In American History

Credit Hours: 3.00. Individual and group study of topics in American history from the colonial period to the present. Topics reflect the research, teaching, or historiographical specialties of the faculty offering the course. Subtitles indicate the focus of the research seminar. Prerequisite: Master's student standing. **Credits:** 3.00

HIST 67000 - Seminar In Latin American History

Credit Hours: 3.00. Research or reading seminar in Latin American History on a selected topic in colonial or national period of Latin American History. Topics vary. It may be repeated once with change of topic. Students must have been admitted into M.A. or Ph.D. history programs or any other graduate program at Purdue. Also, adequate knowledge of languages pertinent to research topic is expected. No prior knowledge of Latin American History is required. **Credits:** 3.00

HIST 69800 - Research MA Thesis

Credit Hours: 1.00 to 18.00. Research MA Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

HIST 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Honors

HONR 12000 - Introduction To Research

Credit Hours: 3.00. In this course you will take an idea and blow it up. You will "blow it up" to better understand its elements, and its connections to various ways of creating knowledge. Then you will take the resultant pieces and use them to construct a research plan that's inclusive of at least two forms of inquiry. **Credits:** 3.00

HONR 19900 - Interdisciplinary Honors - Introductory Seminar

Credit Hours: 1.00 to 6.00. These introductory topic seminars are designed to open intellectual horizons and allow opportunities for learning by inquiry in a collaborative environment. Courses are limited to 20 participants or less, may be team-taught, and emphasize close interaction between the professor(s) and the students. **Credits:** 1.00 to 6.00

HONR 19901 - Honors First Yr Experience I

Credit Hours: 1.00. All JMHC students take this 1 credit course each semester (fall and spring) of their first year. This "Honors First Year Experience" is designed to introduce students to college-level honors education. Learning outcomes include how to be flexible thinkers, inclusive collaborators, and ethical leaders. In fall, students explore interdisciplinary topics in small seminars with dedicated faculty and work in groups with JMHC student mentors in "world readiness" labs. **Credits:** 1.00

HONR 19902 - Honors First Yr Experience II

Credit Hours: 1.00. All JMHC students take this course each semester (fall and spring) of their first year. This course is designed to introduce students to college-level honors education. Learning outcomes include how to be flexible thinkers, inclusive collaborators, and ethical leaders. This course is the second half of the required course sequence taken by all students entering the Honors College. Restricted to Honors College students. **Credits:** 1.00

HONR 19903 - Interdisciplinary Approaches In Writing

Credit Hours: 3.00. This course is a writing-intensive course in which students learn how to find, evaluate, and use credible information, how to express themselves well in a variety of different written genres, and how to write for different audiences. **Credits:** 3.00

HONR 22000 - Community Of Inquiry

Credit Hours: 2.00. This course is for new members of the Honors College community, who entered as continuing Purdue students or transferred to Purdue. It, being your first or one of your first courses in the Honors College, is designed to help you hone some of the fundamental learning outcomes of an honors education: interdisciplinary thinking, critical thinking, problem-solving, research thinking, collaboration, and global awareness. You will also engage with the pillars of the Honors College and develop community within the Honors College. To accomplish these objectives, the course is simultaneously project-based and

experiential. You will work in multi-disciplinary teams on applied research that emphasizes critical and multi-dimensional thinking about real-world problems. Through project-based learning, you will move your skills beyond identifying and understanding a problem to identifying and formulating solutions to that problem. The problem addressed in the course is local or global in scope and has social, economic, political, and/or environmental implications for our local and/or global community as well as begs a multi-disciplinary, innovative solution. Continuing in the vein of experiential learning and of building your honors ethos, you will attend events (some as a class, others individually) and participate in programs in the Honors College and across campus that embody the Honors College's pillars: Community and Global Engagement, Leadership, Research, and Interdisciplinary Academics. You will curate a schedule of events that take place during the semester and reflect on these experiences. Permission of department required. **Credits:** 2.00

HONR 22100 - Exploring Place

Credit Hours: 3.00. "Exploring Place" is an examination of the cultural, social and historical dynamics that influence communities and relationships of a site. Blending independent study and distance learning, in this experiential learning course, the student and the instructor work together to design an individualized, in-depth study of the place in which the student is located. This study will be attentive to the social, cultural, political, economic, and other forces that have shaped this place historically and today, while also focusing on community life and the relationships between residents, institutions, organizations, and others. Exploring Place offers students the opportunity to better understand the people and places around them, expand their worldviews, and increase their self-awareness as they engage within these spaces and understand their place in them. **Credits:** 3.00

HONR 22200 - Solutions Lab Global

Credit Hours: 2.00. In this course, students from Purdue University (West Lafayette, Indiana) and at universities abroad will collaborate virtually in interdisciplinary teams to identify solutions to a major global challenge. Each semester, the theme of the global challenge changes. At the start of the course, students at both universities will meet together as a class to learn about the topic from a range of disciplinary perspectives through guest lectures, assigned readings, and class discussions. Students will then be divided into interdisciplinary teams with members from both universities and provided a prompt related to the semester's theme. Teams will spend several weeks of the course focused on researching, developing, and packaging their solutions, before presenting them publicly at the end of the term. In addition to increasing knowledge of the topic and improving teamwork skills, students in this course will advance in intercultural knowledge, skills, and attitudes through their international collaborative experience. **Credits:** 2.00

HONR 29500 - Interdisciplinary Honors - Independent Experience

Credit Hours: 1.00 to 3.00. Individual experiential projects undertaken with faculty supervision. Permission of instructor required. **Credits:** 1.00 to 3.00

HONR 29900 - Interdisciplinary Honors - Experiential Learning

Credit Hours: 1.00 to 6.00. These interdisciplinary topics seminars are designed to offer experiential learning on campus, in the community, and around the world. Courses are limited to 20 participants or fewer, may be team-taught, and emphasize close interaction between the professor(s) and the students. Students will participate in active learning exercises that may include study away and study abroad, workshops, research and creative skill building, community collaboration, and/or service learning. Seminar topics will vary from semester to semester. **Credits:** 1.00 to 6.00

HONR 29901 - Interdisciplinary Honors - Honors Mentors

Credit Hours: 2.00. This hands-on course provides leadership training to the continuing Honors College students selected to work as mentors for the required, first-year honors course. Students work closely with a faculty instructor. Restricted to Honors College students. Department permission required. **Credits:** 2.00

HONR 31000 - Space-Time!

Credit Hours: 3.00. In Space-time!, we will explore how our relationship to space and time has changed over human history. We will focus primarily on the last two centuries and how interconnected changes in science, technology, and culture altered our sense of the scope, age, and nature of the reality around us. The ideas around space and time offer us an occasion to see how arts, philosophy, sciences, and our own experiences shape the way we see the world. Students, too, will explore the cross-influences of arts, philosophy, and sciences, as they write their own creative works, engage complex ideas from new perspectives, and expand their imaginations. **Credits:** 3.00

HONR 31100 - Replicants

Credit Hours: 3.00. From ancient mythology to Blade Runner 2049, the creation of artificial bodies has captured the human imagination. This course asks: how do the materials we use to re-create the human body affect the way that we construct our humanity? We will examine the different materials people have used to replicate the body throughout history. The course is organized thematically by materials such as wood, wax, silicone, and digital media. This course emphasizes hands-on learning; we will cast wax masks, sculpt clay figurines, and create automata, among other experiential activities. The types of replicants we will study in this course range from voodoo dolls to Real Dolls, death masks to Deep Fakes, and statues to cyborgs. For the final project, you will choose a case study of a replicant to write about in an exploratory paper. **Credits:** 3.00

HONR 31200 - Jazz

Credit Hours: 3.00. Jazz artists "speak to each other in the language of music." In Jazz, we will explore the nature of this artistic conversation with many of its cultural influences, geographical variations, and temporal iterations. Throughout our time together we will interrogate varying facets of the social impact such a conversation facilitates. Furthermore, we will explore the musical language of jazz with its power to make collective performance stronger. And we will investigate the ways in which this artists' talk became the "talk of the town" and country as a medium through which people could break from dominant cultures. We will make sense of and process our journey by creating our own jazz ensemble, featuring the layered textures of our lives as inspiration for the note and lyric. **Credits:** 3.00

HONR 31300 - Science, Technology, & Society

Credit Hours: 3.00. Science and technology are deeply intertwined with the distribution of costs and benefits in human society, underscoring the need for critical perspectives. This project-based course will examine the social and ethical implications of science and technology using interdisciplinary methodologies/approaches. Students will have the opportunity to address questions such as: How have particular scientific discoveries and technologies emerged or evolved? How have they shaped society, and how has society shaped science and technology? How have science and technology compounded social inequalities (race, class, gender), and how can they be changed to reduce inequalities? Topics that will be explored will vary each semester. **Credits:** 3.00

HONR 31400 - The Human Epoch

Credit Hours: 3.00. In this course, students will explore the entangled relations between humanity and the environment from multiple social contexts and time periods. Throughout the class, students will read, analyze, and discuss interdisciplinary scholarship from the social and behavioral sciences. Classroom activities will take the form of discussion, projects and group assignments, and writing assignments, with an emphasis on peer-to-peer learning. Students will create a project aimed at a public audience that demonstrates knowledge about key course topics and communicates connections between social/behavioral knowledge and personal, civic, ethical, or global decisions and policies. As a result of taking this course, students will be able to understand and evaluate critical questions about humanity and its ecologies, recognize the importance of those questions for various audiences, and draw connections between course materials and their own perspectives about the world. **Credits:** 3.00

HONR 31500 - Across Differences

Credit Hours: 3.00. To understand and combat systemic injustices, our students must be equipped to engage with the historical and present-day racial and ethnic "reckonings" that define the United States, and large parts of the globe. This course offers students an opportunity to focus on cultural landscapes/contexts, to learn how race and ethnicity permeate cultural texts, genres, and industries. The course trains students to recognize how race-and-ethnicity-based inequities intersect with issues of class, gender, and/or sexuality, and how these intersections articulate themselves in/through culture. Students will grapple with the colonial, national, transatlantic, trans-cultural, and diasporic underpinnings of culture. Topics that will be explored will vary each semester, but to attend to the diverse ways in which students learn and demonstrate their learning, all sections will use interdisciplinary materials like songs, films, video games, sporting events, poems, neighborhood maps, photographs, fine art pieces, oral histories, interviews, and newspapers, in addition to traditional/scholarly publications.**Credits:** 3.00

HONR 39500 - Interdisciplinary Honors - Independent Study

Credit Hours: 1.00 to 3.00. Individualized course of study undertaken with faculty supervision. Permission of instructor required. **Credits:** 1.00 to 3.00

HONR 39900 - Interdisciplinary Honors - Special Topics Seminar

Credit Hours: 1.00 to 6.00. This course is designated for a wide range of honors seminars that stress interdisciplinary understanding, intellectual flexibility, creative thought, and group discussion. Topics vary by semester. Open to students at all levels. **Credits:** 1.00 to 6.00

HONR 46000 - Technological Justice

Credit Hours: 3.00. In this course, students will study interdisciplinary approaches to technology ethics for responding to today's pressing technological dilemmas in a range of contexts, from healthcare, mass incarceration, and airport security to social media, smart cities, and space travel. Students will grapple with how historical and present-day inequalities, institutional environments, decision-making cultures, and regulatory systems impact the technological design process and distribution of technology's risks and rewards in society. We will ask ourselves how relations of power inform the ways technologies are designed and experienced, as well as how power shapes dominant and insurgent approaches to achieving technological justice. The primary deliverable in this class is for you to conceive of and carry out your own "Technological Justice" Project, based on your interests, passions, and personal and/or professional goals. **Credits:** 3.00

HONR 46100 - Well-Being

Credit Hours: 3.00. Copenhagen, Zurich, Helsinki, Stockholm, and Tokyo are the five most livable cities in the world according to MONOCLE's 2021 Quality of Life Index. They are the highest-ranking cities when using metrics to measure crime, emergency services' response time, transportation networks, cycling culture, food, drink, retail, and the number of independent bookshops. MONOCLE's Quality of Life survey is one among the many that exist to rank the world's best cities, but wealth is one theme that emerges from among the varying indices and their respective results. The metrics, indeed the participants responding to the metrics, represent populations of people with high levels of discretionary income. How might the metrics reflect different values if these indices include a different kind of participant, such as the urban poor? **Credits:** 3.00

HONR 46200 - Protein Design With FoldIt

Credit Hours: 3.00. The protein folding problem is a grand challenge in biology. How does a protein's amino acid sequence dictate its three-dimensional structure? FoldIt is an online game in which players determine the most stable folded structure of hypothetical proteins that have been predicted by unique computer algorithms to perform specific functions in the cell. Students in this course will be introduced to the mechanics of the FoldIt software to fold computer-predicted proteins into their native structures as well as design novel proteins that can bind and deactivate the COVID-19 spike protein. **Credits:** 3.00

HONR 46300 - Research Thinking Portfolio

Credit Hours: 2.00. This course establishes a new pathway for Honors completion through a critical engagement with the Undergraduate Research pillar of the college. This course will empower Honors students to leverage their research, scholarly, and creative experiences in curricular as well as co- and extra-curricular experiences toward completing the HC curriculum. Our course will combine workshops, hands-on laboratories, group discussion, and one-on-one meetings. The major assignment is a reflective portfolio, which will serve as a record of your past experiences and an opportunity to reflect on the ways in which your time as an Honors College student has shaped your research thinking and helped prepare you for life beyond the university. Successful completion of the course fulfills the scholarly project requirement of the HC curriculum. **Credits:** 2.00

HONR 46400 - Scholarly Project

Credit Hours: 3.00. This course fulfills the scholarly project requirement of the Honors College curriculum. Students will engage in original research projects that produce new knowledge. **Credits:** 3.00

HONR 49500 - Honors Independent Research

Credit Hours: 1.00 to 6.00. Individualized research under faculty supervision. Permission of instructor required. **Credits:** 1.00 to 6.00

HONR 49900 - Honors Research Project

Credit Hours: 1.00 to 6.00. This course is designated for a wide range of faculty-led collaborative research projects. Topics will vary by semester. Permission of department required. **Credits:** 1.00 to 6.00

HONR 59901 - Research Mentorship Development Program

Credit Hours: 3.00. The Research Mentorship Development Program is designed for Purdue based on a nationally recognized curriculum and prepares graduate students or postdocs to mentor undergraduates in research. Effective mentoring of undergraduate researchers requires specific skillsets and approaches. Implementation of these strategies can lead to a productive and mutually beneficial experience for both students and their mentors. The course is designed for graduate students who plan to work with new researchers in their labs or research groups and who plan to enter academia or pursue careers in which they will mentor others in scholarship or research. Graduate students or postdocs selected for the program are matched with honors students who are interested in research. Permission of department required. **Credits:** 3.00

Horticulture

HORT 10100 - Fundamentals Of Horticulture

Credit Hours: 3.00. Biology and technology involved in the production, storage, processing, and marketing of horticultural plants and products. Laboratories include experiments demonstrating both the theoretical and practical aspects of horticultural plant growth and development. **Credits:** 3.00

HORT 11000 - Opportunities In Horticulture

Credit Hours: 1.00. A survey of the field of horticulture, with emphasis on horticultural information and career opportunities. This course will utilize a lecture format with a combination of presentations by the instructor and guest speakers with expertise and experience in specialized areas of horticulture. **Credits:** 1.00

HORT 12100 - Medicine In The Garden

Credit Hours: 1.00. A survey of the uses and properties of horticultural plants for human health and well-being. Topics will focus on the close relationships between plants and human physiology, nutrition, medicines, mind-altering drugs, poisons, and beverages. **Credits:** 1.00

HORT 12200 - Living Landscapes: Grow, Design, Sustain

Credit Hours: 1.00. This course is designed for students in the department of Horticulture and Landscape Architecture or those interested in HLA majors. Students will learn about concepts such as plant science, land use, landscape design, sustainability, food systems, and more. Activities include learning from faculty in various fields, taking field trips, and participating in engaging academic and social activities. The course will cover broad topics related to plants, what you can study and courses you can take, and how you can put plants to work in a variety of careers. **Credits:** 1.00

HORT 20100 - Plant Propagation

Credit Hours: 3.00. Theoretical and applied aspects of controlled plant reproduction by sexual and asexual techniques, including seeds, grafting and budding, layering, cuttings, micropropagation (in vitro culture), and specialized structures. Lectures emphasize morphological changes and physiological processes involved in plant propagation. Laboratory exercises illustrate the practical applications of propagation techniques. **Credits:** 3.00

HORT 21000 - Fundamentals Of Turfgrass Culture

Credit Hours: 3.00. (AGRY 21000) An introductory course in turfgrass management emphasizing turfgrass growth and development, species characteristics, their adaptation and basic cultural requirements for ornamental and functional turfgrass areas. The requirements and cultural inputs needed for proper establishment and maintenance of a high-quality, low-maintenance lawn will be discussed. **Credits:** 3.00

HORT 21100 - Fundamentals Of Turfgrass Culture Laboratory

Credit Hours: 1.00. (AGRY 21100) Companion lab to AGRY 21000. Laboratory exercises will focus on turfgrass and seed anatomy, morphology, identification as well as the hands-on basic principles of turfgrass culture. Designed for the student who intends to pursue a career in turfgrass management and plans to enroll in AGRY 51000. Enrollment preference will be given to Turfgrass Science Majors. **Credits:** 1.00

HORT 21200 - Greenhouse And Landscape Fundamentals For Educators

Credit Hours: 3.00. (ASEC 21200) This course will prepare future educators in using a greenhouse and landscape as teaching tools. The key focus will be preparing students to apply greenhouse and landscape management fundamentals in order to teach these concepts in the classroom. Laboratories will explore how to identify and produce both woody and herbaceous plants while safely maintaining and operating greenhouse technologies. Students will also explore how to implement landscape design technologies and identify tools, equipment, and landscape plants. Permission of instructor required. **Credits:** 3.00

HORT 21700 - Woody Landscape Plants

Credit Hours: 4.00. Recognition and identification of woody landscape plants; plant characteristics in terms of landscape function. **Credits:** 4.00

HORT 21810 - Flowers For Color

Credit Hours: 1.00. Survey of annual and tender/tropical perennial ornamentals commonly used for seasonal color programs and curb appeal; recognition; cultural requirements; and use in landscape plantings. **Credits:** 1.00

HORT 21820 - Hardy Herbaceous Landscape Plants

Credit Hours: 2.00. Survey of hardy perennial herbaceous ornamentals including native and non-native species, bulbs, groundcovers, grasses, ferns, aquatics; recognition; cultural requirements; and use in landscape plantings. **Credits:** 2.00

HORT 27000 - Floral Design And Interior Plant Management

Credit Hours: 3.00. Elements and principles of floral design, as well as the identification, culture, and propagation of indoor plants. Topics in the art of floral design from both the florist's and the consumer's perspective, as well as information on growing houseplants. A variety of creative, hands-on lab projects include fresh flowers & foliage, silk, and dried materials. **Credits:** 3.00

HORT 27500 - Honors Course - Lower Division

Credit Hours: 1.00 to 4.00. Utilized to offer a new honors course for a maximum of three years. Variable title, credit, and instructional type. Course may be repeated for credit if content and titles are different. Offered primarily to first- and second-year students. Courses offered must be approved by departmental or program faculty and College of Agriculture Honors Committee. Permission of instructor required. **Credits:** 1.00 to 4.00

HORT 29100 - Selected Topics In Horticulture

Credit Hours: 1.00 to 3.00. This variable-credit, lower-level selected topics course will be used for lower-division undergraduate research projects, for development of new lower-division courses and for temporary courses for lower-division students. Permission of instructor required. **Credits:** 1.00 to 3.00

HORT 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in horticulture. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

HORT 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in horticulture. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

HORT 30100 - Plant Physiology

Credit Hours: 4.00. Basic physiological processes of higher plants, particularly as related to the influence of environmental factors on growth, metabolism, and reproduction. Laboratory experiments involve hands-on experience with numerous aspects of plant physiology, including water relations, photosynthesis, growth, dormancy, hormones, and flowering. **Credits:** 4.00

HORT 30600 - History Of Horticulture

Credit Hours: 3.00. The origins and development of agriculture, with specific emphasis on horticulture from prehistory to the present in relation to civilization and modern culture. **Credits:** 3.00

HORT 31110 - Aquaponics

Credit Hours: 1.00. (SFS 31100) (FNR 31300) There has been a significant renewed interest in the investigation of integrated fish-food plant systems. Such systems have a long and rich history, particularly in Asia; and our impending food crisis has kindled an interest in developing aquaponics systems in western countries. Many growers are turning to controlled environment and hydroponic production methods to produce high-value crops in tight quarters. The waste disposal problem of the fish can become the nutrient supply to the plants. **Credits:** 1.00

HORT 31700 - Landscape Contracting And Management

Credit Hours: 3.00. Principles and practices applicable to the installation and management of landscape plants. Topics include site and project assessment, site modification and plant installation, the business practices of estimating and bidding, and plant management. Requires class trips. Students will pay individual lodging or meal expenses when necessary. **Credits:** 3.00

HORT 31800 - Field Production Of Horticultural Crops

Credit Hours: 3.00. A survey of the principles and practices of field production of horticultural crops: fruits, vegetables, herbs, and nursery crops. Production principles will be discussed in lab prep while laboratory exercises will emphasize practical hands-on experience in modern technology of specialty crop production including management inputs, cultivar selection, crop manipulation, harvesting and handling. **Credits:** 3.00

HORT 31900 - Controlled Environment Production Of Horticultural Crops

Credit Hours: 3.00. This course combines production principles with environmental concepts and advances in technology to provide a comprehensive training in sustainable production of herbaceous ornamentals and vegetables in controlled environment systems. The laboratory instruction provides hands-on experience with the practice of growing crops under controlled environments by combining the learning from lab prep with the use of technology to control environment during production. **Credits:** 3.00

HORT 32100 - Hydroponics Systems

Credit Hours: 3.00. This course is designed for students in the department of Horticulture and Landscape Architecture or those interested in controlled environment agriculture (CEA). This course offers students foundational information and hands-on experience on hydroponic and soilless cultivation of horticultural crops. Production practices, growing systems, new technologies, and current challenges are discussed.**Credits:** 3.00

HORT 32200 - Greenhouse Crop Production

Credit Hours: 3.00. This course will offer students foundational information on the principles of planning, organizing, and managing greenhouse operations for bedding plant production. Students will learn about current cultural practices and challenges faced by the industry, as well as how environmental factors are monitored and controlled in production facilities. Hands-on activities will focus on integrated crop management practices for commercial greenhouse production. Case studies and discussions of relevant literature will help prepare students for positions in the green industry.**Credits:** 3.00

HORT 37000 - Professional Floral Design

Credit Hours: 3.00. Principles and techniques of commercial-scale floral design for weddings, funerals, hospitals, personal, and parties. Design construction for fresh, dried, and silk materials. Survey of retail florist management. Permission of department required. **Credits:** 3.00

HORT 39000 - Cooperative Program In Horticulture

Credit Hours: 0.00. Supervised work experience in horticultural industry. Programs must be preplanned and conducted under the direction of the departmental coordinator with the cooperation of an employer. Students must submit a summary report. Permission of department required. **Credits:** 0.00

HORT 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in horticulture. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

HORT 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in horticulture. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

HORT 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in horticulture. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

HORT 40000 - Horticulture Study Abroad

Credit Hours: 0.00 to 8.00. Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities. **Credits:** 0.00 to 8.00

HORT 40300 - Tropical Horticulture

Credit Hours: 3.00. An introduction to the agriculture of the tropics and subtropics, emphasizing horticultural crops. Offered in even-numbered years. **Credits:** 3.00

HORT 42700 - Horticulture Capstone

Credit Hours: 1.00. Based on an approved work or internship experience, or case study, or mentored research experience, or production activity, students will collect information and develop a written analytical exploration of the commercial enterprise, internship institution, or research or production activity. The written analysis will be appropriate to the student's area of concentration. In addition, a summary oral presentation based on specific aspects of their experience will be made by each student. Prerequisite: Completion of an approved work or internship experience or mentored research experience. **Credits:** 1.00

HORT 43500 - Developing An Agricultural Startup

Credit Hours: 4.00. Principles of marketing and business management in the horticultural industries; market organization, performance, and planning; financial planning, pricing, promotion, cost control, and legal aspects of retailing. Case studies in direct farm, floral, and garden center management. **Credits:** 4.00

HORT 45000 - In The English Landscape: Integrating History, Horticulture, And Landscape Architecture

Credit Hours: 3.00. Intensive four weeks in residence in Corsham, UK with visits to significant sites to examine the intersections between human culture and the natural environment that results in the developed landscape. Offered in even-numbered years. Permission of instructor required. **Credits:** 3.00

HORT 47500 - Honors Course - Upper Division

Credit Hours: 1.00 to 4.00. Utilized to offer a new honors course for a maximum of three years. Variable title, credit, and instructional type. Course may be repeated for credit if content and titles are different. Offered primarily to third- and fourth-year students. Courses offered must be approved by departmental or program faculty and College of Agriculture Honors Committee. Permission of instructor required. **Credits:** 1.00 to 4.00

HORT 49100 - Special Assignments In Horticulture

Credit Hours: 1.00 to 3.00. Training in research techniques, statistical methods, and record procedures. Assigned research problems. A written report of work accomplished is required. Permission of instructor required. **Credits:** 1.00 to 3.00

HORT 49900 - Thesis Research

Credit Hours: 1.00 to 6.00. For students doing individualized research on horticultural problems; report required. Arrange with academic advisor and honors research advisor before registering. Admission to the honors program. Permission of instructor required. **Credits:** 1.00 to 6.00

HORT 50600 - Commercial Grape And Wine Production

Credit Hours: 3.00. (FS 50600) A study of professional grape growing and wine production with an emphasis on Midwestern climates, adapted varieties, and recommended wine styles. This course is especially intended for upper-level undergraduate, or graduate students in the College of Agriculture that have completed basic coursework in plant sciences, biology and chemistry. Students will learn the principles of viticulture and enology and the practices of commercial grape growing and wine making. Must be 21 years old. Permission of instructor required.**Credits:** 3.00

HORT 51300 - Nutrition Of Horticulture Crops

Credit Hours: 1.00. An integrated course about plant nutrition focused on horticultural crops. The unique features of nutrient availability in a soil-less horticultural media will be highlighted. An emphasis will be placed on understanding the physiological basis of plant responses to nutrient application. Weeks 1-5. **Credits:** 1.00

HORT 52500 - The Plant Microbiome

Credit Hours: 3.00. Students will learn about the latest methods to collect and analyze root and shoot exudates, quantify the composition and activity of microbes associating with plants, and determine how these associations influence plant health and productivity. Critical reviews of the primary literature and development of a research proposal will help students acquire the skills needed to conduct research on this rapidly emerging topic. **Credits:** 3.00

HORT 53000 - Introduction To Computing For Biologists

Credit Hours: 3.00. This course will teach the basic skills and knowledge required to operate in UNIX environment and program in Python. The course is designed to teach graduate, and advanced undergraduate students in plant and animal sciences the skill set required to analyze and interpret their own datasets. The lectures and associated lab section will provide students hands-on experience in working within a high-performance computing environment to analyze genome-scale datasets. **Credits:** 3.00

HORT 53100 - Applied Plant Genomics

Credit Hours: 2.00. This course aims to provide students an introduction to the theory and practice of functional genomics in plants. The course is centered around the many forms in which DNA sequencing technologies are applied to understand plant genomes, their variation and their function. The course will cover concepts in plant genome sequencing, transcriptome profiling and functional enrichment analyses in sets of genes. This is a full semester course that meets twice a week for: 1. A lecture that covers the rationale and theory of the topic and 2. A hands-on lab section that provides experiential learning with the computational tools and packages used in plant genomics and transcriptomics. **Credits:** 2.00

HORT 54100 - Postharvest Technology Of Fruits And Vegetables

Credit Hours: 1.00. (FS 54100) Theoretical and applied aspects of methods being used for enhancing the quality and shelf life of harvested fruits and vegetables. Factors that affect the longevity of produce and technology used to control these factors and reduce deterioration of produce between harvest and consumption/processing will be emphasized. Weeks 11-15. **Credits:** 1.00

HORT 55100 - Plant Responses To The Environment

Credit Hours: 3.00. Future agricultural production and the environment will encounter multifaceted challenges from global climate change, heat and drought incidence and severity, and limited land and resources. An understanding of how plant responds to these changes is essential to develop new technologies and systems approaches to mitigate the negative impacts and enhance agricultural crop productivity. This is an advanced plant biology course covering the present state of understanding of phenological, physiological, and molecular and genetic mechanisms and processes by which plants acclimate to transient and chronic environmental extremes. **Credits:** 3.00

HORT 55300 - Plant Growth And Development

Credit Hours: 3.00. (BTNY 55300) Topics include seed dormancy, cell expansion and plant growth, pattern formation, phase transition, flowering, pollination and fertilization, seed development, fruit development, and senescence. This course is the second in a series of team-taught courses in the core curriculum of the Purdue Plant Biology Program. **Credits:** 3.00

HORT 57200 - Stakeholder Involvement In Landscape Management

Credit Hours: 2.00. Engaging the public in natural resource decision-making is an increasingly important and complex task. This course provides an overview of how to include diverse stakeholders in decision-making, collaboration, and conflict resolution through readings, class discussions, and role-plays. **Credits:** 2.00

HORT 59000 - Special Studies In Horticulture

Credit Hours: 1.00 to 3.00. Special studies in horticulture not covered in regular coursework. The field in which work is offered will be indicated in the student's record. Permission of instructor required. **Credits:** 1.00 to 3.00

HORT 60100 - Planning And Presenting Plant Science Research

Credit Hours: 1.00. The purpose of this course is to acquaint students with the culture of scientific research and the processes of scientific discovery and review. This course will: (1) acquaint students with techniques used in presenting short scientific talks, as e.g., at national meetings, (2) expose students to procedures used in preparing scientific papers, proposals, etc., (3) introduce students to the outcomes expected to be achieved by graduate education and the processes by which students are mentored and evaluated, (4) help students begin formulating their research project proposal, (5) acquaint students with guidelines for biosafety and responsible conduct of research and provide a forum for discussion of ethical issues confronting researchers, particularly those inherent in participating in extramurally-funded research, (6) acquaint students with intellectual property issues involved in

scientific research, (7) acquaint students with core research facilities across campus, and (8) expose students to discussions regarding the importance of diversity and an atmosphere of mutual respect to research excellence. This course is taken for a letter grade and carries one hour of credit. **Credits:** 1.00

HORT 60200 - Horticulture Research Seminar

Credit Hours: 1.00. Weekly attendance at the Horticulture and Landscape Architecture Departmental seminars to help graduate students develop an appreciation for attending seminars and learning appropriate and effective presentation skills. HORT 602 compliments HORT 60100 and HORT 60300 by extending the presentation and project development approaches learned, so that students are better ready to prepare and defend their project proposals in HORT 60300. Prerequisite: BCHM 56100. **Credits:** 1.00

HORT 60300 - Grants And Grantsmanship

Credit Hours: 1.00. Focuses on funding opportunities in agricultural research and techniques of writing successful scientific grant proposals. Students will write a proposal on a research topic of their choice during the course, and they will gain experience in the peer review process by preparing written reviews of proposals and participating in a panel meeting in which proposals are discussed and ranked. **Credits:** 1.00

HORT 64000 - Metabolic Plant Physiology

Credit Hours: 3.00. (BCHM 64000, BTNY 64000) Topics include photosynthesis, respiration, carbohydrate and lipid metabolism, and nitrogen, sulfur, and secondary metabolism. This course is the third in a series of core courses in the Purdue Plant Biology Program graduate curriculum. Prerequisite: BCHM 56100, BTNY 55300 or HORT 55300, Prerequisite: BIOL 55100 or HORT 55100. **Credits:** 3.00

HORT 69500 - Horticulture Seminar

Credit Hours: 0.00. Topics of current interest to staff and students. **Credits:** 0.00

HORT 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

HORT 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Hospitality and Tourism Management

CSR 40400 - Strategic Management For Service Industries

Credit Hours: 3.00. Effective management of organizational resources in a coherent and seamless manner is necessary to realize a competitive advantage. Through the analysis of internal and external forces, students develop strategies to help an organization realize its goals and objectives. Through the application of concepts, tools, and principles of strategy and competitive advantage, this course emphasizes strategy formulation, implementation, and evaluation to ensure the long-term success of an organization. The course is structured to enhance students' analytical, critical thinking, and verbal skills by integrating academic and experiential knowledge from previous functional courses such as accounting, finance, marketing, operations, human resources, etc. **Credits:** 3.00

HTM 234TN - Cultural Heritage Tourism

Credit Hours: 3.00. Analyzes visitor and host community dynamics and the management of tangible and intangible cultural heritage assets. Elements examined include management and development of cultural tourism attractions and links to community.**Credits:** 3.00

HTM 328HN - Beers Of The World

Credit Hours: 3.00. Explore the world's great beer styles, including imports and craft beers, as well as beer flavors and off-flavors, the brewing process, ingredients, history, beer and food pairing, competitions, judging and more. Sampling and field trips will be required. Students will also be prepared to take the Certified CiceroneR exam.**Credits:** 3.00

HTM 372TN - Tourism Geography

Credit Hours: 3.00. Explores principal geographic features, population centers and attractions including travel destinations across the world.**Credits:** 3.00

HTM 10010 - Exploring Transformational Experiences In Hospitality And Tourism

Credit Hours: 1.00. In an age where experiences have become the new currency, businesses must adapt and thrive in the experience economy to succeed. This course introduces students to the concept of transformational experiences within the experience economy, providing them with the knowledge and skills needed to navigate this dynamic landscape. Students will gain a better understanding of where their passions lie within the broader scope of hospitality and tourism, preparing them for academic and career-related success. **Credits:** 1.00

HTM 10100 - Hospitality And Tourism Student Seminar

Credit Hours: 1.00. Course assists the student new to Purdue to become acquainted with the Purdue system and with the HTM department and program. Information presented to assist students with developing strategies for academic and career-related success at Purdue. **Credits:** 1.00

HTM 14100 - Financial Accounting For The Service Industries

Credit Hours: 3.00. In today's ever-changing service industry, a strong grasp of financial accounting is crucial for effective financial management and business success. In this course, students will learn the practical skills needed to create accurate financial statements, analyze financial data, and make informed decisions. **Credits:** 3.00

HTM 16200 - Introduction To Event And Meeting Planning Industry

Credit Hours: 3.00. Upon completion of this course, students will have a comprehensive overview of the event and meeting industry. Topics will include the supply and demand side of event and meeting management, the basic planning process needed for any event or meeting, sustainability, business ethics, and keeping pace with current industry trends through guest lectures from event and meeting planners. **Credits:** 3.00

HTM 17300 - Tourism Systems

Credit Hours: 3.00. Tourism is a global phenomenon impacting destination communities, incorporating a range of hospitality-related businesses and organizations, and enriching the lives of tourists and residents alike. This course examines key elements of tourism systems, how these elements interact to deliver unique travel experiences, and how destination stakeholders can use

tourism for sustainable development. The course will strengthen students' understanding of tourism systems while preparing them to successfully engage in it for a variety of career options in tourism and hospitality industries. **Credits:** 3.00

HTM 18000 - Hospitality Operations

Credit Hours: 3.00. Hospitality leaders require a deep understanding of the fundamental principles and practical aspects of managing operations within the dynamic and fast-paced hospitality industry to effectively run a business. This course will address topics including principles of management, organizational structures, managerial decision-making, hospitality metrics, and the responsibilities of managers. Through these topics, the course will strengthen students' understanding of the hospitality industry as it exists today while preparing them for the industry of the future.**Credits:** 3.00

HTM 18100 - Introduction To Lodging Management

Credit Hours: 3.00. History, features, operation procedures and management of lodging facilities both in the United States and in other parts of the world. The course involves an experiential learning component. **Credits:** 3.00

HTM 18101 - The Union Club Hotel Experience

Credit Hours: 1.00. Hospitality businesses are complex operations requiring unique managerial approaches to deliver exceptional guest and employee experiences. The Union Club Hotel is ideally positioned to expose students to managerial roles in a multi-million-dollar asset. Students will shadow managers who oversee hotel departments and interact with corporate leaders through this experiential course while learning how managers ensure an exceptional guest experience, provide a positive employee experience, and execute efficient hospitality operations. The knowledge gained in this course is transferable to all hospitality businesses, making this course valuable for all.**Credits:** 1.00

HTM 19100 - Sanitation And Health In Foodservice, Lodging, And Tourism

Credit Hours: 3.00. This course introduces students to the foodservice component of the Hospitality and Tourism industry and explores food safety and other health-related issues. Application of sanitation principles in restaurants, hospitals, schools, hotels, cruise ships, airlines, and international travel are covered. Students must pass a National Sanitation Certification Examination to receive credit. **Credits:** 3.00

HTM 20000 - Career Exploration And Development Seminar

Credit Hours: 1.00. Successfully pursuing a career takes time and intentional effort to build the required expertise to compete in today's job market. As part of the professional development curriculum, this course is designed to equip students with essential skills and knowledge to start the journey in their chosen careers. Through interactive discussions, practical exercises, and guest speakers, students will gain insights into various aspects of career planning, job search strategies, personal branding, and professional growth. The course aims to help students become confident, proactive, and well-prepared professionals as they begin their time at university, while aligning with the National Association of Colleges and Employers Career Readiness Competencies.**Credits:** 1.00

HTM 20200 - Hospitality And Tourism Work Experience

Credit Hours: 1.00. This course is a supervised paid industry work experience in the hospitality and tourism industry. Students are required to present a signed agreement from their employer prior to initiating employment. Students are also required to prepare a series of work and reflective reports. A minimum of 320 work hours is required for completion during either a summer or semester period. **Credits:** 1.00

HTM 21200 - Leading For Success In Service Industries

Credit Hours: 3.00. Effective leaders possess knowledge of organizational behavior and skills which provide the capacity to enhance organizational performance. Drawing upon leadership and organizational behavior theories, this course will provide students with the tools necessary to lead teams in service industries. Areas of focus include understanding individual differences and team dynamics, motivating and developing employees, effective decision-making, communication, influence, diversity, and leading change. This course will include preparation for a leadership development certificate, such as the Dale Carnegie Leadership certificate, to be earned upon successful completion of the course. **Credits:** 3.00

HTM 21800 - Creating Experiences For A Diverse Society

Credit Hours: 3.00. This course will provide students with knowledge and skills related to diversity, equity, and inclusion (DEI), and provide students an opportunity to actively increase their cultural competence to help them work with others effectively in professional settings. The course provides frameworks, terminology, and tools for engaging in productive conversations around difficult topics related to DEI. Students use critical and reflective thinking, as well as effective problem solving to create inclusive experiences for all stakeholders. **Credits:** 3.00

HTM 23100 - Marketing In Service Industries

Credit Hours: 3.00. Marketing plays a crucial role in service industries, addressing unique service challenges. Its importance lies in engaging customers, establishing trust and credibility, distinguishing from competitors, boosting revenue, and fostering sustainable growth and success. This course equips students with a customer-centric approach to service industry marketing, emphasizing the integral role of marketing in a service organization's strategic planning. The course exposes students to service marketing principles, components, and marketing practices. **Credits:** 3.00

HTM 24100 - Managerial Accounting In Service Industries

Credit Hours: 3.00. Interpreting, analyzing, and making decisions based on financial data are core management competencies critical for business success. This course is designed to enable students to interpret and analyze financial data within dynamic and fast-paced service industries. This course focuses on the application of accounting principles, financial tools, and decision-making strategies in service industries. **Credits:** 3.00

HTM 25500 - Advanced Spreadsheet Techniques For Hospitality And Tourism Management

Credit Hours: 2.00. This course builds upon information and skills obtained in an entry-level-computing course. It will take students to the next level by introducing them to more advanced techniques used in Hospitality, Tourism, Retail, and Sales Management. **Credits:** 2.00

HTM 25501 - Fundamentals Of Excel And Data Analytics In Service Industries

Credit Hours: 3.00. The proper application of data analytics is important for optimizing the performance of service enterprises. Spreadsheet programs make it easy to manage and visualize data as well as perform basic data analyses. Microsoft Excel is one of the primary tools used for business reporting and decision-making tasks. In this course, students will receive hands-on training in a wide range of Excel functionalities including using functions and formulas, working with tables, creating charts, and analyzing data using PivotTables. This course will use practical, real-world applications to train students how to make business decisions.**Credits:** 3.00

HTM 26200 - Festivals And Special Events

Credit Hours: 3.00. This course offers a comprehensive overview of the theory and procedures associated with the coordination of festivals and special events. Essential topics will include the conceptualization, planning, coordination, sponsorship,

marketing, funding, staffing, legal issues, and assessment of festivals and special events. Students will gain hands-on experience by volunteering to work a minimum of six hours to set up, help coordinate, or tear down a large-scale festival or special event. **Credits:** 3.00

HTM 29000 - Seminar

Credit Hours: 1.00. Current issues facing the hospitality and tourism industry are presented and discussed. An emphasis is placed on exploring the various means used to study and understand these issues. Admittance into the HTM Honors Program. **Credits:** 1.00

HTM 29001 - Food And Beverage Management

Credit Hours: 3.00. Food and beverage (F&B) operations are integral to the hospitality and tourism industry. This course equips students with the foundational knowledge needed to directly manage commercial and non-commercial F&B operations and successfully partner with external F&B providers in lodging, events, tourism, and other hospitality settings. Students are introduced to how F&B processes are integrated with marketing, procurement, and financial management. Students must pass accredited industry recognized certification exams.**Credits:** 3.00

HTM 29101 - The John Purdue Room Restaurant Experience

Credit Hours: 2.00. Hospitality enterprises are complex, requiring experience in operations and customer service to ensure organizational success. The John Purdue Room (JPR) is uniquely positioned to provide students with experiential learning in a restaurant operation. Students rotate through staff and management positions in various roles. Production methods, equipment and product flow are covered in the back-of-the-house, while customer service and service recovery techniques are practiced in the front-of-the-house. Management skills learned and practiced in the JPR are transferable to all service industries. **Credits:** 2.00

HTM 29102 - Introduction To Foodservice Management

Credit Hours: 3.00. An introduction to food preparation methods and service techniques in quantity food settings. Students become familiar with ingredients and culinary terminology, and learn to read, write and evaluate menus. Recipe conversion, inventory and costing skills are developed. Production methods, equipment, and product flow are examined. Front-of-the-house service techniques as well as front-and-back-of-the-house interactions will be studied. **Credits:** 3.00

HTM 29700 - Introduction To Honors Research

Credit Hours: 1.00. Introduces students to the design and implementation of an honors research project. **Credits:** 1.00

HTM 30000 - Semester Internship Experience In Hospitality And Tourism

Credit Hours: 0.00. Mechanism to recognize students in the Purdue system the semester they are off campus participating in an approved semester internship program with a hospitality company. Permission of department required. **Credits:** 0.00

HTM 30200 - Hospitality And Tourism Industry Internship I

Credit Hours: 1.00 or 2.00. Opportunities for learning through professional work experience that is practical, meaningful, and aligned with career aspirations are important for career development, planning, and goal setting. As part of the professional development curriculum, this internship course provides students with entry-level experience within the hospitality and tourism industry, broadening their exposure and understanding of the industry to explore potential career paths. Guided by the Ray

Kavanagh Career Center and the National Association of Colleges and Employers (NACE) Career Readiness Competencies, students apply what they are learning in the classroom to the workplace.**Credits:** 1.00 or 2.00

HTM 31100 - Procurement Management For Foodservice

Credit Hours: 3.00. Identifies and describes food, supplies, and related merchandise used in the foodservice industry. Provides methods and criteria for recognizing quality, evaluating, specifying, purchasing, and inspecting these products. Discusses the use of technology in the purchasing component of the foodservice industry. **Credits:** 3.00

HTM 31200 - Talent Management For Service Industries

Credit Hours: 3.00. Service organizations are labor-intensive, requiring effective talent management to be successful. Managers must be able to attract, develop, motivate, and retain employees to deliver exceptional service. Building on leadership skills and management principles, this course will emphasize the strategic role of human resource management with topics that span the lifecycle of a job (e.g., recruitment, selection, training, performance management, compensation, etc.). Students will explore the science behind effective talent management, developing knowledge and skills that will prepare them to manage a growing and diverse workforce. **Credits:** 3.00

HTM 31400 - Franchising

Credit Hours: 3.00. The study of franchise administration, operations, and marketing, with a special emphasis on hospitality-related franchises. Includes a study of the legal regulation of franchises, the franchisee-franchisor relationship, and unique problems in operating a franchise. **Credits:** 3.00

HTM 31500 - Club Management And Operations

Credit Hours: 3.00. A study of the organization, administration, operation, and opportunities within the private club industry, with emphasis on the manager's duties. **Credits:** 3.00

HTM 31700 - Business Etiquette For Managers

Credit Hours: 1.00. A review of contemporary standards of human interaction in the workplace. How manners, etiquette and style affect and enhance everyday dealings with others. **Credits:** 1.00

HTM 32200 - Hospitality Facilities Management

Credit Hours: 3.00. Technical and managerial issues relating to the operation and maintenance of the physical plant and equipment in hospitality industry facilities. **Credits:** 3.00

HTM 33100 - Hospitality And Tourism Sales And Service

Credit Hours: 3.00. Application of sales and customer service methods used to generate revenues for hospitality and tourism businesses. Emphasis is placed on a hands-on assignment which requires students to identify a product that they will market and sell, as well as participate in a sales blitz. **Credits:** 3.00

HTM 34100 - Operations Control And Analysis In The Hospitality Industry

Credit Hours: 3.00. Applications of the control process and quantitative analysis to effectively manage an efficient and profitable hospitality business. The emphasis is on planning budgets, controlling operational activities, and evaluating performance. **Credits:** 3.00

HTM 34200 - Financial Management For Service Industries

Credit Hours: 3.00. To create value for owners, managers need to understand the implications of long-term investment and the importance of securing finance to ensure sustainable growth. The primary purpose of this course is to understand the role of financial management, to learn analytic concepts and managerial tools for making capital investment decisions and to become familiar with major financial instruments and concepts such as time value of money, risk-return, capital budgeting, cost of capital, and capital structure.**Credits:** 3.00

HTM 35100 - E-Business For The Hospitality Sector

Credit Hours: 3.00. This course introduces the students to the technological foundation of the internet, e-business strategies and models, as well as the social and ethical issues concerning the internet. The students will gain a better understanding of how hospitality and tourism organizations conduct internet-based activities, and have integrated their online and overall business strategies. **Credits:** 3.00

HTM 35700 - Disruption And Innovation In Hospitality & Tourism

Credit Hours: 3.00. Hospitality and tourism businesses face unprecedented industry shifts requiring proactive leaders. Through this course students will develop an innovative mindset, rethink the status quo, and amplify their creative thinking in designing solutions to current and future business challenges.**Credits:** 3.00

HTM 36200 - Event And Meeting Management

Credit Hours: 3.00. The principles and practices of event and meeting management will be covered in this course, including: strategic event planning process, project management, risk management, financial management, human resources, stakeholder management, meeting or event design, site location and management, marketing, professionalism, and ethics. Students will gain hands-on experience planning, directing, organizing and controlling a small-scale event. **Credits:** 3.00

HTM 37000 - Sustainable Tourism And Responsible Travel

Credit Hours: 3.00. This course will examine issues associated with sustainability in the hospitality and tourism industry. It will examine how principles of sustainable development and the triple bottom line (economic, social and environmental) are applied to hospitality and tourism. The course will address sustainability across a variety of tourism sectors including destination management, lodging, restaurants and meetings. The course will also examine consumer issues associated with sustainability. **Credits:** 3.00

HTM 37200 - Global Tourism Geography

Credit Hours: 3.00. Introduction and analysis of specific world travel destinations, including the exploration of geographic features, customs and tradition, population centers, visitor attractions, political, religious, language and other cultural differences as these relate to the hospitality and travel industry. The course is designed to teach students specific geographic knowledge and develop a deeper understanding and empathy for cultural values and traditions that exist outside their own culture. **Credits:** 3.00

HTM 38110 - Revenue Management In Service Industries

Credit Hours: 3.00. Revenue management plays a vital role in guiding service businesses to allocate resources efficiently, understand customer behavior, stay competitive, and achieve long-term sustainability and profitability. This course provides students with the theoretical foundation and practical applications of revenue management in service industries. The course cultivates students' revenue optimization mindset and analytical skills. Students will have the opportunity to earn an industry-recognized certification. **Credits:** 3.00

HTM 38600 - Fundamentals Of Hotel Asset Management

Credit Hours: 3.00. The value of a hotel is based on both its operation and the real estate holding. A successful manager needs to understand the relationship between operations and the management of the real estate asset. Hotel asset management involves overseeing operating performance and real estate planning with the goal of achieving long-term profitability and enhancing the value of the hotel property. This course will introduce students to the principles and practices of hotel asset management including real estate management, contracts, as well as the planning and execution of hotel investments. Students with an interest in hospitality finance and real estate investment are encouraged to take graduate-level courses in this area and explore the finance and real estate minors following the successful completion of this course.**Credits:** 3.00

HTM 39000 - Undergraduate Special Problems

Credit Hours: 0.00 to 6.00. Individual or group participation in supervised reading, laboratory experiences, field experiences, or research in special areas of the field. Permission of instructor required. **Credits:** 0.00 to 6.00

HTM 39001 - Undergraduate Research In Hospitality And Tourism Management

Credit Hours: 1.00 to 3.00. This course allows undergraduate students to gain valuable experience and knowledge through research in the hospitality and tourism industry. Permission of instructor required. **Credits:** 1.00 to 3.00

HTM 39200 - Classical Cuisine

Credit Hours: 1.00. Supervised hands-on cooking experience to enhance competencies needed in professional cooking. Permission of instructor required. **Credits:** 1.00

HTM 39700 - Directed Honors Research

Credit Hours: 1.00 to 3.00. Directed independent honors research for CFS Honors Program students. Students must select a faculty advisor for the course. Permission of instructor required. **Credits:** 1.00 to 3.00

HTM 39800 - International Special Topics

Credit Hours: 1.00 to 6.00. Course taken during an international experience that is recognized by the University. **Credits:** 1.00 to 6.00

HTM 39900 - Special Topics In HTM

Credit Hours: 1.00 to 6.00. Various topics that may change from semester to semester are presented by HTM faculty. **Credits:** 1.00 to 6.00

HTM 40000 - Career Mastery: Navigating Your Career And Professional Development Seminar

Credit Hours: 1.00. Successful professionals possess a strong sense of self and the ability to observe the world around them, reflecting, synthesizing, and responding effectively. As the capstone to the professional development curriculum, students have the ability to refine these skills through discussion and reflection in this seminar-style course. Guided by the National Association of Colleges and Employers (NACE) Career Readiness Competencies, this course focuses on honing various aspects of personal and professional development, with a focus on contemporary issues in the workplace, ensuring students are prepared to be effective leaders. Students will be confident, proactive, and well-prepared professionals with a mindset required to successfully transition into the professional world.**Credits:** 1.00

HTM 40200 - Hospitality And Tourism Industry Internship II

Credit Hours: 1.00. Career development is an ongoing process of refinement and reflection of professional aspirations as one moves along their career path accumulating work experience. As part of the professional development curriculum, and building on the HTM 30200 entry-level internship experience, this course provides students with a graduate-ready experience in their chosen field, focusing on leadership skill development. Through hands-on experiences and guided learning, students gain real-world professional experience while refining their leadership abilities. Students reflect on their performance to foster personal growth in preparedness for careers post-graduation.**Credits:** 1.00

HTM 41100 - Hospitality And Tourism Law

Credit Hours: 3.00. Legal issues can damage or even destroy businesses. The primary goal of this course is to educate students to identify behaviors and situations that are likely to result in legal liability for themselves and their operation. By identifying potential legal liabilities, students will be able to develop strategies to reduce their exposure and better determine when to involve a lawyer. Topics include court procedures, civil rights, contracts, negligence, legal and ethical relationships with patrons, employment law, real estate law, ethics, and risk management. Students will use critical thinking and effective problem-solving to analyze cases and determine potential ways to reduce the likelihood of similar legal problems in the future. **Credits:** 3.00

HTM 42200 - Hospitality Facilities Design And Management

Credit Hours: 3.00. The facility is the largest asset for most hospitality operations and profoundly impacts guest experience. How it is designed and managed can be the difference between operational success and failure. The primary goal of this course is to foster student understanding of facility design and physical plant maintenance. Students will learn standard language and concepts along with problem-solving and project management techniques to enable cost-effective decisions in creating a physical environment that maximizes the guest experience.**Credits:** 3.00

HTM 43600 - Customer-Centric Service Design And Management

Credit Hours: 3.00. This course explores and informs the design, management, and innovative strategies of customer-centric firms through the theoretical and empirical services management literature. The course uses conceptual frameworks and cases from a variety of industry sectors. **Credits:** 3.00

HTM 44100 - Financial Management For The Hospitality Industry

Credit Hours: 3.00. This course deals with subjects and issues facing a financial manager in the hospitality and tourism industry. The primary purposes of this course are to understand the role of financial management, to learn analytic concepts and managerial tools for making capital investment decisions and to become familiar with major financial instruments and concepts such as time value of money, risk-return, capital budgeting, cost of capital, capital structure. **Credits:** 3.00

HTM 44300 - Hospitality Operations Control And Analysis

Credit Hours: 3.00. To be successful, a business must maximize revenue and efficiently control costs. This course will equip students with the knowledge and skills needed to plan, analyze, and control service operations. Students will learn essential

managerial skills such as establishing operational standards, forecasting sales, budgeting, controlling, and evaluating performance throughout the product cycle.**Credits:** 3.00

HTM 46200 - Advanced Event And Meeting Management

Credit Hours: 3.00. Advanced aspects of meeting and event management principles and practices will be covered in this course. A focus is placed on: strategic planning, project management, finance and risk management, event design, site management, and ethics. **Credits:** 3.00

HTM 49000 - Independent Study

Credit Hours: 1.00 to 4.00. Independent study. Permission of instructor required. **Credits:** 1.00 to 4.00

HTM 49110 - Wine Sommelier Certification

Credit Hours: 1.00. This course involves the application of previously learned information about the principles of wine including vine growing, wine production, sensory evaluation of wine and practices involved in selection and sales of wine in a foodservice establishment. Students are immersed in the analysis and application of the principles and practices of the Guild of the Master Sommelier Program including Level one Certification. Student must be at least 21 years of age. **Credits:** 1.00

HTM 49111 - Beverage Operation Management

Credit Hours: 1.00. This course teaches students the historical background and modern day principles and management practices regarding the production, selection, purchasing, storage, and service of beverage alcohol in all aspects of the hospitality industry. Students must pass the ServSafe Responsible Service of Alcohol certification examination to earn course credit. **Credits:** 1.00

HTM 49112 - Management And Service Of Beverage Alcohol

Credit Hours: 2.00. This course introduces the principles and practices associated with the production of beverage alcohol in the hospitality industry. Lectures and structured tastings will guide students in identifying and describing the unique characteristics of fermented beverages commonly found in the hospitality industry. Course fee. Students will be tasting alcohol as part of this course, they need to be at least 21 years of age to do so legally. Department permission required. **Credits:** 2.00

HTM 49200 - Advanced Foodservice Management

Credit Hours: 4.00. Utilize managerial skills and techniques with planning, organizing, directing and controlling a full-service restaurant operation. Management teams of two to three students develop, market, and operate a restaurant that is open to the public. Emphasis is placed on utilizing effective management skills to create a high-quality, profitable operation with well planned systems and highly motivated, organized employees. **Credits:** 4.00

HTM 49201 - Hospitality Operation Management And Leadership

Credit Hours: 4.00. Students apply managerial skills and techniques in organizing, directing and controlling a full-service restaurant operation as they rotate through a variety of managerial positions. Students will also participate in lectures, assignments, and projects on topics related to leadership, such as interpersonal communications (emphasis on culture, gender and age differences), ethical leadership (emphasis on integrity and credibility), public speaking, teamwork and critical thinking. Permission of department required. **Credits:** 4.00

HTM 49700 - Honors Research Project

Credit Hours: 1.00 to 4.00. The completion of the independent honors research project for CFS Honors Program students. Must have an approved Honors Project Proposal. Permission of instructor required. **Credits:** 1.00 to 4.00

HTM 49900 - Feasibility Studies And Business Development In Hospitality And Tourism

Credit Hours: 3.00. The study of business development. The course will cover all stages in the feasibility and development process. Emphasis will be on strategic planning, design of systems, models and problem analysis, leading to the opening of a successful hospitality or tourism business. **Credits:** 3.00

HTM 49901 - Strategic Management In Service Industries

Credit Hours: 3.00. Effective management of organizational resources in a coherent and seamless manner is necessary to realize a competitive advantage. By analyzing internal and external forces, students develop strategies to help a service organization realize its goals and objectives. Through the application of concepts, tools, and principles of strategy development and competitive advantage, this course emphasizes strategy formulation, implementation, and evaluation to ensure the long-term success of a service organization. The course is structured to enhance students' analytical, critical thinking, and communication skills by integrating their academic and experiential knowledge from previous functional courses such as accounting, finance, marketing, operations, human resources, etc. **Credits:** 3.00

HTM 50100 - Research Methods In Hospitality And Tourism

Credit Hours: 3.00. Introduction to behavioral and economic research design, and the development of research proposals. **Credits:** 3.00

HTM 50101 - Statistical Laboratory

Credit Hours: 1.00. Introduction to the use of software used in behavioral research projects. **Credits:** 1.00

HTM 50200 - Management Information Systems For The Hospitality Industry

Credit Hours: 3.00. Analysis and design of management information systems for hotels, restaurants, and the travel industry. Topics include cost and value information, data management, local area and wide area networks, implementation of system and impact of information systems on hospitality organizations. **Credits:** 3.00

HTM 50300 - Business Statistics And Quantitative Analysis In Hospitality

Credit Hours: 3.00. Data analysis is an important skill for effective managerial decision-making. As advances in technology have made substantial amounts of data available to managers, it is increasingly important to be able to convert business data into actionable information. This course deals with the fundamentals of statistical analysis and forecasting techniques. Students will develop the ability to summarize and quantitatively analyze business data and make forecasts while taking into account seasonality and trends. **Credits:** 3.00

HTM 50400 - Consumer Behavior

Credit Hours: 3.00. Understanding how and why consumers make decisions about purchasing goods, services, and experiences allows companies to tailor their business strategies, product development, and customer service efforts to meet the specific needs and preferences of their target customer base. This course addresses the growing demand for professionals to better understand psychological, social and situational influences of consume behavior. This course provides students not only with an understanding of consumer behavior concepts and theories, but also with the tools and methodologies that can be directly applied

to real-world scenarios to navigate dynamic markets, effectively engage customers, and drive business success in today's competitive marketplace.**Credits:** 3.00

HTM 50500 - Hotel Asset Management & Investment

Credit Hours: 3.00. Asset management is an indispensable discipline in the hospitality industry, aimed at maximizing the value of hotel properties in alignment with the owners' and investors' strategic objectives. A competent manager in the industry needs to possess basic understanding of asset management principles and practices for operational and strategic decisions. This course exposes students to the multifaceted world of representing ownership interests in managing hotel investments, and helps students to establish a robust corporate finance foundation to become a competent manager in the industry. Through this course, students develop a nuanced understanding of the intricate interplay among operational issues, real estate management, and financial decisions, and effectively apply the learned knowledge to hotel real estate investment and operation strategies.**Credits:** 3.00

HTM 50600 - Leading People In Service Industries

Credit Hours: 3.00. Leadership requires an understanding of human behavior, organizational culture, and strategy. In this class, students are exposed to leadership theory through the extant literature. Facilitated by readings and class discussion, students develop critical and analytical understanding of how theory informs and connects to practice. The course topics include human resources functions, organizational and human behavior, human values and motivations, team dynamics, decision-making, and change management. This course takes an interdisciplinary approach, with student learning drawn from different fields.**Credits:** 3.00

HTM 50700 - Integrated Marketing Communications For Service Industries

Credit Hours: 3.00. This course addresses the unique challenges and opportunities in marketing the intangible, inseparable, variable, and perishable service products. Balancing theoretical research and practical applications, this course provides a systematic review of key components and processes for an effective integrated marketing communication for service industries. Students will learn how to leverage both long-standing and emerging marketing communication approaches (e.g., strategic marketing and promotion, branding, public relations, digital marketing, social media, influencer marketing and artificial intelligence application) to create customer awareness, manage customer expectations, build customer relationships, and ensure customer satisfaction and loyalty.**Credits:** 3.00

HTM 50800 - Cultivating A Service Excellence Mindset

Credit Hours: 3.00. Understanding the fundamental principles of service management is essential to successfully manage service organizations in a complex market environment. This course utilizes major theoretical frameworks, such as Service-Dominant Logic, to address key issues in managing service organizations, including creating service culture, motivating a service-minded workforce, co-creating service value, and achieving service excellence. Students develop managerial skills through a thorough understanding of service strategies, systems, and processes to optimize service value.**Credits:** 3.00

HTM 50900 - Service Experience Design

Credit Hours: 3.00. The success of service organizations requires well-planned design of the service environment and customer experience journey to enhance operational efficiency and excellence, drive customer satisfaction and loyalty, and differentiate from competitors. Addressing the importance of developing and providing optimal customer experience in service industries, this course aims to inspire a design-thinking approach to create contemporary customer experiences in various service settings. By gaining insights from the service design theories, students will gain knowledge to effectively manage the physical environment, service interactions, and service delivery processes to enhance the overall service experience quality. Learning by practice, students will apply the learned design tools to envisage, blueprint, and devise innovative service experience solutions.**Credits:** 3.00

HTM 51000 - Strategic Revenue Management In Service Industries

Credit Hours: 3.00. Revenue management is a vital strategic tool enabling decision-makers to coordinate various functions leading to company-wide profit maximization. This course empowers students with analytical tools to generate optimal revenue solutions in a competitive marketplace. In the course, students learn economics of pricing and market competition, models and algorithms for capacity allocation, overbooking, and forecasting through a variety of real-world contexts.**Credits:** 3.00

HTM 51100 - Hospitality Business Law And Risk Management

Credit Hours: 3.00. This course provides an overview and analysis of the legal aspects of managing a hospitality and tourism business. Risk management principles will be utilized to develop liability mitigation plans. Discussion board and case studies will be utilized to facilitate students' understanding and application of legal concepts for managing and owning businesses. Topics covered include: the rights and responsibilities of hospitality businesses and owners in the areas of civil rights, employment law, negligence, contract law, relationships with guests and others, licensing, real estate law, and product liability; the principles of risk management; and the fundamentals of business insurance. **Credits:** 3.00

HTM 51200 - Leadership In Hospitality And Tourism

Credit Hours: 3.00. This course will focus on the knowledge and skills required for effective leadership. Topics will draw upon an extensive body of research on leadership theory and practice and cover organizational behavior and team dynamics, business communication, decision-making, motivation and change management. In addition, specific skill development in the areas of problem-solving, written and oral communications, leading teams and goal setting, it will include models for examining personal career paths, ethical decision-making and the role or organizational change agents. This course will take an interdisciplinary approach and analyze leadership through different lenses and how leadership insights can be effectively applied to hospitality organizations. Students will examine leadership examples where individuals moved an organization from normal to exceptional functioning and extraordinary results. **Credits:** 3.00

HTM 51300 - Strategy In Service Industries

Credit Hours: 3.00. Strategic management plays a pivotal role in helping industry leaders gain a competitive advantage and accomplish business goals in an ever-changing marketplace. This course centers on the exploration of various theories, frameworks, and models to understand contemporary issues and challenges in service industries. Through the application of strategic management principles and strategy-oriented tasks, students comprehend essential topics in strategic management, including environmental and competitor analysis, strategic planning, strategy formulation, strategy execution, and strategic evaluation and control.**Credits:** 3.00

HTM 51400 - Business Analytics For Service Industries

Credit Hours: 3.00. In today's highly dynamic business environment, decision-makers often encounter problems that are complex and data intensive. This course focuses on a variety of techniques from the field of business statistics and exposes students to statistical and decision analytics to solve data-driven decision-making problems. The course adopts a practical spreadsheet-based approach to facilitate decision-making and explores the practical applications of these techniques across various functional fields, with a specific focus on service industries.**Credits:** 3.00

HTM 52200 - Foodservice Equipment And Facility Design

Credit Hours: 4.00. Development of efficient workspaces for hospitality operations. Topics include the principles of selection, operation, and maintenance of foodservice equipment; the application of human factors, ergonomics, environmental concerns in the development of workflow patterns; and the use of computer-aided design (CAD) to prepare facility drawings. **Credits:** 4.00

HTM 53100 - Hospitality And Tourism Marketing II

Credit Hours: 3.00. This course will examine marketing strategy in tourism and hospitality organizations. Students will actively engage in the application, analysis, and evaluation of marketing principles as they are applied to tourism and hospitality. **Credits:** 3.00

HTM 53600 - Advanced Service Management In Hospitality And Tourism

Credit Hours: 3.00. Approximately two-thirds of U.S. economic activity resides in the service sector. Subsequently, service firms' foci on the needs of their customers are rewarded by positive customer outcomes such as behavioral loyalty and positive word of mouth. This course explores and informs the design, management, and innovative service strategies of firms who operate in the service sector through the theoretical and empirical services management literature. **Credits:** 3.00

HTM 54100 - Advanced Hospitality Accounting And Finance Systems

Credit Hours: 3.00. Specialized accounting and finance systems as related to the hospitality industries. Applications of budgeting and pricing models, performance evaluations and incentives systems, and short-term asset management are discussed, as well as other current subjects. **Credits:** 3.00

HTM 54200 - Strategic Revenue Management In The Hospitality Industry

Credit Hours: 3.00. In this course, we will treat revenue management as a strategic platform for maximizing property-wide incomes, thus property value. The course is designed to provide students the theoretical foundation, tactical tools, and practical applications of revenue management. At the end of the course, students should be able to identify the problems and challenges during the implementation of revenue management systems and anticipates future trends and prospects. **Credits:** 3.00

HTM 55300 - Cultivating A Service Excellence Mindset For Healthcare Professionals

Credit Hours: 3.00. Notwithstanding the importance for healthcare services to prioritize clinical outcomes for patients, there is a growing need to think about the patient experience beyond science-driven, evidence-based practices. The healthcare sector is being transformed by consumerism and transparency that demands a more holistic approach to managing the patient experience. In order to promote patient engagement and to enhance their experience, an intentional strategic intent, as reflected in a service excellence mindset, is required. This course seeks to establish the foundation of this mindset for healthcare professionals that are driven to make a difference in their patients' lives. The aim of the course is for students to develop a greater appreciation for the complexity of providing excellent service in the healthcare industry. The course will stimulate students to think differently and more deeply about the patient experience through a service management lens. In doing so they will develop the necessary skills to make effective decisions in the constantly changing patient experience landscape. Permission of department required.**Credits:** 3.00

HTM 55400 - Designing The Patient Experience For Contemporary Healthcare Systems

Credit Hours: 3.00. In the rapidly evolving healthcare industry, optimizing the patient experience remains a fundamental focus of practice. Addressing the practical challenge and complexity of providing excellent healthcare services, this class aims to inspire a design-thinking approach to reimagine and reinvent the patient experience in the contemporary healthcare systems. Learning by practice, students will apply the design tools to envisage, blueprint, and devise a patient experience solution. Gaining insights on experience-centric innovations in the healthcare domain, students will develop capabilities to better manage the service interactions, facility, and processes to enhance the quality of the patient experience and ease the stress of a hospital stay. Permission of department required.**Credits:** 3.00

HTM 55500 - Investing In Healthcare Human Capital

Credit Hours: 3.00. The modern work environment is increasingly focused on working with people in teams - working with people and for people. In seeking to motivate and lead people, it is imperative to acknowledge individuals have different backgrounds, perspectives, and viewpoints. In successfully balancing the challenges of working with people in the labor intensive, diverse and high-stakes nature of the healthcare industry, this class seeks to provide knowledge on organizational behavior concepts (e.g., employee performance, satisfaction, engagement, and motivation; group behavior, teamwork; emotional labor, stress, work-life balance) and the skills to practice this knowledge as a healthcare professional. This course will provide students with the foundational building blocks to adapt to the changing landscape of the work environment, applying theories and exercising critical thinking skills to realize a transformative healthcare workforce experience. Permission of the department required.**Credits:** 3.00

HTM 57100 - Economics Of Travel And Tourism

Credit Hours: 3.00. This course includes the asset theory of tourism, cost-benefit analysis, tax policy impacts, and other economic and statistical aspects of tourism. The course will examine research designed to determine economic impacts of the hospitality and tourism industries. **Credits:** 3.00

HTM 58100 - Advanced Hotel Management

Credit Hours: 3.00. A study of current service management theories as they apply to hotel management. Theory topics include strategic planning, hotel organization and communication, organizational leadership, and control systems. Topics will be discussed from the viewpoint of the hotel's general manager. **Credits:** 3.00

HTM 59000 - Problems In Hospitality And Tourism

Credit Hours: 1.00 to 4.00. Individual study in advanced subject areas. A course plan must be submitted to the supervising professor. Permission of instructor required. **Credits:** 1.00 to 4.00

HTM 59001 - Graduate Professional Industry Internship

Credit Hours: 1.00. The Graduate Professional Industry Internship allows graduate students to gain valuable experience through paid employment with a company in the hospitality and tourism industry or a related industry. In addition, each student will research an issue and provide a potential solution to a problem faced by the employer. This course is not repeatable without special permission from the HTM Graduate Policy Committee and is only open to HTM graduate students who have completed a minimum of two semesters and 16 hours of graduate coursework in HTM. Credit is not allowed for both HTM 59001 and HTM 59002. Permission from Graduate Professional Industry Internship Coordinator is required to enroll in this course. Permission of instructor required. **Credits:** 1.00

HTM 59002 - Graduate Professional Industry Research

Credit Hours: 3.00. The primary emphasis of the Graduate Professional Industry Research is research on a relevant issue within the hospitality and tourism industry. To enhance the research project, it is anticipated that the research will typically be linked to a paid employment experience in the hospitality and tourism industry or a related industry. This course is not repeatable without special permission from the HTM Graduate Policy Committee and is only open to HTM graduate students who have completed a minimum of two semesters and 16 credit hours of graduate coursework in HTM. Credit is not allowed for both HTM 59001 and HTM 59002. Permission from the Graduate Professional Industry Research Coordinator is required to enroll in this course. Permission of department required. **Credits:** 3.00

HTM 59100 - Research Issues In Food Service Management

Credit Hours: 3.00. The course will focus on research issues related to the food service industry and their short- and long-term implications. Topics will include essential issues in food safety, product development, food service consumer interests, food production, and waste management. Exposure to quantity food production and purchasing. **Credits:** 3.00

HTM 59500 - Applied Management Concept

Credit Hours: 4.00. In this capstone course students integrate their knowledge with concepts and skills learned from previous coursework. Students will examine and deliberate executive-level hospitality and tourism concepts. They shall create an innovative project to address the micro and macro variables of an industry problem, gap, or challenge in Hospitality and Tourism Management (HTM) that synthesizes analytical, critical thinking, business, strategic, and operational hospitality and tourism management skills. Students shall conduct applied management research, access and gather plan-specific information, and construct both hospitality-standardized written and presentation versions of the project. Permisson of department required. **Credits:** 4.00

HTM 60100 - Research Development And Design

Credit Hours: 3.00. This course will equip doctoral students to think like a scholar and develop the ability to design rigorous research. Students will learn research philosophy, research idea development, and the development and evaluation of research processes and methods. Emphases are placed on developing students' confidence in conceptualizing, developing, designing, and writing empirical and theoretical research.**Credits:** 3.00

HTM 60200 - Research Topics And Methods Seminar

Credit Hours: 1.00. Examination of current research in hospitality and tourism. Focuses on industry research needs and appropriate methodologies. Open to graduate students and honors undergraduates. Required for doctoral students. Prerequisite: HTM 50100, STAT 50100, STAT 50200. **Credits:** 1.00

HTM 61200 - HTM Management Challenge Analysis

Credit Hours: 3.00. A course designed to discuss specific management problems in the hospitality and tourism industries. Through the use of case studies, students study current challenges, management analysis, the process of decision-making, and the impacts of corporate decisions. Prerequisite: basic management organization class. **Credits:** 3.00

HTM 61400 - Theory Of The Consumer

Credit Hours: 3.00. This course will examine concepts and theories that have been developed for understanding consumer choices and behaviors in society and marketplaces. Students will learn classic and modern consumer theories, such as behavioral economics and applied psychological and sociological theories. It will discuss how these theories can help explain consumer tendencies such as preferences, choices, and other consumption-related behaviors. **Credits:** 3.00

HTM 61500 - Theory Of The Firm

Credit Hours: 3.00. In this course, students examine concepts, models, and theories developed for the understanding of firm and organizational behavior. This course equips students with knowledge of classic and contemporary theories, such as those related to managerial economics, pricing and price discrimination, organizational structure and culture, employee productivity, firm financial behaviors, marketing management, and operations management.**Credits:** 3.00

HTM 63100 - Strategic Marketing In Hospitality And Tourism

Credit Hours: 3.00. Evaluates the role of marketing strategy within overall corporate strategic planning. Segmentation theory, brand segmentation, niche marketing, program life cycles, and positioning approaches are discussed. Emerging concepts, such as visioning, relationship marketing, strategic alliances, and database marketing are studied. Prerequisite: HTM 53100. **Credits:** 3.00

HTM 64200 - Advanced Personnel Systems In Restaurants, Hotels, And Institutions

Credit Hours: 3.00. Examination of the philosophical and operational alternatives related to establishing and directing human resource systems in complex restaurant, hotel, and institutional organizations. Prerequisite: HTM 34100, 41100; 6 credit hours at the upper division undergraduate level in Business, Management, Marketing. **Credits:** 3.00

HTM 68100 - Seminar In Hotel Management Research

Credit Hours: 3.00. Analysis of hotel industry research based on current policy issues. Prerequisite: HTM 58100. **Credits:** 3.00

HTM 69000 - Hospitality And Tourism Research Problems

Credit Hours: 1.00 to 4.00. Development of an individual research project for doctoral students. Projects are designed to broaden understanding of specific research techniques or to add to subject matter knowledge necessary for completion of the doctoral thesis. A paper worthy of submission to a refereed journal is expected upon project completion. Prerequisite: Doctoral student standing. Permission of instructor required. **Credits:** 1.00 to 4.00

HTM 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

HTM 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Human Development and Family Science

HDFS 10000 - Orientation To Current Issues In Human Development And Family Science

Credit Hours: 1.00. Introduction to fields related to Human Development and Family Science, including majors and career paths. You will meet faculty, alumni, and professionals working in related areas. You will be matched with an advanced student mentor who will help you learn how to become successful as a HDFS student and beyond. Required of all students majoring in the department. Non-majors interested in learning more about HDFS majors are also welcome. **Credits:** 1.00

HDFS 20100 - Introduction To Relationship And Family Science

Credit Hours: 3.00. An examination of interpersonal processes involved in forming and maintaining quality relationships with family members and close others. Emphasis is on relationship dynamics and family functioning across the life course. Also considered are linkages between relationship and family processes and the broader social environment. Basic components of the research process will be introduced. **Credits:** 3.00

HDFS 21000 - Introduction To Human Development

Credit Hours: 3.00. This course provides an introduction to the development of individuals from the prenatal period to adulthood and old age. Theories and research findings related to physical growth, cognitive and language development and social and emotional development will be discussed. CTL: Developmental Psychology. **Credits:** 3.00

HDFS 22500 - Human Development Across Cultures

Credit Hours: 3.00. This course provides a basis for interdisciplinary exploration of cross-cultural human development and family relations throughout the lifespan. Key topics include international variation in cultural understandings of parent-child relationships, gender roles, education, work, social relationships, and health/wellness. Students will explore professional applications in an increasingly globalized world. **Credits:** 3.00

HDFS 26000 - Young Children With Exceptional Needs

Credit Hours: 3.00. A broad overview of learner characteristics and service delivery models for young children (birth-8 years) who are at-risk or have identified disabilities. Students gain understanding of disabilities in young children, of laws relating to persons with disabilities, and roles of special and general educators in providing services to students with identified disabilities. **Credits:** 3.00

HDFS 28000 - Diversity In Individual And Family Life

Credit Hours: 3.00. Students are introduced to aspects of individual and family life in diverse cultures, particularly racially and/or ethnically diverse families in the United States. The nature of relationships between dominant and minority cultures is considered. Implications of diversity for practice with diverse populations are emphasized throughout the course. **Credits:** 3.00

HDFS 30500 - Biosocial Foundations Of The Family

Credit Hours: 3.00. Family ties and family processes in the promotion of individual health and management of disease across the life course are covered. Course reviews research on families and health from multiple disciplinary perspectives. **Credits:** 3.00

HDFS 31000 - Guidance In Early Childhood

Credit Hours: 3.00. This course presents a developmental, child-centered approach to the guidance and discipline of young children, including children with disabilities. Influential theories, relevant research, and effective guidance methods for the early childhood teachers and other professionals working with young children and families, including families from different cultural and economic backgrounds, are discussed. Admitted to Gate B. **Credits:** 3.00

HDFS 31100 - Child Development

Credit Hours: 3.00. This course addresses the study of development from infancy through childhood. It includes processes of physical, cognitive, language, social, and emotional development. Processes are discussed within the framework of historical and contemporary theories and current research. In addition, it covers topics related to methodologies used in the study of infant and child development. Finally, the conditions of children in different parts of the world are considered. **Credits:** 3.00

HDFS 31200 - Adult Development

Credit Hours: 3.00. An in-depth study of developmental processes from the transition to adulthood through old age. Particular emphasis is placed on understanding the influence of contexts on adult development. **Credits:** 3.00

HDFS 31300 - Adolescent Development

Credit Hours: 3.00. An overview of the normative developmental changes that occur during adolescence, with specific attention to individual and relational adjustment. **Credits:** 3.00

HDFS 31400 - Atypical Child Development

Credit Hours: 3.00. Atypical child development from conception to adolescence can emerge from genetic, medical/health, educational, psychological, and/or contextual factors. This course will survey factors (e.g., premature birth, obesity, neurodevelopmental disorders, learning difficulties, child abuse, and war) that contribute to atypical child development. It will assess how and when typical and atypical developmental trajectories diverge and the roles of measurement and intervention. **Credits:** 3.00

HDFS 31801 - Developmental Assessment

Credit Hours: 3.00. This course provides an introduction to the variety and characteristics of developmental assessments for young children, birth to age 8. Students learn formal and informal strategies for documenting individual development and learning; linking assessment and instruction; and, the use of assessment for determining eligibility for early intervention/early childhood special education. Students learn partnering with families, other professionals, as well as cultural and ethical issues in assessment. **Credits:** 3.00

HDFS 32500 - Health And Health Care For Children And Families

Credit Hours: 3.00. This course discusses leading causes of child health problems as well as examines the child and family reactions and adjustment to illness and disability. A developmental perspective on coping with health problems from early childhood through adolescence is presented. An overview on global child health disparities is also addressed. **Credits:** 3.00

HDFS 33000 - Sexuality And Family Life

Credit Hours: 3.00. Provides the student with a basic knowledge of human sexuality as it pertains to individuals, couples and families. The course is designed to be helpful to students who will become family life educators as well as to be helpful to students as individuals, spouses, and parents. **Credits:** 3.00

HDFS 33100 - Skills For Helping Professionals In Individual, Family And Group Settings

Credit Hours: 3.00. This course is an introduction to skills commonly used in helping professions, including relationship-building skills, beginning interviewing skills, and group process skills. Attention is paid to cultural competence and professional ethics. This course includes a weekly lab experience involving practice of the helping skills, as well as a service-learning project in which helping skills are used in a community setting. **Credits:** 3.00

HDFS 33200 - Stress And Coping In Contemporary Families

Credit Hours: 3.00. Examines theoretical perspectives related to family stress and resilience in multicultural and diverse family settings, and connects these perspectives to empirical work on family dynamics, coping, and dysfunction across the lifespan. Topics such as economic stress and poverty, immigrant families, single-parent families, homeless families, adoption, military families, maltreatment, and families coping with illness are explored. The class focuses on environmental, cultural, as well as biological contributions to both risk and resilience processes in individuals and families. **Credits:** 3.00

HDFS 34100 - Working With Parents

Credit Hours: 3.00. This course focuses on developing and maintaining effective relationships between parents and professionals working with children, within the context of family-centered practices. Issues related to cultural, linguistic, economic, and developmental differences that affect relations between families and professionals are examined. **Credits:** 3.00

HDFS 34300 - Assessment And Case Management

Credit Hours: 3.00. This course is an introduction to case management as a service delivery approach for helping individuals and families in need. This course provides opportunities to practice basic helping and case management skills such as building rapport, assessing client needs, developing intervention plans, professional ethics, and professional writing. **Credits:** 3.00

HDFS 34600 - Research Design And Program Evaluation

Credit Hours: 3.00. This course is an introduction to research methods as used in community programs for children and families including review and application of existing research literature, generating research questions, conducting program needs assessments, evaluating processes and outcomes of existing programs, designing and interpreting applied research studies, and understanding ethical responsibilities in the use and application of research. Instruction has been designed to provide the skills necessary to use existing research and generate new data to benefit programs. **Credits:** 3.00

HDFS 34800 - Administration Of Social Service Not-For-Profit Organizations

Credit Hours: 3.00. This course introduces students to aspects of not-for-profit management identified as keys by leaders in existing agencies. Students will prepare themselves for specifically establishing, building, working in and leading not-for-profit organizations. **Credits:** 3.00

HDFS 39000 - Special Topics In HDFS

Credit Hours: 1.00 to 6.00. Supervised readings, discussion, lectures and/or research on special topics in family and individual development. Permission of instructor required. **Credits:** 1.00 to 6.00

HDFS 39800 - International Special Topics

Credit Hours: 1.00 to 6.00. Course taken during an international experience that is recognized by the University. **Credits:** 1.00 to 6.00

HDFS 40000 - Social Studies In Preschool And Primary Grades

Credit Hours: 2.00. This course focuses on teaching social studies in preschool and primary grade classrooms. It covers the developmental foundations and curriculum applications of social studies teaching in pre-kindergarten and of social studies in primary grades and includes ways to plan, implement and evaluate developmentally appropriate instruction for children with and without disabilities and children who are learning English. Field hours will be required.**Credits:** 2.00

HDFS 40500 - Language, Literacy, And Social Studies In Preschool And Primary Grades

Credit Hours: 3.00. This course focuses on teaching language, literacy and social studies in preschool and primary-grade classrooms. It covers the developmental foundations and curriculum applications of language, literacy and social studies teaching in pre-kindergarten and of social studies in primary grades and includes ways to plan, implement and evaluate developmentally appropriate instruction for children with and without disabilities and children who are learning English. **Credits:** 3.00

HDFS 40510 - Literacy In Preschool And Primary Grades

Credit Hours: 3.00. This course focuses on teaching literacy in preschool and primary-grade classrooms. It covers the developmental foundations and curriculum applications of literacy teaching in pre-kindergarten and primary grades and includes ways to plan, implement, and evaluate developmentally appropriate instruction for children with and without disabilities and children who are learning English. Field hours will be required.**Credits:** 3.00

HDFS 40600 - Mathematics In Preschool And Primary Grades

Credit Hours: 4.00. This course focuses on teaching mathematics in preschool and primary grade classrooms. It covers the developmental foundations and curriculum applications of mathematics teaching and includes ways to plan, implement and evaluate developmentally appropriate mathematics instructions for children with and without disabilities and children who are learning English. Field-based experiences in preschool or primary-grade classrooms are included. **Credits:** 4.00

HDFS 40800 - Early Intervention / Early Childhood Special Education: Issues And Professional Practices

Credit Hours: 4.00. An introduction to the field of early intervention / early childhood special education including its origin, services, and practices in working with young children ages birth through eight with or at risk for developmental delays and disabilities and their families. Designing curriculum, environments, and services where all children are included, have equal opportunity for access and engagement, and feel a sense of belonging is addressed. For Early Childhood Education and Exceptional Needs majors only. A field experience in preschool or primary-grade classrooms is included. **Credits:** 4.00

HDFS 40900 - Science In Preschool And Primary Grades

Credit Hours: 3.00. This course focuses on teaching science in preschool and primary grade classrooms. Developmental foundations and curriculum applications of science teaching including ways to plan, implement and evaluate developmentally appropriate science instruction for young children with and without disabilities and those who are learning English. **Credits:** 3.00

HDFS 41200 - Professionalism And Music And Movement In Early Childhood

Credit Hours: 3.00. This course focuses on foundations of professionalism in early childhood education and early childhood special education. Additionally, this course discusses music and movement in early learning environments. It covers the developmental foundation and curriculum applications of music and movement activities and includes ways to plan, implement and evaluate developmentally appropriate music and movement instruction for children with and without disabilities and children who are learning English. **Credits:** 3.00

HDFS 41500 - Approaches To Early Childhood Education

Credit Hours: 3.00. The historical and theoretical basis for early childhood education and early intervention is emphasized. Relations between theory and practice are examined and illustrated with model early childhood programs. Addresses cultural/developmental diversity, ethics, and standards in early childhood education and intervention. **Credits:** 3.00

HDFS 41800 - Understanding Autism

Credit Hours: 3.00. (PSY 41800, SLHS 41800) This course will explore the etiology, neuroscience, diagnosis, and treatment of autism spectrum disorder (ASD). Approached from a multi-disciplinary perspective this course brings together gene, brain, and behavioral sciences with the aim of developing a better understanding of autism. The course will begin with an overview of ASD as a complex behavioral phenotype. This will include discussion of the history ASD and the expansion of the diagnostic criteria associated with the disorder. This introduction will be followed by several classes in which we will examine some of the key domains of impairment in ASD: reciprocal social interaction, language and communication, and restricted and repetitive

behaviors. We will also consider the deficits associated with, but not defining of ASD, and examine co-morbid conditions frequently present in individuals with ASD. We will then address the topics of brain architecture, neurochemistry, and genetics and gene expression, all of which we will attempt to relate back to the behavioral features of autism. We will end the course with a review of treatment practices and their efficacy and an examination of impact of ASD on the family and society. **Credits:** 3.00

HDFS 42000 - Developmental Foundations Of Infant And Toddler Curriculum

Credit Hours: 3.00. Study of typical and atypical development in infants and toddlers as well as implication for practice. Focuses on infant toddler developmental assessment and designing and implementing learning activities in all developmental areas and enhancing parent/professional relationships. Includes a practicum experience with infants and toddlers. **Credits:** 3.00

HDFS 43030 - Human Development And Family Studies Student Mentors

Credit Hours: 1.00 to 3.00. Advanced undergraduate students selected for this opportunity to serve as mentors to beginning and prospective HDFS students in the department's orientation course (HDFS 10000). Mentors will be matched with a small group of students with similar major/career interests. Mentors will lead small group discussions, provide guidance and feedback, and otherwise serve as a role model to the students. Mentors will receive support and training to be effective in this role. Permission of instructor required. **Credits:** 1.00 to 3.00

HDFS 44000 - Expanded ECEEN Student Teaching

Credit Hours: 1.00 to 3.00. This is a full semester of supervised expansion of student teaching in an approved environment that serves children ages birth through 3rd grade with and without disabilities. This experience will occur the semester prior to full-time student teaching and be supervised by an HDFS faculty member and the classroom cooperating teacher. Monthly HDFS sponsored professional development seminars will also be required.**Credits:** 1.00 to 3.00

HDFS 45000 - Supervised Teaching In Inclusive Programs For Young Children

Credit Hours: **16.00.** This is 16 full-time weeks of supervised teaching in an approved environment that serves children ages birth through 3rd grade with and without disabilities. This experience will be supervised by a HDFS faculty member and the classroom cooperating teacher. Monthly HDFS-sponsored professional development seminars and additional teacher education meetings will also be required. This will partially fulfill requirements for the Indiana Early Childhood Education and the Early Childhood Special Education teaching license. Admission to Student Teaching required.**Credits:** 16.00

HDFS 45010 - Supervised Teaching In Inclusive Programs For Young Children

Credit Hours: 12.00. This is 16 full-time weeks of supervised teaching in an approved environment that serves children ages birth through 3rd grade with and without disabilities. This experience will be supervised by a HDFS faculty member and the classroom cooperating teacher. Monthly HDFS-sponsored professional development seminars and additional teacher education meetings will also be required. This will partially fulfill requirements for the Indiana Early Childhood Education and the Early Childhood Special Education teaching license. Admission to Student Teaching required.**Credits:** 12.00

HDFS 45100 - Internship & Career Preparation For Human Services

Credit Hours: 2.00. This course includes an overview of HDFS-related professions, self-evaluation, career search skills, exploration of internship opportunities, and professional development. Students will complete arrangements for their field placement. **Credits:** 2.00

HDFS 45400 - Internship & Career Preparation For Developmental And Family Science

Credit Hours: 2.00. This course includes an overview of HDFS-related professions, self-evaluation, career search skills, exploration of internship opportunities, and professional development. Students will complete arrangements for their field placement. **Credits:** 2.00

HDFS 45500 - Human Services Capstone Internship

Credit Hours: 6.00 or 12.00. Supervised full-time or half-time internship in human services, doing work typical of an entry-level bachelor-degreed professional. Students will integrate and build upon knowledge developed during their studies in human services. Students will use and enhance their skills in direct service to client or indirect service. Students will work in the placement setting secured during HDFS 45400. Example field placement sites include: government or community agencies; social service agencies; hospitals; and recreational settings. Permission of Department required. Must be a student in good academic standing during the internship semester. **Credits:** 6.00 or 12.00

HDFS 45800 - Development And Family Science Capstone Internship

Credit Hours: 6.00. Supervised internship for the Developmental & Family Science major, doing work typical of an entry-level bachelor-degreed professional. Students will integrate and build upon knowledge developed during their studies in developmental and family science. Students will use and enhance their skills in child development, family and community health, or another area related to developmental and family science. Students will work in the placement setting secured during HDFS 45400. Must be a student in good academic standing during the internship semester. Permission of Department required. **Credits:** 6.00

HDFS 49000 - Independent Study

Credit Hours: 1.00 to 4.00. Independent study. Permission of instructor required. **Credits:** 1.00 to 4.00

HDFS 49101 - Mentored Research In Human Development And Family Studies I

Credit Hours: 3.00. Independent study in which student engages in research under the supervision of a faculty member. Involves developing a research proposal, beginning the project, and submitting a summary of the project plan and progress. First semester of a two-semester sequence to fulfill the requirements of the capstone thesis for the Developmental & Family Science major. Permission of instructor required. **Credits:** 3.00

HDFS 49102 - Mentored Research In Human Development And Family Studies II

Credit Hours: 3.00. Independent study in which student engages in research under the supervision of a faculty member. Involves completing a research project, writing up the results, and presenting the results to a new audience. Second semester of a two-semester sequence to fulfill the requirements of the capstone thesis for the Developmental & Family Science major. Permission of instructor required. **Credits:** 3.00

HDFS 59000 - Special Problems

Credit Hours: 0.00 to 5.00. Special subjects for investigation and experiment according to the individual student's interest and need. Permission of instructor required. **Credits:** 0.00 to 5.00

HDFS 60000 - Families And Health Across The Life Course

Credit Hours: 3.00. Interpersonal processes of family members and close others in the promotion of individual health choices and management of disease across the life course are covered. Course topics include involvement of family and close others in: health promotion and disease prevention; disease management; interactions with healthcare providers; and informal caregiving in the family context. **Credits:** 3.00

HDFS 60100 - Advanced Child Development

Credit Hours: 3.00. This course provides an overview of foundational and current developmental research on changes that occur within the individual throughout infancy, childhood, and early adolescence. Emphasis is given to processes and mechanisms that have been proposed to explain developmental changes. This course includes attention to social and cultural contexts within which individuals develop. Prerequisite: Graduate-level coursework in Child Development or Psychology. **Credits:** 3.00

HDFS 60200 - Advanced Family Studies

Credit Hours: 3.00. Integrative and comprehensive assessment of both classic and recent contributions in the field of family studies. Other topics include major theory and research, historical, current, and future critical issues in family studies. Prerequisite: 12 hours of social sciences including six hours of advanced undergraduate courses preparing student for the study of the family. **Credits:** 3.00

HDFS 60400 - Developmental And Family Approaches To Diversity And Oppression

Credit Hours: 3.00. In this course, we will utilize an intersectional lens throughout the course to critically examine the development of individuals oppressed due to their minority status in the United States. We will review current research and literature across disciplines to: 1) understand the origin, meaning, and purpose of race and racism; 2) learn about the history of oppression and resilience of minoritized groups; 3) analyze systems of discrimination; 4) introduce theoretical frameworks for studying the unique, intersectional experiences of minoritized populations and examples of their application to empirical research, and 5) discuss how research can be used to advance social justice. Permission of department required. **Credits:** 3.00

HDFS 60600 - Advanced Human Development

Credit Hours: 3.00. This course provides an overview of human development and serves as a graduate-level introduction to HDFS. Relevant theories and models will provide the structure for consideration of the nature, processes, and mechanisms of developmental change. Particular attention will be paid to diversity in developmental influences and trajectories, including atypical development. Students will gain specific knowledge and professional skills through the pursuit of individual research interests, culminating in a written grant proposal and class presentation of the proposal. **Credits:** 3.00

HDFS 61300 - Quantitative Methods I: Inferential Statistics And ANOVA

Credit Hours: 3.00. This course provides a basic understanding of foundational concepts and tools used in statistical analysis and inference in the behavioral sciences, including data preparation, sample description, hypothesis testing, univariate and bivariate statistics, and ANOVA. Emphasis is placed on the conceptual and interpretive understanding of statistical methods. Prerequisite: Undergraduate coursework in Statistics. **Credits:** 3.00

HDFS 61500 - Research Methods In Child And Family Study

Credit Hours: 4.00. Basic research methods employed in the study of children and families are examined, including quantitative and qualitative designs, data collection, analysis, and interpretation. In the laboratory component, students are afforded supervised practice in the application of various methods using selected statistical analysis programs. Prerequisite: Graduate course in Statistics. Permission of instructor required. **Credits:** 4.00

HDFS 61700 - Quantitative Methods II: Regression

Credit Hours: 4.00. This course has two primary goals: 1) provide students with foundational knowledge related to linear regression statistical analyses, and 2) provide students with the opportunity to practice writing, interpreting, and presenting

regression analyses for the purposes of dissemination. Prerequisite: HDFS 61300 or PUBH 60100 or STAT 50100 or PSY 64600. Permission of instructor required. **Credits:** 4.00

HDFS 61900 - Adolescent And Youth Development In Context

Credit Hours: 3.00. This graduate-level course examines the major developmental issues of adolescents and youth with attention to their familial, cultural, and socio-economic backgrounds. Topics include health and well-being; biological, socio-emotional, and cognitive development; sexual and racial/ethnic identity; risks and resilience; peer and family relationships; civic engagement and activism; positive youth development; and the transition to adulthood. Course readings focus primarily on adolescents and youth in the United States, although international contexts are also incorporated across the class. **Credits:** 3.00

HDFS 62000 - Current Issues In Early Childhood Education

Credit Hours: 3.00. Emphasis on current issues in early childhood education as they are affected by contemporary social change with observation and analysis of a variety of programs for young children. Prerequisite: HDFS 60100. **Credits:** 3.00

HDFS 62200 - Child Development Within The Family Context

Credit Hours: 3.00. This course provides an overview of (1) foundational and current child development theories and (2) research on typical individual change throughout infancy and childhood within the family context. Emphasis is given to milestones, and to the processes and mechanisms proposed to explain developmental change. The course takes a chronological age-approach to study development within the family context and covers the following stages: prenatal and infancy, early childhood, and middle childhood. Initially the course places the individual within the larger family context and then delineates development/growth within the realms of physical growth, brain, motor, sensation, perception, language, social, cognitive, feeding/eating, sleep, self-regulation, attachment, and temperament/personality development. Across these realms diversity and historical standards around typical development expectations will also be incorporated. Permission of instructor required. **Credits:** 3.00

HDFS 62500 - Child And Family Social Policy

Credit Hours: 3.00. An examination of selected issues related to child and family policy relevant to scholars of CDFS. These issues include: (1) influences of research on children and families on the policy process; (2) the role of child and family specialists as advocates and analysts; (3) policy formulation, enactment, and evaluation; and (4) child and family policy in cross-national perspective. Prerequisite: HDFS 60100 and HDFS 60200. **Credits:** 3.00

HDFS 62700 - Multilevel Modeling In Developmental And Family Research

Credit Hours: 3.00. This course gives students a basic grounding in the class of statistical techniques known as multilevel modeling (MLM), also known as hierarchical linear modeling (HLM), mixed models, or random coefficient models. Primary discussions will be on applications of these models to the study of marriages, relationships, families, aging, and child and adult development, but also will touch on biomedical, educational, and economic examples. The focus is on three types of multilevel models: growth-curve models, organizational models, and daily experience models. Students will also learn how to use SAS Proc Mixed for conducting MLM analyses. Students are assumed to have taken at least two graduate statistics courses and have a solid understanding of regression analysis. Prerequisites: STAT 50100 and STAT 50200 or HDFS 61300 and PSY 63100. **Credits:** 3.00

HDFS 62800 - Structural Equation Modeling

Credit Hours: 3.00. This course provides an introduction to classic structural equation models with latent variables (SEM). The primary steps of implementing SEMs will be covered to include: model specification, model identification, parameter estimation,

and model evaluation (model fit). Background training in statistical regression is required. Permission of instructor required. **Credits:** 3.00

HDFS 62900 - Interventions Across Developmental And Family Contexts

Credit Hours: 3.00. This course will focus on the scientific foundations of designing and conducting interventions for improving the human condition across diverse developmental and family contexts. A particular emphasis in this course will be on experimental and quasi-experimental designs for making causal inferences and understanding mechanisms of intervention effects. Students will gain specific knowledge of intervention design, implementation and fidelity, and scale-up of interventions, as well as how to evaluate proposed or existing interventions. Co-design processes with intervention users and qualitative methods for understanding intervention needs and implementation will also be examined. Prerequisite: none. **Credits:** 3.00

HDFS 64400 - Biosocial Processes In Developmental And Family Research

Credit Hours: 3.00. In this course we discuss theoretical models and empirical research regarding the interplay between biology and context in development, focusing on the unique interactions that occur within families. Prerequisite: HDFS 60100 and HDFS 60200. **Credits:** 3.00

HDFS 64900 - Multidisciplinary Gerontology

Credit Hours: 3.00. A multidisciplinary overview of aging that provides a background for graduate studies on aging. An examination of sociological, psychological, and biological theory and research in the field of aging. The aging process from cells to social security will be covered. Guest lectures introduce students to experts in gerontology on Purdue's campus. Projects will assist students in developing appropriate professional skills in their field of study. Students are expected to have basic research and writing skills in their field of study. The course serves as a graduate-level introduction to the field of gerontology. There are several options for course projects. Prerequisite: HDFS 60100 and STAT 50100. **Credits:** 3.00

HDFS 65800 - Attachment Relationships

Credit Hours: 3.00. This graduate course studies child-parent relationships theory and research from the respective of Attachment Theory. Prerequisite: CDFS 60300. Permission of instructor required. Prerequisite: HDFS 60100 and a basic graduate-level statistic course. **Credits:** 3.00

HDFS 67900 - Qualitative Research On Families

Credit Hours: 3.00. Provides an introduction to qualitative research theory and methods and prepares graduate students to conduct and evaluate qualitative family research. Students conduct observations, interviews, and basic data analysis. Prerequisite: a course in research methods. **Credits:** 3.00

HDFS 68000 - Professional Issues For Child And Family Specialists

Credit Hours: 3.00. Professional issues involved in working with children and families. Questions of ethics, legal relationships, and value problems may be pursued, as may such pragmatic inquiries as the role of professional organizations and labor unions in these fields. **Credits:** 3.00

HDFS 68500 - Current Research Topics In Child Development And Family Studies

Credit Hours: 1.00 to 3.00. Consideration of current subjects in child development and family studies research. Particular emphasis will be placed on one topic each semester according to the research interests of the instructor. **Credits:** 1.00 to 3.00

HDFS 68501 - Developmental Seminar

Credit Hours: 1.00. Consideration of current subjects in child development and family studies research. Particular emphasis will be placed on one topic each semester according to the research interests of the instructor. **Credits:** 1.00

HDFS 69000 - Directed Research In HDFS

Credit Hours: 1.00 to 4.00. Directed research and supervised research on a topic in student's area of specialization. Permission of instructor required. **Credits:** 1.00 to 4.00

HDFS 69700 - Graduate Student Colloquium

Credit Hours: 1.00. Research presentations by faculty members, graduate students, and invited speakers. Includes attention to: (1) the responsible conduct of research, (2) professional/scholarly and teaching development, and (3) diversity, equity, and inclusion. **Credits:** 1.00

HDFS 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

HDFS 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Industrial Engineering

IE 577 - Human Factors In Engineering

Credit Hours: 3.00. (PSY 57700) Survey of human factors in engineering with particular reference to human functions in human-machine systems, and consideration of human abilities and limitations in relation to design of equipment and work environments. **Credits:** 3.00

IE 20000 - Industrial Engineering Seminar

Credit Hours: 0.00. An orientation course to inform students of the major options in the industrial engineering program, assistance in selection of appropriate electives to meet career objectives, introduction to the faculty, and selection of an academic advisor. **Credits:** 0.00

IE 23000 - Probability And Statistics In Engineering I

Credit Hours: 3.00. An introduction to probability and statistics. Probability and probability distributions. Mathematical expectation. Functions of random variables. Estimation. Applications oriented to engineering problems. **Credits:** 3.00

IE 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in industrial engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

IE 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in industrial engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

IE 30000 - Honors Program Seminar

Credit Hours: 0.00. An orientation course intended for juniors who have demonstrated exceptional academic ability and desire to conduct meaningful independent research or solve unique engineering design projects during their senior year of study. **Credits:** 0.00

IE 33000 - Probability And Statistics In Engineering II

Credit Hours: 3.00. Introduction to statistical inference and experimental design. Correlation, regression, single and multi-factor ANOVA, non-parametric methods. Applications to statistical quality control. **Credits:** 3.00

IE 33200 - Computing In Industrial Engineering

Credit Hours: 3.00. Introduction to computing in industrial engineering. Reinforcement of scientific programming skills on typical IE tasks, together with introduction to simulation and related computer tools. **Credits:** 3.00

IE 33500 - Operations Research - Optimization

Credit Hours: 3.00. Introduction to deterministic optimization modeling and algorithms in operations research. Emphasis on formulation and solution of linear programs, networks flows, and integer programs. **Credits:** 3.00

IE 33600 - Operations Research - Stochastic Models

Credit Hours: 3.00. Introduction to probabilistic models in operations research. Emphasis on Markov chains, Poisson processes, and their application to queuing systems. **Credits:** 3.00

IE 34300 - Engineering Economics

Credit Hours: 3.00. Cost measurement and control in engineering studies. Basic accounting concepts, income measurement, and valuation problems. Manufacturing cost control and standard cost systems. Capital investment, engineering alternatives, and equipment replacement studies. Not open to students with credit in CE 39400. **Credits:** 3.00

IE 37000 - Manufacturing Processes I

Credit Hours: 3.00. Principal manufacturing processes; metal cutting, grinding and metal forming operations, machine tools, and tools and tooling. Nontraditional machining and welding. Introduction to computer-aided manufacturing and computer-aided graphics and design, N/C programming, robots, and flexible manufacturing systems. Classroom and laboratory demonstrations included. Not open to students with credit in ME 36300. **Credits:** 3.00

IE 38199 - Professional Practice Co-Op I

Credit Hours: 0.00. Professional practice with qualified employers in industry, government, or small business and a comprehensive written report of this practice. Professional Practice students only. Permission of department required. **Credits:** 0.00

IE 38299 - Professional Practice Co-Op II

Credit Hours: 0.00. Professional practice with qualified employers in industry, government, or small business and a comprehensive written report of this practice. Professional Practice students only. Permission of department required. **Credits:** 0.00

IE 38300 - Integrated Production Systems I

Credit Hours: 3.00. Basic concepts in the design and operational control of integrated production systems. Includes topics on facility layout and material handling, material flow and information flow, resource and capacity planning, and shop floor control and scheduling. **Credits:** 3.00

IE 38399 - Professional Practice Co-Op III

Credit Hours: 0.00. Professional practice with qualified employers in industry, government, or small business and a comprehensive written report of this practice. Professional Practice students only. Permission of department required. **Credits:** 0.00

IE 38600 - Work Analysis And Design I

Credit Hours: 3.00. Fundamentals of work methods and measurement. Applications of engineering, psychological, and physiological principles to the analysis and design of human work systems. **Credits:** 3.00

IE 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in industrial engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

IE 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in industrial engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

IE 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in industrial engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

IE 39699 - Professional Practice Internship

Credit Hours: 0.00. Professional practice with qualified employers within industry, government, or small business and a comprehensive written report of this practice. Permission of department required. **Credits:** 0.00

IE 43100 - Industrial Engineering Design

Credit Hours: 3.00. Capstone design experience for industrial engineering students involving analysis and synthesis of unstructured problems in practical settings. Students work in teams to formulate issues, propose solutions, and communicate results in formal written and oral presentations. Prerequisite: all 30000-level industrial engineering courses required for the BS IE degree. **Credits:** 3.00

IE 47000 - Manufacturing Processes II

Credit Hours: 3.00. The interrelations of materials, processes, and design with various aspects of manufacturing. **Credits:** 3.00

IE 47200 - Imagine, Model, Make

Credit Hours: 3.00. This course develops a holistic view of an initial competency in engineering design by conceiving, designing, manufacturing, and optimizing a system component such as a complex structural part. Activities include hand sketching, CAD modeling, and operation of CNC machining equipment for rapid prototyping. Tolerance requirements will be verified and optimized prior to the fabrication of the part in the laboratory using rapid prototyping techniques. The focus is on the design process itself as well as the complementary roles of human creativity and computational methods and tools. **Credits:** 3.00

IE 47400 - Industrial Control Systems

Credit Hours: 3.00. Introduction to automatic controls with reference to automation of industrial machines and processes, including linear dynamic systems, feedback control, and elements of systems analysis. Introduction to digital control. **Credits:** 3.00

IE 48100 - Introduction To System Simulation

Credit Hours: 3.00. The course presents a general introduction to simulation concept and methodology. It covers simulation modeling in specialized simulation environments. Practical application of simulation to diverse systems will be discussed. Proper design and analysis of the simulation experiment is emphasized. Permission of department required. **Credits:** 3.00

IE 48400 - Integrated Production Systems II

Credit Hours: 3.00. Extensions of topics on the design and operational control of integrated production systems. Includes production databases, facility layout, material handling, advanced control and scheduling, and physical distribution. Case studies, lab assignments, and projects. **Credits:** 3.00

IE 48600 - Work Analysis And Design II

Credit Hours: 3.00. Continuation of IE 38600. Applications of engineering, computer sciences, information sciences, and psychological principles and methods to the analysis and design of human work systems. **Credits:** 3.00

IE 49000 - Special Topics In Industrial Engineering

Credit Hours: 1.00 to 6.00. Special topic courses and projects of contemporary importance or of special interest that are outside the scope of the standard undergraduate curriculum. Permission of instructor required. **Credits:** 1.00 to 6.00

IE 49500 - Industrial Practices Seminar

Credit Hours: 1.00. Solution of industrial engineering problems, with particular emphasis on current industrial experience obtained through the cooperative engineering education program. For cooperative program students only. **Credits:** 1.00

IE 49900 - Research In Industrial Engineering

Credit Hours: 1.00 to 6.00. Individual research projects for students with honors standing, or other students with the approval of their advisors. Permission of instructor required. **Credits:** 1.00 to 6.00

IE 52500 - Healthcare Delivery Systems

Credit Hours: 3.00. This course is to introduce the interconnected sectors in the complex U.S. healthcare delivery systems, including in-patient care, emergency departments, surgical services, out-patient clinics, long-term care, pharmacies, laboratories, as well as supporting industries such as insurance, food services, information technologies, etc. The course focuses on the management of healthcare services by the industrial engineering principles and quantitative decision-making methodologies. **Credits:** 3.00

IE 53000 - Quality Control

Credit Hours: 3.00. Principles and practices of statistical quality control in industry. Control charts for measurements and for attributes. Acceptance sampling by attributes and by measurements. Standard sampling plans. Sequential analysis. Sampling inspection of continuous production. **Credits:** 3.00

IE 53200 - Reliability

Credit Hours: 3.00. Reliability of components and multi-component systems. Application of quantitative methods to the design and evaluation of engineering and industrial systems and processes for assuring reliability of performance. Economic and manufacturing control activities related to product engineering aspects of reliability. Principles of maintainability. Product failure and legal liability. **Credits:** 3.00

IE 53300 - Industrial Applications Of Statistics

Credit Hours: 3.00. The application of statistics to the effective design and analysis of industrial studies relating to manufacturing and human factors engineering in order to optimize the utilization of equipment and resources. Emphasis on conducting these studies at the least cost. **Credits:** 3.00

IE 53500 - Linear Programming

Credit Hours: 3.00. Optimization of linear objective functions subject to linear constraints. Development of theory and algorithmic strategies for solving linear programming problems. **Credits:** 3.00

IE 53600 - Stochastic Models In Operations Research I

Credit Hours: 3.00. An introduction to techniques for modeling random processes used in operations research. Markov chains, continuous time Markov processes, Markovian queues, reliability and inventory models. **Credits:** 3.00

IE 53700 - Discrete Optimization Models And Algorithms

Credit Hours: 3.00. An introduction to classic models and algorithms for discrete optimization. Basic theory and computational strategies for exact and heuristic solution of integer, combinational, and network problems in the context of classic models. **Credits:** 3.00

IE 53800 - Nonlinear Optimization Algorithms And Models

Credit Hours: 3.00. Survey of computational tools for solving constrained and unconstrained nonlinear optimization problems. Emphasis on algorithmic strategies and characteristic structures of nonlinear problems. **Credits:** 3.00

IE 54100 - Nature-Inspired Computation

Credit Hours: 3.00. This course is about algorithms that are inspired by naturally occurring phenomena and applying them to optimization, design and learning problems. The focus is on the process of abstracting algorithms from the observed phenomenon, their outcome analysis and comparison as well as their "science". This will be done primarily through the lens of evolutionary computation, swarm intelligence (ant colony and particle-based methods) and neural networks. **Credits:** 3.00

IE 54500 - Engineering Economic Analysis

Credit Hours: 3.00. Analysis of engineering costs and capital investments. Applications of classical optimization, mathematical programming, and the theory of production to the analysis of investment proposals. Evaluation and selection of individual projects and formulation of capital investment programs. **Credits:** 3.00

IE 54600 - Economic Decisions In Engineering

Credit Hours: 3.00. Topics in decision-making and rationality including decision analysis, decision-making under uncertainty, and various descriptive and prescriptive models from operations research, economics, psychology, and business. Applications are drawn from engineering decision-making, public policy, and personal decision-making. Attention also is paid to designing aids to improve decision-making. **Credits:** 3.00

IE 54900 - Machine Vision In Intelligent Robotic Systems

Credit Hours: 3.00. Introduction to machine vision and learning algorithms from a human-machine interaction standpoint, and application of machine vision techniques to the design of human-integrated cybernetic systems, such as, robotic systems, flexible automation, and wearable electronics. **Credits:** 3.00

IE 55600 - Job Design

Credit Hours: 3.00. (PSY 55600) Task analysis, personnel selection and training, job and organization design, and criteria development and use. Human factors related to job design in order to increase job satisfaction and productivity. **Credits:** 3.00

IE 55800 - Safety Engineering

Credit Hours: 3.00. Application of human factors and engineering practice in accident prevention and the reduction of health hazards are presented. The objective of this course is to provide an understanding of the safety and health practices which fall within the responsibilities of the engineer in industry. Special attention is devoted to the detection and correction of hazards and to contemporary laws and enforcement on occupational safety and health. **Credits:** 3.00

IE 55900 - Cognitive Engineering Of Interactive Software

Credit Hours: 3.00. Theory and applications of software design to improve productivity and job satisfaction on information processing and cognitive tasks in the workplace. Human information processing models and cognitive theories will be used to provide a theoretical basis for how to choose and display information to the user. Other topics include user-friendly displays and empirical approaches to software design. Applications of the design theory are stressed by class projects. **Credits:** 3.00

IE 56100 - Introduction To Convex Optimization

Credit Hours: 3.00. (AAE 56100) Introduction to convex analysis, convex optimization problems, algorithms of convex optimization and measures of their complexity, and application of convex optimization in aerospace engineering. Recognition of convex optimization problems that arise in scientific and engineering applications. Introduction to software tools to solve convex optimization problems. **Credits:** 3.00

IE 56600 - Production Management Control

Credit Hours: 3.00. Background and development of production management, plus current concepts and controls applicable to production management functions. Not open to Industrial Engineering students with a minor in management. **Credits:** 3.00

IE 57000 - Manufacturing Process Engineering

Credit Hours: 3.00. Theories and applications of materials forming and removal processes in manufacturing, including product properties, process capabilities, processing equipment design, and economics. A systems approach to all aspects of manufacturing process engineering. **Credits:** 3.00

IE 57400 - Industrial Robotics And Flexible Assembly

Credit Hours: 3.00. Lab by arrangement. Design, analysis, and operation of robotic systems. System components and their control. Languages for robot control. Application design and analysis. Part feeders and tooling for robot workstations and automated assembly. Methods for planning robotic and assembly applications. **Credits:** 3.00

IE 57700 - Human Factors In Engineering

Credit Hours: 3.00. (PSY 57700) Survey of human factors in engineering with particular reference to human functions in human-machine systems, and consideration of human abilities and limitations in relation to design of equipment and work environments.**Credits:** 3.00

IE 57800 - Applied Ergonomics

Credit Hours: 3.00. Analysis, modeling, and design of jobs and systems to be consistent with human factors and ergonomic principles. **Credits:** 3.00

IE 57900 - Design And Control Of Production And Manufacturing Systems

Credit Hours: 3.00. Design and control of discrete part manufacturing systems in contemporary production environments, with emphasis on flexible, demand-driven, product-based manufacturing. Currently used planning and control methodologies, such as MRP, OPT, and JIT are reviewed and integrated with appropriate facility design methodologies, including cellular design algorithms. Introduction to Computer Integrated Manufacturing (CIM) architecture and reference models and relevant control procedures, including basis approaches to appropriate data management methodologies. **Credits:** 3.00

IE 58000 - Systems Simulation

Credit Hours: 3.00. Philosophy and elements of digital simulation language. Practical application of simulation to diverse systems. Computer simulation exercises and applications are required. **Credits:** 3.00

IE 58100 - Simulation Design And Analysis

Credit Hours: 3.00. An introduction to simulation of stochastic systems on digital computers. Emphasis is on the fundamentals of simulation as a statistical experiment. Topics include uniform random numbers, input modeling, random variate generation, output analysis, variance reduction, and optimization. **Credits:** 3.00

IE 58200 - Advanced Facilities Design

Credit Hours: 3.00. Study of the theoretical and applied aspects of manufacturing systems layout. Emphasis on contemporary manufacturing, including the layout of cellular systems, automated material handling systems, and storage systems. **Credits:** 3.00

IE 58300 - Design And Evaluation Of Material Handling Systems

Credit Hours: 3.00. Analysis for design and evaluation of material handling systems with emphasis on material flow control and storage. Analytic models and simulation used. Economic justification models for material handling systems. **Credits:** 3.00

IE 58800 - e-Work And e-Service

Credit Hours: 3.00. e-Work is defined as the collaborative, computer-and-communication-supported work in highly distributed organizations of humans/robots/autonomous systems. This course is devoted to learning the basic principles, theories, and applications for the design of effective e-Work and e-Service systems. Relevant discoveries at Purdue and elsewhere are also presented. **Credits:** 3.00

IE 59000 - Topics In Industrial Engineering

Credit Hours: 1.00 to 6.00. Selected topics in industrial engineering for seniors and graduate students. Permission of instructor required. **Credits:** 1.00 to 6.00

IE 63000 - Multiple Objective Optimization

Credit Hours: 3.00. Theory and applications of multiple objective optimization and multiple criteria decision making. Existence and specification of single and multiple attributive value and utility functions. Risk aversion. Characterization and generation of efficient (Pareto optimal) solutions to vector optimization problems. Domination cones. Interactive algorithms. Prerequisite: IE 53500. **Credits:** 3.00

IE 63200 - Scheduling Models

Credit Hours: 3.00. Development and discussion of mathematical and simulation models for scheduling and sequencing the flow of jobs or activities in manufacturing environments. Techniques include dynamic programming, branch and bound, linear and integer programming, heuristics and stochastic network simulation. Prerequisite: IE 57900; IE 53500 or IE 53700. **Credits:** 3.00

IE 63300 - Dynamic Programming

Credit Hours: 3.00. Theory and applications of finite and infinite stage sequential decision processes, including Markovian decision problems, efficient computational methods, and computer software package. Prerequisite: IE 53500, IE 53600. **Credits:** 3.00

IE 63400 - Integer Programming

Credit Hours: 3.00. An advanced course on theory and algorithms for integer and mixed integer optimization problems. Convergence of integer programming algorithms, dual relaxations, Benders decomposition, cutting plane theory, group theory of integer programs, and linear diophantine equations. Prerequisite: IE 53500, IE 53700. **Credits:** 3.00

IE 63500 - Theoretical Foundations Of Optimization

Credit Hours: 3.00. An advanced course in theoretical foundations of mathematical programming. Convex analysis, global and local duality and optimality, general algorithmic convergence. Offered in alternate years. Prerequisite: IE 53500. **Credits:** 3.00

IE 63900 - Combinatorial Optimization

Credit Hours: 3.00. An advanced course in combinatorial optimization. Emphasis on the theory and strategies of combinatorial algorithms including complexity theory, advance issues in network flows, matching, matroids, and combinatorial polyhedra. Prerequisite: IE 53500. **Credits:** 3.00

IE 64600 - Advanced Decision Theory

Credit Hours: 3.00. An advanced course on the theory and models of decision-making and rationality. Material includes advanced topics in decision analysis, models of probabilistic reasoning, decision-making in competitive situations, and models of human and computer reasoning (including artificial intelligence). Prerequisite: IE 54600. **Credits:** 3.00

IE 65600 - Research Seminar In Human Factors

Credit Hours: 3.00. An in-depth study of topics of special interest in human factors. A variable title course where topics change from semester to semester. Possible topics include cognitive engineering in expert systems, human resource management, skills acquisition and retention, knowledge elicitation, and knowledge representation. Permission of instructor required. **Credits:** 3.00

IE 65900 - Human Aspects In Computing

Credit Hours: 3.00. Advanced topics in ergonomic, cognitive, and social aspects of using computerized systems are discussed with regard to comfort and user satisfaction, ease and productive use of computerized systems, and effective implementation of computerized technologies in the workplace. Prerequisite: IE 55900. **Credits:** 3.00

IE 67000 - Advanced Topics In Manufacturing Engineering

Credit Hours: 3.00. Advanced research topics and approaches in manufacturing engineering, including processes and equipment. Research methodology, nontraditional processes, manufacturing systems, and competitive aspects of manufacturing. Prerequisite: IE 57000. **Credits:** 3.00

IE 67400 - Cyber Methods For Advanced Production Control

Credit Hours: 3.00. The study of the theoretical foundation and relevance of advanced cyber methods in the planning and control of intelligent production operations; manufacturing operating systems; synchronization in decentralized systems; recovery in

decentralized systems; parallel processing; distributed databases; factory networks; reasoning and logic for production control. Prerequisite: IE 57400 or 57500 or 57900. **Credits:** 3.00

IE 68000 - Advanced Simulation Design And Analysis

Credit Hours: 3.00. An introduction to the literature of simulating stochastic systems, with emphasis on probabilistic and statistical aspects. Prerequisite: IE 58100. **Credits:** 3.00

IE 69000 - Advanced Topics In Industrial Engineering

Credit Hours: 1.00 to 6.00. Advanced study in various fields of industrial engineering for graduate students. Credits and hours to be arranged. Permission of instructor required. **Credits:** 1.00 to 6.00

IE 69600 - Graduate Professional Practice

Credit Hours: 0.00. Practice in industry and comprehensive written reports of this practice. Permission of instructor required. **Credits:** 0.00

IE 69700 - Seminar

Credit Hours: 0.00. Industrial engineering problems with particular emphasis on current research. **Credits:** 0.00

IE 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

IE 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Industrial Engineering Technology

IET 11100 - Introduction To Manufacturing And Supply Chain Systems

Credit Hours: 3.00. A survey of organizational units and their function within an enterprise, including a brief history of organizations. The course emphasizes a systems perspective and how decisions in one area impact the entire system. Topics include operations, financial, marketing, planning, quality control, process strategy, logistics, and safety. **Credits:** 3.00

IET 15000 - Quantitative Methods For Technology

Credit Hours: 3.00. Application of statistical techniques to typical problems in technology. Topics include data collection, descriptive statistics calculation, hypothesis testing, sampling, continuous and discrete distribution, probability, ANOVA, and related topics. The course also introduces the use of spreadsheet and other software to solve statistical calculations. Introduction to SPC is included. Basic metrology, concepts of gage and meter calibration calculations, instrument linearity, repeatability, reproducibility, sensitivity, precision, and instrument control are included.**Credits:** 3.00

IET 19000 - Topics In Industrial Technology

Credit Hours: 1.00 to 3.00. Hours, credit, and subject matter to be arranged by staff. This is not for independent study. Permission of instructor required. **Credits:** 1.00 to 3.00

IET 21400 - Introduction To Supply Chain Management Technology

Credit Hours: 3.00. This course is an introduction to supply chain management technology. Topics include supply chain functions including how to organize a supply chain, supply chain strategy, supply chain process mapping, and use of supply chain technologies, analysis, and performance measurements. **Credits:** 3.00

IET 23500 - Introduction To Systems Thinking And Process Improvement

Credit Hours: 3.00. This course provides the foundation for technology systems processes and practices. The content covers the discussion of current systems issues, basic systems technology processes, and the role of systems engineering professionals in a global business environment. Topics include basic principles of systems thinking, the concepts of performance and cost measures, alternative design concepts, lean processes, and sustainable life-cycle management within an enterprise and across the supply chain. **Credits:** 3.00

IET 28100 - Industrial Safety

Credit Hours: 3.00. A course designed to develop understanding of, and insight into, the basic aspects of accident prevention and safety. Specific attention will be given to (1) the psychological aspects of accident prevention; (2) the principles of accident prevention; (3) the practical aspects of planning, implementing, and maintaining a safe environment; and (4) standards, current laws, and regulations. Field trips may be required. **Credits:** 3.00

IET 31300 - Technology Innovation And Integration: Bar Codes To Biometrics

Credit Hours: 3.00. This course provides the foundation for automatically capturing data in a system. The content covers an introduction to technology used in automatic identification and data capture systems, including: bar codes; radio frequency identification; smart cards, and biometrics. Topics also include an immersive semester project that examines the integration of these technologies, as well as advanced problem-solving. **Credits:** 3.00

IET 31600 - Statistical Quality Control

Credit Hours: 3.00. This course introduces the application of statistical and probability tools to develop, implement, and maintain effective quality assurance in technology and service systems. A systems approach to product or service quality from inception to disposal is employed. Factors affecting variation in quality are studied. The concepts and implications of quality from a global business environment are examined.**Credits:** 3.00

IET 33100 - Advanced Industrial Safety And Health Management

Credit Hours: 3.00. An introduction to OSHA and standards development for occupational health in general industry. Special emphasis is on fire protection and egress, flammable and combustible liquids, electrical, personal protective equipment, machine guarding, industrial hygiene/blood-borne pathogens, ergonomics, and ISO 9000/14000 integration. **Credits:** 3.00

IET 33400 - Economic Analysis For Technology Systems

Credit Hours: 3.00. This course examines techniques of economic analysis for systems technologists, engineers, and leaders who evaluate and determine the financial attractiveness of multiple alternatives. Emphasizes economic feasibility and applying time value of money concepts to cost-volume-profit decisions. Topics include present worth, rate of return, benefit-cost, payback, breakeven analysis, depreciation, economic optimization, and decision-making under uncertainty. **Credits:** 3.00

IET 33520 - Human Factors For Technology Systems

Credit Hours: 3.00. This course provides the foundation for examining the intersection of people, technology, policy, and work across technology systems. Topics include the evaluation, analysis, and design recommendations for improving the safety and efficiency of human-technology interactions. **Credits:** 3.00

IET 33610 - Risk Analysis And Assessment

Credit Hours: 3.00. This course introduces the tools for identifying and analyzing inherent risks associated with the decision-making process. The challenges of quantitative risk assessment are introduced using decision trees, influence diagrams, and probability models. The concepts of risk index, options, avoidance, prevention, and reduction are discussed in the context of technology systems. **Credits:** 3.00

IET 33620 - Total Productive Maintenance

Credit Hours: 3.00. This course emphasizes the importance of effective maintenance planning and execution for efficient and economical operation of service or technology systems. A systems approach to maintenance planning is taken. Maintenance activities are discussed from reliability and productivity perspectives in the context of technology systems. Semester-long, team based research project is typically required.**Credits:** 3.00

IET 34200 - Warehouse And Inventory Management

Credit Hours: 3.00. A course designed to develop understanding of types of warehouses, methods of organizing the warehouse environment, and determining efficient inventory control procedures. Technology applications related to the management of warehouse and inventory stock-keeping units (SKU) are investigated. Storage of inventory, placement of inventory, picking, packing, shipping, and other internal logistics management topics will be explored. **Credits:** 3.00

IET 34250 - Purchasing And Contract Management

Credit Hours: 3.00. This course examines the processes by which goods and services are acquired through purchasing and contract management. Topics include procurement, contract strategies, source selection, identifying contract type, product liability and risk, the bid process and response evaluation; contract risk assessment, contract negotiation, and contract law. **Credits:** 3.00

IET 34300 - Technical And Service Selling

Credit Hours: 3.00. A study of sales models and techniques for technical and service sales in business-to-business environments, including development of channel relationships, long-term sales agreements, customer relationship management efforts, total cost of ownership tools and complex sales presentations. Covers critical sales skills such as e-economy sales and marketing, lead management, building credibility, consultative selling, ethical negotiations, and sustainable product management. **Credits:** 3.00

IET 34350 - Business To Business Sales Management

Credit Hours: 3.00. This course covers key topics in sales management while emphasizing customer relationship management, sales productivity, and the effects of technology on the sales function. Topics include analyzing multiple channel models; establishing sales plans; incentivizing and motivating the sales force; and evaluating, monitoring, and managing the effectiveness of the sales force. **Credits:** 3.00

IET 36400 - Total Quality Control

Credit Hours: 3.00. This course is aimed at determining customer needs and wants and interpreting these into design during production, follow-up on field performance, and feeding back quality information to further improve the quality system.**Credits:** 3.00

IET 41100 - Applications Of Lean And Six Sigma Methodologies

Credit Hours: 3.00. This hands-on course focuses on emerging business practices that are geared toward making an organization more effective and efficient. Highlighted topics will include use of lean and six sigma methodologies in today's business environments. These methods are used for achieving long term profits through customer satisfaction, waste elimination, and elevation of employee skills to eliminate waste and defects at the source. Application of these methods in various environments such as service, health care and manufacturing organizations will be explored. Students are expected to work in teams to apply systematic problem solving processes to solve case studies and/or real-world issues. Supporting concepts such as implementation of new business practices and culture change will also be explored.**Credits:** 3.00

IET 41300 - Problem-Solving With Automatic Data Collection

Credit Hours: 1.00 to 3.00. Problem-solving skills are applied to manufacturing, distribution, or business data collection problems. Depending on the problem, one or more of the available data collection technologies will be used to address the issue of concern. Field trips may be required. Permission of instructor required. **Credits:** 1.00 to 3.00

IET 41400 - Financial Analysis For Technology Systems

Credit Hours: 3.00. The course provides students with financial tools needed by managers in technical and service fields. Topics include financial statement analysis, using common-sized statements and financial ratios; the strategic profit model; total cost of ownership; pricing for profitability; margin management; cash flow cycles; and budgeting. A corporate financial analysis project is typically required. **Credits:** 3.00

IET 43530 - Operations Planning And Management

Credit Hours: 3.00. A study of enterprise operations and management, demand forecasting, capacity analysis, research and development, production, personnel, and sales. Examples of the procedures necessary to provide a product or service are included. The course focuses on the tools necessary to solve problems, such as decision analysis, linear programming, transportation modeling, enterprise resource planning (ERP) systems, and forecasting models. Field trips may be required and industry-sponsored research projects are typically completed. **Credits:** 3.00

IET 43540 - Facilities Planning And Material Handling

Credit Hours: 3.00. This course takes a systematic approach to design of facilities and material handling systems for effective and lean production of goods and services. An array of qualitative and quantitative tools and techniques are introduced and utilized, emphasizing lean principles, waste reduction, and overall efficiency of operations. Flow analysis and optimization tools, including computer simulation, are introduced. Strong emphasis is placed on a comprehensive semester-long team project as an integral component of this course.**Credits:** 3.00

IET 43630 - Design Of Experiments

Credit Hours: 3.00. Introduction to statistical design of experiments. The course examines the difference between single, multivariate, and factorial experimental designs. Concepts of optimization and response surface methodologies are introduced. The course focuses on interpreting and communicating experimental results.**Credits:** 3.00

IET 43640 - Lean Six Sigma

Credit Hours: 3.00. A study of the Lean Six Sigma quality and process improvement methodology, using the define, measure, analyze, improve, and control (DMAIC) process. The course addresses advanced topics in statistical quality; introduces quality management concepts as they pertain to the Lean Six Sigma methodology; and provides preparation for the Green Belt Certification exam. **Credits:** 3.00

IET 44275 - Global Transportation And Logistics Management

Credit Hours: 3.00. A study of the various aspects of logistics. The development, implementation, and control of physical transportation systems, product distribution, warehousing, and inventory policy models will be emphasized. A working knowledge of third and fourth-party logistics and transportation strategies will be analyzed. The impact of logistics and transportation in the global environment will be discussed. **Credits:** 3.00

IET 44500 - Strategic Supply Chain Management

Credit Hours: 3.00. A course designed to build upon previous courses with subjects related to managing a distribution enterprise. Modules in sales management, financial analysis, strategic planning, logistics, purchasing, and the legalities of distributor and manufacturer relationships will be combined with case studies to provide students with practice in establishing policy and making decisions from the manager's point of view. Field trips may be required. **Credits:** 3.00

IET 48390 - Industrial Engineering Technology Capstone I: Problem Identification And Analysis

Credit Hours: 3.00. This is the first semester of a two-semester capstone sequence, which focuses on an industry-based, team approach to problem-solving. An array of qualitative and quantitative tools is used to identify and analyze an industrial or business process. Data collection, process maps, flow analysis, Pareto chart, computer simulation, and other optimization tools will be used to identify problem areas and possible solutions. **Credits:** 3.00

IET 48395 - Industrial Engineering Technology Capstone II: Project Design

Credit Hours: 3.00. This is the second course of two-semester capstone sequence, addressing an industry-based problem. The focus of the course is on designing and implementing an acceptable solution to the project/problem. **Credits:** 3.00

IET 48490 - Supply Chain Management Technology Capstone I: Strategic Planning

Credit Hours: 3.00. This course is the first of two integrative capstone courses for senior-level students. The focus is on how firms formulate, implement, and evaluate strategies. Teams of students will integrate program knowledge, coupled with strategic-management techniques learned, to make decisions and help chart the future of different organizations. The major responsibility of students in the capstone courses is to make objective strategic decisions and to justify them through oral and written communication. **Credits:** 3.00

IET 48495 - Supply Change Management Technology Capstone II: Strategic Analytics

Credit Hours: 3.00. This course is the second of two integrative capstone courses for senior-level students. Students will continue working in teams using a variety of planning and decision-making models to work with organizations to solve problems and make sound decisions. The major responsibility of students in the capstone courses is to make objective strategic decisions and to justify them through oral and written communication. **Credits:** 3.00

IET 49000 - Special Topics In Industrial Engineering Technology

Credit Hours: 1.00 to 3.00. Supervised individual research in industrial engineering technology topics. Permission of instructor required. **Credits:** 1.00 to 3.00

IET 50700 - Measurement And Evaluation In Industry And Technology

Credit Hours: 3.00. An introduction to measurement strategies in industrial, technical, and human resource development environments. The evaluation of measurement outcomes will be the primary focus of the course. **Credits:** 3.00

IET 50800 - Quality And Productivity In Industry And Technology

Credit Hours: 3.00. Examines the contemporary issues of continuous improvement in quality and productivity in manufacturing and service industries. Includes a close examination of the evolving philosophies bearing on the scope, improvement, and costs of quality assurance programs in industry and technology. **Credits:** 3.00

IET 53410 - Implementation And Advanced Topics Of Enterprise Six Sigma

Credit Hours: 3.00. This course is designed to expose master's and doctoral students to the theory behind implementation of Six Sigma at the Enterprise level. Students will develop their own research with regard to the future of the discipline through particular assessments. Topics include structure and methodology of Six Sigma deployment, including: systems thinking, change management, business process management, competitive intelligence through international standards, and the future of the discipline. Students will learn the methodology of Six Sigma at the project level for technical skill building in addition to practices of implementing and managing Six Sigma at an organizational level. Permission of Instructor required. **Credits:** 3.00

IET 54500 - Global Supply Chain Management

Credit Hours: 3.00. The objective of this course is to provide in-depth knowledge of global supply chain management and its application in industries. This course explores supply chain management, expanding beyond the linkage between producer and distributor to include other enterprises in the product life cycle, beginning with concept design and ending in disposal. Learning methodologies include lecture, case study, and collaborative student group activities in applied research. Permission of department required. **Credits:** 3.00

IET 58100 - Workshop In Industrial Engineering Technology

Credit Hours: 0.00 to 8.00. Advanced study of technical and professional topics. Emphasis is on new developments relating to technical, operational, and training aspects of industry and technology education. **Credits:** 0.00 to 8.00

IET 59000 - Special Problems In Industrial Engineering Technologies

Credit Hours: 1.00 to 6.00. Intensive individual study of selected current developments and issues in Industrial Engineering Technology. A faculty sponsor is required for this course. Does not substitute for either M.S. thesis or M.S. project credit. Permission of instructor required. **Credits:** 1.00 to 6.00

IET 59800 - Directed MS Project

Credit Hours: 1.00 to 3.00. A formal investigation of a particular problem under the guidance of the advisory committee. Not applicable to a thesis option plan of study. Enrollment during at least two consecutive terms for a total of three credits is required. Permission of Instructor required. **Credits:** 1.00 to 3.00

IET 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Industrial and Molecular Pharmaceutics

IMPH 10000 - Pharmaceutical Sciences Orientation

Credit Hours: 1.00. An orientation course for incoming freshmen or CODO students enrolled in the Bachelor of Sciences in the Pharmaceutical Sciences program. Provides an introduction to the scope of the program, the career opportunities for graduates, the curriculum rationale, and the faculty and staff support structure. **Credits:** 1.00

IMPH 45100 - Industrial Practical Training

Credit Hours: 1.00. Course allows students to gain practice-related employment experience in industrial pharmacy. Students receive credit for practical experience in the session when they participate in the practical experience and complete the course paper requirement. Pre-approval of enrollment through ISS is required prior to employment experience. Permission of instructor required. **Credits:** 1.00

IMPH 49000 - Special Topics

Credit Hours: 1.00 to 6.00. An honors course for superior students to be used in relation to, and to supplement, an existing course; an in-depth approach to topics of current interest, utilizing the original literature as prime source material. A laboratory project may be included. Permission of instructor required. **Credits:** 1.00 to 6.00

IMPH 56200 - Introduction To Pharmaceutical Manufacturing Processes

Credit Hours: 4.00. A course intended to provide the student with basic understanding of both the theoretical and practical aspects of pharmaceutical manufacturing by combining a thorough classroom treatment of the underlying principles of each pharmaceutical unit operation with hands-on execution of these activities in the laboratory. Permission of instructor required. **Credits:** 4.00

IMPH 57400 - Pharmaceutical Biotechnology

Credit Hours: 3.00. Pharmaceutical biotechnology is the array of scientific and engineering principles used to develop, manufacture, and regulate biologic drugs. Biologic drugs - also known as "biologics", "biopharmaceuticals", or "large molecule drugs" - are medicinal agents derived from living systems, in contrast to more conventional "small molecule drugs" produced by organic chemical synthesis. Since the approval of the first recombinant human insulin in 1982, biologics have grown from niche products to occupy a prominent place in the pharmaceutical armamentarium. Today, biologics provide innovative treatments for a host of previously intractable diseases, including cancers, autoimmune disorders, and diabetes. The global biologics market was more than $300 billion in 2019, accounting for 20-25% of all pharmaceutical sales. This course introduces students to pharmaceutical biotechnology. The five didactic sections of the course present: (i) the biotech drug market, (ii) cellular and molecular biology foundations, (iii) formulation and stability of biotech drug products, (iv) analytical methods for quality assurance, and (v) manufacturing methods. In the sixth and final section of the course, students will present case studies on currently approved biotech drugs, integrating and applying what they've learned. The course is intended for beginning graduate students in the Departments of Industrial and Physical Pharmacy, Chemical Engineering, and Biomedical Engineering. The course may also be suitable for well-qualified upper-division undergraduates. Permission of department required.**Credits:** 3.00

IMPH 58000 - Physical Chemical Principles

Credit Hours: 3.00. Applications of physical chemical principles to pharmaceutical systems. **Credits:** 3.00

IMPH 58300 - Advanced Biopharmaceutics

Credit Hours: 3.00. A comprehensive course dealing with the interaction of biological and physicochemical considerations relating to drug effectiveness and dosage form design. **Credits:** 3.00

IMPH 58700 - Pharmaceutical Solids

Credit Hours: 2.00. Provides students with the ability to identify and characterize polymorphs and hydrates and to understand their behavior in the presence of water. Both classical methods and new techniques for the study of pharmaceutical solids and their interaction with water are included. Scientific principles are blended with practical examples to provide a conceptual basis for understanding particular problems. **Credits:** 2.00

IMPH 59000 - Special Topics In Industrial And Molecular Pharmaceutics

Credit Hours: 1.00 to 6.00. Special topics in selected areas of industrial and molecular pharmaceutics. Permission of instructor required. **Credits:** 1.00 to 6.00

IMPH 68000 - Pharmacokinetics And Biopharmaceutics

Credit Hours: 3.00. Pharmacokinetics (PK) is the study of the time course of the absorption, distribution, metabolism and excretion (ADME) of a drug, compound or new chemical entity (NCE) after its administration to the body. Biopharmaceutics examines the relationship between the physical/chemical nature of a drug, the dosage form and the route of administration on the rate and extent of systemic drug absorption. Knowledge of the pharmacokinetic and biopharmaceutics properties of an NCE are critical to its selection as a lead candidate in a drug discovery program, its use as a functional research tool, and its use as a therapeutic agent. This course will be an overview of the development of pharmacokinetic principles, including guidelines for conducting clinical studies, and equations required to characterize the disposition of drugs and their metabolite(s). Students will develop the ability to probe the mechanisms and physiological processes responsible for ADME. Pharmacodynamics, the relationship between drug concentration and effect, and the issues surrounding stereospecific PK will presented. Prerequisites: Admission to the IMPH graduate program and at least one course in pharmacology and one course in mammalian or human physiology. Permission of instructor required. **Credits:** 3.00

IMPH 69000 - Special Problems

Credit Hours: 0.50 to 6.00. Individual research topics selected from the areas of industrial pharmacy, physical pharmacy, or biopharmaceutics. Permission of instructor required. **Credits:** 0.50 to 6.00

IMPH 69600 - Seminar In Industrial And Physical Pharmacy

Credit Hours: 0.00 or 1.00. Discussion of recent research developments in physical pharmacy, industrial pharmacy, and biopharmaceutics related to the physicochemical properties, availability, effectiveness, and safety of drugs and drug products. Topics are presented by staff, students, and invited speakers. **Credits:** 0.00 or 1.00

IMPH 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Industrial Technology

IT 43500 - Distribution Management Policy

Credit Hours: 3.00. A course designed to build upon previous distribution-related courses with subjects related to managing a distribution enterprise. Modules in sales management, strategic planning, supply-chain logistics, purchasing, and the legalities of distribution manufacturer relationships will be combined with case studies to provide students with practice in making decisions and establishing policy from the manager's point of view. Field trips may be required. **Credits:** 3.00

IT 51000 - Developing Courses For Industry And Technology

Credit Hours: 3.00. Principles and procedures in planning, organizing, and developing instructional content for industrial, technical, and human resource development courses. **Credits:** 3.00

IT 53000 - Biometric Technology Test Design, Performance, And Evaluation

Credit Hours: 3.00. An introduction of methods of designing biometric testing, performance, and evaluation analyses. Specifically, methods of evaluating fingerprint, face recognition, iris, and voice recognition data are explored using ROC curves, CMC, Rank statistics, and DET curves. The course examines testing requirements from submission of IRB documents to the final analysis. A component of comparative analysis within modalities is included. **Credits:** 3.00

IT 54000 - Biometric Performance And Usability Analysis

Credit Hours: 3.00. An introduction of test methodologies from disciplines outside of biometrics, which include: usability, ergonomics, human factors, and human-computer interaction, in order to demonstrate how biometric data analysis can benefit from understanding how humans interact with biometric sensors during the testing and evaluation of biometric systems. The course explores test methods, case studies, and prior biometric testing reports in order to develop a test methodology that includes information on how users interact with biometric systems. Permission of department required. **Credits:** 3.00

IT 54500 - Biometrics Technology And Applications

Credit Hours: 3.00. Examines biometrics technology as it relates to security, access control, and the authentication of individuals. The course will examine biometric technologies including iris, face, finger, hand geometry, dynamic signature verification, skin print analysis, and voice recognition. Permission of instructor required. **Credits:** 3.00

IT 56800 - Developing Instructional Materials For Industry And Technology

Credit Hours: 3.00. Principles and procedures in locating, evaluating, producing, and integrating instructional materials and aids into industrial, technical, and human resource development programs. **Credits:** 3.00

IT 57100 - Project Management In Industry And Technology

Credit Hours: 3.00. The factors influencing decisions during the initiation, implementation, and termination of industrial and manufacturing projects are examined. Students work as project teams, using project management tools to develop implementation strategies. Permission of instructor required. **Credits:** 3.00

IT 58100 - Workshop In Industrial Technology

Credit Hours: 0.00 to 8.00. Advanced study of technical and professional topics. Emphasis is on new developments relating to technical, operational, and training aspects of industry and technology education. **Credits:** 0.00 to 8.00

IT 59000 - Special Problems In Industrial Technology

Credit Hours: 1.00 to 6.00. Independent study of a special problem under the guidance of a member of the staff. Does not substitute for either M.S. thesis or M.S. project credit. Permission of instructor required. **Credits:** 1.00 to 6.00

IT 59800 - Directed MS Project

Credit Hours: 1.00 to 3.00. A formal investigation of a particular problem under the guidance of the advisory committee. Not applicable to a thesis option plan of study. Enrollment during at least two consecutive terms for a total of three credits is required. Permission of department required. **Credits:** 1.00 to 3.00

IT 65700 - Fingerprint Performance And Usability

Credit Hours: 3.00. This course covers topics of fingerprint capture, fingerprint feature extraction, fingerprint matching, and attacks on fingerprint systems. The course requires analysis of real fingerprint data and the integration of fingerprint recognition in existing infrastructures. Development of a fingerprint recognition system is required. Prerequisites: IT 54500 and either IET 50700 or STAT 50100. **Credits:** 3.00

IT 65800 - Biometric Systems Interoperability: Applications And Challenges

Credit Hours: 3.00. This course provides a technology neutral approach to the discussion of biometric system interoperability. It examines the issues of biometric sub-systems of different biometric modalities and sub-systems of the general biometric model. Students will be able to critically evaluate the impact of interoperability of sub-systems on the performance of the entire system. Prerequisites: IT 54500 and either IET 50700 or STAT 50100. **Credits:** 3.00

Information and Library Science

ILS 10000 - Introduction To Information Studies

Credit Hours: 3.00. This course will provide a foundation for navigating and engaging with the information-rich world. Students will define and assess information in order to address real-world situations; map their information landscape and effectively engage with information systems as well as human sources of information; develop a practice of critical and ethical information use; and conceptualize, apply, and examine the strategies for information and knowledge management, production, and dissemination. Students will examine the societal impact and implications of information and information privilege to explore the applications and consequences of information, in addition to examining data practices and methods. This will provide students with an opportunity to strengthen their research and information literacy skills, reflect in an informed and critical manner, and give them the tools to successfully make ethical, evidence-based decisions in the academic and professional context.**Credits:** 3.00

ILS 10300 - Introduction To Data Lifecycle Management

Credit Hours: 1.00. Introduces concepts of the management of data throughout its lifecycle. Understanding different types of data and their functions. Managing data in the context of a particular discipline or profession. Finding and evaluating data purposefully. Using data ethically and responsibly. Creating and sharing data for reuse, accountability, and enhancement. Making decisions and communicating using data, including data analysis and visualization. Protecting and archiving data. **Credits:** 1.00

ILS 17500 - Information Strategies For Hospitality & Tourism Management

Credit Hours: 1.00. This course will provide students with a framework of information search skills and problem-solving they can utilize in their area of study and in everyday life. It will also incorporate technology literacy components with active learning. Class sessions will consist of lecture, group discussion, demonstrations, and in-class activities and out-of-class activities. The course is intended for first-semester freshman students. Department permission required. **Credits:** 1.00

ILS 18000 - Preparing For Your Undergraduate Research Experience

Credit Hours: 1.00. This course is for prospective Purdue undergraduate researchers who are interested in conducting undergraduate research or creative endeavors. Purdue students who have not already started an independent research project with a research mentor will learn valuable skills to market themselves to individuals and research programs. Throughout the course, students will develop components for a final application packet to submit to a research team or program they choose. Department permission required. **Credits:** 1.00

ILS 19500 - Special Topics In Information And Data Science

Credit Hours: 1.00 to 4.00. Study of selected topics from the practice of information and data science, varying from semester to semester. Topics may include data management and organization, digital scholarship, data visualization, computer languages for data and information science, information literacy, archival literacy, and emerging trends in information and data science. Permission of department required. **Credits:** 1.00 to 4.00

ILS 20100 - Introduction To Digital Humanities

Credit Hours: 3.00. This is an interdisciplinary foundational course that combines theory and practice to teach students in and about digitally mediated culture. Accordingly, this course fosters a critical understanding of the digital and its implication for the development of a technologically driven society. Students will be introduced to digital inquiry and critical practice and explore the ways that the digital transforms knowledge acquisition and production across the humanities, social sciences and sciences. Students will engage in readings and activities that help them form substantive perspectives on the digital formulations and practice through digital technologies and tools. Students will also experiment with digital methods and tools by building a digital project. This course places an emphasis on engaged learning through online and in-class discussion, digital activities, and collaborative work. Permission of instructor required. **Credits:** 3.00

ILS 23000 - Data Science And Society: Ethical Legal Social Issues

Credit Hours: 3.00. This course provides an introduction to Ethical, Legal Social Issues (ELSI) in Data Science. Students will be introduced to interdisciplinary theoretical and practical frameworks that can aid in exploring the impact and role of Data Science in society. This is a writing intensive course. Students will work individually and on collaborative assignments. **Credits:** 3.00

ILS 23500 - SPIRaL, Part I: Commencing Information Literacy Research

Credit Hours: 2.00. Over the course of a year-long research experience, SPIRaL undergraduate researchers engage in original research to investigate how information literacy-in its many forms-can inform real-world solutions to contemporary information challenges, such as mis/disinformation. In the first half of the semester, SPIRaL students will explore the information literacy literature to build a foundation for our research this year. In this early part of the semester, students will be introduced to the different views scholars have of information literacy, the various research approaches they employ, and the range of real-world information challenges information literacy researchers attend to with their research. Students will use the insights from the existing information literacy and information challenges research to inform the research study they will carry out over the year. In second part of the fall semester, students will commence original research that addresses a need or gap in the literature. Students will apply data collection methods and reflect on the affordances of qualitative research approaches in pursuing knowledge about information literacy's role in addressing information challenges. Across this year-long research experience, the SPIRaL research team will aim to: 1. expand what is known about the role information literacy can play in addressing significant information challenges in the world, and 2. enrich the information literacy research community by welcoming new and passionate undergraduate researchers into this work.**Credits:** 2.00

ILS 23600 - SPIRaL, Part II: Conducting Information Literacy Research

Credit Hours: 1.00. Over the course of a year-long research experience, SPIRaL undergraduate researchers engage in original research to investigate how information literacy-in its many forms-can inform real-world solutions to contemporary information challenges, such as mis/disinformation. The second semester of SPIRaL builds upon the work completed in the previous semester. We will spend the first half of the semester analyzing the data collected last semester. We will then present our research approach, findings, and implications in various scholarly venues.**Credits:** 1.00

ILS 25000 - Introduction To Geographic Information Systems

Credit Hours: 3.00. Geographic Information Systems (GIS) plays an important role in many disciplines as a tool for data management, query, visualization, and analysis. It can be used for natural resource management, environmental studies, agriculture, as well as social and political studies. This course will introduce students the basic knowledge about GIS, including the fundamental concepts of GIS, data models and management strategies, as well as some basic spatial analysis skills. Practical work will be introduced and completed using Esri ArcGIS Pro software. Permission of department required. **Credits:** 3.00

ILS 28000 - Understanding Your Undergraduate Research Experience I

Credit Hours: 1.00. This course is for current Purdue undergraduate researchers to hone skills necessary for successfully reflecting on and completing the experience. During this course, students will utilize their research experience to apply skills such as managing time with a research project, communicating your research, utilizing Purdue Libraries' resources, and providing feedback to peer researchers. Students will deliver research pitches about their own project and provide critiques to others' pitches. Department permission required.**Credits:** 1.00

ILS 29000 - Independent Study In Information Science

Credit Hours: 1.00 to 3.00. Intensive study on specific topics in information or data science that are not otherwise covered by courses currently offered at Purdue. Plan of Study and assessment method are agreed upon by faculty and student prior to course registration. **Credits:** 1.00 to 3.00

ILS 29500 - Special Topics In Information And Data Science

Credit Hours: 1.00 to 4.00. Study of selected topics varying from semester to semester, from the practice of information and data sciences. Topics may include data management and organization, digital scholarship, data visualization, computer languages for data and information science, information literacy, archival literacy, and emerging trends in information and data science. **Credits:** 1.00 to 4.00

ILS 30000 - Information, Culture, And Society

Credit Hours: 3.00. Information and information systems shape our beliefs, influence decision-making, define our collective knowledge, and are integral to being an informed, responsible, and engaged citizen in our modern world. This course will examine the intricate relationship between information and society to better understand how information ecosystems, constituted by various technologies and practices, shape and are shaped by individual identities, structures of power, and ethical considerations/human values. Using an interdisciplinary and team-based approach, students will gain essential skills to navigate their information-rich world.**Credits:** 3.00

ILS 30100 - Data Foundations, Tools, And Applications

Credit Hours: 3.00. Data are everywhere. Data permeates every aspect of our lives, from journalistic reporting to workplace projects to artificial intelligence applications. This course covers the basics of the data research lifecycle, including locating and managing datasets, along with applying different methods and tools a to craft compelling stories about data. Students will learn the difference between data and information and how to transform raw data into information to be communicated to a wider audience. This course offers unique skills for students from any discipline who want to discover the world of data.**Credits:** 3.00

ILS 33000 - The Age Of Mis/Dis/Malinformation

Credit Hours: 3.00. In our current moment, often known colloquially as the "Information Age," the veracity of information is of incredible importance, yet we see the viral spread and consumption of "bad" information: misinformation, disinformation, and malinformation. These three forms of information are spread globally regarding every event. Even though more people have access to information sources than ever before, we still are living in the age of mis/dis/malinformation.**Credits:** 3.00

ILS 33100 - Conspiracy Theories

Credit Hours: 3.00. In the information age, we have witnessed a dramatic resurgence of paranoia and violence, fueled by the very technologies meant to provide access to knowledge and information. In this course, we will uncover conspiracies together, seeking to understand how such strange ideas originate and spread.**Credits:** 3.00

ILS 38000 - Understanding Your Undergraduate Research Experience II

Credit Hours: 1.00. This course is for current Purdue undergraduate researchers to build upon the previous course and focus on research data collection, presentation, and communication for current Purdue undergraduate researchers. During this course, students will learn and discuss various forms of data and collection practices. Students will develop their own academic poster to present their research project's data and implications. Students are encouraged to present their poster at one of Purdue's undergraduate research conferences near the end of the semester. This course is the second course taken as undergraduate researchers and introduces material at this advanced level. This higher-division course is normally scheduled for juniors and seniors. Department permission required.**Credits:** 1.00

ILS 39500 - Special Topics In Information And Data Science

Credit Hours: 1.00 to 4.00. Study of selected topics varying from semester to semester, from the practice of information and data sciences. Topics may include data management and organization, digitals scholarship, data visualization, computer languages for data and information science, information literacy, archival literacy, and emerging trends in information and data science. Department approval required. **Credits:** 1.00 to 4.00

ILS 48000 - Beyond Undergraduate Research

Credit Hours: 1.00. This course is for current Purdue undergraduate researchers to build on previous courses and focus on continuing their education in graduate or professional school. During this course, students will learn and discuss the various phases of identifying, selecting, applying to and funding graduate or professional school programs. Students will also gain a deeper comprehension of the qualities and skills that make research mentors effective while developing skills they will need to be successful mentees and peer mentors. Students will conduct research to identify potential programs of interest and develop a statement of purpose. Department permission required.**Credits:** 1.00

ILS 49000 - Independent Study In Information Science

Credit Hours: 1.00 to 3.00. Intensive study on specific topics in information or data science that are not otherwise covered by courses currently offered at Purdue. Plan of Study and assessment method are agreed upon by faculty and student prior to course registration. **Credits:** 1.00 to 3.00

ILS 49500 - Special Topics In Information And Data Science

Credit Hours: 1.00 to 4.00. Study of selected topics varying from semester to semester, from the practice of information and data sciences. Topics may include data management and organization, digital scholarship, data visualization, computer languages for

data and information science, information literacy, archival literacy, and emerging trends in information and data science. **Credits:** 1.00 to 4.00

ILS 51200 - Information Strategies For Science, Technology, And Engineering Research

Credit Hours: 1.00. This course focuses on information strategies for successful research in science, engineering, and technology disciplines. Students will learn about how scholarly information and discipline relevant grey literature (e.g., patents, technical standards) are created, organized, disseminated, retrieved, and managed. In addition, students will learn strategies to critically evaluate information and present their research effectively and ethically. **Credits:** 1.00

ILS 51400 - Information Skills For Health Professionals

Credit Hours: 1.00. This course is designed to help you develop essential information skills to support your professional goals and prepare you to succeed in graduate or professional school in the health sciences. Learn how to navigate PubMed and other subject-specific databases, and differentiate between various types of research articles. Become adept at saving, organizing, and annotating articles so you can easily locate them, "cite while you write," and share them with your classmates or research group. Prepare for writing for publication. And avail yourself of the resources and services academic libraries provide, beyond books and journals, to support your coursework and research. Permission from department or instructor required. **Credits:** 1.00

ILS 54000 - Critical GIS: Theory And Applications

Credit Hours: 3.00. This course will provide students with a critical overview of the role power, culture, justice and injustice, and oppression have played in the practice and history of cartography. In this hands-on course students will learn the basic GIS skills and techniques that will help them understand place and space through critical theories of race, gender, sexuality, indigeneity, class, ability, colonialism, and the State. We will engage theoretical texts on mapping and social justice to identify how GIS and maps can expose and resist oppression and inequality. Students will apply critical theory through the practice of critical cartography to analyze a course-related topic of their choosing and use GIS tools to create an original project. Students will move away from the traditional research paper and engage with a digital research platform that enhances research impact and scholarship reach while applying such tools to interrogate the power dynamics contained within them. It provides the opportunity to serve as a tool for community collaborations in social activism as a shareable document. This class is designed to offer an interdisciplinary approach to place-based research and its connections to social justice.**Credits:** 3.00

ILS 59000 - Independent Study In Information Sciences

Credit Hours: 1.00 to 3.00. Intensive study on specific topics in information or data science that are not otherwise covered by courses currently offered at Purdue University. Plan of study and assessment is agreed upon by faculty and student before registration. Permission of department required. Permission of instructor required. **Credits:** 1.00 to 3.00

ILS 59500 - Special Topics In Information And Data Science

Credit Hours: 1.00 to 4.00. Intensive study of selected topics varying from semester to semester, from the practice of information and data sciences. Topics may include data management and organization, digital scholarship, data visualization, computer languages for data and information science, information literacy, archival literacy, and emerging trends in information and data science. Permission of the instructor is required for undergraduates. **Credits:** 1.00 to 4.00

ILS 63000 - Digital Humanities Foundations

Credit Hours: 3.00. This course introduces graduate students to the core theoretical and practical components of Digital Humanities. Students engage key theoretical texts in weekly seminars and practice central methodologies in weekly work sessions. **Credits:** 3.00

ILS 63100 - Digital And Analog Archives

Credit Hours: 3.00. Digital and Analog Archives provides an overview of archival theory and practice, including archival arrangement and description, preservation, and digitization best practices. Lab components incorporate archival research, digital reformatting, metadata creation, the creation of digital archives, and presentation of archives to users. **Credits:** 3.00

ILS 65000 - Introduction To Computational Text Analysis

Credit Hours: 3.00. This course provides an introduction to the methods, debates, and tools of computational text analysis, specifically crafted for the humanities and social science graduate students. **Credits:** 3.00

ILS 69000 - Independent Study In Information Sciences

Credit Hours: 1.00 to 3.00. Intensive study on specific topics in information or data science that are not otherwise covered by courses currently offered at Purdue University. Plan of study and assessment is agreed upon by faculty and student before registration. Permission of department required. Permission of instructor required. **Credits:** 1.00 to 3.00

ILS 69500 - Special Topics In Information And Data Science

Credit Hours: 1.00 to 4.00. Intensive study of selected topics varying from semester to semester, from the practice of information and data sciences. Topics may include data management and organization, digital scholarship, data visualization, computer languages for data and information science, information literacy, archival literacy, and emerging trends in information and data science. **Credits:** 1.00 to 4.00

Interdisciplinary Engineering

IDE 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

IDE 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

IDE 30100 - Professional Preparation In Interdisciplinary Engineering

Credit Hours: 1.00. Seminar covering topics required for professional preparation of engineers including functioning in teams, communication, ethics, global and societal impacts, how people learn, and contemporary issues impacting and impacted by engineering. **Credits:** 1.00

IDE 36000 - Multidisciplinary Engineering Statistics

Credit Hours: 3.00. Statistical methodology is critical to the engineering problem-solving process. This course introduces engineering students to the role of statistics in problem-solving, and to the design and presentation of simple models and experiments. An emphasis will be placed on using computer software to perform statistical analyses and to the interpretation of

the software results. This is a recommended course for the MDE statistics elective. Permission of instructor is required. **Credits:** 3.00

IDE 38199 - Professional Practice Three-Session Coop I

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Permission of department required. **Credits:** 0.00

IDE 38299 - Professional Practice Three-Session Coop II

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Permission of department required. **Credits:** 0.00

IDE 38399 - Professional Practice Three-Session Coop III

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Permission of department required. **Credits:** 0.00

IDE 38500 - Design Methodologies For Diverse Stakeholders

Credit Hours: 3.00. This course focuses on engineering design methodologies with a concern for the needs of diverse stakeholders. The course brings together topics drawn from a variety of disciplines (including anthropology, education, psychology, human-computer interaction and engineering) to introduce interdisciplinary engineering approaches to: (1) design tools, systems, and/or environments to support cognitive processes and (2) engage in human-centered and learner-centered design. The semester design project provides a context for students to apply these methods. Permission of Instructor required. **Credits:** 3.00

IDE 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

IDE 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

IDE 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

IDE 39699 - Professional Practice Internship

Credit Hours: 0.00. Internship experience in multidisciplinary engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Permission of department required. **Credits:** 0.00

IDE 48000 - Engineering Ethics In Interdisciplinary Contexts

Credit Hours: 3.00. The purpose of this course is to provide students with tools and strategies to reason through situations with ethical issues that they may encounter as engineering students and in their future careers. To this end, this course seeks to enhance students' awareness of ethical issues in interdisciplinary engineering contexts, ability to reason through ethical challenges in diverse engineering contexts, courage to respond to ethical issues in their future practice, ability to work effectively on teams, and the ability to communicate with others.**Credits:** 3.00

IDE 48300 - Multidisciplinary Engineering Analysis And Decision Making

Credit Hours: 1.00. Application of product evaluation, cost estimating, and product/project feasibility and viability analysis from multidisciplinary perspectives in the context of new product development. Topics include exposure to company success measures, quantitative and qualitative analysis, sensitivity analysis, cost-benefit analysis, project comparisons, new product life-cycle analysis, and related engineering decisions. Topics are explored through case-based, industrially focused examples. The course centers on the creation and use of analytical spreadsheets with computer tools/software for routine engineering analysis and decision-making. **Credits:** 1.00

IDE 48400 - Multidisciplinary Engineering Design Methodology

Credit Hours: 1.00. Engineering design methods targeted for MDE students. Introduction to Multidisciplinary Teams, Design Project Scoping and Task Clarification, Design Data Acquisition & Management, Design Communication & Iteration. and Design Review Processes. Permission of department required. **Credits:** 1.00

IDE 48500 - Multidisciplinary Engineering Design Project

Credit Hours: 3.00. Capstone design experience for multidisciplinary engineering students. Physical system or process system design projects, related to contemporary or potential problems involving interdisciplinary teams of engineers. Permission of instructor required. **Credits:** 3.00

IDE 48700 - Multidisciplinary Engineering Senior Professional Development

Credit Hours: 1.00. Senior professional development covers and assesses students in Multidisciplinary Engineering professional outcomes including, teamwork, professional and ethical responsibility, communication, impact of engineering in context, lifelong learning, impact of contemporary issues, and leadership. Methods to obtain a professional position after graduation. **Credits:** 1.00

IDE 49500 - Special Topics In Interdisciplinary Engineering

Credit Hours: 1.00 to 4.00. Primarily designed for interdisciplinary engineering subject areas for which there is no specific course offered, but for which there is sufficient student interest to justify teaching a specialized course on a trial basis. May be repeated for credit as long as the topic being taught is not repeated. **Credits:** 1.00 to 4.00

Interdisciplinary Studies

IDIS 20100 - Introduction To Digital Humanities

Credit Hours: 3.00. This is an interdisciplinary foundational course that combines theory and practice to teach students in and about digitally mediated culture. Accordingly, this course fosters a critical understanding of the digital and its implication for the development of a technologically driven society. Students will be introduced to digital inquiry and critical practice and explore the ways that the digital transforms knowledge acquisition and production across the humanities, social sciences and sciences. Students will engage in readings and activities that help them form substantive perspectives on the digital formulations and practice through digital technologies and tools. Students will also experiment with digital methods and tools by building a digital project. This course places an emphasis on engaged learning through online and in-class discussion, digital activities, and collaborative work.**Credits:** 3.00

IDIS 29000 - Interdisciplinary Topics

Credit Hours: 0.00 to 6.00. Course topics and patterns will vary. **Credits:** 0.00 to 6.00

IDIS 49000 - Directed Reading In Interdisciplinary Studies

Credit Hours: 1.00 to 3.00. Reading under the direction of the instructor in a particular field of study. Permission of instructor required. **Credits:** 1.00 to 3.00

IDIS 49100 - Special Topics In Interdisciplinary Studies

Credit Hours: 1.00 to 4.00. Special topics or projects under the direction of the instructor in a particular field of specialization. **Credits:** 1.00 to 4.00

IDIS 59000 - Directed Reading In Interdisciplinary Studies

Credit Hours: 1.00 to 3.00. Reading under the direction of the instructor in a particular field of study. Permission of instructor required. **Credits:** 1.00 to 3.00

IDIS 59100 - Selected Topics In Interdisciplinary Studies

Credit Hours: 3.00. A study of selected topics, taught by an instructor in whose particular field of specialization the content of the course falls. **Credits:** 3.00

Italian

ITAL 10100 - Italian Level I

Credit Hours: 3.00. A beginning Italian course with emphasis on communicative skills (listening and speaking), literacy (reading and writing) and culture. **Credits:** 3.00

ITAL 10200 - Italian Level II

Credit Hours: 3.00. Continuation of ITAL 10100. **Credits:** 3.00

ITAL 10500 - Accelerated Basic Italian

Credit Hours: 3.00. An accelerated basic Italian course that substitutes for ITAL 10100 and ITAL 10200. Knowledge of a foreign language required. **Credits:** 3.00

ITAL 11200 - Elementary Italian Conversation

Credit Hours: 1.00. Development of oral skills for self-expression. Guided practice in conversation to enhance communicative competence. Small group discussions in Italian on various topics. **Credits:** 1.00

ITAL 20100 - Italian Level III

Credit Hours: 3.00. A continuation of ITAL 10200. **Credits:** 3.00

ITAL 20200 - Italian Level IV

Credit Hours: 3.00. An intermediate Italian course with emphasis on communicative skills (listening and speaking), literacy skills (reading and writing) and culture. **Credits:** 3.00

ITAL 20500 - Accelerated Intermediate Italian

Credit Hours: 3.00. An accelerated second-year Italian course with focus on furthering the development of listening, reading, speaking and writing abilities at the intermediate level. **Credits:** 3.00

ITAL 21200 - Intermediate Italian Conversation

Credit Hours: 1.00. Development of oral skills for self-expression. Guided practice in Italian conversation to enhance communicative competence. Small group discussions in Italian on various topics. Not open to students enrolled in or having credit for ITAL 30100 or above. **Credits:** 1.00

ITAL 23100 - Dante's Divine Comedy

Credit Hours: 3.00. Reading and discussion of Dante's Divine Comedy. The major critical approaches to Dante's masterpiece will be reviewed. All readings, papers, and examinations will be in English. **Credits:** 3.00

ITAL 28000 - Italian Culture And Civilization

Credit Hours: 3.00. Course focuses on salient aspects of Italian culture and civilization from the Middle Ages to the present. In English. **Credits:** 3.00

ITAL 28100 - The Italian Renaissance And Its Scientific And Cultural Impact On Western Civilization

Credit Hours: 3.00. This course introduces students to the most important cultural and scientific writings of the Italian Renaissance, and shows the pivotal influence of the Renaissance on the development of Western civilization as a whole. Classes and readings entirely in English; no knowledge of Italian needed. **Credits:** 3.00

ITAL 28500 - Intercultural Migration To Italy In Film, Literature, And Art

Credit Hours: 3.00. This course introduces students to the complexities of recent migrations to Italy through the perspectives of film, literature, and art. The course covers a wide range of topics, from a historical and geographical overview of migrations to Italy, to the hotly debated issues of immigration policies, Italian citizenship law, human rights and social justice, and the process of reimagining the Italian identity in more diverse and inclusive terms. Course taught in English. No Italian knowledge required.**Credits:** 3.00

ITAL 30100 - Italian Level V

Credit Hours: 3.00. Continued development of Italian speaking, listening, reading, and writing abilities, using materials dealing primarily with everyday life and civilization in Italy from a variety of sources (e.g., newspapers, magazines, TV, recent literature, etc.). Conducted primarily in Italian. **Credits:** 3.00

ITAL 30200 - Italian Level VI

Credit Hours: 3.00. Further work to develop speaking, listening, reading, and writing abilities in Italian, on the basis of materials dealing with the ideas and events that have shaped present-day Italy. Conducted primarily in Italian. **Credits:** 3.00

ITAL 31200 - Advanced Italian Conversation

Credit Hours: 1.00. One credit hour advanced Italian conversation course focused on the development of oral and aural skills for self-expression. Course provides students with guided practice in conversation to enhance communicative competence. Discussions in Italian on various topics. Course may be taken concurrently with ITAL 30100, 30200, 34100 and 34200. **Credits:** 1.00

ITAL 33000 - The Italian Cinema

Credit Hours: 3.00. The development and evolution of Italian cinema after World War II. The class will center on the viewing and discussion of films and will survey a broad spectrum of directors and styles. Knowledge of Italian not required. **Credits:** 3.00

ITAL 33300 - The Spirit Of Italian Comedy

Credit Hours: 3.00. This course explores various types of Italian comedy, focusing on theater and cinema. Particular emphasis will be given to Renaissance theater, commedia dell'arte, Goldoni, Pirnadello, Dario Fo, and to the new generation of Italian comedians. In English. **Credits:** 3.00

ITAL 33500 - Italian-American Cinema

Credit Hours: 3.00. This course offers an overview of the major filmmakers associated with the representation of Italian Americans in the United States film world. Students will view and discuss major filmmakers and their films, and will write critical essays on film topics. Conducted in English. **Credits:** 3.00

ITAL 34100 - Italian Literature I: From The Middle Ages To The Enlightenment

Credit Hours: 3.00. This is the first course of a two-semester sequence presenting an overview of Italian literature. Students will read and discuss major authors and texts and will write critical essays on literary topics. Readings, discussion, and papers in Italian. **Credits:** 3.00

ITAL 34200 - Italian Literature II: From Romanticism To The Present

Credit Hours: 3.00. This is the second course of a two-semester sequence presenting an overview of Italian literature. Students will read and discuss major authors and texts and will write critical essays on literary topics. Readings, discussion, and papers in Italian. **Credits:** 3.00

ITAL 38100 - Italian And Italian American Food Culture

Credit Hours: 3.00. This course provides a comprehensive exploration of the rich and diverse food cultures of Italy and Italian American communities. Through a combination of historical, cultural, visual, and culinary perspectives, students will gain an in-depth understanding of the traditions, influences, and innovations that have shaped Italian and Italian-American cuisine.**Credits:** 3.00

ITAL 39300 - Special Topics In Italian Literature Or Cinema

Credit Hours: 3.00. This course will focus on particular aspects of Italian literature, cinema or culture. No knowledge of Italian required. **Credits:** 3.00

ITAL 39400 - Special Topics In Italian Literature

Credit Hours: 3.00. This course studies a particular aspect in Italian literature (e.g., a theme, device, character type, motif, place) by reading a varied selection of works of different genres, styles, and/or periods. Readings, discussion, and papers in Italian. **Credits:** 3.00

ITAL 39900 - Special Study Abroad Credit It Italian

Credit Hours: 1.00 to 4.00. This course number is for assignment after the fact of credits in Italian earned while enrolled at a foreign university on a Study Abroad program which cannot be appropriately accommodated under an established Purdue course number. It is not for use for courses offered at or conducted by Purdue. **Credits:** 1.00 to 4.00

ITAL 49300 - Advanced Topics In Italian Literature Or Cinema

Credit Hours: 3.00. This course will analyze in depth particular aspects of Italian literature, cinema or culture. No knowledge of Italian necessary. **Credits:** 3.00

ITAL 59000 - Directed Reading In Italian

Credit Hours: 1.00 to 4.00. Directed readings in Italian. Permission of instructor required. **Credits:** 1.00 to 4.00

Japanese

JPNS 10100 - Japanese Level I

Credit Hours: 3.00 or 4.00. A basic study of standard Japanese. Students will be introduced to spoken and written forms of the language from the beginning. Language form and use are equally emphasized. Relevant cultural aspects. Hiragana, Katakana, and 85 Kanji. **Credits:** 3.00 or 4.00

JPNS 10200 - Japanese Level II

Credit Hours: 0.00 to 4.00. A continuation of the study of elementary Japanese. Task-oriented activities will be incorporated to encourage language use as well as pattern practice for linguistic accuracy. Relevant cultural aspects will be introduced. 120 Kanji. **Credits:** 0.00 to 4.00

JPNS 20100 - Japanese Level III

Credit Hours: 3.00 or 4.00. A study of intermediate Japanese. Occasional use of authentic materials for listening and reading practice. Task-oriented exercises, communicative activities, and pattern practice are used to facilitate learning of the spoken and written language. 110 Kanji. **Credits:** 3.00 or 4.00

JPNS 20200 - Japanese Level IV

Credit Hours: 3.00 or 4.00. A continuation of intermediate Japanese. Active use of authentic materials for listening and reading practice. Task-oriented exercises, communicative activities, and pattern practice for learning of the spoken and written language. 150 Kanji. **Credits:** 3.00 or 4.00

JPNS 23000 - Japanese Literature In Translation

Credit Hours: 3.00. Reading and discussion of selected texts from major writers and genres. The course provides a broad survey of the Japanese literary tradition and its cultural and historical background. Emphasis may vary from year to year. Knowledge of Japanese not required. **Credits:** 3.00

JPNS 24100 - Introduction To The Study Of Japanese Literature

Credit Hours: 3.00. Reading and discussion of selected Japanese poetry, prose, and drama; introduction to methods of literary criticism, applied to the reading of Japanese literary discourse. Texts, discussion, and written assignments largely in Japanese. **Credits:** 3.00

JPNS 28000 - Introduction To Modern Japanese Civilization

Credit Hours: 3.00. A survey of modern Japanese culture. Various aspects are covered, such as geography, economy, society, the political system, family, education, traditional arts, business, and language. Current issues will be discussed in a timely manner. Lectures in English. **Credits:** 3.00

JPNS 30100 - Japanese Level V

Credit Hours: 3.00. Continued development of Japanese speaking, listening, reading, and writing abilities, using materials dealing primarily with everyday life and civilization in Japan from a variety of sources (e.g., newspapers, magazines, TV, recent literature, etc.). Conducted primarily in Japanese. **Credits:** 3.00

JPNS 30200 - Japanese Level VI

Credit Hours: 3.00. Further work to develop speaking, listening, reading, and writing abilities in Japanese, on the basis of materials dealing with the ideas and events that have shaped present-day Japan. Conducted primarily in Japanese. **Credits:** 3.00

JPNS 31300 - Intermediate Reading In Japanese I

Credit Hours: 3.00. This course provides students with further study in reading Japanese at the intermediate level. The course also reviews and introduces 500 basic kanji. **Credits:** 3.00

JPNS 33000 - Japanese Cinema

Credit Hours: 3.00. A survey of the development of Japanese cinema after World War II. The class focuses on the viewing and discussion of the films and examines a variety of directors with different styles and thematic messages. **Credits:** 3.00

JPNS 34100 - Japanese Literature I: Modern Japanese Literature

Credit Hours: 3.00. Selected reading of poetry, drama, and fiction of modern Japanese literature. Students will read and discuss major authors and texts and will write critical essays on literary topics. Conducted largely in Japanese. **Credits:** 3.00

JPNS 36100 - Elementary Survey Of Japanese Linguistics

Credit Hours: 3.00. This course surveys all areas of Japanese Linguistics, including phonetics, phonology, morphology, syntax, semantics, and pragmatics, focusing on systematizing fragmentary knowledge students are assumed to have acquired through Japanese language courses. **Credits:** 3.00

JPNS 36300 - Relationship Of Japanese Language And Society

Credit Hours: 3.00. This course examines the Japanese language with reference to the way the language is being used in the Japanese society. Particular areas include keigo (honorific language), aizuchi (backchannel), silence, gender issues, in-group vs. out-group. **Credits:** 3.00

JPNS 39900 - Special Study Abroad Credit In Japanese

Credit Hours: 1.00 to 4.00. This course number is for assignment after the fact of credits in Japanese earned while enrolled at a foreign university on a Study Abroad program which cannot be appropriately accommodated under an established Purdue course number. It is not for use for courses offered at or conducted by Purdue. **Credits:** 1.00 to 4.00

JPNS 40100 - Japanese Level VII

Credit Hours: 3.00. Advanced work on the development of Japanese speaking, reading, and writing abilities, focusing on materials dealing with culture and the arts of Japan. Conducted mostly in Japanese. **Credits:** 3.00

JPNS 40200 - Japanese Level VIII

Credit Hours: 3.00. This course is a continuation of Fourth Year Japanese I. It continues work on the acquisition of advanced-level proficiency in speaking, listening, reading and writing. Students are given opportunities to understand the main ideas of extended discourse, to read texts which are linguistically complex, and to write about a variety of topics. **Credits:** 3.00

JPNS 44200 - Manga And Anime

Credit Hours: 3.00. In this class, students will study the globally popular art forms of Japanese comic books, known as manga, and cartoons, known as anime, from an academic perspective. We will approach the study of these media via the disciplines of literary studies, art history, visual culture studies, and the study of popular culture. While examining manga and anime as visual and literary media, we will consider topics including Japanese history, the environment, war, gender, sexuality, family, tradition, religion, philosophy, Japan's relationship to the globe, and genres of popular literature such as fantasy, horror, and science fiction. Materials to be covered include historical illustrated fiction of the 18th and 19th centuries (the prehistory of manga), foundational manga from the post-WWII era, manga by women writers, contemporary popular manga, anime films that ignited the global anime phenomenon, and anime films by the latest major directors. **Credits:** 3.00

JPNS 48500 - Culinary Culture Of Japan

Credit Hours: 3.00. Advanced-level language and culture course about the food of Japan. It covers gastronomy, celebrations, history, art, mythology, and other aspects of daily life related to the culinary traditions of Japan. Students will further develop their speaking, listening, reading and writing abilities in Japanese. They will have the opportunity to apply their skills in practical

contexts and discuss cultural considerations, as well as participate in some hands-on cooking experience. Conducted entirely in Japanese. Permission of department required. **Credits:** 3.00

JPNS 49000 - Special Topics In Japanese Language

Credit Hours: 1.00 to 3.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 3.00

JPNS 52100 - Teaching Japanese As A Foreign Language

Credit Hours: 3.00. Introduces a wide range of techniques used in teaching Japanese as a foreign language. Discusses theoretical issues concerned with the learning and teaching of Japanese. Permission of instructor required. **Credits:** 3.00

JPNS 56000 - Survey Of Japanese Linguistics

Credit Hours: 3.00. This course is intended to provide the student with a systematic overview of the Japanese language. It covers most major areas of linguistics, from phonetics to pragmatics. Conducted in Japanese. **Credits:** 3.00

JPNS 57500 - Theories Of Japanese Language Acquisition

Credit Hours: 3.00. Advanced course designed to provide an overview of major theoretical issues in Japanese language acquisition research. Permission of instructor required. **Credits:** 3.00

JPNS 59000 - Directed Reading In Japanese

Credit Hours: 1.00 to 4.00. Directed readings in Japanese. Permission of instructor required. **Credits:** 1.00 to 4.00

JPNS 59400 - Special Topics In Japanese Literature

Credit Hours: 1.00 to 4.00. Reading and extensive discussion of selected texts from different writers and genres. Provides in-depth research on a variety of issues related to Japanese literary and cultural traditions. Knowledge of advanced Japanese required. Permission of instructor required. **Credits:** 1.00 to 4.00

JPNS 59600 - Special Topics In Japanese Linguistics.

Credit Hours: 1.00 to 4.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 4.00

JPNS 67900 - Seminar In Japanese Linguistics

Credit Hours: 3.00. Advanced study and research on a significant topic in Japanese linguistics. Topic to be announced in advance. Permission of instructor required. **Credits:** 3.00

JPNS 69800 - Research MA Thesis

Credit Hours: 1.00 to 18.00. Research MA Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Jewish Studies

JWST 33000 - Introduction To Jewish Studies

Credit Hours: 3.00. An interdisciplinary course touching on the full range of Jewish experience from antiquity to the present. Several members of the Jewish Studies faculty and guest lecturers participate, representing such fields as anthropology, history, language, literature, philosophy, politics, religion, and sociology. **Credits:** 3.00

JWST 59000 - Directed Readings In Jewish Studies

Credit Hours: 3.00. A reading course in aspects of Judaica directed by the instructor in whose particular field of specialization the content of the reading falls. Permission of Instructor required. **Credits:** 3.00

Korean

KOR 10100 - Korean Level I

Credit Hours: 4.00. This course is the first half of the Elementary Korean language sequence. It is designed for those who have no prior (or very limited) knowledge of Korean. Lecture will introduce new material and explain conversational patterns considering grammatical, lexical, and pragmatic aspects of Korean. Some class meetings will be conducted entirely in Korean. Emphasis is placed on the fundamentals of listening, speaking, reading, and writing. In addition, students will be exposed to everyday life contexts (e.g., language use, culture, etc.) likely to be encountered in contemporary Korean society. **Credits:** 4.00

KOR 10200 - Korean Level II

Credit Hours: 4.00. This course is the second half of the elementary Korean language sequence. As a continuation of KOR 10100, the main purpose of this course is to expand on the study of the Korean language and culture. The class will introduce new material and explain conversational patterns considering grammatical, lexical, and pragmatic aspects of Korean. Some class meetings will be conducted entirely in Korean. Students continue to learn vocabulary, pronunciation, grammar, and the writing system by practicing Korean to achieve Novice High level of speaking, listening, reading, and writing. **Credits:** 4.00

KOR 20100 - Korean Level III

Credit Hours: 4.00. This course is the first half of the intermediate Korean language sequence. The main purpose of this course is to expand on the study of the Korean language and culture, and develop an Intermediate Low proficiency level. Some class meetings are conducted entirely in Korean. Students practice reading and listening comprehension, grammar, vocabulary building, and conversations that require a variety of styles, pragmatic considerations, and knowledge of Korean cultural topics. Skills for simple narration and written report will be enhanced. Students rely on authentic materials for introduction of Korean culture and authentic language usage. **Credits:** 4.00

KOR 20200 - Korean Level IV

Credit Hours: 4.00. This course is the second half of the intermediate Korean language sequence. The main purpose of this course is to expand on the study of the Korean language and culture, and develop an Intermediate Mid proficiency level. Some class meetings are conducted entirely in Korean. The course provides students with further conversational and grammatical skills. Students practice reading comprehension, grammar, vocabulary, and conversation using textbooks and authentic materials for introduction of Korean culture and authentic language usage. **Credits:** 4.00

KOR 24100 - Introduction To Korean Literature

Credit Hours: 3.00. This course will introduce students to major trends, genres, perspectives, and ideas in Korean literature, including poetry, essays, and short stories, from the early 20th century up to the present day. Covering significant historical milestones such as the Japanese Colonial Period, Liberation Day, and the post-liberation era, the literary works discussed in this course offer diverse perspectives on these time periods. By exploring prominent themes, forms, and literacy techniques, students

will gain insight into modern Korean literary traditions within the evolving context of Korean culture and society. The language of instruction will be in English.**Credits:** 3.00

KOR 28000 - Special Topics In Korean Language

Credit Hours: 3.00. This course will be offered as a variable-title course focusing on Korean language topics such as history of Korean language, Korean linguistics, Korean dialects, Korean sociolinguistic studies, applied linguistic foci in Korean language, etc. **Credits:** 3.00

KOR 28200 - Korean Culture And Society

Credit Hours: 3.00. This course explores Korean culture from antiquity to the present. Students will investigate the dynamic political and social forces that have shaped Korean history, comparing and contrasting them with those of other Asian countries. Various hands-on activities include an introduction to Korean cuisine, traditional musical instruments and costumes, and other cultural artifacts and practices. **Credits:** 3.00

KOR 30100 - Korean Level V

Credit Hours: 3.00. This course aims to help students develop their language skills in four areas-speaking, listening, reading, and writing-in Korean at the advanced level. It covers grammar and vocabulary, reading comprehension, fluency, conversation manners, and public speaking. Emphasis will be on the appropriate use of Korean in a variety of situations including schools, companies, and formal/informal meetings. This course also enables students to understand Korean culture and history and to develop cross-cultural insights by comparing Korean society with US society. Korean history, image of Korea, and current social trends in Korea will be discussed for a solid understanding of Korean culture in which Korean language is embedded. **Credits:** 3.00

KOR 30200 - Korean Level VI

Credit Hours: 3.00. This course aims to help students develop their language skills in four areas-speaking, listening, reading, and writing-in Korean at the advanced level. It covers grammar and vocabulary, reading comprehension, fluency, conversation manners, and public speaking. Emphasis will be on the appropriate use of Korean in a variety of situations including schools, companies, and formal/informal meetings. This course also enables students to understand Korean culture and history and to develop cross-cultural insights by comparing Korean society with US society. Korean history, image of Korea, and current social trends in Korea will be discussed for a solid understanding of Korean culture in which Korean language is embedded. **Credits:** 3.00

KOR 33000 - Introduction To Korean Cinema

Credit Hours: 3.00. This course examines Korean society and culture through cinematic representations. Through film, the course provides a broad understanding of the major social and political changes in Korean society, as well as a brief history of Korean cinema and the transformations in the structure of the Korean film industry. Students will learn to identify major directors such as Park Chan-wook, Lee Chang-dong, and Bong Joon-ho, films, and genres. All films will be screened with English subtitles. **Credits:** 3.00

KOR 38000 - Special Topics In Korean Culture

Credit Hours: 3.00. This course will be offered as a variable-title course focusing on traditional, historical, social, and political themes of Korea. **Credits:** 3.00

KOR 38100 - Introduction To Korean Food Culture

Credit Hours: 3.00. This course is an advanced-level language and culture course that uses food as a lens for understanding the history, cultures, and society of Korea. It covers gastronomy, history, ideologies of modern Korean cuisine, and other aspects of daily life related to Korean traditions. Through this course, students will enhance their proficiency in speaking, listening, reading, and writing in Korean. They will explore a range of topics connected to the eating, making, and representation of food. The primary language of instruction will be Korean, with some supplementary reading material in English.**Credits:** 3.00

KOR 40100 - Korean Level VII

Credit Hours: 3.00. This course aims to help students develop their language skills in four areas (speaking, listening, reading, and writing) at the advanced level. It covers grammar and vocabulary, reading comprehension, fluency, conversation manners, and public speaking. By dealing with various topics on authentic materials including news, articles on websites, and short stories, this course enables students to enhance linguistics knowledge and skills and also helps them to understand Korean culture, history, and current issues in Korea. It is expected that students will be able to discuss various topics and express opinions fluently in both spoken and written language.**Credits:** 3.00

KOR 48000 - Special Topics In Korean Studies

Credit Hours: 3.00. This course will be offered as a variable-title course focusing on topics related to contemporary Korean culture, arts, literature, etc. Or an internship totaling approximately 100-120 hours per semester or summer in Korea may also be credited through this course. **Credits:** 3.00

Landscape Architecture

LA 10110 - Survey Of Landscape Architecture

Credit Hours: 2.00. An overview of landscape architecture, this course provides students with their first introduction to the knowledge areas, skills, and abilities that form the foundation of the landscape architecture profession. The course offers a preview of the discipline for pre-landscape architecture and horticulture students while also providing general information for students across campus who have an interest in becoming familiar with landscape architecture. **Credits:** 2.00

LA 10600 - Accelerated Foundations Studio

Credit Hours: 6.00. Conceptualizing, recording, and presenting site design ideas through problem-solving projects. Introduction to design and to presentation techniques fundamental to landscape architecture. Short projects give students exposure to a variety of design topics and presentation materials (pencil, ink, pastel, paper and board) and freehand lettering through two- and three-dimensional creative projects. Materials used are purchased by the student. **Credits:** 6.00

LA 11600 - Graphic Communication In Design I

Credit Hours: 3.00. A foundational course that covers a broad spectrum of hand-graphic communication techniques fundamental to landscape design including hand-drafting, sketching, architectural lettering, conceptual graphics, illustrative rendering, technical drawing, and drawing to scale. A series of short studio exercises will foster three-dimensional thinking and associated drawing methods. Materials used are purchased by the student. **Credits:** 3.00

LA 11700 - Graphic Communication In Design II

Credit Hours: 3.00. A course in graphic communication theory focusing on digital skills and processes. Project-based instruction will be used to simulate design office procedures through 2D and 3D exercises using raster and vector software. **Credits:** 3.00

LA 16100 - Land And Society

Credit Hours: 1.00. An introduction to human interaction with the landscape with emphasis on the science of ecology and the technological advancements that form the response to contemporary social and environmental issues. Specific topics include: shifting cultural views of nature, climate change, land development patterns, green infrastructure and building technologies, and the role of design in shaping responses. **Credits:** 1.00

LA 16600 - History And Theory Of Landscape Architecture

Credit Hours: 3.00. A study of the historic evolution of landscape architecture to the status of a recognized profession. The course covers the social, economic, political, climatic, and other factors that have influenced the development of design styles and theories. **Credits:** 3.00

LA 21600 - Studio I: Foundational Design

Credit Hours: 3.00. Landscape architectural site design, an introduction into processes and products. Building on the introduction to graphics in LA 11600 this is an introduction to the processes and production of site design and development drawings. Recording, conceptualizing and presenting site design ideas through problem solving projects. Emphasis on hand and computer drafting and drawing skills to communicate design ideas. Permission of department required.**Credits:** 3.00

LA 22600 - Studio II: Site Analysis And Design

Credit Hours: 4.00. Methods, principles and the process of designing in the built environment. Basic principles of site organization and composition are presented and applied in a series of exercises and studio projects. Role of the design process is reinforced both as a problem-solving tool and as a means of creativity and ideation.**Credits:** 4.00

LA 22700 - Planting I: Creating Ecologically Connected Landscapes

Credit Hours: 3.00. Review of design principles as related to plant design characteristics; design implications of plant responses to environment; review of landscape plants in fall. **Credits:** 3.00

LA 24600 - Site Engineering: Earthwork And Stormwater

Credit Hours: 4.00. Earthwork, grading, surface drainage and storm water management. Properties of contour lines and topographic representation. Standards for grading practices, notation, and nomenclature. Methods for calculating volumes of cut and fill. **Credits:** 4.00

LA 27500 - Honors Course - Lower Division

Credit Hours: 1.00 to 4.00. Utilized to offer a new honors course for a maximum of three years. Variable title, credit, and instructional type. Course may be repeated for credit if content and titles are different. Offered primarily to first- and second-year students. Courses offered must be approved by departmental or program faculty and College of Agriculture Honors Committee. Permission of instructor required. **Credits:** 1.00 to 4.00

LA 29000 - Special Topics In Landscape Architecture

Credit Hours: 1.00 to 4.00. Special topics in landscape architecture are explored. Topic selection is based on student interest. Permission of instructor required.**Credits:** 1.00 to 4.00

LA 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in landscape architecture. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

LA 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in landscape architecture. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

LA 30900 - Co-Op Preparation

Credit Hours: 1.00. The material presented in this course consists of a broad overview of the employment opportunities in the professional practice of landscape architecture and the ways to secure an internship. It provides the student with information about career choices in landscape architecture and an appropriate knowledge base with which to make informed internship choices. Students prepare written and graphic documents for seeking employment. Students prepare for interviews and communications leading to employment as an intern in landscape architecture. Course meets during weeks 1-8. **Credits:** 1.00

LA 31600 - Studio IV: Park And Open Space Design

Credit Hours: 4.00. Design theory and meaning in landscape architecture. Past, current and emerging design theories are investigated via lectures, research assignments and studio projects. Projects gain in size, complexity and depth of meaning. Emphasis on the role theory plays both as a stabilizing force and as a catalyst for change.**Credits:** 4.00

LA 32500 - Ecological Landscape Performance And Planting

Credit Hours: 3.00. Study of plants and their integration with other site features (e.g., water, landform) to increase sustainability. Plants will not only be studied for their aesthetic and spatial uses in the landscape, but also their ecological functions and temporal dynamics. The relationship of plants to site planning, ecosystems, and human use will be explored. Various scales, sustainable practices, and landscape performance will be considered. Class trip may be required. Students will pay individual lodging or meal expenses when necessary.**Credits:** 3.00

LA 32600 - Studio V: Community Design And Planning

Credit Hours: 4.00. Community planning and design. Past, current and emerging planning theories are investigated via lectures, research assignments and studio projects. The interrelationship of land use, circulation, and open space are explored using environmental and sustainable principles within a framework of traditional neighborhood design.**Credits:** 4.00

LA 34600 - Site Systems II

Credit Hours: 3.00. Earthwork, grading, surface drainage and storm water management. Properties of contour lines and topographic representation. Standards for grading practices, notation and nomenclature. Methods for calculating volumes of cut and fill. Methodology for horizontal and vertical alignment of roads and trails. **Credits:** 3.00

LA 35600 - Site Engineering: Construction Documents And Advanced Systems

Credit Hours: 4.00. Methods and standards of construction documentation using current technology. Preparation and packaging of site-related technical drawings and bid packages. Methods for site layout and dimensioning. Organization and composition of planting plans, plant lists, grading plans, lighting plans, and associated detail sheets. Standards and sequence of site-related specification documents.**Credits:** 4.00

LA 39000 - Professional Cooperative Programs In Landscape Architecture

Credit Hours: 0.00. Supervised work experiences in landscape architectural offices and in the landscape construction or maintenance industry. Programs must be preplanned and conducted under the direction of the cooperative educational coordinator in cooperation with an employer. Students must submit a summary report of the work experience. Consent of cooperative program coordinator required. Department permission required. Additionally, student must have a C- or better average in all LA courses taken to date. **Credits:** 0.00

LA 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in landscape architecture. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

LA 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in landscape architecture. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

LA 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in landscape architecture. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

LA 40000 - Landscape Architecture Study Abroad

Credit Hours: 0.00 to 8.00. Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities. **Credits:** 0.00 to 8.00

LA 41600 - Studio VI: Urban Design

Credit Hours: 4.00. An intensive design studio focusing on urban issues, including environmental, social, and economic approaches to the built environment. Exploration of development history, regulatory structures, local and regional demographics, economies, and environmental systems will be expressed through detailed design proposals, case study, and presentation critiques.**Credits:** 4.00

LA 42600 - Studio VII: Landscape Architecture Capstone

Credit Hours: 4.00. This course will focus on the integration and application of accumulated knowledge of landscape architecture from the student's previous coursework and internship experience. Students will be challenged to identify and solve problems in community-based projects. The students will also communicate, through reports and presentations, their results and plan to community audiences, faculty, and other students. Students will also do directed readings and then discuss topics related to the current and future practices of landscape architecture and environmental design.**Credits:** 4.00

LA 45000 - In The English Landscape:Integrating History, Horticulture, and Landscape Architecture

Credit Hours: 3.00. Intensive four weeks in residence in Corsham, UK with visits to significant sites to examine the intersections between human culture and the natural environment that results in the developed landscape. Offered in even-numbered years. Permission of instructor required. **Credits:** 3.00

LA 47500 - Honors Course - Upper Division

Credit Hours: 1.00 to 4.00. Utilized to offer a new honors course for a maximum of three years. Variable title, credit, and instructional type. Course may be repeated for credit if content and titles are different. Offered primarily to third- and fourth-year students. Courses offered must be approved by departmental or program faculty and College of Agriculture Honors Committee. Permission of instructor required. **Credits:** 1.00 to 4.00

LA 47600 - Professional Practice Of Landscape Architecture

Credit Hours: 2.00. A study of the principles and practice of landscape architecture in private and public offices. The course covers project acquisition, office management, and project implementation procedures. Preparation of a professional compendium is required. **Credits:** 2.00

LA 48100 - Special Topics In Landscape Architecture

Credit Hours: 1.00 to 3.00. This variable-credit, special topics course will be used for rotating topics dealing with skills, knowledge, and experiences related to landscape architectural theory, expression, and practice. Non-Landscape Architecture students may gain enrollment with permission of instructor. **Credits:** 1.00 to 3.00

LA 48200 - Contemporary Issues In Landscape Architecture

Credit Hours: 2.00. Rotating topics that explore focused issues in landscape architecture theory and practice. Analysis and experience of contemporary issues, designs, and designers explored through presentation, discussion, critique, and practice of thematic content. Non-Landscape Architecture students may gain enrollment with permission of instructor. **Credits:** 2.00

LA 49000 - Special Problems In Landscape Architecture

Credit Hours: 1.00 to 6.00. Independent in-depth study and presentation of specific research or design problems selected by the student in consultation with the instructor. Open only to advanced students. Permission of instructor required. **Credits:** 1.00 to 6.00

LA 49900 - Thesis Research

Credit Hours: 1.00 to 6.00. For students doing individualized research on landscape architecture; report required. Arrange with academic advisor and honors research advisor before registering. Admission to the honors program required. Permission of instructor required. **Credits:** 1.00 to 6.00

LA 50100 - Research Methods For Design Applications

Credit Hours: 1.00. The growing need for understanding the role of individuals, communities, and society in shaping the natural environment has led to a greater emphasis on landscape architectural research and the need to provide training in the research methods to support these efforts. It is an exciting time to enter this arena as landscape architects are collaborating with natural and social scientist to achieve better conservation outcomes, promote sustainable behaviors, and increase awareness and understanding of the complex environmental challenges facing our society. Non-Landscape Architecture students may gain enrollment with permission of instructor. **Credits:** 1.00

LA 58100 - Special Topics In Landscape Architecture

Credit Hours: 1.00 to 3.00. Rotating topics dealing with skills, knowledge, and experiences related to landscape architectural theory, expression, and practice. **Credits:** 1.00 to 3.00

LA 58200 - Contemporary Issues - Landscape Architecture

Credit Hours: 2.00. Rotating topics that explore focused issues in landscape architecture theory and practice. Analysis and experience of contemporary issues, designs, and designers explored through presentation, discussion, critique, and practice of thematic content. Permission of instructor. **Credits:** 2.00

Languages and Cultures

LC 10100 - Special Topics In Foreign Languages I

Credit Hours: 3.00 or 4.00. Special topics in Foreign Languages. Permission of department required. **Credits:** 3.00 or 4.00

LC 10200 - Special Topics In Foreign Languages II

Credit Hours: 3.00 or 4.00. Topics vary. Permission of department required. **Credits:** 3.00 or 4.00

LC 20100 - Special Topics In Foreign Languages III

Credit Hours: 3.00 or 4.00. Topics vary. Permission of department required. **Credits:** 3.00 or 4.00

LC 20200 - Special Topics In Foreign Languages IV

Credit Hours: 3.00 or 4.00. Special Topics in Foreign Languages IV. Permission of department required. **Credits:** 3.00 or 4.00

LC 23000 - Crossing Borders: Introduction To Comparative Literature

Credit Hours: 3.00. (CMPL 23000) Foundations for comparison of works in different languages, thematic (philosophical, sociological, psychological) and structural (genre, composition, use of linguistic devices); parallel interrelation of theme and structure in works of different literatures. The importance of literary norms and systems of genres. Examination of crosscurrents in different literatures during successive periods of development. **Credits:** 3.00

LC 23100 - Fairytale, Folktale, Fable

Credit Hours: 3.00. This course provides an overview of fairytale, folklore, and fable traditions across various cultures and historical periods, as well as an examination of their ongoing influence on contemporary cultures. Taught in English. **Credits:** 3.00

LC 23500 - East Asian Literature In Translation

Credit Hours: 3.00. Reading and discussion of selected East Asian poetry, prose, and drama. Focus will be on the traditions of China and Japan, but may include works of other cultures such as Korea. Emphasis may vary yearly, stressing traditional or modern literatures. **Credits:** 3.00

LC 23700 - Our Common Bond: Languages And Cultures In A Global Context

Credit Hours: 3.00. (CMPL 23700) Students learn what lies behind the concept of Liberal Arts: the capabilities, insights and skills of individuals who think critically and freely. It exposes students from across the university to the ideas, skill-set and inspiration that emanates from the liberal arts. They will be introduced to the discipline of Comparative Literature by examining the specific roles that languages and cultures play in the globalized world. The course also demonstrates how a Language and Cultures degree will put students at a greater advantage in career opportunities. **Credits:** 3.00

LC 23900 - Women Writers In Translation

Credit Hours: 3.00. An examination of international female writers' literary creativity in the context of women's studies and feminist theory, as articulated in their specific cultural and geographical milieu. Course content will vary in terms of cultural focus. In English. **Credits:** 3.00

LC 26100 - Introduction To The Linguistic Study Of Foreign Languages

Credit Hours: 3.00. Overview of linguistics and the role of language in society; fundamental concepts of linguistic analysis. The course focuses on linguistic phenomena found in French, German, Russian, and Spanish, with material, examples, and assignments drawn primarily from those languages whenever appropriate. **Credits:** 3.00

LC 26300 - Introduction To Computational Linguistics

Credit Hours: 3.00. This course introduces students to computational linguistics, a subfield of linguistics that studies natural languages from a computational perspective. The course covers both the theoretical and engineering topics ranging from aspects of formal linguistic structure to tools of language technology. The course will provide an understanding of the essential characteristics and differences between fields of inquiry such as computational linguistics, natural language processing (NLP), machine learning, and artificial intelligence (A.I.). There are no prerequisites and students are not expected to have any previous programming background, although the course introduces students to Python 3 programming language. Python is the ideal choice for NLP and AI due to its robust capabilities, strong community support, flexibility, and readability. It is a requirement for all NLP practitioners.**Credits:** 3.00

LC 26500 - Introduction To Neurohumanities

Credit Hours: 3.00. This course introduces students to the main developments in the neurohumanities particularly since the 1990s, with focus on cognitive literary and cultural studies. The course emphasizes not only the role of psychology, neuroscience, evolutionary biology, and other STEM and social scientific fields in interpreting cultural artifacts, but also how literary and cultural studies contribute significantly to those fields. Students will learn skills which will enable them to consider and interpret works of art, broadly defined, through a highly interdisciplinary cognitive-studies lens as they explore how the humanities are intricately intertwined with the sciences.**Credits:** 3.00

LC 26600 - World Literature: From The Beginnings to 1700 A D

Credit Hours: 3.00. World literature in translation. A comparative and chronological survey of the masterpieces of Eastern and Western literature. **Credits:** 3.00

LC 26700 - World Literature: From 1700 A D To The Present

Credit Hours: 3.00. World literature in translation. A comparative and chronological survey of the masterpieces of Eastern and Western literature. **Credits:** 3.00

LC 28000 - Special Topics In Languages And Cultures

Credit Hours: 3.00. Special topics relating to world languages and cultures. **Credits:** 3.00

LC 28100 - Introduction To World Food Cultures

Credit Hours: 3.00. This course introduces students to global food culture and world gastronomy. It covers different aspects of food studies such as food representations in art and literature, national identity, culinary traditions, and world trade and migration in respect to food. This course will give students a broad overview of the relation between food and many other disciplines, allowing them to connect the topics addressed to their own fields of study. Conducted in English. No prerequisites.**Credits:** 3.00

LC 30000 - World Literature Through The Photographic Lens

Credit Hours: 3.00. The course critically explores the photographic characteristics of modern world literature. It examines the deep, dynamical, and fascinating relationship between photography and literature.**Credits:** 3.00

LC 32300 - Global Sustainable Engineering

Credit Hours: 1.00 or 3.00. The main goal of this course is to encourage students to think like global engineers by focusing curricular activities on engineering case studies from a humanistic-engineering perspective. The case studies examined in the course may include past, present, and hypothetical engineering successes and failures; analyses will require engineering skills combined with understanding of cultural perspectives of local communities and cultural context (i.e., sociological, anthropological, and historical information and analyses that contribute to cultural understanding). This humanities-infused approach will encourage students to develop a new mindset--a way of seeing current and hypothetical engineering plans, projects, and impacts through local communities' pasts and presents, unique values, perspectives, and daily ways of life.**Credits:** 1.00 or 3.00

LC 33100 - Comparative Literature In Translation

Credit Hours: 3.00. A course in the study of a special topic related to works in several foreign literatures, directed by an instructor whose particular field of specialization will be highlighted. **Credits:** 3.00

LC 33200 - Global Horror Cinema

Credit Hours: 3.00. The course introduces horror cinema across the globe, through the technical and thematic analysis of different subgenres and domestic trends. In addition to building analytical skills regarding film concepts and theories, the course is designed to implement critical skills in film studies, cultural studies, and global studies.**Credits:** 3.00

LC 33300 - The Middle Ages On Film

Credit Hours: 3.00. Introduction to the Middle Ages through films in various languages and genres from the beginning of film history to the present. Reading literary, historical, legal, and film theory texts in conjunction with the films, students critically analyze representations of the Middle Ages and the cultural context from which these emerge. **Credits:** 3.00

LC 33800 - Language Through Films

Credit Hours: 3.00. The course critically explores language(s) via the medium of cinema where language plays a key role in the film. It is intended to introduce students to the fundamental place language occupies within human experience, to advance knowledge of some of the features of the system of language, develop a sharper ear for language, a better understanding of its

nature, and a livelier interest in all its manifestations. The course will be taught in English and films will be shown with subtitles. **Credits:** 3.00

LC 36100 - Sound And Form In Language

Credit Hours: 3.00. Examination of the nature of sound systems (phonology) and form systems (morphology) of language, as well as techniques of phonological and morphological analysis, using material from various languages. Central focus on phonetic and phonological structure, and on inflectional and derivational morphology. **Credits:** 3.00

LC 36800 - Sociolinguistic Study Of African American English

Credit Hours: 3.00. A study of the history, structure, uses, and educational concerns of African American English in African American speech communities and the U.S. culture at large. **Credits:** 3.00

LC 37100 - Phonetics Of Foreign Languages

Credit Hours: 3.00. Introduction to articulatory phonetics for students of foreign languages. Mechanisms of production of speech sounds. Production and discrimination of sounds of other languages; contrast with English sounds; practice in pronunciation and phonetic transcription. Introduction to the International Phonetic Alphabet (IPA). Credit will not be awarded for more than one of SLHS 30600, LING 31500, and LC 37100. **Credits:** 3.00

LC 39900 - Special Study Abroad Credit In Foreign Languages

Credit Hours: 1.00 to 4.00. This course number is for assignment after the fact of credits in foreign languages earned while enrolled at a foreign university on a Study Abroad program which cannot be appropriately accommodated under an established Purdue course number. It is not for use for courses offered at or conducted by Purdue. **Credits:** 1.00 to 4.00

LC 47500 - Theories Of Teaching World Languages

Credit Hours: 3.00. This course is designed to assist you in the process of becoming a skilled professional who can teach world language(s). You will develop an understanding of the connection between effective language teaching and successful language learning, be able to think critically about your own teaching and teaching materials, and gain an understanding of various theories, methods, approaches, and techniques in world language teaching. Areas of emphasis include the nature of language learning theories, early approaches to language pedagogy, communicative language teaching methodology, the relationship between theory and practice, aspects of interaction between speakers in the classroom, skills-based theories, sociocultural perspectives, individual differences between learners, and usage-based approaches to second language acquisition. **Credits:** 3.00

LC 49000 - Special Topics In Foreign Languages And Literatures

Credit Hours: 1.00 to 4.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 4.00

LC 49900 - Research In Foreign Languages

Credit Hours: 1.00 to 3.00. Undergraduate research into a topic in foreign languages. Permission of instructor required. **Credits:** 1.00 to 3.00

LC 51900 - Teaching Of Foreign Languages

Credit Hours: 3.00. A basic course designed to provide a forum for ideas connecting theory and research to teaching practice. Explores issues related to how learning and teaching can be enhanced and presents ideas that can be implemented in the classroom. Permission of instructor required. **Credits:** 3.00

LC 56300 - Historical Linguistics

Credit Hours: 3.00. (ANTH 56300, ENGL 56300) A survey of mechanisms and motivations of linguistic change. Topics include phonological, morphological, semantic and syntactic change, comparative and internal reconstruction, linguistic variation, language contact, and linguistic typology. **Credits:** 3.00

LC 56500 - Sociolinguistics

Credit Hours: 3.00. (ANTH 56500, COM 56500, ENGL 56500, LING 56500) An introduction to language in its social context, focusing on uses and users of language. Topics include social class, ethnic group, gender, language attitudes, and bilingualism. **Credits:** 3.00

LC 57000 - Introduction To Semiotics

Credit Hours: 3.00. (ANTH 51900, SLHS 58900, COM 50700, ENGL 57000) The study of languages, literatures, and other systems of human communication. Includes a wide range of phenomena that can be brought together by means of a general theory of signs. The course deals with three fundamental areas: 1) verbal communication, 2) nonverbal communication (iconic systems, gestures, body language, etc.), and 3) communication through art forms. **Credits:** 3.00

LC 57300 - Methods Of Experimental Research In Linguistics

Credit Hours: 3.00. The course is an overview of experimental methods used in linguistic research. The goal of the course is to introduce basic concepts, terminology, and procedures associated with experimental research in general, and to survey the types of experiments typically conducted in several major subfields of linguistics, including the associated experiment designs and approaches to data analysis. The course will focus mainly on designing and conducting the experiment, rather than on data analysis, although the data analysis techniques appropriate to the types of data will be briefly discussed whenever possible. The course will also cover additional topics such as ethics of experimental research (preparing an IRB protocol), doing background research, getting funding, choosing the right conference for presenting the results, writing a conference abstract, creating and delivering a conference presentation/poster, and writing up the results for publication. **Credits:** 3.00

LC 57500 - Theories Of Foreign Language Acquisition

Credit Hours: 3.00. An advanced course designed to provide an overview of major theoretical issues in foreign language acquisition research. Provides a broad historical introduction to theories of acquisition that underlie these different perspectives. This course also provides an understanding of skills assessment and selection of instructional materials. Permission of instructor required. **Credits:** 3.00

LC 57700 - Acoustic Analysis Of Speech

Credit Hours: 3.00. This course is an introduction to those aspects of acoustics most pertinent to understanding speech production and perception. It covers sound waves and their properties, digital signal processing, hearing and loudness, sound recording, and details of the acoustics of specific speech sounds such as vowels, plosives, fricatives, and nasals. The course includes a prominent practicum component aimed at learning to use software tools, specifically Praat, for analyzing acoustic properties of speech sounds. **Credits:** 3.00

LC 59000 - Directed Reading In Foreign Languages

Credit Hours: 1.00 to 4.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 4.00

LC 59300 - Special Topics In Literature

Credit Hours: 1.00 to 4.00. Special topics in Literature. Permission of instructor required. **Credits:** 1.00 to 4.00

LC 59600 - Special Topics In Linguistics

Credit Hours: 1.00 to 4.00. Special topics in Linguistics. Permission of instructor required. **Credits:** 1.00 to 4.00

LC 63000 - Comparative Literature: Function And Methods

Credit Hours: 3.00. (CMPL 63000) An introduction to methods, problems, and the bibliographical tools pertaining to comparative study. Required of all students in the Comparative Literature Program. **Credits:** 3.00

LC 63900 - Seminar In Comparative Literature

Credit Hours: 3.00. (ENGL 66500 and CMPL 65000) Exploration of a significant topic in comparative literature, e.g., the arts of translation, thematology, genre studies, literary movements, literary relations between countries. (See Comparative Literature.) Prerequisite: ENGL 66000 or LC 63000. **Credits:** 3.00

LC 65000 - Topics In Theory

Credit Hours: 3.00. Study of theoretical approaches to literature, the arts, or general culture (e.g., cognitive science, deconstruction, feminism, hermeneutics, postmodernism, postcolonial studies, reader response, semiotics). Examines methodologies and confronts them with literary texts. Permission of instructor required. **Credits:** 3.00

LC 65900 - Seminar In Literature And Culture Of The African Diaspora

Credit Hours: 3.00. An examination of the African Diaspora through the study of literatures and cultures of Latin America and the Caribbean. Prerequisites: Experience working with literatures of the African Diaspora and critical theory. **Credits:** 3.00

LC 67900 - Seminar In Linguistics

Credit Hours: 3.00. Advanced study and research on a significant topic in linguistics. Topic to be announced in advance. Permission of instructor required. **Credits:** 3.00

LC 69800 - Research MA Thesis

Credit Hours: 1.00 to 18.00. Research MA Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

LC 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Latin

LATN 10100 - Latin Level I

Credit Hours: 3.00. Introduction to classical Latin language. Focus on grammar, syntax, vocabulary, and elementary readings. **Credits:** 3.00

LATN 10200 - Latin Level II

Credit Hours: 3.00. Second semester introduction to Latin. Focus on grammar, syntax, vocabulary, and elementary readings in classical Latin and the language of the Vulgate. **Credits:** 3.00

LATN 10500 - Accelerated Basic Latin

Credit Hours: 4.00. Foundational Latin grammar course designed to prepare students to read classical and post-classical Latin in a single intensive semester. Focus on grammar, syntax, vocabulary, and elementary readings. The accelerated Latin course assumes *no* previous knowledge of Latin and makes it possible for the diligent student to be able to read *any* Latin prose or poetry (with a dictionary) after a single semester. (Upon completion students will be prepared to enroll in Latin 201.) **Credits:** 4.00

LATN 20100 - Latin Level III

Credit Hours: 3.00. Intermediate reading course in Latin, designed to strengthen students' grasp of grammar and syntax, broaden vocabulary, and develop foundational skills in reading and translation. **Credits:** 3.00

LATN 20200 - Latin Level IV

Credit Hours: 3.00. Upper intermediate reading course in Latin prose and poetry, designed to consolidate students' grasp of grammar and syntax, broaden vocabulary, and develop precision and confidence in reading and translation. **Credits:** 3.00

LATN 31500 - Latin Paleography I

Credit Hours: 3.00. This course gives students the opportunity to work with original medieval Latin manuscripts, involving transcription and translation, as well as study of the creation, care, and preservation of rare manuscripts. **Credits:** 3.00

LATN 34300 - Roman Oratory

Credit Hours: 3.00. Development of advanced Latin reading skills, alongside exploration of social, political, and rhetorical issues raised by the published versions of speeches performed in ancient Rome. **Credits:** 3.00

LATN 34400 - Roman Epic

Credit Hours: 3.00. Development of advanced Latin reading skills, alongside exploration of social, political, and rhetorical issues raised by epics such as Vergil's Aeneid, Ovid's Metamorphoses, or other hexameter poetry. **Credits:** 3.00

LATN 34500 - Roman Elegy

Credit Hours: 3.00. Readings and discussion of selections from Roman Elegy, including selected passages from such authors as Catullus, Tibullus, Propertius, and Ovid. **Credits:** 3.00

LATN 34600 - Roman Rhetoric

Credit Hours: 3.00. Development of advanced Latin reading skills, alongside exploration of the social, political and literary questions raised by Roman rhetorical theory. **Credits:** 3.00

LATN 34700 - Roman Comedy

Credit Hours: 3.00. Readings and discussion of Roman comedy, including selected works of Plautus and Terence. **Credits:** 3.00

LATN 44200 - Roman Lyric Poetry

Credit Hours: 3.00. Readings and discussion of selections from Roman lyric poetry, with special attention to Catullus and Horace. **Credits:** 3.00

LATN 44300 - Roman Satire

Credit Hours: 3.00. Readings and discussion of Roman satire, including selected passages from Horace, Juvenal, Petronius, and Seneca. **Credits:** 3.00

LATN 44400 - Roman Philosophers

Credit Hours: 3.00. Readings and discussion of Roman philosophical texts. **Credits:** 3.00

LATN 44500 - Roman Encyclopedists

Credit Hours: 3.00. Readings and discussion of texts representative of Roman encyclopedism, including selected passages from Pliny the Elder, Aulus Gellius, and Nonius Marcellus. **Credits:** 3.00

LATN 44600 - Roman Historians

Credit Hours: 3.00. Readings and discussion of Roman historical texts. **Credits:** 3.00

LATN 49000 - Directed Reading In Latin

Credit Hours: 1.00 to 3.00. Directs the reading of students with special interests. Guides students in profitable reading in subjects of their own choice. Permission of instructor required. **Credits:** 1.00 to 3.00

LATN 59000 - Directed Reading In Latin

Credit Hours: 1.00 to 4.00. Directed reading of selected texts in classical and/or medieval Latin. Permission of instructor required. **Credits:** 1.00 to 4.00

LATN 60100 - First Course To Establish Reading Knowledge

Credit Hours: 3.00. The first of two Latin courses designed to satisfy the graduate reading proficiency requirement. **Credits:** 3.00

LATN 60500 - Second Course To Establish Reading Knowledge

Credit Hours: 3.00. Second of two courses designed to develop basic reading skills in classical and post-classical Latin. Prerequisite: LATN 60100. **Credits:** 3.00

Latina American and Latino Studies

LALS 25000 - Introduction To Latin American And Latino Studies

Credit Hours: 3.00. Interdisciplinary and integrative presentation and examination of the historical, political, economic, and cultural processes of Latin America, from independence to the present followed by an analysis of scholarly works that include theoretical models, methodological strategies, and analytical approaches to learning about US Latinos. Special emphasis is placed on the immigrant experience and its role in the incorporation of Latinos into the US society. **Credits:** 3.00

LALS 26000 - U S Latino Culture

Credit Hours: 3.00. This course uses an interdisciplinary approach to study Latino culture in the United States through art, film, literature, music and theater. **Credits:** 3.00

LALS 30100 - Latin American Literary And Cultural Studies

Credit Hours: 3.00. Focuses on Latin American literatures and cultural products, such as film, music, and/or art. As a variable-topics course, individual sections may variously focus on South and/or Central America, Mexico, the Caribbean, U.S. Latina/o populations, or any combination of the above. Individual sections may also examine major cultural and historical movements, and/or canonical and emerging authors and artists. May be repeated for credit. **Credits:** 3.00

LALS 30300 - Latin American Languages And Linguistics

Credit Hours: 3.00. Focuses on the languages and linguistic practices of Latin American and/or U.S. Latina/o populations, also including the Caribbean. As a variable-topics course, individual sections may variously focus on the nature and structure of specific languages, as well as the study of their dialects, semantics, and histories; the history, structure, uses, and educational concerns of Latin American indigenous, Caribbean Creole and/or U.S. Latina/o speech communities; or any combination of the above. May be repeated for credit. **Credits:** 3.00

LALS 34700 - Latin American Politics

Credit Hours: 3.00. Focuses on major aspects of Latin American and/or U.S. Latina/o politics and development. As a variable-topics course, individual sections may variously focus on U.S. foreign policy toward countries in Latin America, the U.S.'s historical role in the politics of the Western hemisphere, the impact of the military on political development, the dynamics of Latin American industrialization, Latin America's changing international role, Latinas/os's political participation in the United States, or any combination of the above. Individual sections may also Latin American political thought from the colonial period through the present day. **Credits:** 3.00

LALS 35500 - Political Economy Of Latin America

Credit Hours: 3.00. Examines the salient issues of the 21st century in the political economy of Latin America. The first part introduces students to the historical evolution of the region's economy and its socio-economic and political determinants. Then it focuses on topical inquiry, analyzing key policy areas, frameworks and choices at the core of the current political economy of the region's countries: fiscal and industrial policies, monetary and financial policies and policies on trade, migration and inequality, energy and the environment. **Credits:** 3.00

LALS 40100 - Special Topics In Latin American/Latino Studies

Credit Hours: 3.00. Investigation of a special topic in Latin American or US Latina/o studies. The topic will vary from semester to semester. **Credits:** 3.00

LALS 40200 - Directed Reading In Latin American/Latino Studies

Credit Hours: 1.00 to 6.00. Directs the reading of students with special interests in Latin American or U.S. Latina/o studies. Guides students in profitable reading in subjects of their own choice. Individual conferences; no class meetings. Permission of instructor required. **Credits:** 1.00 to 6.00

Linguistics

LING 20100 - Introduction To Linguistics

Credit Hours: 3.00. Basic concepts of linguistics and methods of analysis of language; overview of linguistics and the role of language in society. Introduction to phonology, morphology, syntax, and semantics, and to problem-solving techniques, with material drawn from a variety of languages. **Credits:** 3.00

LING 31100 - Fundamentals Of Phonology And Morphology

Credit Hours: 3.00. Basic concepts and tools of phonological and morphological analysis viewed through the material of American English. Current theoretical approaches to phonology and morphology, including word-formation processes and applications. **Credits:** 3.00

LING 31500 - Elements Of Phonetics

Credit Hours: 3.00. Introduction to articulatory phonetics. Mechanisms of production of speech sounds. Sounds of languages of the world, ear training for discriminating speech sounds, and practice in broad and narrow phonetic transcription. Introduction to the International Phonetic Alphabet (IPA). Credit will not be given for both LING 31500 and SLHS 30600. **Credits:** 3.00

LING 32100 - Foundations Of Syntax And Semantics

Credit Hours: 3.00. Introduction to syntactic and semantic analysis based on American English and its dialects. Underlying structure and its relation to meaning. Analysis of parts of speech, constituent phrases, sentence structure, representations, ambiguity, and applications of current theory. Credit will not be given for both LING 32100 and ENGL 32800. **Credits:** 3.00

LING 36800 - Sociolinguistic Study Of African American English

Credit Hours: 3.00. A study of the history, structure, uses, and educational concerns of African American English in African American speech communities and the United States culture at large. **Credits:** 3.00

LING 39800 - Special Topics In Linguistics I

Credit Hours: 3.00. Investigation of a special topic in linguistics. The topic will vary from semester to semester. Permission of instructor required. **Credits:** 3.00

LING 47000 - TENL Practicum

Credit Hours: 3.00. As the final course of the TENL program, the Practicum builds on participants' knowledge and skills of teaching multilingual learners by revisiting previous learning in the TENL program. This course requires participants to

demonstrate mastery and application of concepts covered in previous courses (e.g., oral language progression, literacy development, test construction, domains/subsystems of language, language teaching methodologies, etc.) and assesses what participants currently know and believe about English language instruction, literacy acquisition, and approaches to professional development. Experiential learning or fieldwork in a classroom setting is required. In order to qualify for TENL certification, students must obtain a grade of C or higher in all TENL courses. **Credits:** 3.00

LING 49000 - Directed Reading In Linguistics

Credit Hours: 1.00 to 4.00. Independent study and reading on a topic in linguistics directed by a faculty member. Permission of instructor required. **Credits:** 1.00 to 4.00

LING 49800 - Special Topics In Linguistics II

Credit Hours: 3.00. Investigation of a special topic in linguistics. The topic will vary from semester to semester. Permission of instructor required. **Credits:** 3.00

LING 49900 - Research In Linguistics

Credit Hours: 1.00 to 3.00. Undergraduate research into a designated topic in linguistics. Permission of instructor required. **Credits:** 1.00 to 3.00

LING 50000 - Introduction To Linguistics

Credit Hours: 3.00. Fundamental concepts and methods of linguistic analysis of natural languages; overview of linguistics and the role of language in society. Introduction to phonology, morphology, syntax and semantics, and to problem-solving techniques, with material drawn from a wide variety of languages. Offered in conjunction with ANTH 51400 or AUSL 58000 or ENGL 50600 or LC 56100. **Credits:** 3.00

LING 50100 - Language Acquisition

Credit Hours: 3.00. This course offers an introduction to main linguistic, psycholinguistic and sociocultural approaches to language acquisition theory and research. Through extensive reading, students will develop a deep understanding of central issues affecting language acquisition in typically developing children, including age effects, and input and output conditions in the acquisition of syntax, semantics, phonology, lexicon and morphology. Emphasis will be made on experimental approaches and research methods in the acquisition of syntax in L1 and child bilingual development. **Credits:** 3.00

LING 51100 - Phonology I: Descriptive Analysis

Credit Hours: 3.00. Foundations of phonological analysis. Development of concepts and methods for the analysis of phonological data and the phonological structures of natural languages within the framework of generative phonology. Focuses on problem solving and linguistic argumentation. Offered in conjunction with ENGL 51300. **Credits:** 3.00

LING 51101 - Methods And Materials In Tesol I

Credit Hours: 3.00. This course provides an overview and critical discussion on the profile of English language learners (ELLs), their cultural and linguistic backgrounds, features of academic language, the main language teaching theories and methods and how they inform current practices in various contexts, as well as US education policy on ELLs. The course also has an emphasis on the teaching of listening and speaking. The students are given ample opportunities to understand the integration of implicit and explicit instruction on various language concerns, e.g., phoneme-awareness, word augmentation, sentence structure, listening comprehension, oral fluency etc. Students will also apply the principles of teaching to a mini-teaching task, where they can put

theories into practice, observe and share feedback. In order to qualify for TENL certification, students must obtain a grade of C or higher in all TENL courses.**Credits:** 3.00

LING 51200 - Phonology II: Theoretical Approaches

Credit Hours: 3.00. Examination, comparison, and evaluation of contemporary phonological theories, with focus on the contribution of each theory to our understanding of representations and operations in phonological analysis. Primary emphasis is on autosegmental phonology, metrical phonology, lexical phonology, and optimality theory. **Credits:** 3.00

LING 51201 - Methods And Materials In TESOL II

Credit Hours: 3.00. This course aims at broadening course participants' understanding of principles and practices of course & lesson planning, assessment, and materials development for English as a new or foreign language (ENL/EFL) instruction. Building on topics covered in Methods and Materials for TESOL I, we will examine explicit instructional approaches and strategies with an emphasis on developing reading and writing skills in the English language for culturally and linguistically diverse learners. While there is an emphasis on literacy instruction in this course, participants should keep in mind that all of the 4 language skills (reading, writing, listening, and speaking) are integrated and evidence of this integration is expected in the design of lesson plans. Throughout the semester, we will explore 5 major interrelated topics, which are guided by and embedded in philosophies and theories of education, language, second language acquisition (SLA), teaching, and learning: standards, curriculum, pedagogy, culture, and literacy acquisition. This course involves pre-professional education/training. Experiential learning or fieldwork in a classroom setting is required. In order to qualify for TENL certification, students must obtain a grade of C or higher in all TENL courses.**Credits:** 3.00

LING 52100 - Syntax I: Syntactic Analysis

Credit Hours: 3.00. Foundations of syntactic analysis and syntactic theory within the framework of generative grammar. Focuses on the central concepts of syntactic theory and on the principles and methods of syntactic analysis and argumentation using a core of topics relevant for syntactic theory. Offered in conjunction with ENGL 51200. **Credits:** 3.00

LING 52200 - Syntax II: Issues In Syntax

Credit Hours: 3.00. Deeper examination of a wider range of syntactic phenomena and evaluation of competing theoretical analyses proposed to account for them. Constructing theoretical analyses and evaluating their explanatory adequacy for Universal Grammar. Topics include LF phenomena, functional projections, and structural representations. **Credits:** 3.00

LING 53100 - Semantics I: Lexical And Sentential Semantics

Credit Hours: 3.00. Foundations of semantic analysis and survey of current linguistic semantic theories and methods. Semantics at the lexical and sentential levels. Combinatorial, truth-conditional, pragmatic, contextual, and computational semantics. Offered in conjunction with ENGL 51100. **Credits:** 3.00

LING 53200 - Semantics II: Formal And Grammatical Semantics

Credit Hours: 3.00. A formal, logic-based study of semantic relations. Semantics of individuals and objects, attributes, determiners, definite descriptions, quantifiers, events, time, and space. **Credits:** 3.00

LING 54100 - Historical Linguistics And Language Change

Credit Hours: 3.00. A general examination of the ways in which languages and their subsystems change over time and of the forces that produce change. The comparative method; internal reconstruction; geographical variation; and social variation.

Overview of world language families and genetic relationships. Offered in conjunction with ENGL 56300 or LC 56300. **Credits:** 3.00

LING 56000 - Service Learning In Languages And Linguistics

Credit Hours: 1.00 to 4.00. This course aims to introduce the student to critical reflective thinking and experiential learning that address local and global needs and foster civic responsibility. This service learning course is a multifaceted method of teaching and learning that enriches a students' academic life and real life learning by engaging her/him in meaningful hands-on service to the community while gaining valuable knowledge and skills that integrate with course objectives. **Credits:** 1.00 to 4.00

LING 56300 - Language Acquisition

Credit Hours: 3.00. This course offers an introduction to main linguistic, psycholinguistic and sociocultural approaches to language acquisition theory and research. Through extensive reading, students will develop a deep understanding of central issues affecting language acquisition in typically developing children, including age effects, and input and output conditions in the acquisition of syntax, semantics, phonology, lexicon and morphology. Emphasis will be made on experimental approaches and research methods in the acquisition of syntax in L1 and child bilingual develpment. **Credits:** 3.00

LING 56500 - Sociolinguistics

Credit Hours: 3.00. (ANTH 56500, COM 56500, ENGL 56500, LC 56500) An introduction to language in its social context, focusing on uses and users of language. Topics include social class, ethnic group, gender, language attitudes, and bilingualism. **Credits:** 3.00

LING 57000 - Field Methods In Linguistics

Credit Hours: 4.00. This course deals with the basic techniques for collecting language data, and is designed to reproduce and explore the conditions and methods of linguistic fieldwork in a classroom. The course also addresses questions related to the ethics of retrieving linguistic data, the relations between the linguist and the speaking communities, and the use of the collected data. A non-Indoeuropean lesser-studied language will be examined with the help of a native speaker of the language. The main area of its grammar will be covered: phonetic and phonological system, inflectional and derivational morphology, basic syntactic structures and basic semantic phenomena. The final goal is to obtain a basic grammatical description of the language. Lab sessions will be directed towards the training in the software and audio and video tools used for the trade. **Credits:** 4.00

LING 57600 - Latin American Indigenous Languages And Cultures

Credit Hours: 3.00. This course will help students to learn the importance of understanding the diversity of Latin American indigenous languages and cultures as well as the intercultural understandings gained when these indigenous languages are valued within the global context. Moreover, this course will provide a general cultural and linguistic framework to understand the sociolinguistic status of the language within the context where it exists. In this course, students will deepen their knowledge of Latin American indigenous cultures and their historics, as a means to achieving a greater understanding of both a shared humanity and the variety of human experiences. **Credits:** 3.00

LING 59000 - Directed Reading In Linguistics

Credit Hours: 1.00 to 4.00. Independent study and reading on a topic in linguistics directed by a faculty member. Permission of instructor required. **Credits:** 1.00 to 4.00

LING 59100 - Special Topics In Phonology

Credit Hours: 3.00. Investigation of an advanced topic in phonology. Topic varies from semester to semester. Permission of instructor required. **Credits:** 3.00

LING 59300 - Special Topics In Semantics

Credit Hours: 3.00. Investigation of an advanced topic in semantics. Topic varies from semester to semester. Permission of instructor required. **Credits:** 3.00

LING 59400 - Special Topics In Historical Linguistics

Credit Hours: 3.00. Investigation of an advanced topic in historical linguistics. Topic varies from semester to semester. Permission of instructor required. **Credits:** 3.00

LING 59800 - Special Topics In Linguistics

Credit Hours: 1.00 to 4.00. Investigation of an advanced topic in linguistics. Topic varies from semester to semester. Permission of instructor required. **Credits:** 1.00 to 4.00

LING 61900 - Seminar In Phonology

Credit Hours: 3.00. Intensive study and research on a selected topic in phonology. Topic varies from semester to semester. Permission of instructor required. **Credits:** 3.00

LING 62900 - Seminar In Syntax

Credit Hours: 3.00. Intensive study and research on a selected topic in syntax. Topic varies from semester to semester. **Credits:** 3.00

LING 68900 - Seminar In Linguistics

Credit Hours: 3.00. Intensive study and research on a selected topic in linguistics. Topic varies from semester to semester. Permission of instructor required. **Credits:** 3.00

LING 69000 - Individual Seminar

Credit Hours: 1.00 to 3.00. Under the individual guidance and supervision of a faculty member, students will select and investigate a topic and will produce a paper of professional caliber on the subject. Prerequisite: Doctoral student standing and Linguistics majors only. Permission of instructor required. **Credits:** 1.00 to 3.00

LING 69800 - Research MA Thesis

Credit Hours: 1.00 to 12.00. Research MA Thesis. Permission of instructor required. **Credits:** 1.00 to 12.00

LING 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Management

MGMT 100XN - Business Administration: Introduction

Credit Hours: 3.00. Business administration from the standpoint of the manager of a business firm operating in the contemporary economic, political, and social environment. No credit for Kelley School of Business students when taken concurrently with or after the integrative core. Typically offered Fall Spring Summer.**Credits:** 3.00

MGMT 151FN - Personal Finances Of The College Student

Credit Hours: 1.00. This course is an introduction to the basic planning tools and concepts for college-age financial literacy. Emphasis on financial decisions and challenges facing a typical college student. Topics include careers, goal setting, budgeting, tax planning and credit, including options for financing higher education. Foundation of the Financial Literacy Curriculum.**Credits:** 1.00

MGMT 152FN - Basic Financial Planning And Investment

Credit Hours: 1.00. Introduction to the basic planning tools and concepts for financial literacy into adulthood and retirement. Emphasis on analyzing, selecting and managing investments over a lifetime. Topics include, time value of money, financial statements, retirement objectives, and investing in various financial assets. Part of the Financial Literacy Curriculum**Credits:** 1.00

MGMT 200AN - Foundations Of Accounting

Credit Hours: 3.00 to 5.00. The course addresses the role of accounting in society and business, with a special emphasis on fundamental concepts and the basic design of accounting systems. This course is intended for non-business majors who are interested in learning about how accounting affects their lives and businesses. Credit not given for both BUS A2000 and either BUS A2010 or BUS A2020.**Credits:** 3.00 to 5.00

MGMT 200WN - Introduction To Business And Management

Credit Hours: 3.00. Business administration from the standpoint of the manager of a business firm operating in the contemporary economic, political, and social environment. No credit for Kelley Business students when taken concurrently with or after the integrative core.**Credits:** 3.00

MGMT 254LN - Commercial Law I

Credit Hours: 3.00. Includes the nature of law, torts, contracts, the sale of goods, and the legal regulation of business competition. The purpose of this course is to examine the legal framework for business activity and to explore how to manage that framework in a rapidly changing legal environment. The areas of the law studied include contracts, torts, employment law, intellectual property, forms of business enterprises, and the legal regulation of business competition. Credit not given for both BUS L2010 and BUS L2030.**Credits:** 3.00

MGMT 300FN - Introduction To Financial Management

Credit Hours: 3.00. Broad survey of finance for non-School of Business students. Topics include the determinants of interest rates and the time value of money; the sources and uses of financial information; the structure, role, and regulation of financial markets; monetary policy; the pricing of risk in financial markets; goals of investors; and how firms manage their financial affairs, including planning, budgeting, and decision making.**Credits:** 3.00

MGMT 300MN - Introduction To Marketing

Credit Hours: 3.00. Examination of the market economy and marketing institutions in the United States. Decision making and planning from the manager's point of view; impact of marketing actions from the consumer's point of view. No credit toward a degree in business.**Credits:** 3.00

MGMT 300PN - Introduction To Operations Management

Credit Hours: 3.00. Offered for students with a formal minor in business. The operations function is concerned with the activity associated with the production of goods and services. Provides an overview of operating decisions and practices in both manufacturing- and service-oriented firms. While no attempt is made to cover any particular area in depth, standard terms and concepts required to communicate effectively with operating personnel are introduced. No credit toward a degree in business.**Credits:** 3.00

MGMT 340ZN - Introduction To Human Resources

Credit Hours: 3.00. Introduction to Human Resources.**Credits:** 3.00

MGMT 560 - Manufacturing Planning And Control

Credit Hours: 2.00 or 3.00. An advanced course in manufacturing planning and control systems, emphasizing the integration of demand forecasting, inventory control, production scheduling, and production control. Topics are linked through case studies and an elaborate manufacturing computer simulation game. **Credits:** 2.00 or 3.00

MGMT 562 - Project Management

Credit Hours: 2.00. Emphasizes the use of PC-based project management software and its applications, particularly in manufacturing organizations and especially new product development projects. Extensive use is made of several case studies to illustrate the planning and monitoring of a project. Class is held in a computer lab. **Credits:** 2.00

MGMT 571 - Data Mining

Credit Hours: 2.00. Introduces the concepts, techniques, tools, and applications of data mining. The material is approached from the perspective of a business analyst, with an emphasis on supporting tactical and strategic decisions. Includes a variety of techniques to identify nuggets of information or decision-making knowledge in bodies of data, and extracting these in such a way that they can be put to use in the area, such as decision support, prediction, forecasting, and estimation. **Credits:** 2.00

MGMT 573 - Optimization Modeling With Spreadsheets

Credit Hours: 2.00. The course emphasizes applications of optimization through cases and computer exercises. The applications are chosen to provide insights into business and economics. Areas covered include linear, network, integer, and nonlinear optimization. At the end of the course, the students should have the ability to model optimization problems work with software to solve optimization problems relate to optimization theory in a variety of application settings develop optimization insights into applications in marketing, finance, and operations and get some basic exposure to EXCEL automation. Prerequisites: Students are expected to have taken a basic MBA (core) course in business analytics (such as the masters core MGMT 67000). **Credits:** 2.00

MGMT 581 - Big Data Technologies

Credit Hours: 2.00. There is an exponential growth in the adoption of big data technologies in every walk of life. Organizations are collecting, storing, and analyzing massive amounts of data. This data is commonly referred to as big data because of its large volume, the velocity with which it is collected and transmitted, the variety of forms it takes, and veracity of its origin and content.

In order to capitalize on the opportunities presented by big data, businesses are putting in place technologies, people, and processes. Just collecting, transmitting and storing big data creates little value for an organization. For many organizations, the term big data currently represents only a data infrastructure such as the Apache Hadoop family of products. The key to delivering real value from big data is the use of analytics. Data must be analyzed and the results used by decision makers and organizational processes in order to generate value. The main objective of this course is to learn how to collect, process, store, and analyze big data. Assignments could easily be completed in Python or SQL. We assume no familiarity with Linux and will introduce you to all essential Linux commands. Students need access to a computer with a 64 bit operating system and at least 4 GB of RAM. Note: 8 GB or more of RAM is strongly recommended. **Credits:** 2.00

MGMT 582 - Management Of Organizational Data

Credit Hours: 2.00. Provides the basic concepts and skills needed to analyze and organize business data, as well as to utilize the organized data to answer a variety of business queries. After successful completion, students will have an understanding of why database management is important and what it entails, how to analyze the data requirements of a business scenario and represent these requirements by means of entity-relationship (ER) diagrams, translate an ER diagram into normalized relations for a relational database management system, write simple and relatively complex data retrieval commands in the SQL language for an Oracle database, use Microsoft Access as a front end to a server database in Oracle, be familiar with several selected topics of current interest in the data management arena. **Credits:** 2.00

MGMT 614 - Investments

Credit Hours: 2.00 to 4.00. Examination of the process of asset valuation. Emphasis on portfolio analysis, security selection, risk-return relationships, and performance evaluation. Additional topics considered include security analysis, option pricing and analysis, futures contracts, and security market operations. **Credits:** 2.00 to 4.00

MGMT 638 - Pricing Strategies And Analysis

Credit Hours: 2.00. The course enables participants to formulate a systematic framework for approaching the problem of pricing a product, and more generally, a product line. The concepts and analytical methods necessary to develop such a framework are explored and incorporate marketing, competitive, and legal aspects. The course will use a combination of lectures, case discussions and exercises. Prerequisite: MGMT 62000. **Credits:** 2.00

MGMT 642 - Portfolio Management

Credit Hours: 2.00 to 4.00. Methods of analysis of common stocks and bonds for individual and institutional portfolios. Review of the empirical evidence of security market efficiency, and implications of that evidence for various methods of security analysis. Team projects to analyze the economy, the particular industry or sector, and selected firms within the industry or sector, and to make specific buy-hold-sell recommendations for the stocks and bonds of those firms. Prerequisite:MGMT 61000 . Typically offered Fall Spring.**Credits:** 2.00 to 4.00

MGMT 644 - Venture Capital And Investment Banking

Credit Hours: 2.00 to 4.00. Examines the process of corporate value creation through financial policy choices. The sequence of topics roughly parallels the life cycle of a typical corporation. Begins by studying the financing of entrepreneurial companies. Then studies the investment banking and capital acquisition process employed for public securities issues. Also examines capital acquisition and reorganization decisions, such as the use of hybrid securities like convertible debt and PIPEs, project financing bankruptcy reorganizations, and equity structurings. Prerequisite: MGMT 61000. **Credits:** 2.00 to 4.00

MGMT 647 - Financial Engineering

Credit Hours: 2.00 or 3.00. The objective of this course is to provide students with the necessary skills to value and hedge a wide variety of derivatives contracts used in financial markets. The main tool of analysis of the course is stochastic calculus set in continuous-time. Some basic knowledge of stochastic processes would be helpful, but not essential: we will cover what we need in class. The course covers valuation of securities using modern martingale methods as well as the necessary parameter estimation and numerical methods such as Monte Carlo simulations. Applications will include derivatives such as options on stocks, bonds and currencies, as well as valuation of defaultable securities, and modeling the term structure of interest rates and risk management with Value-at-Risk. Prerequisites: MGMT 61400, or similar coursework with instructor permission. **Credits:** 2.00 or 3.00

MGMT 652 - Entrepreneurship

Credit Hours: 2.00 or 3.00. Examines entrepreneurship with a focus on the start-up process for high growth new ventures. Cases will be used, and students will conduct a feasibility analysis of a new venture concept. Prerequisites: MGMT 61000 and MGMT 62000. Concurrent Prerequisites: MGMT 65000. **Credits:** 2.00 or 3.00

MGMT 655 - Competitive Strategy

Credit Hours: 2.00 or 3.00. Examines how firms obtain and sustain superior returns through the development and implementation of a competitive strategy at the business-unit level. Focus is on strategies that develop and exploit two sources of superior returns: unique value-creating resources (e.g., patents, brand equity, operational capabilities), and powerful positions in markets and supply chains. Participants are expected to be familiar with basic competitive strategy concepts and tools, such as "five-forces analysis", the value chain, and generic strategies. Presents a more analytical perspective of strategy, drawing from game theory. Prerequisites: MGMT 65000. **Credits:** 2.00 or 3.00

MGMT 687 - Design For Instincts: Social Networks And Engagements

Credit Hours: 1.00 to 3.00. This course will build on design thinking and game design techniques to develop process, policies, and/or products that appeal to human instincts. We will cover ideas that provide insights into, for example, new product development, entrepreneurship or designing HR policies. To name a few examples of projects we will discuss, SAP's points-based system to encourage carpooling that helps the company save on large gas expenses; at challenge.gov, the Whitehouse encourages innovative solutions through crowdsourcing; and at companies like Google, and Best-Buy, employees participate in information assimilation games called prediction markets providing information to senior managers about ongoing projects. In this course, you will examine the mechanisms behind designing for human instincts and thereby developing an understanding of their effective use in the modern firm. Gamification is one form of design for human instincts. In order for any design to be effective, it should involve clearly defined strategies and wellmanaged execution. To identify effective strategies, and metrics for the application of techniques to business, this course will draw upon interdisciplinary source material as well as real-world case studies. It will also identify a number of significant pitfalls to techniques, as well as notable legal and ethical issues, and the problems with implementing radical change in established firms. As a part of this class, you will be designing, playing, and evaluating various games. **Credits:** 1.00 to 3.00

MGMT 690 - Advanced Problems In Management

Credit Hours: 1.00 to 4.00. Advanced investigation in a specific management field at the graduate level. **Credits:** 1.00 to 4.00

MGMT 10000 - Introduction To Management

Credit Hours: 1.00. An introduction to and survey of the field of management. Exposure to the different functional areas of management will be stressed. Focus will be on the individual development of the student in regard not only to future professional employment but also to his or her educational planning. Required for freshman management students. **Credits:** 1.00

MGMT 11000 - Introduction To Management And Information Strategies

Credit Hours: 2.00. An introduction to and survey of the field of business. Exposure to the different functional areas of management will be stressed. Focus will be on the individual development of the student in regard not only to future professional employment but also to his or her educational planning. Designed to build and sharpen students' information-gathering skills. Guides students in developing systematic methods for finding, evaluating, and presenting information. Students apply their knowledge of business in a Case Competition. Required for freshman Krannert Leaders Academy students. **Credits:** 2.00

MGMT 17300 - Data Mining Lab

Credit Hours: 1.00. The Data Mining Lab provides a guided Experiential Learning environment for School of Business', especially BS BAIM's, freshman and sophomore students to learn the basics of business data variety, how they are organized, and what insights may be mined for. Students will have hands-on experience to get familiar with a specific data mining tool, R, for carrying out some data mining experiments. Completion of this course will not only enable students to see how the prerequisite or accompanying foundational courses are relate to their major studies but also help them better preparing for successes in their multiple upper division course studies.**Credits:** 1.00

MGMT 17500 - Information Strategies For Management

Credit Hours: 1.00. Designed to build and sharpen students' information-gathering skills. Guides students in developing systematic methods for finding, evaluating, and presenting information. Organization and use of electronic and print tools will be explained through discussion, hands-on exercises, and homework assignments. Permission of instructor required. **Credits:** 1.00

MGMT 19000 - Freshman Level Problems In Management

Credit Hours: 1.00 to 4.00. Investigation into a specific topic area of Management. Arrange with instructor before enrolling. **Credits:** 1.00 to 4.00

MGMT 19100 - Cooperative Work Experience I

Credit Hours: 0.00. Practice in business or other institutions. Admission to the cooperative program of education is required. **Credits:** 0.00

MGMT 19200 - Cooperative Work Experience II

Credit Hours: 0.00. Practice in business or other institutions. **Credits:** 0.00

MGMT 19300 - Cooperative Work Experience III

Credit Hours: 0.00. Practice in business or other institutions. **Credits:** 0.00

MGMT 19400 - Cooperative Work Experience IV

Credit Hours: 0.00. Practice in business or other institutions. **Credits:** 0.00

MGMT 19500 - Cooperative Work Experience V

Credit Hours: 0.00. Practice in business or other institutions. **Credits:** 0.00

MGMT 19700 - Careers In Accounting & Finance

Credit Hours: 1.00. This course explores the various career opportunities available to accounting majors, as well as opportunities available to non-accounting majors who have a strong background in accounting. While most students believe public/private accounting are the only career options for accounting majors, we examine other avenues such as hedge funds, private equity and consulting, among others.**Credits:** 1.00

MGMT 20000 - Introductory Accounting

Credit Hours: 3.00. The objectives of the course are to help students: (1) understand what is in financial statements and what the statements say about a business, (2) identify the business activities that caused the amounts that appear in the statements, and (3) understand how, when, and at what amount the effects of manager and employee actions will appear in the statements. CTL:IPO 1801 Accounting I **Credits:** 3.00

MGMT 20100 - Management Accounting I

Credit Hours: 3.00. An introduction to management's internal use of accounting information--for decision making, production management, product costing, motivating and evaluating performance, and budgeting. CCN:IPO 1802 Accounting II **Credits:** 3.00

MGMT 21200 - Business Accounting

Credit Hours: 3.00. The two primary objectives are to teach the skills to produce financial information-to send the relevant signals to decision makers; and to teach the skills to interpret the financial report-to receive the signals. To meet these objectives the students will gain an understanding of the reasoning behind the processes used to record financial information and the manner in which it is reported to external decision makers; gain an understanding of the four basic statements; and an understanding of the importance of financial statement information in interpreting the performance of organizations. **Credits:** 3.00

MGMT 22000 - Making The Business Case

Credit Hours: 3.00. This course develops one's ability to address situations faced by managers. This involves collecting information, analyzing that information to determine what decision or action is required and then selling the recommended decision or action to the management team. Selling this is done using one's persuasive skills in both telling a story and illustrating that story. **Credits:** 3.00

MGMT 24200 - Contemporary Problems In Personal Finance For Minorities

Credit Hours: 3.00. This course is designed to allow students to make informed decisions regarding their current and future financial position. Utilizing basic tools such as financial statements and budgets, the students can learn how to plan effectively for continuous financial stability. Students also are able to acquire a basic understanding of different saving instruments, investments, and retirement planning methods, as well as the benefits of purchasing real assets and accumulating wealth to allow stability. Students also have the opportunity to explore other interesting topics of personal finance through presentations and voluntary participation in class discussion. Permission of instructor required.**Credits:** 3.00

MGMT 24300 - Contemporary Thought Of Minorities In Management

Credit Hours: 3.00. The basic goal of this course is to introduce the minority student to the vast opportunities that are available in the field of management. The logic of a business education for the minority student is a reflection of the phenomenon that many corporations today are actively seeking minorities for managerial positions. Each semester, approximately 15 Fortune 500 companies are invited to the class to give presentations about entry-level opportunities with their firms. Other topics include the interview, resume writing, dual-career couples, the work force, affirmative action, minorities in the corporate world, etc. Each student is required to give a class presentation covering a business area of interest followed by class discussion over the topic. **Credits:** 3.00

MGMT 25400 - Legal Foundations Of Business I

Credit Hours: 3.00. An examination and study, for management students, of the nature and place of law in our society, both national and international, the social and moral bases of law enactment, regulation of business, legal liability, enforcement procedures, and the legal environment for managers. **Credits:** 3.00

MGMT 25500 - Foundations Of Business Ethics

Credit Hours: 1.00. Business ethics can be defined as the principles and standards that determine acceptable conduct in business organizations. During the course, we will examine ethical concepts, then dig into frameworks like Stakeholder Analysis, right v. right, and many more. This is your opportunity to evaluate past cases of ethical violations while also pre-thinking how you want to lead in the organization you work for across your career. Pre-thinking and planning who you want to be and how you want to lead is a critical piece of ethical leadership, and this course is designed to build you in that process.**Credits:** 1.00

MGMT 25600 - Technology Landscape

Credit Hours: 1.00. Success in business requires an understanding of today's rapidly evolving technological landscape. This course provides students with an overview of emerging technologies that are shaping the future of business. Weekly meetings feature forums with technology experts and business practitioners, giving students insights into the latest technological advancements and their practical applications in diverse business contexts.**Credits:** 1.00

MGMT 26100 - Introduction To Supply Chain Management

Credit Hours: 3.00. This course seeks to introduce general concepts in supply chain management, including procurement, supply planning, demand planning, and logistics. This course is designed around a corporate partnership to provide students with the opportunity to collaborate on solving a large-scale supply chain challenge. In the first five weeks of the semester, students will be introduced to basics of SCM through lectures, cases, and assignments. Beginning in the sixth week, students will form teams to work on a real-world case presented by the corporate partner, a complex problem broken down into six learning areas, each with a corresponding deliverable.**Credits:** 3.00

MGMT 28500 - Knowledge Management

Credit Hours: 3.00. Practical, hands-on introduction to the major techniques of computer-based knowledge management including: text management, data base management, ad hoc inquiry, forms management, customized report generation, business graphics, spreadsheet analysis, and programming. These are examined from the standpoint of how they can be personally used by managers to solve typical problems. All are presented and illustrated within a unified conceptual framework and particular emphasis is given to the integration of techniques. The four major interface approaches are introduced. Students are also acquainted with the topics of business expert systems and remote communications. **Credits:** 3.00

MGMT 28800 - Programming For Business Applications

Credit Hours: 3.00. This course will cover the fundamentals of business rules and logic in a business application development context. Students will acquire these skills using computer programming. A modern programming language will be used to learn and reinforce logical concepts, including abstraction, process flow, variable assignment, and control structures, as well as proper programming and application development practices, including documentation. **Credits:** 3.00

MGMT 28900 - Doster Leadership Conference Board Experiential Course

Credit Hours: 1.00. This experiential course focuses on developing leadership and managerial skills through the planning and execution of the Doster Leadership Conference. The course is designed for students currently in a leadership role related to the

Doster Leadership Conference. The material is developed to offer evidence-based approaches to tasks and issues you will face in your role as a board member for the Doster Leadership Conference. In this course, you'll learn to tackle real-world challenges, improve communication, and foster effective teamwork. You'll also gain insights into event logistics, budgeting, and stakeholder engagement while honing your problem-solving abilities. By actively participating in the conference's development, you'll grow as a leader, event organizer, and team member and be better prepared for leadership and project management roles in the future. Ultimately, you will become a stronger, more thoughtful, more organized, and more creative board member and board committee as a whole. Permission of instructor required.**Credits:** 1.00

MGMT 29000 - Problems In Management

Credit Hours: 0.00 to 4.00. Arrange with instructor before enrolling. Investigation in a specific management field. Permission of instructor required. **Credits:** 0.00 to 4.00

MGMT 29050 - Professional Internship

Credit Hours: 0.00. Students should be pursuing an internship complementing their academic plans-of-study (majors, minors, and concentrations within the Krannert School of Management). The intended purpose of the internship experience is to help students clarify career interests and prepare for future roles in Accounting; Analytical Consulting; Economics; Finance; Human Resources (OBHR); Industrial Management; International Business; Management; Management Information Systems; Marketing; Supply Chain, Manufacturing, and Operations Management; Quantitative Methods; or Strategic Management. Students must be seeking a Bachelor of Science degree in the School of Management. Employment must be related to the students major, minor, or area of academic concentration. May not be taken for more than five (5) semesters. Permission of instructor required. **Credits:** 0.00

MGMT 29110 - Integrated Business & Engineering Seminar I

Credit Hours: 1.00. The seminar courses to expose students to contemporary topics related to the design and management of modern organizations and enterprises. These seminars will leverage the expertise of faculty across Purdue, prominent alumni, and thought leaders in each (flexible, rotating) topic area. Seminar topics might include contemporary topics, for example, artificial intelligence, cybersecurity, climate resilience, and sustainable economic growth. Seminars will also focus on professional development of students along with discovery, development, and practice of skills required to enable a diverse team to address complex problems affecting a wide range of stakeholder through collaboration, communication, and application of a wide range of influencing strategies and techniques. Simulation, guest speakers, projects, field visits will be used as appropriate. **Credits:** 1.00

MGMT 29120 - Integrated Business & Engineering Seminar II

Credit Hours: 1.00. The seminar courses to expose students to contemporary topics related to the design and management of modern organizations and enterprises. These seminars will leverage the expertise of faculty across Purdue, prominent alumni, and thought leaders in each (flexible, rotating) topic area. Seminar topics might include contemporary topics, for example, artificial intelligence, cybersecurity, climate resilience, and sustainable economic growth. Seminars will also focus on professional development of students along with discovery, development, and practice of skills required to enable a diverse team to address complex problems affecting a wide range of stakeholder through collaboration, communication, and application of a wide range of influencing strategies and techniques. Simulation, guest speakers, projects, field visits will be used as appropriate. **Credits:** 1.00

MGMT 29130 - Integrated Business & Engineering Seminar III

Credit Hours: 1.00. The seminar courses to expose students to contemporary topics related to the design and management of modern organizations and enterprises. These seminars will leverage the expertise of faculty across Purdue, prominent alumni, and thought leaders in each (flexible, rotating) topic area. Seminar topics might include contemporary topics, for example, artificial

intelligence, cybersecurity, climate resilience, and sustainable economic growth. Seminars will also focus on professional development of students along with discovery, development, and practice of skills required to enable a diverse team to address complex problems affecting a wide range of stakeholder through collaboration, communication, and application of a wide range of influencing strategies and techniques. Simulation, guest speakers, projects, field visits will be used as appropriate. **Credits:** 1.00

MGMT 29140 - Integrated Business & Engineering Seminar IV

Credit Hours: 1.00. The seminar courses to expose students to contemporary topics related to the design and management of modern organizations and enterprises. These seminars will leverage the expertise of faculty across Purdue, prominent alumni, and thought leaders in each (flexible, rotating) topic area. Seminar topics might include contemporary topics, for example, artificial intelligence, cybersecurity, climate resilience, and sustainable economic growth. Seminars will also focus on professional development of students along with discovery, development, and practice of skills required to enable a diverse team to address complex problems affecting a wide range of stakeholder through collaboration, communication, and application of a wide range of influencing strategies and techniques. Simulation, guest speakers, projects, field visits will be used as appropriate. **Credits:** 1.00

MGMT 29150 - IBE Professional Development

Credit Hours: 0.00. This course is meant to promote meaningful reflection on multiple experiential learning opportunities offered to IBE cohort members as 2nd Year/Sophomores & 3rd Year/Juniors. The course will be required each semester during the 2nd and 3rd Years of the IBE program cohort experience. Assignments will include a reflection quiz or paper based on each event experience. Students will be required to complete at a minimum, 3 experiential learning experiences and corresponding reflections. All questions for surveys will be available on the Brightspace page.**Credits:** 0.00

MGMT 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in management. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

MGMT 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in management. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

MGMT 29300 - Diversity In The Workplace

Credit Hours: 3.00. Diversity can be defined as real or perceived differences among people with regards to race, ethnicity, sexual orientation, religion, age, physical and mental ability, and family status that affect an individual's treatment, opportunities and outcomes. As demonstrated in the workplace, diversity is the numerous ways that employees are viewed as being similar or different. Through this course, students will examine the historical context and the emergence of diversity in the workplace including bias, meritocracy, privilege, social identity frameworks, organizational culture, allyship and advocacy. **Credits:** 3.00

MGMT 29400 - Navigating Gender In The Workplace

Credit Hours: 3.00. This course has four objectives: (1) To Increase self-awareness and understand its value in managing careers; (2) To learn how gender culture and implicit bias may affect workplace experiences; (3) To develop strategies to deal with gender related challenges; and (4) To develop competencies in leading effective, gender-aware teams. By exploring these areas, students

will develop new insights for managing their careers, and they will learn new leadership strategies to help their teams achieve higher levels of performance. **Credits:** 3.00

MGMT 29450 - Women In Leadership

Credit Hours: 1.00. Ready to grow your confidence in leadership? In this one-credit course, we will explore how to develop and grow your talents, strengths and leadership while also making an impact at the school of business. We'll also explore what leadership looks like in different contexts, tools you need, and how to be a more inclusive leader. **Credits:** 1.00

MGMT 29500 - Career Readiness & Exploration

Credit Hours: 1.00. Start developing career readiness competencies through an engaging, hybrid course. Come prepared to create and modify your career necessities (resume, LinkedIn profile, elevator pitch, etc.), while growing in the competencies employers are looking for when hiring recent graduates! Following career necessities, you'll get a taste of what you might encounter in the workforce, and what steps you can take to explore other career options if you get into the workplace and find it's not a good fit. Jump-start your career through MGMT 29500! **Credits:** 1.00

MGMT 30400 - Introduction To Financial Management

Credit Hours: 3.00. Introductory course providing a foundation in corporate finance and covering topics such as: discounted cash flow valuation, bond valuation, equity valuation, option valuation, factors influencing a firm's cost of capital, and international finance issues. **Credits:** 3.00

MGMT 30500 - Business Statistics

Credit Hours: 3.00. Introduction to business statistics as related to facilitating managerial decision making. Topics include descriptive statistics, probability models, estimation, hypothesis testing, and regression analysis. Students use software to do their own analyses.**Credits:** 3.00

MGMT 30600 - Management Science

Credit Hours: 3.00. Use of optimization, simulation, and decision theory models to support management decision making. Emphasis on modeling and interpreting results for managerial applications of linear and integer programming models, network problems, simulation models, and decision analysis. Computer applications are stressed. **Credits:** 3.00

MGMT 31000 - Financial Management

Credit Hours: 3.00. Management of the financial affairs of the industrial enterprise. Working capital management, current asset management, capital budgeting, stock and bond valuation, and capital structure decisions. Typically offered Fall Spring Summer.**Credits:** 3.00

MGMT 32300 - Principles Of Marketing

Credit Hours: 3.00. This course aims to provide students with a broad understanding of marketing concepts that are useful to managers in a variety of applications including the marketing of consumer products, marketing of services, business-to-business marketing, and the marketing challenges that arise in not-for-profit organizations. Marketing involves identifying customer needs, then satisfying those needs by offering the right product and/or service at an acceptable price, making it available to customers through appropriate distribution channels, and promoting it in ways that motivate purchase as much as possible. The course serves as a foundation for marketing knowledge in general. No credit for students in the School of Management, except economics majors. Offered Fall Spring Summer.**Credits:** 3.00

MGMT 32400 - Marketing Management

Credit Hours: 3.00. The objective of this course is to introduce students to the concepts, analyses, and activities that comprise marketing management, and to provide practice in analyzing and solving marketing problems. The course is also a foundation for advanced elective courses in marketing. Topics covered in the course include customer behavior, market segmentation, product positioning, market research, product management, pricing, promotion, sales force management and competitive analysis.**Credits:** 3.00

MGMT 33100 - Development And Impact of Equal Employment Law

Credit Hours: 3.00. This class will delve into the legal issues that affect women and men with regard to gender discrimination, equality under the law, sexual harassment, the wage gap, the glass ceiling, affirmative action, family law, and more. The class will be lead through a variety of teaching formats including lectures, activities, presentations, and more. Through this course students will learn about these important areas and, in the process, develop strategies that will assist them as they pursue careers in business and management. Students will have the opportunity to delve deeply into areas that interest them and will impact their future careers. They will do this through a research topic and presentation. Sophomores and juniors are encouraged to enroll. The content may be of particular interest to women, but the course is open to all students. **Credits:** 3.00

MGMT 33200 - Business World Problem Solving

Credit Hours: 3.00. The class engages students to work in cross-functional teams to analyze business problems,develop recommendations, and persuade decision makers through the presentation of compelling solutions. In the classroom students will work together in teams to solve problems that are difficult for firms to outsource and are usually solved in-house without the opportunity to engage a consultant. **Credits:** 3.00

MGMT 33500 - Strategic Business Writing

Credit Hours 3.00. This course is designed to help Daniels School of Business undergraduate students become more effective, strategic writers in a business setting. However, there will be opportunities in this class to develop and practice speaking and interaction skills as well. The course format involves class lectures/discussions and extensive written work. **Credits:** 3.00

MGMT 33900 - Krannert Mentoring & Leadership Program

Credit Hours: 2.00. This course will help students learn mentoring best practices and qualities of an effective mentor while practicing and developing these qualities in themselves as they mentor incoming Krannert first-year students. Additional topics include: 1) how to implement and assess mentoring programs in companies, 2) how mentoring builds ethics and leadership skills, and 3) how to be a better cross-cultural mentor. **Credits:** 2.00

MGMT 34900 - Accounting Analysis & Modeling

Credit Hours: 3.00. Accounting information is found everywhere in business organizations. This introductory course is designed to equip students with the skills to analyze and model accounting information. Although much of the course's focus will be on external users of financial statement information, the course also covers the use of internal information for managerial decision making. The course heavily emphasizes the use of Excel as a tool to prepare and analyze data, as well as to summarize and communicate the results. Students will also gain a basic understanding of Tableau.**Credits:** 3.00

MGMT 35000 - Intermediate Accounting I

Credit Hours: 3.00. Financial reporting for interested external parties. Emphasis on asset valuation, income measurement, and preparation of financial statements, and on appreciation of discretion available to preparers. Typically offered Fall Spring.**Credits:** 3.00

MGMT 35100 - Intermediate Accounting II

Credit Hours: 3.00. Continuation of Intermediate Accounting I. An examination of additional problems in financial reporting, including long-term assets, liabilities, owners' equity, income taxes, earnings per share, leases, and pensions. Typically offered Fall Spring.**Credits:** 3.00

MGMT 35200 - Strategic Management

Credit Hours: 3.00. The course focuses on understanding competitive forces and how organizations strive to build sustainable competitive advantages through business- and corporate-level strategies. It integrates and builds upon previous training in functional areas and presents new analytical tools for developing an understanding of the strategic decisions that determine future directions and effectiveness of the organization. **Credits:** 3.00

MGMT 35300 - Intermediate Accounting For Non-Accounting Majors

Credit Hours: 3.00. The course is designed to meet the needs of students of predominantly finance students, as a firm grasp of key accounting concepts is critical to success in most finance professions. Throughout the course we will study measurement and reporting issues related to selected important financial statement items. The goal of this course is to educate students on major accounting topics that are likely to influence key financial decisions such as different inventory methods, different depreciation methods, lease recognition, pension accounting, among other topics. **Credits:** 3.00

MGMT 35500 - Consulting Tools And Skills

Credit Hours: 3.00. This novel course will provide an opportunity for motivated students to gain exposure to the skills and tools necessary to succeed in the consulting industry. There will be a chance to work in small teams to define client problems, collect and analyze data, develop solution proposals, and implement recommendations. Students will also be given an insider's look into the history of consulting, common types of consulting, and professional standards in this specialized area of management. Honing skills in project management, presentation delivery, storytelling, and stakeholder engagement will form the foundation of the tools used to solve client challenges. **Credits:** 3.00

MGMT 36100 - Operations Management

Credit Hours: 3.00. Operations Management (OM) is an area of business concerned with the production of goods and services. It involves the responsibility of ensuring that business operations are efficient in terms of using as little resource as needed, and effective in terms of meeting customer requirements. The course covers five major OM topics: process analysis, process variability, quality management, inventory management, and supply chain management. The course aims to provide a working knowledge of the vocabulary of OM, to help students develop an ability to design, improve, and manage processes by answering the questions: What are the components of a process? How should various process parameters such as capacities, output, and work-in-process inventories be calculated? What are the major opportunities for improving a process? The students get familiar with key issues (cost, quality, delivery, and flexibility) and problems (e.g., variability) facing an operations manager. At the end of the course, the students analyze operational strengths and weaknesses of a local firm, suggest some improvements of its operations and present the results. **Credits:** 3.00

MGMT 37000 - Real Estate Fundamentals

Credit Hours: 3.00. This course introduces the basic concepts, principles, and analytic methods applied in the field of real estate. The course covers topics including legal, financial, economic and marketing concepts related to real estate. The goal of the course is to expose students to the field of real estate and prepare them for more advanced real estate courses.**Credits:** 3.00

MGMT 37300 - Accounting Information Systems & Data Analytics

Credit Hours: 3.00. Learn how to manage the design, control and operation of accounting information systems. The emphasis is on identifying the information needs of decision makers and developing appropriate business process control in the design of accounting information systems. Gain an understanding and appreciation of the accounting information system and how it is used to successfully manage, audit and develop processes to support today's evolving business environment. **Credits:** 3.00

MGMT 37500 - Real Estate Law

Credit Hours: 3.00. The course provides an overview of real estate law and its influence on various aspects of the real estate industry. The course examines the legal issues surrounding the nature of real property, types of ownership and possession, real estate contracts, escrow and title and insurance, zoning, financing, landlord and tenant, land use regulations, environments law and regulations, and agency ethics.**Credits:** 3.00

MGMT 38199 - Professional Practice Co-Op I

Credit Hours: 0.00 to 3.00. Professional practice with qualified employers within industry, government, or small business. Typically offered Fall Spring Summer.**Credits:** 0.00 to 3.00

MGMT 38200 - Management Information Systems

Credit Hours: 3.00. This case-oriented course is designed to familiarize students with existing and emerging technologies and their business applications. It also covers issues, problems, and opportunities that information systems (IS) executives and general managers face when managing IS resources in their organizations. Includes lectures, presentations, case analyses and discussions, and a World Wide Web project. Case discussions cover real situations and deal with the operational and strategic decisions that every IS manager has to make in managing and exploiting the available information technology. Typically offered Fall Spring Summer.**Credits:** 3.00

MGMT 38299 - Professional Practice Co-Op II

Credit Hours: 0.00 to 3.00. Professional practice with qualified employers within industry, government, or small business. Industrial Practice Fee is attached to this course. Typically offered Fall Spring Summer.**Credits:** 0.00 to 3.00

MGMT 38399 - Professional Practice Co-Op III

Credit Hours: 0.00 or 1.00. Professional practice with qualified employers within industry, government, or small business. Industrial Practice Fee is attached to this course. Typically offered Fall Spring Summer.**Credits:** 0.00 or 1.00

MGMT 38800 - Python For Business

Credit Hours: 3.00. This course will cover the business rules and logic in a business application development context. These skills will be acquired using computer programming; specifically employing Python. Solution development will reinforce logical concepts process flow, variable assignment, and control structures, as well as proper programming and application development practices.**Credits:** 3.00

MGMT 38900 - Using R For Business Analytics

Credit Hours: 3.00. The main purpose of this course is to introduce and familiarize undergraduate students to RStudio and the R programming language as tools for business data analytics. Students will develop a small portfolio of projects that demonstrate fundamental knowledge of programming, exploratory data analysis, data visualization, and basic predictive modeling techniques using R. The emphasis of the course will be on hands-on applied projects in R in which students will be able to appreciate and visualize statistical and machine learning concepts tailored to real world business applications. **Credits:** 3.00

MGMT 39000 - Junior Level Problems In Management

Credit Hours: 0.00 to 4.00. The Accounting Internship provides work experience in businesses or other institutions. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 0.00 to 4.00

MGMT 39010 - Accounting Internship

Credit Hours: 1.00. An Accounting, Economics, Industrial Management or Management related work experience. This internship experience is intended to complement the student's academic plan-of-study and help prepare him/her for his/her future role in Accounting, Economics, Industrial Management or Management. A letter from the prospective employer stating the period of employment, hours per week, job title, job qualifications, and job description may be requested before registration will be permitted. Permission of instructor required. Typically offered Fall Spring.**Credits:** 1.00

MGMT 39020 - Management Internship

Credit Hours: 1.00. An Accounting, Economics, Industrial Management or Management related work experience. This internship experience is intended to complement the student's academic plan-of-study and help prepare him/her for his/her future role in Accounting, Economics, Industrial Management or Management. A letter from the prospective employer stating the period of employment, hours per week, job title, job qualifications, and job description may be requested before registration will be permitted. Permission of instructor required. Typically offered Fall Spring.**Credits:** 1.00

MGMT 39030 - Industrial Management Internship

Credit Hours: 1.00. An Accounting, Economics, Industrial Management or Management related work experience. This internship experience is intended to complement the student's academic plan-of-study and help prepare him/her for his/her future role in Accounting, Economics, Industrial Management or Management. A letter from the prospective employer stating the period of employment, hours per week, job title, job qualifications, and job description may be requested before registration will be permitted. Permission of instructor required. Typically offered Fall Spring.**Credits:** 1.00

MGMT 39040 - Economics Internship

Credit Hours: 1.00. An Accounting, Economics, Industrial Management or Management related work experience. This internship experience is intended to complement the student's academic plan-of-study and help prepare him/her for his/her future role in Accounting, Economics, Industrial Management or Management. A letter from the prospective employer stating the period of employment, hours per week, job title, job qualifications, and job description may be requested before registration will be permitted. Permission of instructor required. Typically offered Fall Spring.**Credits:** 1.00

MGMT 39050 - Finance Internship

Credit Hours: 1.00. A Finance-related work experience. This internship experience is intended to complement the student's academic plan of study and help prepare him/her for his/her future role in Finance. A letter from the prospective employer stating the period of employment, hours per week, job title, job qualifications, and job description may be requested before registration will be permitted. Permission of instructor required. **Credits:** 1.00

MGMT 39060 - Human Resource Internship

Credit Hours: 1.00. A Human Resource-related work experience. This internship experience is intended to complement the student's academic plan of study and help prepare him/her for his/her future role in HR. A letter from the prospective employer stating the period of employment, hours per week, job title, job qualifications, and job description may be requested before registration will be permitted. Permission of instructor required. **Credits:** 1.00

MGMT 39070 - Management Information Systems Internship

Credit Hours: 1.00. A Management Information Systems related work experience. This internship experience is intended to complement the student's academic plan-of-study and help prepare him/her for his/her future role in MIS. A letter from the prospective employer stating the period of employment, hours per week, job title, job qualifications, and job description may be requested before registration will be permitted. Permission of instructor required. Typically offered Fall Spring.**Credits:** 1.00

MGMT 39080 - Manufacturing, Operations, Supply Chain Internship

Credit Hours: 1.00. A Manufacturing, Operations, or Supply Chain related work experience. This internship experience is intended to complement the student's academic plan of study and help prepare him/her for his/her future role in Manufacturing, Operations, or Supply Chain. A letter from the prospective employer stating the period of employment, hours per week, job title, job qualifications, and job description may be requested before registration will be permitted. Permission of instructor required. **Credits:** 1.00

MGMT 39090 - Marketing/Sales Internship

Credit Hours: 1.00. A Marketing/Sales related work experience. This internship experience is intended to complement the student's academic plan of study and help prepare him/her for his/her future role in Marketing/Sales. A letter from the prospective employer stating the period of employment, hours per week, job title, job qualifications, and job description may be requested before registration will be permitted. Permission of instructor required. **Credits:** 1.00

MGMT 39100 - Strategic Thinking And Decision-Making

Credit Hours: 3.00. This course focuses on how to think strategically and make good business decisions. By the end of the class, you will be able to do the following: (1) Recognize biases in how people process information, conducting user tests and interviews to gain insights from prototypes to make business development decisions; (2) Engage in decision-making strategies to design/develop prototypes in a variety of media (digital and/or physical) for the appropriate level of fidelity necessary to communicate, understand, and test innovative ideas; (3) Select and use appropriate methods/tools/equipment to make decisions and design/prototype innovative ideas; (4) Pitch a viable solution for a validated problem to a variety of potential investors and/or stakeholders.**Credits:** 3.00

MGMT 39200 - Optimizing Personal Brand And Image

Credit Hours: 3.00. This course will focus on four areas: personal branding, social and digital media strategies, financial literacy and philanthropy. You'll gain an understanding of how to convey your image to an external audience, evaluate the proper channels to maximize and monetize that image responsibly, select advisors to help negotiate contracts and invest your money, and establish charities and events that support your personal causes. You'll learn which media and financial landmines to avoid while staying true to your personal principles and philosophies, and you'll gain leading-edge information about the technologies to keep you ahead in the game of life. **Credits:** 3.00

MGMT 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in management. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

MGMT 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in management. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

MGMT 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in management. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

MGMT 39699 - Professional Practice Internship

Credit Hours: 0.00 to 1.00. Professional experience in Management. Program coordinated by Office of Professional Practice with cooperation of participating employers. Students submit reflective summaries and receive company evaluation. Permission of Instructor required.**Credits:** 0.00 to 1.00

MGMT 39800 - Using R For Business Analytics

Credit Hours: 3.00. The main purpose of this course is to introduce and familiarize undergraduate students to RStudio and the R programming language as tools for business data analytics. Students will develop a small portfolio of projects that demonstrate fundamental knowledge of programming, exploratory data analysis, data visualization, and basic predictive modeling techniques using R. The emphasis of the course will be on hands-on applied projects in R in which students will be able to appreciate and visualize statistical and machine learning concepts tailored to real world business applications.**Credits:** 3.00

MGMT 40100 - Executive Forum

Credit Hours: 1.00. A lecture-discussion course featuring executives from business firms and other organizations. Emphasis is placed on the actual practice of management in corporate America, on career selection and mobility, on styles of management, and on other topics not normally covered in undergraduate courses.**Credits:** 1.00

MGMT 40300 - Database Management Systems

Credit Hours: 3.00. Intensive study of computer-based tools and methods for developing information systems for accounting and other managerial applications. The course concentrates on data base management techniques as the foundation for construction information systems. The coverage has a highly practical orientation. Specific topics include tool selection criteria, file management techniques, data base management concepts, comparative study of the major data models, schema design methodology, procedural and nonprocedural access languages, data security, data integrity, performance tuning, multiuser processing, and software integration. **Credits:** 3.00

MGMT 40500 - Six Sigma And Quality Analytics

Credit Hours: 3.00. The course is an undergraduate elective offered as part of the Center for Manufacturing Management Enterprises (CMME) quality initiatives. Provides an overview of various tools and methods for total quality management. **Credits:** 3.00

MGMT 41100 - Investment Management

Credit Hours: 3.00. Examination of investment alternatives relevant to the individual and/or family-unit investor. Operations of the markets in which securities are traded. Theory and application of security valuation, portfolio construction, capital markets, and performance evaluation. Particular attention given to fixed income securities, common stocks, options, investment companies, and other popular investment alternatives. Typically offered Fall Spring.**Credits:** 3.00

MGMT 41150 - Futures And Options

Credit Hours: 3.00. The course covers basic features and pricing of derivative securities such as forwards, futures, and options.**Credits:** 3.00

MGMT 41200 - Financial Institutions And Markets

Credit Hours: 3.00. Introduction to financial markets and management of financial institutions. Emphasis on determinants of interest rates, and measurement and management of financial risk. Concentration on management of depository firms such as banks and savings and loans. **Credits:** 3.00

MGMT 41220 - FinTech

Credit Hours: 3.00. Dramatic development in technology is fundamentally transforming all aspects of financial intermediation including lending, payment services, investments and trading. The goal of the course is to introduce these new developments to students with the emphasis on underlying economic mechanisms. We will start with talking about fiat money but quickly delve into cryptocurrencies and their applications. We will talk about tokens, smart contracts, automated market making and how applications of these concepts are transforming financial services and financial inclusion. We will cover these topics by analyzing real companies and contrast them with traditional players in the financial system. **Credits:** 3.00

MGMT 41250 - Fixed Income Securities

Credit Hours: 3.00. This course includes examination of fixed income securities institutions that invest, roles in institution, portfolios and math associated with assessing characteristics of fixed income securities. **Credits:** 3.00

MGMT 41300 - Corporate Finance

Credit Hours: 3.00. The course provides the theoretical and problem-solving tools needed in entry-level financial analysis positions in a corporate, commercial lending, or investment banking setting. Topics include corporate valuation, cash flow forecasting, project evaluation, capital structure, dividend policy, capital acquisition, and mergers/acquisition. Typically offered Fall Spring.**Credits:** 3.00

MGMT 41310 - Financial Data Analysis And Modeling

Credit Hours: 3.00. In the business world today, finance professionals are going to be given opportunities to analyze and model data. The objective of MGMT 41310 is to give students opportunities to work with financial data sets to ask and answer real questions that businesses have. In this course, students will use several data analysis software packages including R. Additionally, the course will include extensive application of Excel tools for Financial Modeling. **Credits:** 3.00

MGMT 41350 - Venture Capital And Entrepreneurial Finance

Credit Hours: 3.00. This course includes descriptions of markets for start-up businesses, venture capital financial structures, valuation of start-ups, role of venture capital in economic development and business growth strategies. **Credits:** 3.00

MGMT 41500 - International Financial Management

Credit Hours: 3.00. The course explores financial decision making in an international framework from the perspective of the management of a multinational corporation. Topics covered include the international financial markets, the measurement and management of exchange risk and political risk, and the financial aspects of the decision to set up cross-border operations. **Credits:** 3.00

MGMT 41601 - Corporate Mergers And Acquisitions

Credit Hours: 3.00. The financial analysis of corporate acquisitions, mergers, and reorganizations including asset acquisitions, joint ventures, spin-offs, sell-offs, equity carve-outs, bankruptcy proceedings and reorganizations, and corporate governance. The course uses a combination of lectures, readings, and case analysis. Typically offered Fall Spring.**Credits:** 3.00

MGMT 41650 - Financial Engineering

Credit Hours: 3.00. The objective of this course is to develop necessary skills to value and hedge a wide variety of derivative contracts traded in financial markets. The main tool of analysis of the course is stochastic calculus set in continuous time. Some basic knowledge of stochastic processes would be helpful, but not essential: what needed will be covered in class. The analytic valuation and hedging of derivatives using the modern martingale methods will be the main focus of the course. Applications will include forwards, futures, and options on stocks, bonds and foreign currencies. The numerical methods such as parameter estimation, Monte Carlo simulations, discretization schemes as well as the conditional volatility estimation techniques will also be addressed. In addition to the valuation and hedging derivatives, course also covers Value-at-Risk, credit risk, modeling the term structure of interest rates and the construction of the VIX index using the S&P 500 index options obtained from the IvyDB OptionMetric database.**Credits:** 3.00

MGMT 42000 - Consumer Analytics

Credit Hours: 3.00. Many firms possess extensive information about customers, their transactions, and their relationships with the firms, necessitating expertise for intelligent utilization. The objective of this course is to equip you with a scientific approach to customer marketing, featuring hands-on use of databases, analytics, and computing to collect, analyze, and act on customer information for various industries. This course specifically focuses on customer relationship analytics, including identifying promising prospects and customer acquisition, customer development through up-selling, cross-selling, and personalization, as well as managing customer attrition, retention, and evaluating customer lifetime value. It also explores advanced analytics models such as conjoint analysis, purchase forecasting, and perception analysis. **Credits:** 3.00

MGMT 42110 - Marketing Analytics

Credit Hours: 3.00. This course covers essential decision models and strategic metrics that form the cornerstone of marketing analytics. Using the insight gained in the course, students can predict the outcome of marketing plans to boost return on marketing investment (ROMI). The course emphasizes hands-on learning so students can immediately apply the econometric tools and techniques on a variety of marketing applications. A number of relevant topics are discussed, such as market sizing, forecasting and positioning, promotion budget allocation, and profit maximization. The final piece of this course is guiding the students on how best to craft data-driven presentations to key stakeholders through the use of an experiential learning project provided by an external client. **Credits:** 3.00

MGMT 42120 - Data & AI-Driven Marketing

Credit Hours: 3.00. Marketing is increasingly evolving from traditional approaches to leveraging big data and artificial intelligence (AI) to make strategic decisions and drive impactful campaigns. This course offers an immersive exploration into the intersection of data science, artificial intelligence, and marketing strategies, providing students with the knowledge and skills to thrive in the digital era. It will discuss uses of data science tools and AI algorithms in marketing applications, such as

personalized marketing, sentiment analysis, and ad campaign optimization. Students will also gain hands-on experience on applying the methods to real-world data.**Credits:** 3.00

MGMT 42130 - Consumer Behavior

Credit Hours: 3.00. Consumer behavior is the study of the processes involved when individuals or groups select, purchase, use, or dispose of products, services, ideas, or experiences to satisfy needs and desires. We will draw on research from psychology, marketing, economics and sociology to learn why consumers behave in the ways that they do. The course focuses on three general topics. 1) Consumers as individuals. We will explore basic psychological concepts like intrinsic motivation, perception, memory, and emotions to help us understand behavior. 2) Attitude change and decision-making. We will examine how consumers search and evaluate alternatives, develop attitudes, and make choices. 3) Consumers in their social and cultural settings. We will examine the interaction between the consumer and multiple external influences. We investigate how social elements (friends, family, etc.) and culture influence behavior.**Credits:** 3.00

MGMT 42210 - International Marketing

Credit Hours: 3.00. Most U.S. businesses, large and small, are becoming deeply involved in international business. The trend is going to grow even stronger because of the influence of World Trade Organization and regional trade blocks. Under these circumstances, it is imperative that business managers possess the skill sets to adapt their marketing strategies to the needs of international markets. This course will cover the concepts and theories pertaining to international marketing. It is aimed to provide students with skills in formulating a marketing plan for foreign market entry and conducting business in a foreign country. **Credits:** 3.00

MGMT 42300 - New Product Development

Credit Hours: 3.00. Provides an overview of the new product development process. Detailed insights are provided in the "fuzzy front end" of this process. Targeting positioning, and product decisions are also covered. The second half of the course completes the marketing mix and covers various market testing and product launch issues. **Credits:** 3.00

MGMT 42310 - Global Marketing Management

Credit Hours: 3.00. Most US businesses, large and small, are becoming deeply involved in international business. The trend is going to grow even stronger because of the influence of the World Trade Organization and regional trade blocks. Under these circumstances, it is imperative that business managers possess the skill set to adapt their marketing strategies to the needs of international markets. The course will cover concepts and theories pertaining to international marketing and provide the tools necessary to develop an international marketing plan. **Credits:** 3.00

MGMT 42410 - Sales & Retail Management

Credit Hours: 3.00. Understanding and executing effective sales and retail strategies are essential for achieving overall business success, impacting growth, customer relationships, and competitiveness in the market. This course combines theoretical foundations with practical applications, guiding students in integrating sales and retail management principles into comprehensive business decision-making processes.**Credits:** 3.00

MGMT 42500 - Marketing Research

Credit Hours: 3.00. The purpose of this course is to develop skills in the planning and execution of market research studies designed to acquire useful information for marketing decisions. It aims to familiarize students with techniques of research design, data collection, and analysis. Emphasis is placed on evaluating the results obtained from such investigations. **Credits:** 3.00

MGMT 42610 - Brand Management

Credit Hours: 3.00. This course is designed to provide an understanding of how to manage a brand, product, or product category. The course concerns issues related to customer behavior and customer decision making, with an emphasis on how to utilize such customer-oriented knowledge for building and maintaining brand equity. This course builds on concepts and topics covered in the core marketing course. Typically offered Fall Spring.**Credits:** 3.00

MGMT 42710 - Digital Marketing Strategy

Credit Hours: 3.00. Digital marketing is where marketing meets the internet, wireless devices, and other digital media. The course covers a variety of topics including online advertising, search engine optimization, participation in social media, online listening and monitoring, and web & social media analytics. Through a combination of lecture, case studies, hands-on exercises, and course projects, students develop capabilities in designing, implementing, and evaluating digital marketing strategies. Students can also gain hand-on learning experience in the course by participating in an online marketing project. In the online marketing project, each student team is given $50 to promote a chosen business or organization via online or social media platform (including search engine advertising and online display advertising). **Credits:** 3.00

MGMT 42810 - Pricing Strategy And Analysis

Credit Hours: 3.00. In the era of Big Data, where extensive information is available at consumer level, managers benefit from an increased ability to learn from their customers' behavior. In this scenario pricing becomes a crucial lever for increasing the relationship with the customer and maximizing profits and shareholder value. In this course, students will learn how to systematically approach pricing decisions, taking the perspective of the marketing manager. The course will use a combination of lectures, case discussions and in-class exercises to leverage micro-level transaction data for pricing decisions. **Credits:** 3.00

MGMT 42910 - Experiential Marketing

Credit Hours: 3.00. In this course, students learn to apply marketing concepts to real world marketing problems. Projects are varied and may involve marketing plan development for a start-up, market research, analysis of marketing data, digital marketing, search engine marketing, web design, and social entrepreneurship. Clients include Purdue Marketing Advisory Board members, entrepreneurs working with Purdue's Foundry and Discovery Park, Purdue Research Park start-ups, small and medium-size Indiana businesses, and non-profit organizations. Students are given flexibility in selecting projects of interest. Teams work under the direction of a faculty member. Teams meet regularly with the faculty supervisor and also the project sponsor to review project progress and discuss the next steps towards meeting project requirements. Projects are done in teams, although evaluation is individual. Permission of instructor required. **Credits:** 3.00

MGMT 42930 - Labor Relations

Credit Hours: 3.00. The course focuses on employee-employer relations. Attention is given to topics in legal aspects of union organizing and collective bargaining, labor unions history and structure in the United States, labor management negotiations, dispute resolution procedures, international labor relations, and labor-management cooperation. **Credits:** 3.00

MGMT 43000 - Professional Selling

Credit Hours: 3.00. The course covers all aspects of professional selling to help students develop an understanding of sales managers' goals, decisions, and challenges and learn about the tools, frameworks, and insights to diagnose and resolve strategic and tactical issues of selling. These concepts can help all employees promote their own ideas internally and more effectively work with the sales organization to achieve organizational success. **Credits:** 3.00

MGMT 43600 - Financial Reporting Frameworks

Credit Hours: 3.00. This course is designed to introduce students to the conceptual aspects of various U.S. and global financial reporting frameworks including: U.S. GAAP, IFRS, and Special Purpose Frameworks, as well as the COSO's Integrated-Framework for Internal Control. In addition, the course provides an overview of the FASB, its standard setting process, the Accounting Standards Codification, and a discussion of significant emerging financial reporting issues. **Credits:** 3.00

MGMT 43700 - Social Media Marketing

Credit Hours: 3.00. This course is deigned to equip students with tools and develop marketing skills required to address current marketing problems. The approach is to learn R software for conducting basic scraping on social media sites to understand user behavior and sentiment. In addition, Python will be used for web-scraping data from various websites and websites with dynamic content. The goal is to become familiar with such qualitative techniques as: word clouds, cluster dendrograms, sentiment analysis, and other methods. Occasional homework assignments or check points will be given to gain deeper understanding of the materials covered in class. The deliverables for this project will be a slide presentation (no more than 10 pages, excluding appendices) to showcase what you have learned. This may be included as a part of your resume to show your potential employers. These are some of the basic knowledge of useful skills in web crawling, data mining, and statistical analyses, so you may leverage your portfolio when seeking entry/junior level marketing analyst positions. **Credits:** 3.00

MGMT 43800 - Pricing Strategies

Credit Hours: 3.00. In the era of Big Data, where extensive information is available at the customer level, managers benefit from an increased ability to learn from their customers' behavior. In this scenario pricing becomes a crucial lever for increasing the relationship with the customer and maximizing profits and shareholder value. In this course, students will learn how to systematically approach pricing decisions, taking the perspective of the marketing manager. The course will use a combination of lectures, case discussions and in-class exercises to leverage micro-level transaction data for pricing decisions. **Credits:** 3.00

MGMT 43901 - Real Estate Investment & Development

Credit Hours: 3.00. The course will cover two main topics: real estate development and real state investment. For real estate development, we will discuss the process of the real estate development process, including the basics of the idea conception, feasibility, planning, financing, market analysis, contract negotiation, risk management, marketing, and asset management. For real estate investment, we will discuss the process and techniques of analyzing real property investment, and the effects of market conditions, government policies, and other factors on real estate investment.**Credits:** 3.00

MGMT 43902 - Real Estate Capital Markets & Securitization

Credit Hours: 3.00. The course covers debt and equity secondary markets linked to real estate assets. Main topics include features of commercial and residential mortgages, and mortgage calculation; analysis of agency and non-agency mortgage-backed securities and other instruments; history of mortgage secondary markets; commercial mortgage-based securities (CMBS), and Real Estate Investment Trusts (REITs). The advantages and drawbacks of the capital market products will be discussed and compared, and students develop a deep understanding of the alternatives that are available. The class consists of lectures, guest speakers, readings, class discussions, and case studies.**Credits:** 3.00

MGMT 43905 - Real Estate Industry Project

Credit Hours: 3.00. This course gives students opportunities of working on real-world projects provided by commercial corporations or organizations. Through the experiential learning experience, students have the opportunities to develop knowledge and skills in managing real estate projects. Depending on the available projects, students will work on topics related to real estate investment and development, facility design and renovation, asset management and other issues. The focus is on developing students' ability in applying what they've learned to solve real-world challenges and receiving coaching and feedback from industry experts.**Credits:** 3.00

MGMT 43907 - Advanced Topics In Real Estate

Credit Hours: 3.00. This course covers selected and timely topics in real estate that are not covered in other regular courses. The topics are determined by the instructor offering the course. The instructor may also include advanced analytical techniques for real estate investment decisions, real estate valuation, and other analyses. Cases and research reports may be used in this course.**Credits:** 3.00

MGMT 44301 - Management Of Human Resources

Credit Hours: 3.00. Survey of theory and techniques used in human resource management within organizations. Emphasis is placed on legal concerns, human resource staffing and development, reward systems, and the role of unions in American society. Techniques studied include job analysis, the use of various recruitment and selection procedures, compensation, administration, and collective bargaining. No credit for students in the School of Management. **Credits:** 3.00

MGMT 44310 - China, America And Artificial Intelligence

Credit Hours: 3.00. The key to business success is to read broadly and to understand how culture, economics, history, and politics converge. Through frequent writing assignments, close readings of personal accounts, and daily class discussions, students will gain insights into how culture, economics, history, and politics intersect to influence human behavior and worldviews. Case studies and examples will be drawn from the United States, China, and Taiwan. Finally, we will apply what we have learned to the practice of global cultural dexterity. Students will identify cultural nuances and subtleties in order to share examples of how each student has adapted or failed to adapt to different cultural dynamics. **Credits:** 3.00

MGMT 44362 - Leadership In A Changing World

Credit Hours: 3.00. This course is designed to help you become a more effective leader in a complex and rapidly changing world. Effective leadership-developed over time through practice, feedback, and self-reflection-is crucial for organizational success. While engaging in effective leadership practices can be rewarding, it is also a significant challenge for most people. This course aims to equip you with the knowledge and tools necessary to improve your leadership capabilities and confidence based on evidence-based practices and leadership theories. Through interactive sessions, we will explore various aspects of effective leadership, assess where you stand in your leadership development journey, and hone your leadership skills. By the end of the course, you should be able to recognize the importance of interpersonal relationship skills and abilities in effective leadership, discuss key leadership principles and practices in organizational settings with peers, colleagues, supervisors, and mentors, identify your own leadership strengths and areas for development, propose evidence-based solutions to real-world leadership problems, and develop a leadership philosophy based on your personal values and evidence-based strategies. **Credits:** 3.00

MGMT 44363 - Confident Transitions And Leadership

Credit Hours: 1.00. In this course offered by the Brock Wilson Center for Women in Management, graduating senior women will prepare for a confident transition from student to professional. Students will focus on common issues for new employees as well as be paired with an alumni mentor. They will develop a personal plan for their transition from college student to successful professional through reading and discussing key business leadership books. Through this course, each student will build a plan for the first six months of their job and decide what a successful transition looks like for them. Permission of instructor required. **Credits:** 1.00

MGMT 44428 - Human Resources Management

Credit Hours: 3.00. Survey of the techniques and practices used in human resource management. Emphasis is on legal requirements, cost/benefit considerations, and strategic needs in managing human resources. Topics include recruitment, selection and placement, compensation, work design, and reactions to work. Specific techniques reviewed include assessment

centers, incentive plans, structured interviewing, and autonomous work groups. Current issues and managerial decision making are emphasized. **Credits:** 3.00

MGMT 44429 - Talent Management

Credit Hours: 3.00. This course focuses on the employer-employee relationship at work, and how managers work with employees to improve employee performance. Attention is given to the history of labor relations and performance management in work settings, with an emphasis, however, on contemporary approaches to managing the employer-employee relationship and the systems for managing employee performance. **Credits:** 3.00

MGMT 44430 - Staffing: Talent Acquisition

Credit Hours: 3.00. This course focuses on the effective management of the flow of talent into and through organizations. It covers workforce planning, recruiting and selection, career transitions and other workforce movement. It is designed to teach students the skills to recruit and select the best talent to help drive organizational strategy. It will also prepare students to evaluate methods for job analysis and selection. Students will learn how to design and ask interview questions that are behaviorally anchored and focused on organization-person fit and person-job fit, both of which are important for successful adaptation and effective performance on the job. Students will also learn how to design a process and framework for final individual or group selection. Lastly, they will learn several strategies to successfully orient and onboard new employees. **Credits:** 3.00

MGMT 44431 - Compensation: Total Rewards

Credit Hours: 3.00. This course examines the tangible and intangible aspects of compensation, through the lens of a total reward philosophy of an organization in order to attract, motivate, and retain their Human Capital. It also provides an overview of the considerations necessary to develop a compensation system that is internally and externally equitable and fiscally responsible, including the use of job evaluation and salary surveys. **Credits:** 3.00

MGMT 44432 - Employee And Leadership Development

Credit Hours: 3.00. This course focuses on key strategies and principles for developing employee and leader knowledge and skills in the workplace. The course will provide an overview of how organizations conduct performance management as well as training and development for their workforce. Building from these general overviews, the course will explore specific topics including, for example, training program design and effectiveness, performance evaluation and appraisal, feedback sessions and 360 degree feedback, mentoring, networking, as well as the specific skills and knowledge employees and leaders need to gain from these practices be successful both within their organizations and careers. Students will engage in various activities, assignments and self-assessment techniques in order to illustrate and practice the skills important for employee and leadership development. **Credits:** 3.00

MGMT 44433 - Leading And Working In Teams

Credit Hours: 3.00. This course will explore the forces that affect behavior in teams, and the factors that lead to team success. We will use a variety of readings, cases, activities, and class discussions to build concrete skills related to leading and working in teams. The course will explore the specific challenges associated with leading teams, some of which include: building and designing teams, managing information exchange within and across teams, structuring effective group decision processes, igniting creative thinking, enabling complex problem solving, managing team diversity and conflict, and managing systems of teams. Permission of instructor required. **Credits:** 3.00

MGMT 44434 - Human Resources Analytics

Credit Hours: 3.00. This course introduces concepts, tools, and methods used in collecting, interpreting, and presenting HR data. Students will learn how to gain new insights, solve problems, and drive performance through HR analytics. A central focus of

this course is the ethics of HR analytics. This course teaches students how to ask the right questions in order to intelligently use HR analytics and metrics for business decisions. It discusses the implications of internet AI, business AI, perception AI, and autonomous AI for HR. This course will cover applications including the intelligent use of analytics related to employee engagement, healthcare expenditure, learning and development, performance management, and safety. **Credits:** 3.00

MGMT 44500 - Introduction To Investments And Portfolio Management

Credit Hours: 3.00. Introduction to investments and portfolio management for non-management students. Covers characteristics of stock, bonds, portfolios, and financial markets. Includes introduction to interest rates and time value of money. **Credits:** 3.00

MGMT 44630 - Innovation Management

Credit Hours: 3.00. In this course you learn why organizations struggle to innovate, how to successfully analyze and implement an innovation strategy, and you learn to manage the innovation process. The course consists of two pillars (or 'walls') that enable a company to become innovative (Innovation Strategy and Organization Design) and the innovation process itself. The innovation process contains how to generate, select, implement, protect, experiment, scale, and diffuse ideas. Consequently, this course will provide you the skills and knowledge to manage innovations. Permission of department required.**Credits:** 3.00

MGMT 44670 - The Great Leaders Book Club

Credit Hours: 3.00. One way to learn about leadership and being an effective leader is to learn from other leaders past and present. Numerous articles and books have been written about leadership and/or profile one or more leaders. We will study leaders through historical and contemporary review and analysis of selected books that illustrate important leadership principles and situations. Course readings will typically include books that one would find on bookshelves of top-level leaders in organizations and institutions. Each week students and instructor meet to discuss the assigned readings and identify key leadership lessons and takeaways. These discussions are reinforced through role play and in-class exercises. Students are expected to be active co-participants and will be challenged to ask curious questions and develop critical thinking skills. This class is designed for high potential leaders who take leadership seriously and wish to develop their leadership capability to its fullest. Permission of instructor required. **Credits:** 3.00

MGMT 44671 - Corporate Conscience

Credit Hours: 3.00. Is there a moral component to leadership? Does a moral person translate to a moral manager? What does leading ethically entail? Where have organizations and their leaders failed to act in a way that advances the interests of their employees and society at large? This course takes a case study approach to understanding ethical leadership. We look inside organizations, through case study, to evaluate an organization's corporate conscience, defined here as the extent to which a company or organization prioritizes ethics and demonstrates ethical behavior or unethical behavior. We examine the drivers of ethical decision making and the qualities of what it means to be a servant leader. Permission of instructor required. **Credits:** 3.00

MGMT 44672 - Transformational Leadership Development Immersion Experience

Credit Hours: 1.00 to 4.00. Courses involve leadership immersion trips to develop one's leadership acumen and enable one to reflect on one's guiding principles. Immersion learning takes place in novel, inspiring settings where real leadership is/was required. Permission of instructor required.**Credits:** 1.00 to 4.00

MGMT 44673 - Intensive Leadership Sprint

Credit Hours: 1.00. Intensives are rapid leadership development experiences condensed over a weekend, with topics focused on self-leadership, teambuilding, conflict resolution, decision-making, communication, influence, and visioning. Permission of instructor required.**Credits:** 1.00

MGMT 44680 - Experiential Learning And Team Consulting Projects

Credit Hours: 1.00 to 4.00. This course is for independent team experiential consulting projects. Students work on solving a real-world problem. Projects will typically involve an external corporate or alumni partner that sponsors a project and provides a problem to be solved. Student teams will work with the client to define the scope of engagement, develop a project plan, conduct a needs assessment, provide benchmark data and market analysis, solve problems, make decisions and present recommendations. In addition, students will develop professionalism skills in communicating and interacting with corporate clients through written and oral communication, including a final presentation to corporate stakeholders. Permission of instructor required. **Credits:** 1.00 to 4.00

MGMT 44690 - Negotiation And Decision Making

Credit Hours: 3.00. The purpose of this course is to understand the theory and processes of negotiation so that you can negotiate successfully in organizational and management settings. This course covers a wide variety of negotiation problems faced by business people. In addition, models of effective and ineffective decision-making are introduced and students will have the opportunity to make decisions at both the individual and group levels.**Credits:** 3.00

MGMT 44710 - Competitive Strategy

Credit Hours: 3.00. This course focuses on the dynamics between a firm and the marketplace including interaction with competition. Strategy implementation occurs over multiple periods and is highly dependent on choices and behavior of competition. The course material covers how these dynamics and expectations of competitor response will shape the decisions of managers. This is inclusive of signaling intent to competitors and mutual forbearance to avoid negative sum gain competition. **Credits:** 3.00

MGMT 44810 - Technology Strategy

Credit Hours: 3.00. In today's business environment, it is increasingly apparent that business success is driven by a firm's ability to create and capture value through technology and innovation. Thus, the processes used by firms to develop new technologies, the choices they make regarding how to commercialize their technical knowledge, and the strategies they used to position and build a dominate competitive position all are important issues facing the firm. This course seeks to develop tools for understanding industry evolution with respect to new technology, forecast technological change, and understand the basis for technology in competitive advantage. **Credits:** 3.00

MGMT 45200 - Manufacturing Strategy And Process Innovation

Credit Hours: 3.00. This course examines the management challenges posed by the growth in worldwide manufacturing capabilities, markets, and competition and by rapid advances in technology and the concomitant decline in product life cycles. The manufacturing function is considered within a broader context encompassing design, engineering, purchasing, marketing, and customer service in an effort to assess the degree to which existing management structures successfully meet the challenges arising from the changing manufacturing environment. **Credits:** 3.00

MGMT 45500 - Legal Background For Business I

Credit Hours: 3.00. The nature and place of law in our society, national and international, social and moral bases of law enactment, regulation of business, legal liability, and enforcement procedures. Special emphasis on torts, contracts, and agency. No credit to students in the School of Management. **Credits:** 3.00

MGMT 45600 - Legal Foundations For Business II

Credit Hours: 3.00. A study of commercial law as prescribed by the Uniform Commercial Code, including the law of sales, documents of title, negotiable instruments, and the law relating to security interests. Additional material is presented covering the legal aspects of real estate transactions and personal property transfer.**Credits:** 3.00

MGMT 45900 - International Management

Credit Hours: 3.00. This course focuses on the challenges top managers face in developing strategies and management policies in multinational corporations (MNCs). Major topics usually covered include foreign market entry strategies, motivations and organizational challenges of internationalization, analyzing global industries, managing MNC/host government relations, building competitive advantage in global industries, international alliances and acquisitions, structuring and controlling MNCs, risk management, and the country manager role. **Credits:** 3.00

MGMT 46200 - Advanced Manufacturing Planning And Control Systems

Credit Hours: 3.00. The course examines key concepts in the planning, control, and improvement of processes in manufacturing and service operations. Specific topics covered in the course include: (i) Product/service characteristics that provide value to customers and competitive priorities, (ii) Role of processes and key operations choices to support the competitive priorities, (iii) Process analysis and scheduling, (iv) Throughput principles to deal with adverse impacts of process uncertainties and bottlenecks, (v) Managing capacity and lead times, (vi) Throughput principles to deal with wastes and errors, including the Toyota Production System and Lean Operations, and (vii) Coordinating material/order flows in supply chain - MRP, and Resources and Production Planning - Aggregate Production Planning. The class uses a combination of lectures, cases, simulations, outside speakers, experiential exercises, and student presentations. An important component of the course is a hands-on exercise where students in teams of seven or eight design and run a production process to meet demand for a quality-conscious customer. The teams then present the lessons learned to the class. **Credits:** 3.00

MGMT 46300 - Supply Chain Analytics

Credit Hours: 3.00. This course focuses on rigorous quantitative decision-making in supply chain management. It covers optimization (linear, nonlinear, and integer), stochastics/probability, and simulation. The coursework is conducted through experiential learning activities based on real-world data, proficiency with analytics software, and operation research case studies. MGMT 30600 is highly recommended but not required. Basic Calculus, Statistics, and Excel literacy are required. **Credits:** 3.00

MGMT 46400 - Logistics: Concepts And Models

Credit Hours: 3.00. The course familiarizes students with main concepts and models of business logistics management. Through the course, students develop an ability to design, improve, and manage logistics operations such as Inventory, Transportation, Warehousing, and Logistics Network Design. Since logistics decisions often require certain trade-offs to be made, students develop necessary quantitative and qualitative analytical skills to improve their decision-making. At the end of the course, students should be able to analyze logistics strategy of a firm, identify problems and tradeoffs in different logistics functions, formulate the corresponding models, identify quantitative methods to solve it, obtain results and interpret them for small-size problems using standard spreadsheet software, communicate the results to a broader audience using business language, discuss issues and challenges in same-day delivery, humanitarian logistics, physical internet. **Credits:** 3.00

MGMT 46501 - Strategic Sourcing And Procurement

Credit Hours: 3.00. This elective course will serve as an important complement to the existing OM modules (e.g., MGMT 36100 Operations Management) to introduce more in-depth knowledge about supply chain management to undergraduate students, especially those major in SC&OM, focusing on strategic sourcing and procurement operations which are the building blocks for supply chain operations. More specifically, this course will introduce procure-to-pay process, category management, supplier selection and evaluation, supplier relationship management, vertical integration, global sourcing, outsourcing, auctioning, supply contract design and negotiation, business ethics, legal and compliance issues, etc. Sourcing and procurement is the major job title

for supply chain operations jobs in the industry and our course can also help students to get the professional certificate of sourcing and procurement. Hence, it may also help senior students prepare for the job placements. **Credits:** 3.00

MGMT 46600 - Project Management

Credit Hours: 3.00. This course seeks to introduce different phases of managing projects from conception to termination with particular emphasis on quantitative tools for planning, scheduling, resource allocation, monitoring, and control. In addition, topics such as risk management, quality management and procurement management will be covered. Students will also gain a working knowledge of MSProject software. **Credits:** 3.00

MGMT 46700 - Big Data & Cloud Computing

Credit Hours: 3.00. Cloud computing and big data technologies are rapidly enhancing an organization's business intelligence ecosystem. Two modules of the course are specially designed for students to gain valuable hands-on experience in collecting, cleaning, formatting, integrating, and storing massive amounts of data that may be structured or unstructured, archived, or streaming in a cloud platform. The first module will introduce cloud computing fundamentals, its enabling technologies, main building blocks, and hands-on experience through projects utilizing Google Cloud Platform (GCP). The second module will cover processes for creating data pipelines in GCP so that the student will be able to curate big data for training, analysis, and prediction using AI/ML and other data science techniques.**Credits:** 3.00

MGMT 46800 - Supply Chain Technology

Credit Hours: 3.00. The course will introduce the major SCM information systems and technologies utilized by industry leaders to integrate SCM operations and achieve coordination within and across various business functions. The students will learn how to manage SCM operations, including: sales & distribution, materials management, production planning and control, warehouse management, retail operations. The course will provide students the opportunity to study, analyze, and observe the information systems and technology tools. Topics include Enterprise Resource Planning Systems (ERP), Blockchain, Warehouse Management System (WMS), Transportation Management Systems (TMS), Internet of Things (IOT) in retail. The students will learn how to use the SAP software to execute SCM operations. The course will review the technology implementation process and how such projects should be organized and managed. **Credits:** 3.00

MGMT 47000 - Transport Management I

Credit Hours: 3.00. Basic concepts and models for the transporting and distributing function. **Credits:** 3.00

MGMT 47100 - Transport Management II

Credit Hours: 3.00. Application of the trends in modern management to transportation, with emphasis on effective coordination and control. **Credits:** 3.00

MGMT 47200 - Advanced Spreadsheet Modeling And Simulation

Credit Hours: 3.00. This course covers up-to-date and practical spreadsheet modeling tools that can be applied to a wide variety of business problems from finance, marketing, and operations. The topical coverage consists of the following five modules: (1) Excel functions, skills and financial models; (2) deterministic and stochastic optimization techniques to determine the best managerial actions under internally-and/or externally-imposed constraints; (3) probability distribution fitting techniques to find the most likely description of the uncertainty in future business; (4) simulation modeling techniques to discover and analyze the risk and uncertainties in business environment and processes; (5) application of spreadsheet modeling and simulation techniques in forecasting asset dynamics(stock price) and pricing options and real investment opportunities. This course provides hands-on experience of computer application using Microsoft Excel and the spreadsheet add-ins @RISK, RISKOptimizer, SimQuick, etc. **Credits:** 3.00

MGMT 47300 - Data Mining

Credit Hours: 3.00. Students follow a structured analytical process using popular industry tools (e.g., RStudio, Tableau, SQL) to identify, visualize, and summarize relationships within large data sets to support business problems. More focus is on descriptive analytics which includes business segmentation and clustering methods, but also introduces two predictive analytic methods, decision trees, and neural networks. **Credits:** 3.00

MGMT 47400 - Predictive Analytics

Credit Hours: 3.00. Students build and evaluate predictive models to support regression-type and classification-type business problems using popular industry tools (e.g., RStudio, SAS Enterprise Miner). Methods covered include multiple linear regression, ridge regression, lasso, CART, logistic regression, LDA/QDA, SVM, and ensemble methods such as random forests. **Credits:** 3.00

MGMT 47500 - Machine Learning For Business

Credit Hours: 3.00. This course concerns the latest techniques in machine learning, focusing on deep learning and reinforcement learning, with applications to computer vision, natural language understanding, speech recognition, news recommendation, and others. The course plans to cover Neural Nets, Backpropagation, Convolutional neural network, Recurrent Networks, Autoencoders and other architectures in Deep Learning in the rst half. Next, the course plans to cover multi-armed bandits, Contextual bandits, Markov decision process, and Policy gradient methods in Reinforcement Learning. **Credits:** 3.00

MGMT 47800 - Experiential Project In Analytics

Credit Hours: 3.00. Most degree programs offer students an opportunity to apply the knowledge learned from their studies in an applicable area via a thesis, a research project, or capstone. This course provides such an opportunity and is designed specifically for Business Analytics & Information Management undergraduate students that will pursue analytical-type careers (e.g., Data/OR Analyst, Data Scientist, Decision Scientist, Consultant, Developer, etc.). This course is designed to polish and integrate the knowledge, skills, and abilities you have developed from your coursework by successfully developing an analytics solution with an industry partner in a structured fashion. Thus, most of your time will be devoted to working with your project teammates to provide the answers and deliverables specified by the partner over the course of many two-week sprints. Every project team will be provided with a project description, data dictionary, and access to the dataset (or directions in where to find the necessary data), as well as an NDA to read, understand, sign, and return to your professor before you can gain access to the data. These are tasks that might be required of you to perform when you work on a new project or have a new client. Permission of instructor required. **Credits:** 3.00

MGMT 47900 - Data Visualization

Credit Hours: 2.00 or 3.00. This course is an introduction to the techniques and algorithms for creating effective data visualization. Visualizations are graphical depictions of data that can improve comprehension, communication, and decision making. This course emphasizes application in business settings where visual representation methods that are covered in this course will improve our understanding of complex data and models. We focus in particular on pattern identification, difference and trends in data sets across categories, space, and time. In addition to participating in in-class discussions, students will have sufficient hands-on experience with the tools and techniques covered in this course. Students will be expected to complete several short programming and data analysis assignments. Students will also have an opportunity to work as groups on a final project. Permission of department required. **Credits:** 2.00 or 3.00

MGMT 48400 - Management Of Entrepreneurial Ventures

Credit Hours: 3.00. This course teaches skills required to become an entrepreneur, succeed in a start-up venture, work in venture capital, join a family business, or develop a franchise operation. Students will learn about how to identify and shape emerging

market opportunities, innovate new business models, prepare and evaluate business plans, raise capital, build a skilled founding team, network for resources, and grow an initial market. **Credits:** 3.00

MGMT 48800 - Data-Driven Decisions In Digital Markets

Credit Hours: 3.00. This course analyzes the changes in business models that have been enabled by Internet technologies, and exposes students to hands-on data analyses to quantify the impact these technologies and business models have on firms, economies, and people. **Credits:** 3.00

MGMT 49000 - Problems In Industrial Management

Credit Hours: 1.00 to 4.00. Investigation in a specific management field. Arrange with instructor before enrolling. Permission of instructor required. **Credits:** 1.00 to 4.00

MGMT 49200 - Intellectual Property Management

Credit Hours: 2.00. Intellectual property (IP) has become a strategic opportunity for creating value for the firm. Firms are tasked with understanding how to utilize intellectual property as a competitive advantage in multiple market contexts. In the current economic environment, intellectual assets can be the largest portion of a firm's total wealth. Strategic management of these assets is very critical. Managing intellectual property is about transforming a firm's ideas, know-how, etc., into learning, products, and ultimately cash flow. In Managing Intellectual Property, we examine this topic by viewing intellectual property as both a legal asset (property ownership) and business asset (value-adding). The focus of Managing Intellectual Property is on the integration of IP generation, IP protection, and strategizing functions of the firm in creating value with an IP portfolio. Concepts and frameworks discussed/developed in lecture are exercised in case studies from multiple contexts. **Credits:** 2.00

MGMT 49300 - Storytelling With Data

Credit Hours: 2.00. Business students are trained to be experts in turning data into information. With a strong focus on data visualization, the purpose of this course (Storytelling with Data) is to help students take the next step: Turning that information into action. This course will provide you with helpful frameworks for understanding your audience, insights about how people perceive information best, and effective skills to express your ideas in ways that connect. **Credits:** 2.00

MGMT 49400 - IBE Capstone

Credit Hours: 3.00. The objective of the IBE Capstone course is to provide students with the opportunity to apply and integrate what they have learned from prior courses in "Real World" settings. There are no traditional classes. Rather, students will work in self-managed teams of 5-6 on projects that have both business and engineering elements with the support of a mentor; in many cases the mentor will be from a sponsoring company. The role of the company mentor is to provide advice and guidance to the student team as well as to expose the students to the approaches and processes used in industrial and commercial organizations. The course instructors will also meet with the student teams on a weekly basis to assess progress and provide guidance. Possible options for the projects include: 'Product Design' and 'Business Solution'. The Product Design projects would be focused on the marketing, technical, and economic feasibility of a new product concept. The Business Solution projects would be focused on technical issues in a business context and developing solutions to a "real world" problem presented by a sponsoring company. Examples of these projects might include use of 3-D printing for spare and replacement parts or incorporation of autonomous transportation into a company's operations and supply chain. **Credits:** 3.00

MGMT 49600 - Management Consulting Practicum

Credit Hours: 3.00. Management Consulting Practicum is an elective course consisting of consulting engagements with clients and projects from the Purdue Foundry and other sources. This course uses class time for students working in teams to receive timely guidance on applying a wide range of consulting skills and tools to supplement the client engagements.**Credits:** 3.00

MGMT 50300 - Advanced Accounting

Credit Hours: 3.00. Advanced course in financial accounting. A range of contemporary issues in financial reporting, such as business combinations, investments, consolidations, inflation, multinationals, and tax allocation are covered. Both technical proficiency and user applications are emphasized.**Credits:** 3.00

MGMT 50400 - Tax Accounting

Credit Hours: 3.00. Basic tax course designed to provide an understanding of the various federal taxes, including income, gift, estate, excise, federal insurance contribution, self-employment, and unemployment taxes.**Credits:** 3.00

MGMT 50500 - Management Accounting II

Credit Hours: 3.00. The focus of the course is managerial decision making and the economic role of information. Topics covered include decentralized financial performance evaluation, cost analysis, and financial planning and control systems. **Credits:** 3.00

MGMT 50600 - Auditing

Credit Hours: 3.00. A study of the concepts and procedures of auditing, which is the systematic process of objectively obtaining and evaluating evidence regarding assertions about economic actions and events. Primary emphasis is on audits conducted by independent certified public accountants, but topics covered apply to internal auditing as well. **Credits:** 3.00

MGMT 50700 - Advanced Federal Income Taxes

Credit Hours: 3.00. Advanced course in federal income taxes, with a brief study of gift and estate taxes. Some issues covered in MGMT 50400 are studied in more depth, particularly taxation of corporations and partnerships. The course, which is taught in seminar format, gives the student considerable practice in doing tax research and reporting conclusions. It is especially appropriate for the student entering a career in a tax environment. **Credits:** 3.00

MGMT 50900 - International Accounting

Credit Hours: 3.00. Provides insight into and an understanding of the many accounting problems and issues faced in an international business environment. The material is approached from two compatible and overlapping perspectives: the perspective of accounting or financial management in a U.S. multinational corporation and the perspective of an investor interested in understanding the international business environment.**Credits:** 3.00

MGMT 51099 - Practicum In Taxation Compliance And Consulting

Credit Hours: 1.00 to 3.00. This is an experiential course to provide real-world experience and significant community service through volunteer tax compliance and consulting. The course partners with the Internal Revenue Service Volunteer Income Tax Assistance Program to provide significant free tax preparation and consulting services to low- and middle-income families in the Greater Lafayette community with an additional focus on providing these services to international students at Purdue. Learning outcomes include technical tax abilities as well as soft skills in a professional services environment. **Credits:** 1.00 to 3.00

MGMT 51100 - Fixed Income Securities

Credit Hours: 2.00. Introduction to fixed income securities. Discusses a variety of contracts-starting with pure discount bonds, coupon bonds, and callable bonds. Continues with options on bonds, caps, floors, and interest rate swaps. Introduces the theory of the term structure and present models for pricing fixed income securities. Topics include: spot and forward markets for debt instruments, simple models for interest rate risk management, duration, convexity, organized exchange-traded interest rate

contracts, interest rate swaps, pricing relationships and the theory of the term structure, and single factor models for pricing interest rate claims. **Credits:** 2.00

MGMT 51300 - Student Managed Investment Fund

Credit Hours: 0.00 to 3.00. This course provides undergraduate and graduate students with hands-on portfolio management experience by investing a $300,000 (as of 2017) portfolio in the stock market. This student-managed fund is a large time commitment, and this course is a way to give students class credit for their experiential learning through SMIF. **Credits:** 0.00 to 3.00

MGMT 52000 - Pricing Strategy And Analysis

Credit Hours: 2.00. Builds on the introductory courses in marketing management. Enables students to formulate a systematic framework for approaching the problem of pricing a product, and more generally, a product line. The concepts and analytical methods necessary to develop such a framework are explored and incorporate marketing, economic, psychological, and organizational factors that influence pricing decisions, as well as competitive and legal aspects. Topics covered include value pricing, dynamic pricing, segmented pricing and price discrimination, bundling and multi-part tariffs, sales promotions, and pricing to the distribution channel. **Credits:** 2.00

MGMT 52020 - Analytics For Marketing Managers

Credit Hours: 2.00 or 3.00. The purpose of this course is to learn tools, technologies, applications and practices used to collect, integrate, analyze, and present raw data in order to create insightful visualization and actionable marketing information. It will cover conceptual understanding of marketing performance based on data and statistical methods. Once conceptual understanding is familiarized, students will learn common tools and techniques for marketing managers in today's industry. **Credits:** 2.00 or 3.00

MGMT 52100 - Brand Management

Credit Hours: 2.00. This course exposes students to the issues and activities in brand management. Topics include developing the brand marketing plan, design and execution of integrated marketing communications, testing, launching, and repositioning of brands, creating and managing brand equity, formulating strategies for leveraging and defending brands, product line and category management. **Credits:** 2.00

MGMT 52200 - New Product Development

Credit Hours: 2.00. The course covers new product development issues including idea generation, concept testing, prototype development, patent protection, and product launch. Student teams generate a new product idea, test the idea with target customers, and develop a product launch strategy. **Credits:** 2.00

MGMT 52300 - Digital Marketing Strategy

Credit Hours: 2.00. This course enables students to rethink marketing in the evolving digital age and develop capabilities in developing, implementing, and evaluating digital marketing strategies. Topics include: digital marketing strategy framework, search engine marketing, social media marketing, and location based marketing (mobile). **Credits:** 2.00

MGMT 52500 - Marketing Analytics

Credit Hours: 2.00. This course introduces modern statistical methods for marketing using big data. Firms are increasingly facing vast amounts of data on their customers and the marketplace, thanks to the rapid development of information technology

in the last couple of decades. The challenge is becoming more about how to turn the big data into information and insights to improve firms' marketing decisions and profitability. This course discusses marketing applications for which we may use econometric, statistical, and machine-learning methods to improve and optimize decisions. Students will use RStudio to analyze real-world data and gain hands-on experience on data manipulation, visualization, and analysis. Intro-level Statistics/econometrics (at the level of STAT 35000 or ECON 47200) and R coding experience (comfortable with manipulating data, plotting, defining functions, using for loops, and running linear and logistic regressions in R) are required prerequisites. **Credits:** 2.00

MGMT 52610 - Data And AI-Driven Marketing

Credit Hours: 2.00. Marketing is increasingly evolving from traditional approaches to leveraging big data and artificial intelligence (AI) to make strategic decisions and drive impactful campaigns. This course introduces modern statistical methods and AI algorithms for marketing using big data. It discusses marketing applications for which we may use statistical and machine learning methods to improve and optimize decisions. Students will use Python to analyze real-world data and gain hands-on experience on data manipulation, visualization, and analysis. **Credits:** 2.00

MGMT 52710 - Digital Marketing Applications

Credit Hours: 2.00. Companies today expect their marketing professionals to understand what it takes to develop, implement, and evaluate digital marketing strategies and campaigns. The best way for marketing professionals to gain such expertise is for them to actually build and execute specific digital marketing programs/campaigns using various digital and social media platforms for a real world client. This course offers students a unique hands-on learning opportunity with an online marketing project, each student team is given a budget up to $300 to promote a chosen business or non-profit organization via digital advertising platforms including Google AdWords, Bing Ads, Facebook Business, LinkedIn Sponsored Ads, and Twitter Ads. Students are given flexibility in selecting projects of interest. All students are also expected to pass Google Analytics certification and Google AdWords certification. **Credits:** 2.00

MGMT 52800 - Customer Analytics

Credit Hours: 2.00. Customer Relationship Management (CRM) refers to the selection or identification, acquisition, growth and retention of desired customers to maximize profit. CRM requires a shift in mindset from product-centric to customer-centric management and a new set of tools for understanding and predicting the behavior of current customers. This course focuses on analytical CRM: identifying good prospects and customer acquisition, customer development via up-selling, cross-selling and personalization, customer attrition, retention, and customer lifetime value. While traditional marketing relied on the three pillars of segmentation, targeting and positioning (STP), technological advances have made it possible to obtain customer-level transaction data, and also to target individual customers with a customized marketing mix that is designed to maximize individual customer value. Important strategic questions arise from such a radical shift in marketing mix options, questions such as: How to allocate resources to customer acquisition and to customer retention? Are loyal customers more profitable for firms? Related to these strategic questions are important conceptual and computational issues, such as: What metrics are best used to measure customer profitability? What techniques can be used to identify most profitable customers? How to target profitable customers with customized price, promotion, product, place? This course will equip you with the skills and tools you need to answer such strategic, conceptual and computational questions related to customer relationship management (CRM). Permission of instructor required.**Credits:** 2.00

MGMT 52810 - Marketplace Trends

Credit Hours: 1.00 to 4.00. Provide students with an understanding of microeconomic and macroeconomic concepts that are applicable to business decisions. Emphasis is on how markets and the overall economy work and how they impact the performance of the enterprise. Time is devoted to understanding how decisions made by public policymakers affect the economic climate and thus, the firm's financial performance. International trade topics are included in the discussions which begin with a review of supply and demand, interest rates, foreign exchange, money and banking, and competition and monopoly. The course

also emphasizes the integration of theory, data, and judgment in the analysis of corporate decisions and public policy, and in the assessment of changing domestic and international business environments.**Credits:** 1.00 to 4.00

MGMT 52850 - Consumer Behavior And Marketing

Credit Hours: 2.00. Consumer behavior is the study of the processes involved when individuals or groups select, purchase, use, or dispose of products, services, ideas, or experiences to satisfy needs and desires. We will draw on research from psychology, marketing, behavior economics and other fields to learn why consumers behave in the ways that they do. The course focuses on three general topics: 1) Consumers as individuals. We will explore basic psychological concepts like intrinsic motivation, perception, memory, and emotions to help us understand behavior. 2) Attitude change and decision making. We will examine how consumers search and evaluate alternatives, develop attitudes, and make choices. 3) Consumers in their social and cultural settings. We will examine the interaction between the consumer and multiple external influences. We investigate how social elements (friends, family, etc.) and culture influence behavior. Consumer behavior is an applied discipline rooted in other social sciences, and you will therefore learn multiple concepts, frameworks and theories. Your job is to master those concepts and use them to organize, explain, and predict consumers' judgments and choices. Ultimately you should be able to identify a consumer behavior issue, select a relevant theory to examine and explain the issue, and apply the theory properly to aid in a managerial decision. You will also learn how to run basic applied experiments in consumer behavior to test your theories with real consumers. **Credits:** 2.00

MGMT 52900 - Marketing Consulting Projects

Credit Hours: 3.00. In this course, students learn to apply marketing concepts to real world marketing problems. Projects are varied and may involve marketing plan development for a start-up, market research, analysis of marketing data, digital marketing, search engine marketing, web design, and social entrepreneurship. Clients include Purdue Marketing Advisory Board members, entrepreneurs working with Purdue's Foundry and Discovery Park, Purdue Research Park start-ups, small and medium-size Indiana businesses, and non-profit organizations. Students are given flexibility in selecting projects of interest. Teams work under the direction of a faculty member. Teams meet once a week to review project progress and discuss the next steps generally in the presence of the faculty supervisor. Projects are done in teams, although evaluation is individual. **Credits:** 3.00

MGMT 53000 - Financial Statement Analysis

Credit Hours: 3.00. The course is designed to help students: (a) understand the content of corporate financial reports and analyze the information therein, (b) use the information for evaluating the financial health, operating performance, and growth prospects of corporation-type companies, and (c) learn the various models available and estimate the value of such a company using those models and the information abstracted from the financial reports. The topics to be covered include the corporate financial statements and their relationships, ratio analysis for profitability and risk evaluation, assets/liabilities/owners' equality analysis, intercompany investments, forecasting financial statements, and company valuation models. **Credits:** 3.00

MGMT 53100 - Government/Not-For-Profit Accounting

Credit Hours: 3.00. This course is designed to provide students with a solid understanding of the financial reporting and accounting principles used in the preparation of governmental and not-for-profit entities. Topics include, but are not limited to, fund accounting, city government accounting, state government accounting, special funds, budgetary accounting for the general and special revenue funds, fiduciary funds and government-wide statements, university accounting, accounting for community foundations, not-for-profit accounting, and auditing not-for-profit entities. **Credits:** 3.00

MGMT 53200 - Forensic Accounting And Fraud Examination

Credit Hours: 3.00. This course is designed to help students apply their accounting, auditing, information systems and communication skills to detect financial fraud and unauthorized reporting acts to prepare and present a fraud case for criminal proceedings or civil litigation. These skills are highly valued in the rapidly growing field of forensic accounting. Upon

completing this course, students will understand the role of forensic accountants in examining financial records for fraud and detecting insurance fraud; in providing litigation support; and in capturing digital evidence. This course will also review material related to the Certified Fraud Examiner (CFE) exam. Throughout the course, students will have opportunities to improve their written and oral communication skills, particularly as they relate to communication in the legal settings associated with investigating accounting. **Credits:** 3.00

MGMT 53500 - International Law For Managers

Credit Hours: 2.00. Today's managers work in a highly international business environment. That creates an atmosphere where US laws interact and collide with other countries and international law. In this class we will explore contract, marketing, intellectual property, employment law and more in the international context. We will use case studies and headlines to see how these issues effect real businesses. When you leave, you will be prepared to help lead your employer in the international environment while staying on the right side of the law. **Credits:** 2.00

MGMT 53600 - Employment & Diversity Law For Managers

Credit Hours: 2.00. Managers, regardless of your industry, will routinely face HR and employment issues that collide with the law. In this course, we will examine many laws and the practical ways you can stay on the right side of the law. Don't worry, you aren't in a law school class and I don't expect you to become employment attorneys. However, I will help you gain a working knowledge of employment laws including: The Civil Rights Act, ADA, ADEA, FMLA, FLSA, and a host of alphabet soup. We will also apply these laws from posting a job description to recruiting to hiring to employee reviews to terminating an employee. While I can't guarantee you will never be sued by a disgruntled current or former employee, I can help you put yourself and your company in the best possible position to defend that suit. And don't worry: we will look at lots of quick case studies (less than a page) to give you context you can easily remember. **Credits:** 2.00

MGMT 53700 - Persuasive Communications

Credit Hours: 2.00. The purpose of this course is to work with you to improve your professional communications specifically as those communications relate to client and external communications. We will focus on oral and written communications theory, techniques, and practice. **Credits:** 2.00

MGMT 53900 - Analytics For Social Media Marketing

Credit Hours: 2.00 or 3.00. The objective of this course is to equip students with tools and develop marketing skills required to address current marketing problems. The approach is to learn R software for conducting basic scraping on social media sites to understand user behavior and sentiment. In addition, Python will be used for web-scraping data from various websites and websites with dynamic content. The goal is to become familiar with such qualitative techniques as: word clouds, cluster dendrograms, sentiment analysis, and other methods. Occasional homework assignments or check points will be given to gain deeper understanding of the materials covered in class. **Credits:** 2.00 or 3.00

MGMT 54000 - Computing For Analytics

Credit Hours: 2.00 or 3.00. The main goal of this course is to introduce students to algorithmic thinking and computational tools for data analytics. The course will focus on challenges associated with large data sets and how algorithms and data structures can aid in resolving some of those challenges. The course will introduce relevant programming techniques in Python. Permission of department required.**Credits:** 2.00 or 3.00

MGMT 54400 - Database Management Systems

Credit Hours: 3.00. Covers the theory and practice of database design and usage. Students will learn the importance of data modeling concepts and how to use these effectively and how to plan and design a database, including issues such as data security

and control. The following course is recommended: MGMT 29000 Programming for Business Applications or CS 15900 or CS 17700 or CNIT 17500, all with a C- or higher. **Credits:** 3.00

MGMT 54500 - Systems Development

Credit Hours: 3.00. Focuses on information systems development theories, practices, and tools for rapid adaptation and management of leading-edge as well as emerging computing paradigms. The following courses are recommended: MGMT 38200, with a C- or higher; and MGMT 29000 Programming for Business Applications or CS 15900 or CS 17700 or CNIT 17500, all with a minimum grade of C-. Permission of department required. **Credits:** 3.00

MGMT 54600 - Decision Support And Expert Systems

Credit Hours: 3.00. Since a large percentage of societal and management problems can be characterized as relatively unstructured, this course explores how computers can be used to aid decision makers in dealing with unstructured, as well as structured, problems. Appropriate material from knowledge representation, artificial intelligence, and language theory is considered. Applications selected from environmental management and strategic planning in large organizations are used to illustrate theoretical ideas. Since the key computer software tool is database management, a development of the CODASYL approach to data management is presented. **Credits:** 3.00

MGMT 54700 - Computer Communications Systems

Credit Hours: 3.00. Explores the convergence of telecommunications and computer technology, framed in terms of their strategic impact in the business environment. Components of computer communication systems are surveyed. Major design and analysis issues in the development, implementation, and management of computer communication systems are examined. Relevant emerging trends are highlighted. The course is devoted to technical issues, applications, and case studies covering telecommunication systems used in business. **Credits:** 3.00

MGMT 55200 - Mentoring And Socialization

Credit Hours: 2.00. Students learn about the employee socialization process through case studies, discussion, and presentations. In addition, students receive practical experience through participation in a mentoring program for new students. Class discussions and presentations evolve from students' mentoring experiences, and guest speakers provide real-world perspective on new employee programs. The course helps students develop skills in mediation, leadership, conflict management, and communication. **Credits:** 2.00

MGMT 55360 - Industrial Relations I

Credit Hours: 2.00. An in-depth examination of human resource management in the context of union-management relations. Emphasis is on understanding how and why unions form, the legal context, and changing competitive environment for labor management relations. Covers the dynamics of the collective bargaining process, including the determinants of bargaining power, preparation of labor contract demands, and negotiation tactics. The course culminates with an extended mock negotiation exercise.**Credits:** 2.00

MGMT 55400 - Leading Global Organizations And People Across Cultures

Credit Hours: 2.00 or 3.00. This course focuses on the opportunities and challenges of managing a global multicultural workforce and implementing global organizational people strategies. The overall goal of this class is to help you become a more effective professional and leader in a global world on and off the job by providing information, tools and multicultural opportunities to increase conceptual and practical understanding of how national cultures shape employment settings and its implications for your own behavior as a global business professional and leader who implements human capital and organizational strategies, policies, and practices in a cross-national context. This course will also increase knowledge of and ability to implement current global

human capital, international HRM, and organizational strategies for MNES and domestically. To achieve these goals, student engagement in class sessions, and willingness to share perspectives and opinions, and application of course readings and materials, are critical to the success of this course. A range of participative learning methods are used to facilitate an active classroom environment, including learning log journaling, case analysis, experiential exercises, small group projects, break out discussions, company guest speakers, and self-assessments. The role of the instructor in this course is not always to provide "the" answer, but to create an environment where you can collectively explore, examine and experiment with students' own ideas and share ideas and perspectives on working and managing global firms.**Credits:** 2.00 or 3.00

MGMT 55410 - Training And Development

Credit Hours: 3.00 or 4.00. This course prepares students to design training and develop training programs and to identify principles, practices and methods of staff training and career development. Students will learn and practice how to deliver and evaluate said programs for return on investment (ROI). Emphasis is placed on the application of principles related to adult learning instructional design and program development, evaluation and learning technologies. Specific objectives include topics related to communication, diversity, generational differences and group dynamics.**Credits:** 3.00 or 4.00

MGMT 55500 - Leading Management Of Diversity And Inclusion In Organizations

Credit Hours: 2.00 or 3.00. This course is designed to help participants learn to effectively manage self, peers, teams, clients, and firms in diverse organizational settings and to lead organizational change to foster inclusion, equality, and productive workplaces. The class is designed to develop your skills in leading diversity and inclusion from a multi-level view in the workplace: employee, leader, team member, organizational, and institutional/societal levels. Its goal is to a) improve your ability to work in diverse teams, as well as b) develop your ability to design, and implement strategies to foster cultural and structural change to support the management of an increasingly diverse workforce toward enhanced organizational effectiveness to benefit business, employees, and society. People and leaders in organizations are constantly working with members of different backgrounds, social identities, and experiences, often across distributed and/or digitally connected environments, fostering increased attention to diversity equity and inclusion in transforming employment settings. When understood, supported and leveraged effectively, these differences in social identities, difference and values can help attract and retain talent, strengthen societal and community economic equality, support organizational and team effectiveness; but when overlooked, or mismanaged, these differences can increase turnover, conflict, stress, talent under-utilization, and harm career and work-life wellbeing, health, and productivity. We will focus on advancing understanding of how intersecting organizational and institutional structures and cultures and their relation to strategies for creating diversity; an inclusive culture and positive climate for inclusion and talent management; and developing and retaining diverse talent to foster innovation and organizational effectiveness across multiple levels of intervention. We discuss how to conduct an organizational diagnosis of the current diversity climate and barriers and facilitators for creating a multicultural workplace and a flexible environment supportive of many identities, and how assumptions of "ideal workers" may vary across industry and cultural contexts. You as a leader will be better able to articulate your own DEI vision and develop understanding of strategies that move from description to evidence-based diagnosis to action strategies and implementation in order to move aspirations into organizational change realities. From an individual leadership perspective, we tackle the question: "Why does diversity, equity and inclusion matter in employing organizations and business, what is the state-of-the-art evidence-based knowledge, and what does it mean to me personally in my career and my leadership beliefs?" Specifically, we focus on the business and social science processes - including attitudes toward in-groups and out-groups, stereotyping, identity, privilege, and power, intersectionality, discrimination, bias, influence opportunity, bystander awareness, allyship, difficult conversations, and perspective taking - these topics relate to how members of different social groups perceive and interact with one another. Since managing social identity increasingly involves managing work-life boundaries and work and non-work public and private selves, we will also learn about authenticity choices and social and public/professional identity boundary management. Further, the opportunity to experience higher well-being and work-life balance is increasingly linked to job and life opportunities reflecting growing work-life inequality in society. From an organizational and group perspective, we address the questions: "What are best practices for successful management of diversity and inclusion? And why does it matter to me as a future leader personally and in business and in the communities and world in which I live." **Credits:** 2.00 or 3.00

MGMT 56100 - Logistics

Credit Hours: 2.00 or 3.00. Examines the distribution and delivery functions in a manufacturing or service industry. Topics include inventory control in distribution, transportation planning, distribution requirements planning, analysis of waiting lines, distribution system design and facility location and layout analysis. **Credits:** 2.00 or 3.00

MGMT 56200 - Project Management

Credit Hours: 2.00. Emphasizes the use of PC-based project management software and its applications, particularly in manufacturing organizations and especially new product development projects. Extensive use is made of several case studies to illustrate the planning and monitoring of a project. Class is held in a computer lab.**Credits:** 2.00

MGMT 56300 - Machine Learning For Business Analytics

Credit Hours: 2.00. With the rise in big data, Machine Learning has experienced rapid growth over the last ten years with major advances in its subfields of Deep Learning, Reinforcement Learning, Natural Language Processing, Computer Vision, Robotics, and other subfields. The purpose of this course is to provide the students with a systematic introduction to the recent developments in machine learning through the coverage of modern machine learning concepts and practical business applications, as well as hands-on experience with modern machine learning frameworks. The course plans to cover neural nets, convolutional neural networks, recurrent networks, deep generative models, deep reinforcement learning, and the trustworthy AI framework with the properties of safety, robustness, privacy, and fairness.**Credits:** 2.00

MGMT 56400 - Management Of Service Operations

Credit Hours: 2.00. Special characteristics of services require an interdisciplinary approach to analyzing operations. This course draws upon concepts from accounting, management science, and marketing. Differences and similarities between the service and manufacturing organizations are analyzed. Case studies of service organizations are used extensively. Prerequisite: MGMT 66000 (if Graduate student status) or else MGMT 36100 (if Undergraduate student status). **Credits:** 2.00

MGMT 56500 - Strategic Sourcing And Procurement

Credit Hours: 2.00. This course will address the process of procurement including terminology, metric, and decision making. Additionally, we will investigate the best practices and processes for managing the relationships with suppliers and their performance. We will also explore the sourcing decision and the strategic ramifications of producing/ providing goods and services internally or purchasing them from external organizations. Prerequisites: Students are expected to have taken a basic course on operations (such as the masters core class MGMT 66000: Introduction to Operations Management) and a basic course on supply chain management (such as the masters elective MGMT 66400: Supply Chain Management). **Credits:** 2.00

MGMT 56600 - Global Supply Chain Management

Credit Hours: 2.00. This course will integrate issues from marketing (channels of distribution), logistics, and operations management to develop a broad understanding of a supply chain in a global context. Students will learn how different factors, including exchange rate risk, custom duty and trading policies, geographic distribution of resources and demand, availability and reliability of local supplier, and characteristics of consumer, affect the design and execution of global supply chain strategies. Prerequisites: Students are expected to have taken a basic course on operations (such as the masters core class MGMT 66000: Introduction to Operations Management) and a basic course on supply chain management (such as the masters elective MGMT 66400: Supply Chain Management). Exposure to a course on optimization is also preferred, but not required. The course requires logical and analytical thinking. **Credits:** 2.00

MGMT 56800 - Supply Chain Analytics

Credit Hours: 2.00. There is an exponential growth in the adoption of big data technologies in every walk of life. Organizations are collecting, storing, and analyzing massive amounts of data. This data is commonly referred to as big data because of its large

volume, the velocity with which it is collected and transmitted, the variety of forms it takes, and veracity of its origin and content. In order to capitalize on the opportunities presented by big data, businesses are putting in place technologies, people, and processes. Just collecting, transmitting and storing big data creates little value for an organization. For many organizations, the term big data currently represents only a data infrastructure such as the Apache Hadoop family of products. The key to delivering real value from big data is the use of analytics. Data must be analyzed and the results used by decision makers and organizational processes in order to generate value. The main objective of this course is to learn how to collect, process, store, and analyze big data. Assignments could easily be completed in Python or SQL. We assume no familiarity with Linux and will introduce you to all essential Linux commands. Students need access to a computer with a 64 bit operating system and at least 4 GB of RAM. Note: 8 GB or more of RAM is strongly recommended. **Credits:** 2.00

MGMT 56900 - Ethical And Sustainable Supply Chain Management

Credit Hours: 2.00 or 3.00. This course provides students with knowledge and skills for building and analyzing ethical and sustainable practices in supply chains, taking a holistic view of the interaction between businesses, the environment, and society. **Credits:** 2.00 or 3.00

MGMT 57000 - Spreadsheet Modeling And Simulation

Credit Hours: 2.00. Covers up-to-date and practical spreadsheet modeling tools, which can be applied to a wide variety of business problems in finance, marketing, and operations. Consists of simulation modeling techniques to analyze risk and uncertainties in business environment, optimization techniques to determine the best managerial actions under internally- and/or externally-imposed constraints, and real-world examples and cases to demonstrate broad applications of spreadsheet modeling and simulations in manufacturing and service operations, supply chain systems, yield management, asset dynamics, option pricing, etc. **Credits:** 2.00

MGMT 57100 - Data Mining

Credit Hours: 2.00. Introduces the concepts, techniques, tools, and applications of data mining. The material is approached from the perspective of a business analyst, with an emphasis on supporting tactical and strategic decisions. Includes a variety of techniques to identify nuggets of information or decision-making knowledge in bodies of data, and extracting these in such a way that they can be put to use in the area, such as decision support, prediction, forecasting, and estimation.**Credits:** 2.00

MGMT 57200 - Six Sigma And Quality Management

Credit Hours: 2.00. Establishes the link between quality and productivity design and improvement and variance reduction. The course examines some of the more traditional views on quality, as well as those today, which are gaining greater credibility and influence under the umbrella of TQM. It also covers up-to-date and practical spreadsheet modeling tools that can be applied to a wide variety of business problems from finance, marketing, and operations. **Credits:** 2.00

MGMT 57400 - Frontiers In Manufacturing Technology

Credit Hours: 1.00. This course will explore various types of technologies used in manufacturing today and the implication for future uses and applications. These modules will provide background, applications, and current use cases of the various tools. Students will also conduct weekly research on various technology applications. **Credits:** 1.00

MGMT 57500 - Supply Chain Technology

Credit Hours: 2.00. This course will emphasize the use of supply chain technology for planning and control of dynamic manufacturing systems. This requires the simulation of plans and required changes over time. Therefore, the course will revolve around active learning computer simulations in SAP. **Credits:** 2.00

MGMT 58500 - Information Technology Project Management

Credit Hours: 2.00. The purpose of this class is to provide students with a basic understanding of the tasks and challenges facing IT and analytics project managers. Students learn about projects, roles and responsibilities of project managers. We start by discussing the skills and approaches commonly used in creating and monitoring project plans and braking complex projects down into manageable segments. We also discuss important areas defined in PMI's PMBOK, like scope, time, cost and quality management. Next we look at how IT projects have traditionally been managed, and move on to the study of agile methods. We go through some of the most important aspects of agile project management, such as user stories, agile teams an agile planning, execution and tracking. In learning these tools and techniques, we take a hands-on approach wherever possible and use project management software, exercises and case studies. **Credits:** 2.00

MGMT 58600 - Python Programming

Credit Hours: 2.00 or 3.00. Because data grows exponentially and becomes complex, we need computational methods to collect, store, and analyze them in order to be successful in science, engineering, business, and other professions. Python Programming, is an introductory programming class that meets this need. You will learn how to write computer programs in Python language to solve real-world problems. This class is designed for students that want to learn to computer programming for data science. This course guides students through the basic Python programming language, from initial concepts to final data analysis using python and external packages. **Credits:** 2.00 or 3.00

MGMT 58800 - VBA Programming

Credit Hours: 2.00 or 3.00. This course takes a variety of business topics and implements with state-of-the-art spreadsheet models. Students will gain hands-on experience with a wide range of business problems and databases in finance, marketing, operations, and so on. The focus of this course is to learn Visual Basic for Applications (VBA) to design functions and macros that will enhance spreadsheet models. Students will also have exposure to basics and other advanced topics of spreadsheet modeling. In addition to in-classroom time, this course will also meet in computer-based labs for hands-on instructions and implementation. **Credits:** 2.00 or 3.00

MGMT 59000 - Directed Readings In Management

Credit Hours: 1.00 to 4.00 (West Lafayette, North Central) 2.00 to 4.00 (Calumet). Supervised reading and reports in various subjects. Open only to a limited number of seniors and graduate students. Permission of instructor required. **Credits:** 1.00 to 4.00

MGMT 59100 - Launching Global Leaders

Credit Hours: 0.00 to 2.00. Capitalizing on the unique personal and professional backgrounds of each student in our program, the Launching Global Leaders course provides a comprehensive and customizable leadership development curriculum. In this year long course, students will engage in a 360 assessment of strategically identified professional competencies critical to success in the contemporary workforce. Using these target areas as a guide, students will then customize their leadership development experience by selectively engaging in a variety of program offerings, including: interactive industry simulations, personal and team performance enhancement tools, professional coaching, interactive learning sessions with industry leaders, and workshops in developing intercultural competency, personal branding and career management. **Credits:** 0.00 to 2.00

MGMT 59200 - Contracts For Managers

Credit Hours: 3.00. Purpose of the course is to provide the student with an understanding of the contract legal environment as it pertains to profit and non-profit organizations and of the ethical considerations and social and political influences that affect such organizations. Students will examine a wide range of substantive rules of public law, which will provide a framework for a discussion of the ways in which managerial decision making affects and is affected by the legal environment. **Credits:** 3.00

MGMT 59699 - MS Internship

Credit Hours: 0.00. This course is required as part of the U.S. student visa regulation for international masters who are interning in the U.S. and want to use Curricular Practical Training (CPT). Even if a student is not being paid, they must sign up for the class unless the organization where the internship is being done is a non-profit. Students will be required to receive the necessary CPT permissions prior to enrolling in the course as well as complete paperwork from the Business Career Services office in Rawls Hall 3029. Course can also be taken by students that wish to have an internship transcripted. This course does not apply towards graduation. Does not count towards graduation. Permission of instructor required. **Credits:** 0.00

MGMT 59800 - Analyzing Unstructured Data

Credit Hours: 2.00. This course prepares master students with the advanced and frontier technique for analyzing unstructured data that is built on the prerequisite of basic data analysis on structured data (e.g., data mining using python). Upon completion, students are expected to be competent and skilled in collecting, processing, and analyzing online unstructured data using the state-of-art artificial intelligence modeling (e.g., neural networks and deep learning methods) and the mainstream open-sourced toolboxes (e.g., NLTK, scikit-learn, keras, and TensorFlow); students should at least be proficient to design and lead industry-level practical projects conceptually when working with data scientist. We take text and image as examples for illustration and cover applications of: Text mining and feature extraction (e.g., sentiment, topic, readability, etc.); Image classification (e.g., recognition, etc.); Advanced applications (e.g., translations, chatbot, image expression, etc.). The course is formatted as a combination of seminars and hands-on coding practices in class. Students are expected to code (and debug) in the class. The main method topics covered include Crawling unstructured data using scrapy. Representation and embedding of text and image. Unsupervised learning for unstructured data (e.g., LDA topic modeling, clustering, etc.) Supervised learning for unstructured data (e.g., classic ML models, A/D/C/RNN, LSTM, etc.). Permission of instructor required.**Credits:** 2.00

MGMT 60000 - Accounting For Managers

Credit Hours: 2.00 to 3.00 (West Lafayette) 3.00 (Calumet, North Central). The two-course accounting sequence employs a user's perspective on the firm's database. First, the standard accounting model is developed into a working tool, as no prior study of accounting is assumed. Then illustrative business cases are discussed to show how external reports conform to financial contracts and public regulation. Public reports primarily directed to investors and creditors are analyzed to reconstruct the economic events and managerial decisions underlying generally accepted accounting standards. Prerequisite: Masters student standing and Management majors only. **Credits:** 2.00 to 3.00

MGMT 60100 - Managerial Accounting

Credit Hours: 2.00 to 4.00 (West Lafayette) 3.00 (North Central). Oriented to managers, the course examines the firm's internal systems for costing products or services and their interpretation. A variety of manufacturing and service industries are studies to demonstrate design of flexible cost systems to match the firm's technological, competitive and/or multinational environments. Applications to budgeting, variance analysis, pricing models, performance evaluation and incentives are demonstrated. Case discussion and analytical "what if" modes of instruction are used to enhance managerial skills of students. Design and use of accounting data are linked to other subjects in the program core and to ethical aspects of accounting policy issues. Prerequisite: MGMT 60000. **Credits:** 2.00 to 4.00

MGMT 60200 - Valuation And Financial Statement Analysis

Credit Hours: 2.00. Establishes how to use accounting information to make business and investment decisions. Internally, the information is used to assess performance of units, to evaluate performance of upper-level management, to monitor the firm's investment and financing decisions, and for comparison purposes with the firm's rivals. Externally, accounting information is used by financial analysts, investors and (potential) acquirers to assess the value of the firm, by creditors to assess its credit-worthiness, and by regulators. Prerequisite: MGMT 60000, MGMT 60100. **Credits:** 2.00

MGMT 60300 - Taxes And Business Strategy

Credit Hours: 2.00. Provides a framework for analyzing tax planning. The framework offers an approach to tax planning and business strategy that remains useful long after the next revision of the tax code. It offers an approach that can be readily employed in an international setting. After developing the framework, it will be applied to a variety of business settings that integrate topics from accounting, finance, and economics in order to provide a more complete understanding of the role of taxes in business strategy. Two important concepts will be applied: the concept of implicit taxes (tax-induced differences in before tax rates of return) and the concept of tax clienteles (the effect of cross-sectional differences in tax rates). **Credits:** 2.00

MGMT 60410 - Financial Accounting For Managers

Credit Hours: 1.00 to 4.00. Oriented to managers, this course provides exposure to many financial accounting topics. It will introduce the student to the procedures and practices used in the recording of accounting information, the construction and use of financial statements, and the analysis of financial data. The course has been designed to enhance the student's overall ability to observe and analyze the firm's financial information in order to understand and evaluate current performance. Design and use of accounting data are linked to other subjects in the program core and to ethical aspects of accounting policy issues. **Credits:** 1.00 to 4.00

MGMT 60510 - Managerial Accounting For Managers

Credit Hours: 1.00 to 4.00. Oriented toward managers, this course provides exposure to many managerial accounting topics. It will introduce the student to the procedures and practices used in the recording of accounting information and the analysis of accounting data. The course has been designed to enhance the student's overall ability to observe and analyze the firm's accounting information in order to understand and evaluate current performance. Design and use of accounting data are linked to other subjects in the program core and to ethical aspects of accounting policy issues.**Credits:** 1.00 to 4.00

MGMT 60600 - Seminar In External Reporting I

Credit Hours: 2.00 to 4.00. Seminar examines research issues on the production, dissemination, and use of financial accounting information for economic decisions by external users. The materials covered are primarily empirically oriented. The aim is to expose students to these issues as they are covered in the accounting and related literature. Prerequisite: ECON 60000. **Credits:** 2.00 to 4.00

MGMT 60700 - Seminar In Internal Accounting

Credit Hours: 2.00 to 4.00. Development of a conceptual framework for evaluating information system alternatives. The seminar examines insights into information value provided by the literature. Both the decision-facilitating and contracting-facilitating roles of information are considered. Topics also include auditing issues. Prerequisite: ECON 60700, ECON 61500. **Credits:** 2.00 to 4.00

MGMT 60800 - Selected Research Topics In Accounting

Credit Hours: 2.00 to 4.00 (West Lafayette, North Central) 3.00 (Calumet). Individual and group study of current research problems in accounting. A limited set of problem areas will be covered in any one offering. Emphasis will be placed on current substantive problems and the research methods employed. Prerequisite: MGMT 60100. **Credits:** 2.00 to 4.00

MGMT 60900 - Seminar In External Reporting II

Credit Hours: 2.00 to 4.00. Selective investigation of analytical research of informational and incentive issues in accounting. Emphasis is on the role of externally reported accounting information in asset pricing in financial markets. Prerequisite: ECON 60700, ECON 61000, ECON 61500. **Credits:** 2.00 to 4.00

MGMT 61000 - Financial Management

Credit Hours: 0.00 to 4.00. Analysis of short-term working capital needs. Cash budgeting procedures, pro forma statements, major types of short-term loan arrangements, and short-term asset management. Prerequisite: MGMT 60000, Master's student standing or higher and Management and Computational Finance majors only. **Credits:** 0.00 to 4.00

MGMT 61100 - Advanced Corporate Finance

Credit Hours: 2.00 to 4.00 (West Lafayette, Calumet) 3.00 (North Central). Long-term capital structure planning, capital budgeting, treatment of uncertainty in investment decisions, security underwriting, dividend policies, and mergers. Prerequisite: MGMT 61000. **Credits:** 2.00 to 4.00

MGMT 61200 - Financial Management III

Credit Hours: 2.00 to 4.00 (West Lafayette) 3.00 (Calumet, North Central). Further treatment of topics in the financial management of nonfinancial corporations, from the viewpoint of the internal financial officer. Topics include further coverage of cost of capital and financial planning, as well as cash management, working capital management, short-term financing, advanced capital budgeting, and leasing. Emphasis on applications. Continuation of MGMT 61100 with additional depth and topic coverage. Prerequisite: MGMT 61000. **Credits:** 2.00 to 4.00

MGMT 61500 - International Financial Management

Credit Hours: 2.00 to 4.00 (West Lafayette) 3.00 (Calumet). Integrative course dealing with the management of firms doing business internationally. Emphasis on decision making. Will draw upon, and adapt, managerial decision models developed for domestic operations, as well as cover appropriate international institutional material. Particular focus on finance and strategic management. Prerequisites: ECON 51500. **Credits:** 2.00 to 4.00

MGMT 61601 - Seminar In Capital Markets I

Credit Hours: 2.00. This is the first in a sequence of four PhD level finance courses that cover theoretical and empirical research in capital markets. Offered in alternate years. **Credits:** 2.00

MGMT 61602 - Seminar In Capital Markets II

Credit Hours: 2.00. This is the second in a sequence of four PhD level finance courses that cover theoretical and empirical research in capital markets. Offered in alternate years. Prerequisite: MGMT 61601. **Credits:** 2.00

MGMT 61701 - Seminar In Capital Markets III

Credit Hours: 2.00. This is the third in a sequence of four PhD level finance courses that cover theoretical empirical research in capital markets. Offered in alternate years. Prerequisite: MGMT 61602. **Credits:** 2.00

MGMT 61702 - Seminar In Capital Markets IV

Credit Hours: 2.00. This is the fourth in a sequence of four PhD level finance courses that cover theoretical empirical research in capital markets. Offered in alternate years. Prerequisite: MGMT 61701. **Credits:** 2.00

MGMT 61801 - Seminar In Managerial Finance I

Credit Hours: 2.00. This is the first in a sequence of four PhD level finance courses that cover theoretical empirical research in managerial finance. Offered in alternate years. **Credits:** 2.00

MGMT 61802 - Seminar In Managerial Finance II

Credit Hours: 2.00. This is the second in a sequence of four PhD level finance courses that cover theoretical empirical research in managerial finance. Offered in alternate years. Prerequisite: MGMT 61801. **Credits:** 2.00

MGMT 61901 - Seminar In Managerial Finance III

Credit Hours: 2.00. This is the third in a sequence of four PhD level finance courses that cover theoretical empirical research in managerial finance. Offered in alternate years. Prerequisite: MGMT 61802. **Credits:** 2.00

MGMT 61902 - Seminar In Managerial Finance IV

Credit Hours: 2.00. This is the fourth in a sequence of four PhD level finance courses that cover theoretical and empirical research in managerial finance. Prerequisite: MGMT 61901. **Credits:** 2.00

MGMT 62000 - Marketing Management

Credit Hours: 2.00 to 4.00 (West Lafayette and Calumet) 3.00 (North Central). An integrated analysis of major marketing decisions, including product pricing, advertising, distribution, and sales force policies. Prerequisite: Master's student standing and Management majors only. **Credits:** 2.00 to 4.00

MGMT 62100 - Marketing Management II

Credit Hours: 2.00 to 4.00. Introduces students to the analytical, strategic, and tactical aspects of marketing management. Exposes students to the issues and challenges in the management of the marketing mix, including product policy, pricing, marketing communications, and distribution policy. Prerequisite: MGMT 62000. **Credits:** 2.00 to 4.00

MGMT 62200 - Marketing Strategy

Credit Hours: 2.00 to 4.00 (West Lafayette) 3.00 or 4.00 (Calumet) 3.00 (North Central). Key aspects of marketing strategy formulation and implementation are covered, including customer needs assessment, targeting, and positioning strategies in a competitive market. A managerial perspective allows development of decision-making skills necessary for successful marketing strategies. Prerequisite: MGMT 62000, MGMT 62100. **Credits:** 2.00 to 4.00

MGMT 62300 - Business Marketing

Credit Hours: 2.00 to 4.00. This course deals with the challenges of marketing to commercial enterprises, government organizations, and non-profit institutions. It covers topics including organizational buying behavior, launching and management of new high tech products, beta testing, customer relationship management, and the importance of manufacturing-marketing coordination. Prerequisite: MGMT 62000. **Credits:** 2.00 to 4.00

MGMT 62410 - Digital Marketing Strategy

Credit Hours: 1.00 to 4.00. Developed at a high-level overview of the digital marketing environment, this course provides exposure to both paid and owned digital strategies for businesses. It walks students through the customer journey through data analysis and focuses on key areas of managerial influence along the customer acquisition funnel to understand and evaluate current performance and the areas of opportunity for growth and financial improvement.**Credits:** 1.00 to 4.00

MGMT 62500 - Marketing Research

Credit Hours: 2.00 to 4.00 (West Lafayette) 3.00 (Calumet). Application of statistical and other quantitative concepts to marketing management problems. Prerequisite: MGMT 67000. **Credits:** 2.00 to 4.00

MGMT 62600 - Seminar In Marketing Models

Credit Hours: 2.00 to 4.00. Treatment of theoretical marketing models. Study of marketing models in research setting. Prerequisite: MGMT 62000, 67200. **Credits:** 2.00 to 4.00

MGMT 63000 - Legal And Social Foundations Of Management

Credit Hours: 2.00 to 4.00. An examination of the nature of the legal environment from the viewpoint of the social and moral bases of law. Emphasis is given to the operation of our legal system and its significance in decision functions of management. Prerequisite: Master's student standing and Management majors only. **Credits:** 2.00 to 4.00

MGMT 63100 - The Legal And Social Foundations Of Management II

Credit Hours: 2.00 to 4.00. Covers the social and ethical dilemmas of business policy and decision making, often involving legal, social, and ethical considerations encountered by business managers. Prerequisite: MGMT 63000. **Credits:** 2.00 to 4.00

MGMT 63150 - Accounting For Private Equity

Credit Hours: 2.00 or 3.00. The course offers students with knowledge of private equity services that accounting firms provide to clients. It covers investment banking, buy- and sell-side due diligence, M&A tax services, business valuations, etc.**Credits:** 2.00 or 3.00

MGMT 63250 - Advanced International Accounting

Credit Hours: 2.00 or 3.00. This course is designed to help students a) Learn about the development of international accounting movements and implications in a globalized financial market; b) Develop the ability to read and interpret the financial statements of companies that are prepared in accordance with International Financial Reporting Standards (IFRS); c) Emphasize the importance of professional judgment in international accounting when assessing different accounting treatments for the same event; d) Learn to cope with differences in financial measurement, recognition, and reporting practices; and e) Enhance the students' communication skills. The course should also contribute to the requisite background required for professional examinations such as CPA and to become prepared for a long-range successful accounting, auditing, and/or managerial career. **Credits:** 2.00 or 3.00

MGMT 63350 - Accounting Data Analytics

Credit Hours: 2.00 or 3.00. The skill set that accountants have needed to perform math and to keep order has evolved from pencil and paper, to calculators, and then to spreadsheets and accounting software. A new skill set that is becoming more important for nearly every aspect of business is that of big data analytics: managing large amounts of data in the database, analyzing them and

finding actionable insights and visualizing the results. This course is designed to help accounting students develop an analytical mindset and prepare them to use data analytic programming languages and software like Python, SQL, and Tableau. **Credits:** 2.00 or 3.00

MGMT 63400 - Business Law For Accountants

Credit Hours: 2.00. This course is designed to help prepare students for their professional careers by familiarizing them with aspects of the law that are directly relevant to the practice of accounting. These topics are not only at work every day in business but are also tested on professional examinations such as the Uniform Certified Public Accounting (CPA) Exam. Specific topics include, but are not limited to, contract law, relevant provisions of the Uniform Commercial Code, bankruptcy, and the legal liability of accountants. The course will be taught through a mixture of lectures and class discussions. Students are expected to come to class having completed the assigned readings and ready to participate in class discussions. **Credits:** 2.00

MGMT 63410 - Communications For Accountants

Credit Hours: 2.00. Accountants spend much of their time designing and writing reports, memos, etc. and explaining those communications to others. They communicate regularly with external investors and creditors, regulators, clients and fellow professionals. This course is designed to help accounting students prepare for their professional careers by helping them develop their written and oral communication skills. The course begins with an overview of the writing process and then moves to document organization and design and how to write with conciseness and clarity. The last half of the course focuses on specific forms of written communication (e.g., letters, memos, reports, email, essays on professional exams) and oral presentations. **Credits:** 2.00

MGMT 63450 - Financial Statement Analysis And Valuation

Credit Hours: 2.00 to 3.00. This course is designed to prepare students to become intelligent financial statement users. Understanding how market participants use financial statements will assist professionals in their primary tasks of creating and communicating financial information to these individuals. **Credits:** 2.00 to 3.00

MGMT 63500 - Accounting Information Systems

Credit Hours: 3.00. Accounting information Systems is a course designed to provide students with a solid background in the information systems that accountants use. Topics include, but are not limited to, input, processing and output devices, data communications and networks, document and system flowcharts, organizing and manipulating data in databases, producing reports and forms, popular accounting software, enterprise-wide information systems, security, privacy and ethics for accounting information, and information technology auditing. The course will advance students' abilities in the following areas. **Credits:** 3.00

MGMT 63550 - Accounting Consulting For Entrepreneurship

Credit Hours: 2.00 or 3.00. This course is an experiential learning experience that is part of the Experiential Learning Initiative in the Krannert School of Management. The main goal of the course is to provide various accounting services to STEM start-up companies which are based on Purdue's innovations (www.purduefoundry.com) and to established companies in the bigger corporate world. At the same time, we also would like to give our students the opportunity to apply their acquired classroom knowledge and have them exposed to some real-world accounting problems that start-up or established companies typically experience. Our students are expected to provide various accounting support services that are related to financial accounting & reporting, managerial accounting, business planning, and/or tax issues. The format of the course is very open. The first four weeks will be spent in a classroom setting, with presentations on how to professionally manage a client relationship and how to successfully tackle projects in a challenging STEM start-up and/or established corporate environment. Each project will be completed by teams of 3-5 students, which will be formed at the beginning of the semester. After the initial classroom sessions, the project teams will be on their own, with faculty guidance, running the engagement. The teams will meet with the clients to

determine their needs and expectations. The students will do the work and deliver the output including a final presentation to the client. **Credits:** 2.00 or 3.00

MGMT 63610 - Business Ethics

Credit Hours: 2.00. This course is designed to move past a surface-level understanding that we need to act ethically in the business environment to wrestling with what does that look like and what frameworks can help us do just that. I also firmly believe that we have to prethink our decisions before we are confronted with opportunities to compromise ethically. We will incorporate current headlines to our evaluation of major ethical lapses of the past. **Credits:** 2.00

MGMT 63650 - Accounting Ethics

Credit Hours: 3.00. This course is designed to introduce students to the foundational elements underlying ethics and ethical behavior, with an emphasis on ethical issues facing professional accountants. The course will provide students with a framework of ethical reasoning, professional values and attitudes for exercising professional skepticism, and other behavior that is in the best interest of the public and accounting profession. The course will also review the core values of integrity, objectivity, and independence as well as rules of professional conduct. This course uses real-world case studies and practical hands-on applications in order to enhance the student's ability to recognize ethical dilemmas and overcome them with sound ethical decision-making. Illinois Board of Examiners ethics course required to apply for taking the Uniform CPA Examination.**Credits:** 3.00

MGMT 63750 - Advanced Taxation

Credit Hours: 2.00 or 3.00. This course is directed at students who wish to learn more about the taxation of business entities beyond the basic principles taught in MGMT 504 Introductory Tax Accounting or an equivalent course. The course will cover broad topics such as tax law sources and tax research; the tax advantages and disadvantages of various business entities as well as how entrepreneurs may choose the optimal entity for tax purposes; taxable and nontaxable methods of mergers, acquisitions, and divestitures; fundamental concepts of consolidated tax returns for C Corporations; and the accounting for income taxes under ASC 740. **Credits:** 2.00 or 3.00

MGMT 63850 - Public Company Reporting And Regulation

Credit Hours: 2.00 or 3.00. This course introduces students to the Securities and Exchange Commission's (SEC) rules and regulations as they apply to U.S. companies and their auditors. Requirements for frequently encountered annual reporting responsibilities (e.g., Forms 10-K, 10-Q, 8-K, proxy statements, etc.) and registration statements are explored and analyzed. Actual SEC filings provide real-world applications and interpretation of the SEC's rules. Rules imposed by the primary U.S.-based stock exchanges are introduced as is the history of the SEC and current trends affecting this rule-making body. Additionally, this course encompasses the enforcement power of the SEC and its implications to companies, their officers, and accountants. **Credits:** 2.00 or 3.00

MGMT 63900 - Advanced Auditing And Audit Analytics

Credit Hours: 3.00. This course is designed to help students prepare for their professional careers by strengthening their understanding of the CPA's attest function and familiarizing them with current assurance issues. After finishing the course, students should understand the current state of the Enterprise Risk Management and tools for risk evaluation, be able to identify best practices related to external audit, be prepared to manage an audit group, understand the key aspects of being an audit consultant and be able to work with all levels of internal and external audit professionals. Throughout the course, students will have opportunities to improve their written and oral communication skills, particularly as they relate to communication in the audit setting. The course will also emphasize the impact of recent and current regulatory actions, including the Sarbanes-Oxley Act of 2002, on the audit profession. Prerequisite: MGMT 50600 with a minimum grade of C. **Credits:** 3.00

MGMT 63901 - London Trip For IASB

Credit Hours: 2.00 or 3.00. This is an experiential study abroad class with workshops held at the International Accounting Standards Board (IASB) as well as at one of the leading universities in the UK. In addition, students will visit public multinational companies and/or accounting firms in the Greater London area, UK. **Credits:** 2.00 or 3.00

MGMT 63902 - Accounting And Public Policy

Credit Hours: 1.00 or 2.00. This course offers students an intensive, distinctive, personal and professional development experience, addressing critical public policy institutions, issues, and trends affecting the profession of accounting. Over 3 days in Washington, D.C., participants meet with and gain a greater understanding of the role of regulatory agencies such as the Public Company Accounting Oversight Board and the Securities and Exchange Commission. Participants also have meetings and discussions with organizations governing the accounting profession, such as the American Institute of Certified Public Accountants and the Center for Audit Quality, as well as more informal but important organizations such as trade associations and think tanks. The course often includes visits with members and staff from Congress and officials from the Executive Branch to understand their institutional roles in governing the profession. These meetings include discussions of the relevant tax, securities, commodities, and oversight committees in Congress, for example. Within the Executive Branch, discussions typically include the operations of forensic accounting and compliance within agencies such as the U.S. Treasury and Internal Revenues Service and the Federal Bureau of Investigation. Participants also gain practical insights into the strategic role of government relations, as well as the role of public policy lobbying and advocacy by the overall profession and individual firms, regarding issues that affect them and their clients. Other topical sessions often include discussions of cybersecurity policy, tax policy, and other topics relevant to the profession and key clients.**Credits:** 1.00 or 2.00

MGMT 63910 - Accounting For Managers

Credit Hours: 0.00 or 1.00. Accounting is the language of business. Understanding financial accounting enables professionals inside the firm to communicate with external users. In this course you will be introduced to financial accounting, which focuses on the reports that are generated to provide external users information about a firm's financial position and operational effectiveness. **Credits:** 0.00 or 1.00

MGMT 64000 - Financial Modeling

Credit Hours: 2.00 or 3.00. This course provides an introduction to financial modeling using computer applications. The first part of the course covers how to use Microsoft Excel to analyze historical and pro forma financial statements, stock return data, linear regression analysis, Monte Carlo simulations, Pivot Tables and also covers many advanced functions within Excel. The second part of the course provides an introduction to using SAS to analyze financial data and more advanced regression techniques. Prerequisites: MGMT 61000 (Note: Students who have not taken MGMT 61000 may enroll with instructor permission). **Credits:** 2.00 or 3.00

MGMT 64100 - Options And Futures

Credit Hours: 2.00 to 4.00. Rigorous and applied coverage of the pricing and hedging of options and futures contracts with applications. Prerequisite: MGMT 61000. **Credits:** 2.00 to 4.00

MGMT 64300 - Financial Risk Management

Credit Hours: 2.00 to 4.00. Provides a foundation for understanding ways in which financial institutions and industrial firms can optimally manage financial risks. Concentrates on various "functional" risk measurement problems related to interest rate risk, default risk, exchange rates, and commodity prices. Prerequisite: MGMT 61000. **Credits:** 2.00 to 4.00

MGMT 64500 - Mergers, Acquisitions, And Corporate Control

Credit Hours: 2.00 to 4.00. Focuses on firms' internal governance structures and on pressure from the external market for corporate control, including executive compensation, board of directors' composition, shareholder activism, mergers, and takeovers. Prerequisite: MGMT 61000. **Credits:** 2.00 to 4.00

MGMT 64810 - Marketing Analysis And Planning

Credit Hours: 2.00. The course in Market Analysis and Planning examines the issues associated with the analysis of market opportunities and the formulation of strategic marketing plans to take advantage of market opportunities. Specific analysis issues include the identification of customer needs, competitive advantages, and company capabilities. Results of these analyses lead to choices the firm makes with regard to its market segmentation, target market selection, and positioning. Topics introduced in conjunction with these analyses include product life cycle analysis, product portfolio selection, and strategic resource allocation decisions. Aspects of resource allocation include decisions regarding market research and new product development (or product repositioning). Further, the allocation of firm resources directed at fostering market demand is examined, including the deployment of marketing communications to potential customers and salesforce efforts to attain distribution. A long-term perspective on market analysis and planning is emphasized through the utilization of the Markstrat Simulation. For this computer simulation, student teams participate in multi-period decision-making for their respective companies. Prerequisite: MGMT 62000. **Credits:** 2.00

MGMT 64900 - Global Marketing Management

Credit Hours: 2.00 to 4.00. A seminar using lecture-discussions, cases, and projects. Designed to cover the global marketing environment, market-entry strategy, global marketing programs, organization and control of global marketing operations, and the future of global marketing. Prerequisite: MGMT 62000, MGMT 62100. **Credits:** 2.00 to 4.00

MGMT 65000 - Strategic Management I

Credit Hours: 2.00 to 4.00. Concepts and methods that integrate previous training in functional areas of management. The perspective is that of the general manager charged with directing the total enterprise. Emphasis is given to formulation and implementation of strategy. Prerequisite: MGMT 61000, MGMT 62000, Master's student standing and Management majors only. **Credits:** 2.00 to 4.00

MGMT 65110 - Strategy For Competitive Advantage

Credit Hours: 1.00 to 4.00. Concepts and methods that integrate previous training in functional areas of management. The perspective is that of the general manager charged with directing the total enterprise. Emphasis is given to formulation and implementation of strategy. Prerequisites: MGMT 61300 and MGMT 62000.**Credits:** 1.00 to 4.00

MGMT 65210 - Organizational Development And Consulting Rewards

Credit Hours: 2.00. The course will describe techniques for diagnosing organizations and interventions for improving organizations. Specific interventions will be examined in detail including structural interventions (e.g., organizational design, job design), interpersonal process interventions (e.g., process consultation, team building), and human resource interventions (e.g., performance management, career development). The course will attempt to both build knowledge and provide practice in the various techniques.**Credits:** 2.00

MGMT 65310 - Human Resource Systems

Credit Hours: 3.00. An overview of selected human resource activities/systems for the future human resource professional. Emphasis will be placed on building skills in areas that will provide a foundation for future coursework in human resources management. Topics covered include planning and forecasting human resource needs, job analysis, design and evaluation of training systems, design of performance appraisal systems, and safety and health in the workplace. **Credits:** 3.00

MGMT 65330 - HR Strategy

Credit Hours: 2.00 to 3.00. Survey of theory and techniques used in human resource management within organizations. Emphasis is placed on HRM, Strategic HRM, Managing Human Resources Globally, and Strategically Managing Human Resource Functions. **Credits:** 2.00 to 3.00

MGMT 65340 - Staffing Tools

Credit Hours: 2.00. Provides an in-depth analysis of the methods used in staffing and selection processes. Methods used to evaluate individuals as well as methods used to evaluate selection and promotion tools will be studied. Emphasis on the processes of designing, administering, revising, and evaluating selection programs that comply with government regulation as well as add value to the organization. This course is designed for the future HR professional. Concurrent Prerequisite: MGMT 65310 or OBHR 63300, MGMT 67100 or STAT 51200. **Credits:** 2.00

MGMT 65350 - Staffing Systems

Credit Hours: 2.00. Examines all aspects of the staffing process beginning with applicant recruitment and ending with termination and outplacement. Emphasis on building skills that the general manager will need to evaluate, design, and implement these activities. Designed for the future manager, as well as the future HR professional. Topics will be addressed from an individual perspective, as well as an organizational perspective. Prerequisite: OBHR 63100 or OBHR 63300 or MGMT 65310. **Credits:** 2.00

MGMT 65360 - Industrial Relations I

Credit Hours: 2.00. An in-depth examination of human resource management in the context of union-management relations. Emphasis is on understanding how and why unions form, the legal context, and changing competitive environment for labor management relations. Covers the dynamics of the collective bargaining process, including the determinants of bargaining power, preparation of labor contract demands, and negotiation tactics. The course culminates with an extended mock negotiation exercise. **Credits:** 2.00

MGMT 65370 - Industrial Relations II

Credit Hours: 2.00. An examination of union-management relations topics that build on material addressed in OBHR 640. Topics include causes of strikes, impasse resolution techniques, grievance and arbitration procedures, public sector labor relations, labor-management cooperation, and international labor-management relations. Emphasis is on how changes in the competitive environment have created the need for changes in the traditional union-management relationship. Films, cases, exercises, and guest speakers are utilized. Prerequisite: OBHR 64000 or MGMT 65360. **Credits:** 2.00

MGMT 65380 - Compensation And Reward Systems

Credit Hours: 3.00. The first course in a two-course master's-level sequence focusing on the use of rewards to achieve organizational objectives. Special emphasis is given to compensation as a particularly salient reward. Designed for HR professionals, the course examines the relationship between rewards and organizational characteristics to achieve effective reward practices. Lectures, discussions, case studies, and guest speakers are used to build competence in job evaluation, skill-based pay, and setting pay levels. Prerequisite: OBHR 63100 or OBHR 63300 or MGMT 65310, MGMT 67100 or STAT 51200. **Credits:** 3.00

MGMT 65390 - HR Analytics

Credit Hours: 2.00 to 3.00. This course provides an introduction to the field of HR analytics. HR Analytics is an advanced set of data analysis methodologies, tools and metrics for comprehensive workforce performance measurement and improvement. The objective of HR analytics is to drive evidence-based decisions and action in the workplace. In addition to your instructor, you may hear from expert practitioners and corporate leaders who have "been there and done that" leveraging a myriad of HR analytics along the way. We will also review (and hopefully expand) your understanding of handling data including conceptualizing models, identifying key metrics, collecting data, analyzing data, and presenting data in ways that tell a powerful story. Throughout our course, I will infuse consulting concepts, methodologies, and lessons learned that combined with your analytic skills will help you to effectively serve as an HR Business Partner (internal HR consultant). **Credits:** 2.00 to 3.00

MGMT 65410 - Training And Development

Credit Hours: 2.00 or 3.00. This course prepares students to design training and develop training programs and to identify principles, practices and methods of staff training and career development. Students will learn and practice how to deliver and evaluate said programs for return on investment (ROI). Emphasis is placed on the application of principles related to adult learning, instructional design and program development, evaluation and learning technologies. Specific objectives include topics related to communication, diversity, generational differences and group dynamics. **Credits:** 2.00 or 3.00

MGMT 65420 - Leadership

Credit Hours: 1.00 to 3.00. Examines organizational leadership responsibilities, forms of leadership, the acquisition, use, and consequences of power, critical leader skills, and how corporate environments shape leadership. Emphasis on self-discovery and development of managerial leadership knowledge and skills. **Credits:** 1.00 to 3.00

MGMT 65430 - Negotiations In Organizations

Credit Hours: 1.00 to 3.00. Decision making examines organizational context, stages, creativity, biases, and group processes. Negotiations examine strategies for preparing and conducting negotiations. The principal focus is on individual and interpersonal aspects of each. Permission of department required. **Credits:** 1.00 to 3.00

MGMT 65450 - Human Capital Consulting

Credit Hours: 2.00 or 4.00. Working in a team setting, this course provides real-life experience consulting with an organization to solve a real business problem. The focus is on human capital or human resource-related problems. Students work with a client to define the scope of their engagement, identify needs, conduct outside research (benchmark, market analysis), develop solutions, and identify key deliverables. The project culminates with an executive summary presentation with tangible recommendations to the client's senior leadership. This experience prepares students to serve as an HR Business Partner (HRBP).**Credits:** 2.00 or 4.00

MGMT 65460 - Talent Acquisition

Credit Hours: 2.00 to 3.00. This course focuses on the effective management of the flow of talent into and through organizations. It covers workforce planning, recruiting and selection, career transitions, and other workforce movement. It is designed to teach students the skills to recruit and select the best talent to help drive organizational strategy. Students will also learn how to design a process and framework for final individual or group selection. Lastly, they will learn several strategies to successfully orient and onboard new employees. **Credits:** 2.00 to 3.00

MGMT 65470 - Talent Management

Credit Hours: 2.00 to 3.00. This course focuses on the employer-employee relationship and how managers work with employees to improve their performance. Attention is given to Talent, Talent Management, and Performance Management in work settings, with an emphasis, however, on contemporary approaches to managing the employer-employee relationship and the systems for managing talent. Various definitions of Employee Engagement will be explored, along with how it is, measured, and why it is so important to your organization. Finally, various methods to engage employees in the organization will be studied. **Credits:** 2.00 to 3.00

MGMT 65700 - Manufacturing Strategy And Process Innovation

Credit Hours: 2.00. In recent years many firms have rediscovered manufacturing and operations as a potential source of strategic advantage. In general, these firms have sought to develop capabilities in operations which provide a sustainable advantage in the marketplace. In addition, successful firms have developed processes for understanding the cross-functional implications of product and process choices. In this course, we will seek to understand the circumstances under which particular operating capabilities are most beneficial and how such capabilities can be developed so that operations can be exploited for competitive advantage. Concurrent Prerequisite: MGMT 61000, 65000, 66000. **Credits:** 2.00

MGMT 65730 - Technology Strategy

Credit Hours: 2.00 or 3.00. In today's business environment, it is increasingly apparent that business success is driven by a firm's ability to create and capture value through technology and innovation. Thus, the processes used by firms to develop new technologies, the choices they make regarding how to commercialize their technical knowledge, and the strategies they used to position and build a dominate competitive position all are important issues facing the firm. This course seeks to develop tools for understanding industry evolution with respect to new technology, forecast technological change, and understand the basis for technology in competitive advantage. We take an in-depth look at how technological innovation affects the competitive dynamics of markets, how firms can strategically manage these dynamics, and how firms can create and implement strategies to maximize their likelihood of success. The course introduces tools, concepts, and analytical frameworks that will enhance your ability to define and analyze strategic problems that stem from innovation and technological change, and to identify sources of competitive advantage from both an industry and firm-level perspective. Permission of department required.**Credits:** 2.00 or 3.00

MGMT 65810 - Corporate Consulting Experiential Learning

Credit Hours: 1.00 to 4.00. This course is an engagement with an external firm to solve challenges within the business. Students work together on project teams that require a cross-functional and interdisciplinary perspective. Student mix is determined by project needs and qualifications. Projects are typically sponsored at a senior level of the organization and address enterprise-level issues and challenges of strategic importance. Permission of instructor required. **Credits:** 1.00 to 4.00

MGMT 65900 - Strategic Management II

Credit Hours: 2.00 to 4.00. Further emphasis on understanding how organizations might achieve advantage relative to competitors. Focus is on corporate strategy: the decisions of a multi-business firm. Such decisions include: What range of businesses is appropriate within a single firm? What mode of expansion, e.g., alliance vs. acquisition, is appropriate? How should a firm's administrative systems and structure be organized across multiple businesses or markets to achieve maximum value? What is needed to foster innovation in the organization? Introduces a variety of analytical frameworks to help students qualitatively and quantitatively appraise corporate-level strategies given a firm's unique resource profile and the environment in which it competes. Prerequisite: MGMT 60000, 61000, 62000 and 65000. **Credits:** 2.00 to 4.00

MGMT 66000 - Introduction To Operations Management

Credit Hours: 2.00 to 4.00 (West Lafayette) 3.00 (Calumet, North Central). As goods and services are produced and distributed, they move through a set of inter-related operations or processes in order to match supply with demand. The design of these operations for strategic advantage, investment in improving their efficiency and effectiveness, and controlling these operations to

meet performance objectives is the domain of Operations Management. The primary objective of the course is to provide an overview of this important functional area of business. Prerequisite: MGMT 67000, MGMT 67100. **Credits:** 2.00 to 4.00

MGMT 66100 - Management Of Operating Systems

Credit Hours: 1.00 to 4.00. A project course in which students are exposed to a variety of operations problems as they arise in a real world setting. The focus of the course is problem formulation, analysis, and proposal(s) of an implementable scheme for their resolution. Prerequisite: MGMT 66000. **Credits:** 1.00 to 4.00

MGMT 66400 - Supply Chain Management

Credit Hours: 2.00 to 4.00. Continues the examination of the linkage between a firm's product-market strategy and the role of the operations (i.e., production) function initiated in MGMT 660. Topics include material requirements planning, production activity control, and just-in-time systems. Prerequisite: MGMT 66000. **Credits:** 2.00 to 4.00

MGMT 66700 - International Operations Management

Credit Hours: 2.00. Emphasizes the role of operations in the making of strategic decisions of where to locate and how to coordinate facilities to optimize the performance of a multinational organization. The impact of trade regulations and foreign exchange risk is considered. Case studies of international manufacturing firms develop and illustrate key concepts. Prerequisite: MGMT 66000. **Credits:** 2.00

MGMT 66900 - Operations Management: Practice And Models

Credit Hours: 2.00. A manufacturing laboratory course in which computer and visual information systems are applied to a small-scale replica of a manufacturing facility. Applications include material requirements planning, KANBAN systems, detailed scheduling, and simulation. The overriding objective is to experience how these information systems are implemented and used to improve the physical system. Concurrent Prerequisite: MGMT 66400. **Credits:** 2.00

MGMT 67000 - Business Analytics

Credit Hours: 2.00 to 4.00. Introduction to quantitative decision procedures under uncertainty. Applications of descriptive statistics, probability models, simulation models, interval estimates, and hypothesis testing to management problems. Managerial-oriented cases are used in instruction. Prerequisite: Master's student standing and Management majors only. **Credits:** 2.00 to 4.00

MGMT 67100 - Quantitative Methods II

Credit Hours: 2.00 (West Lafayette) 3.00 (Calumet, North Central). A continuation of Quantitative Methods I. Applications of regression procedure, forecasting technique, and statistical design of experiment method to management problems. Managerial-oriented cases are used throughout the course. Prerequisite: MGMT 67000. **Credits:** 2.00 to 3.00

MGMT 67200 - Advanced Business Analytics

Credit Hours: 2.00. Quantitative decision procedures under uncertainty applied to business problems. Basic concepts in econometrics and multivariate analysis are studied. Several managerial-oriented case studies are used to illustrate estimation, testing, and regression procedures. Prerequisite: MGMT 67100, Master's student standing and Management majors only. **Credits:** 2.00

MGMT 67620 - Optimization For Data Analysis And Decisions

Credit Hours: 2.00 or 3.00. This course covers optimization theory and algorithms for data analysis and decision-making. The topics covered include polyhedral analysis, duality, first-order methods, relaxation techniques, and computational aspects of optimization. The course will use business applications to demonstrate usefulness of the methods. **Credits:** 2.00 or 3.00

MGMT 67700 - Seminar In Quantitative Methods In Management Research

Credit Hours: 3.00. Applications of quantitative methods of analysis to research problems in financial, marketing, and production management. Data processing and statistical inference in management research. Prerequisite: MGMT 67000, MGMT 67100, MGMT 67200. **Credits:** 3.00

MGMT 68000 - Economic Analysis Of Technology Markets

Credit Hours: 2.00 (West Lafayette); 3.00 (Northwest). The core models of microeconomics are fundamental to day-to-day management decisions. This course will cover economic models that describe firm production, pricing, entry/exit decisions, market efficiency, and welfare. Such economic models will be applied to the analyses of a variety of market conditions, including monopoly, oligopoly, and monopolistic competition. It will provide students with an understanding of the implications of economic theory on technology products, firms, markets, and consumers. **Credits:** 2.00 to 3.00

MGMT 68200 - Digital Product Design

Credit Hours: 2.00. This course is a comprehensive exploration of designing digital products that can improve the quality of people's daily lives. It covers value creation with technology and a human-centered design process including improv brainstorming, storyboarding, interviewing, sketches, and selling. Students will learn how to ideate and how to iteratively refine ideas with real users. Students will consider factors driving technology product design decisions such as the unique economic characteristics of today's technology-intensive markets and their impact on strategic interactions among firms and consumers. Students will also learn to discover unmet user needs, reframe problematic situations, envision multiple possible product concepts, and assess their feasibility, viability, and desirability. The course culminates in the creation of a business model, a product sketch, and a plan for taking the product to market.
Credits: 2.00

MGMT 68300 - Technology-Driven Business

Credit Hours: 2.00 to 3.00. Digital technologies such as the Internet, IoT, and AI are rapidly and fundamentally transforming today's companies and industries. They have enabled completely new ways for companies to organize work, generate innovations, make decisions, and interact with customers, suppliers, and competitors. This course is designed for students who want to deeply analyze digital transformations and, more importantly, manage technology-driven businesses. Applying information economics principles and theoretical rigor, this course studies how digital technologies affect consumer behavior, business model innovations, market design, and competitive outcomes. This course trains students to apply data analytics skills to real business problems and develop a rich understanding of the strategic value of digital transformations. **Credits:** 2.00 to 3.00

MGMT 68400 - Information Risk Management

Credit Hours: 2.00. Explores the various issues pertinent to maintaining acceptable levels of information security within organizations. Topics include risk analysis, resource identification, a basic introduction to information security architecture and infrastructure, policy development and deployment, and legal and regulatory issues, including those pertaining to privacy. The course is intended to raise awareness of information security issues across organizations and will be targeted towards managers in all areas, not just information systems. Prerequisite: MGMT 68300. **Credits:** 2.00

MGMT 68600 - Knowledge Management Systems

Credit Hours: 2.00. Discusses the fundamentals of knowledge management and the role of information technology and systems in supporting organizational knowledge management. With a growing emphasis toward managing intangible knowledge assets (compared to tangible physical assets), knowledge management has become an indispensable tool kit for managers. Prerequisite: MGMT 68300. Typically offered Fall.**Credits:** 2.00

MGMT 68700 - AI For Business Decisions

Credit Hours: 1.00 to 3.00. Leading-edge companies in every industry are relying on data and AI to replace intuition and guesswork in their decision-making. This course prepares students to understand how AI can be utilized to create value and a sustainable competitive advantage. It teaches the scientific process of using AI to transform data into predictions and insights for making better business decisions in a real-world setting. Upon completion, students should be able to identify and evaluate value propositions of AI advances, conduct successful AI implementations, and manage AI-driven digital transformations. **Credits:** 1.00 to 3.00

MGMT 68800 - Developing A Global Business Strategy

Credit Hours: 2.00 to 4.00. Provides an introduction regarding the business and strategy challenges faced by managers in our global economy, regardless of whether the firm is a small domestic company or a large multi-national. Major topics for the course include motivations and challenges of internationalization, international business fundamentals, foreign market entry strategies, organizing across countries, analyzing global industries, building competitive advantage in global industries, and the influence of culture and institutions. Prerequisite: MGMT 65000. **Credits:** 2.00 to 4.00

MGMT 69100 - Special Problems In Management

Credit Hours: 1.00 to 4.00. Advanced investigation in a specific management field at the graduate level. For students in the master's programs in management who are registered in the master's program summer session. Permission of instructor required. **Credits:** 1.00 to 4.00

MGMT 69200 - Managerial Communication Skills

Credit Hours: 1.00. Enhances student professionalism in managerial contexts by improving oral communication skills by developing strong oral presentation techniques. **Credits:** 1.00

MGMT 69410 - Communication And Persuasion

Credit Hours: 2.00. Business students are trained to be experts in turning data into information. With a strong focus on data visualization, the purpose of this course is to help students take the next step: Turning that information into action. This course will provide you with helpful frameworks for understanding your audience, insights about how people perceive information best, and practical skills to express your ideas in ways that connect. Permission from department required. Co-requisite: MGMT 69000 - Industry Practicum**Credits:** 2.00

MGMT 69600 - Theoretical Principles For Deep Learning

Credit Hours: 2.00 or 3.00. This course aims to expose you to one of the most active contemporary research directions within machine learning: theoretical principles for deep learning. Despite its undisputedly useful empirical breakthroughs, their understanding is still in many ways nascent. This course provides the latest theoretical aspects of deep learning and representation learning, accompanied by a mixture of reading group sessions and student projects. This is an advanced graduate course designed for master's and Ph.D.-level students and assumes a substantial degree of quantitative research background. **Credits:** 2.00 to 3.00

MGMT 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Manufacturing Engineering Technology

MFET 10301 - Geometric Modeling Applications

Credit Hours: 3.00. This course provides an introduction to the process of 3D geometric CAD modeling, and the construction techniques used in the creation of constraint-based solid and surface models used in engineering disciplines. Part modeling and assembly modeling are included, as well as manipulation of the geometric model to derive variant designs. Emphasis is on the use of the engineering design process as a problem-solving method to capture modeling behavior to enable the downstream use of 3D data in the overall product design process, and its re-use in the product lifecycle.**Credits:** 3.00

MFET 11301 - Product Data Management

Credit Hours: 3.00. This course provides an understanding of the types of data generated and used in the product lifecycle, the current tools and methodologies in the management of that data, and system analysis and implementation techniques for using PDM as the backbone supporting a company's product development and implementation activities. Interaction between various enterprise systems is discussed.**Credits:** 3.00

MFET 15900 - Introduction To The Smart Manufacturing Enterprise

Credit Hours: 1.00. This course serves as an introduction to modern smart manufacturing methods and processes. The course explores the manufacturing enterprise in different industry contexts to illustrate multiple, varied paths to inform students of multiple career opportunities. **Credits:** 1.00

MFET 16300 - Graphical Communication And Spatial Analysis

Credit Hours: 2.00. An introductory course in computer graphics applications for mechanical- and aeronautical-related professions. Experiences focus on visualization, sketching, graphic standards, and problem-solving strategies for engineering design. The course will emphasize the proper use of parametric solid modeling for design intent.**Credits:** 2.00

MFET 20301 - Model-Based Definition

Credit Hours: 3.00. This course provides experience in the development of model-based product definition through the use of contemporary modeling tools and the application of ASME dimensional standards. This course also covers product data exchange and interoperability standards from the perspective of neutral and proprietary data formats and models. Long-term archival concepts are also covered. **Credits:** 3.00

MFET 20401 - Data Capture, Collection, Analysis, And Visualization In Smart Manufacturing

Credit Hours: 3.00. This course provides an introduction as well as hands-on experience in data analysis and visualization in the Smart Manufacturing environment. It introduces students to the role of data in a Smart Manufacturing Enterprise, concepts and techniques of data analytics, and design principles for creating effective data visualization to facilitate managerial decision-making. This course is part of Smart Manufacturing Enterprise Fundamentals and should be taken after completing Introduction to the Smart Manufacturing Enterprise course.**Credits:** 3.00

MFET 21301 - Simulation And Visualization Applications

Credit Hours: 3.00. This course provides an investigation of predictive and documentary capabilities of engineering simulation and visualization tools. The course is based on concepts derived from theoretical computer graphics and related industrial standards, as well as the use of the geometric model-based product definition.**Credits:** 3.00

MFET 23000 - Industrial Internet Of Things, Networks, And Systems I

Credit Hours: 3.00. This course provides an introduction to Industrial Internet of Things (IIoT) devices, networks, and standards in the context of converged information technology (IT) and operations technology (OT) industrial automation systems. Course topics include an examination of IT and OT networks, hardware, architecture, protocols, standards, and security practices in the context of industrial applications.**Credits:** 3.00

MFET 23100 - Industrial Internet Of Things, Networks, And Systems II

Credit Hours: 3.00. This course offers a practical exploration of Industrial Internet of Things (IIoT) in converged information and operations technology (IT/OT) industrial automation systems. Course topics include IT and OT reference architectures, industrial network convergence, standards, and security practices in the context of Edge, hybrid, and Cloud-based industrial applications. Specific focus is given to integrating and securing networked industrial devices with local and cloud-based IT systems in greenfield and brownfield scenarios. **Credits:** 3.00

MFET 24100 - Automatic Control Systems

Credit Hours: 3.00. This course provides students with a comprehensive understanding of feedback control systems and their practical implementation. Students will learn modeling and simulations of linear/linearized dynamic systems, stability study, time domain analysis, frequency domain analysis, root-locus method, design of PID control, compensators, derivation of control law, and system performance analysis through hands-on exercises and simulations. The curriculum emphasizes applications of mechatronics, robotics, and mechanical/electrical engineering technology fields.**Credits:** 3.00

MFET 24800 - Industrial Robot Programming And Applications

Credit Hours: 3.00. This course introduces the fundamental concepts of robotics with emphasis on hands-on experience in programming and application of industrial robots. Topics covered include the introduction of robotics, robot classifications, robot programming, end-of-arm tooling, safety considerations, automation sensors, and robot and system integration. **Credits:** 3.00

MFET 25000 - Smart Manufacturing Cloud Computing Applications

Credit Hours: 3.00. This course introduces concepts and principles of cloud computing and the virtualization of computing resources and services for smart manufacturing applications. The fundamental topics of cloud computing will be addressed, including virtually processing, storing, modeling and analyzing of data in the cloud environment. Fundamental concepts about cloud tools, applications, and services from a production and manufacturing perspective will be presented. Typically offered Fall Spring Summer.**Credits:** 3.00

MFET 28800 - Smart Manufacturing Operational And Information Networks

Credit Hours: 3.00. This course examines the concepts, devices, and common practices associated with modern industrial communication systems and networks. Network devices, intelligent sensors, operations software and controls components are presented. Students learn how connect and provision devices, establish communications between devices and databases, and configure systems for reliable and secure operation. Industrial standards, practices and safety are emphasized throughout the course. **Credits:** 3.00

MFET 29000 - Special Topics In Manufacturing Engineering Technology

Credit Hours: 1.00 to 3.00. Hours, subject matter, and credit to be arranged by faculty. Group instruction in new or specialty areas of Manufacturing Engineering Technology is provided by Technology faculty, subject to MFET curriculum subcommittee approval. **Credits:** 1.00 to 3.00

MFET 29200 - Projects In Automation, Robotics And Mechatronics

Credit Hours: 1.00 to 3.00. Hours, subject matter, and credit to be arranged by faculty. Course is for supervised project development, subject to MFET curriculum subcommittee approval. Intended for lower division students. Permission of instructor required. **Credits:** 1.00 to 3.00

MFET 29900 - Manufacturing Engineering Technology Independent Project

Credit Hours: 1.00 to 3.00. Hours and subject matter to be arranged by instructor and approved by the MFET curriculum committee. Primarily for third- and fourth-semester students with special interests. Permission of instructor required. **Credits:** 1.00 to 3.00

MFET 30000 - Applications Of Automation In Manufacturing

Credit Hours: 3.00. Basic introduction to automation applications in manufacturing and the impact of computer-based systems on a manufacturing company. Coverage includes practices and the various issues related to the application of computer-integrated manufacturing. Emphasis placed on CAD, CAM, CNC, robotics, industrial control elements, PLCs, and computer-based process controls. Does not carry credit toward graduation in MFET. **Credits:** 3.00

MFET 30301 - Digital Manufacturing

Credit Hours: 3.00. This course investigates digital manufacturing methods, tools, and processes. Topics include additive and subtractive production techniques, CNC tools, geometric dimensioning and tolerance, model-based definition, measurement instruments and metrology, and scanning techniques for geometry validation.**Credits:** 3.00

MFET 31301 - The Business Of Managing Digital Product Data

Credit Hours: 3.00. This course provides experience in the business-related aspects of PLM tools and methods. Topics include identifying specifications and roles for system users within an organization, creating database models for digital product information, workflows, virtual machine installation and configuration of PLM systems, budgeting, and benchmarking.**Credits:** 3.00

MFET 32100 - Nature-Inspired Design And Materials

Credit Hours: 3.00. In this course, students will work at the intersection of nature, design, materials, and devices. We will begin by exploring structures in nature, from the microscale to the macroscale. Inspired by nature, teams will design structures, objects, tools, machines, or sensors that incorporate aesthetic elements inspired by their exploration and observation of nature. These designs will then be realized through 3-D printing and will be realized in a proof-of-concept device.**Credits:** 3.00

MFET 34100 - Process And Continuous Control Applications

Credit Hours: 3.00. An examination of devices, algorithms, strategies, and standards used in smart manufacturing continuous process and control serves as the basis of this course. Concepts include Proportional, Integral, & Derivative Control (P&ID), loop

modeling, transfer functions, PID design, implementation and tuning. Course laboratories focus on implementing and tuning systems using industry-grade hardware and devices. **Credits:** 3.00

MFET 34400 - Automated Manufacturing Processes

Credit Hours: 3.00. Shop floor components of computer-integrated manufacturing are explored. Emphasis is focused on current applications and programming practices of various computer-automated manufacturing processes and technologies. Topics include CAD/CAM integration, computer-assisted numerical control programming for 2 ½ and 3-axis contouring, and CNC program verification. **Credits:** 3.00

MFET 34800 - Introduction To Robot Kinematics

Credit Hours: 3.00. This course introduces the fundamentals of robotics with an emphasis on solutions to the kinematics problems of serial robotic manipulators. It covers robot modeling and simulation, forward kinematics, inverse kinematics, analysis of robot motion and static forces, and trajectory planning. **Credits:** 3.00

MFET 35000 - Smart Manufacturing Systems Modeling & Simulation

Credit Hours: 3.00. This course addresses application of industrial internet of things (IIoT) for modeling and simulation of smart manufacturing assets, processes, and operations. Emphasis is on synchronizing modeling/simulation with real-time data to develop innovative services, create efficiencies, and enable productivity improvement in smart factories. **Credits:** 3.00

MFET 35100 - Mixed Reality Smart Manufacturing Applications & Design

Credit Hours: 3.00. The course investigates development strategies, use cases, and mixed reality (MR) application in industrial IoT (IIoT)-based smart manufacturing systems. Emphasis is on superimposing digital content onto physical systems, integrating data from smart and connected manufacturing production operations, processes, and machines. **Credits:** 3.00

MFET 35200 - Smart Manufacturing Production Information Systems

Credit Hours: 3.00. An examination of smart manufacturing information systems with particular focus on applications for horizontal- and vertically-integrated manufacturing organizations. Topics include cloud-based integrated information systems to provide connectivity, visibility, and analytics of production and shop-floor execution systems and integrating manufacturing execution, manufacturing operations management, and enterprise resource planning (ERP) systems. **Credits:** 3.00

MFET 35800 - Smart Manufacturing And The Global Economy

Credit Hours: 3.00. The impact of digital transformation and the study of the contribution of fully integrated, collaborative, smart cyber physical production systems on the global, national, and regional manufacturing economies. **Credits:** 3.00

MFET 36100 - Machine Learning And Manufacturing Analytics

Credit Hours: 3.00. Machine learning (ML) algorithms are used to extract and analyze large amounts of manufacturing data. Fundamental ML analytic techniques and commonly used ML algorithms for manufacturing applications will be introduced. Students will create, train, and deploy ML models on a cloud platform to create enterprise-ready smart manufacturing artificial intelligence (AI) solutions. **Credits:** 3.00

MFET 36300 - Intelligent Manufacturing Systems I

Credit Hours: 3.00. This course investigates how artificial intelligence, industrial IoT, and big data are used to enable predictive analytics with machine learning. Emphasis is on optimizing production processes, improving productivity, quality, efficiency, and integrating predictive maintenance applications in smart manufacturing operations. **Credits:** 3.00

MFET 36400 - Intelligent Manufacturing Systems II

Credit Hours: 3.00. Artificial intelligence (AI), machine learning (ML), industrial IoT (IIoT), and big data are applied to enable predictive analytics with machine learning for optimizing processes and operations in a horizontally-integrated smart manufacturing value-chain network. **Credits:** 3.00

MFET 37100 - Introduction To Precision Machine Design

Credit Hours: 3.00. This is a multidisciplinary course focusing on engineering techniques that are employed to design and develop high-precision automation products equipped with precision mechanisms. Fine mechanisms and precision instruments will be used to illustrate the concepts and applications. Topics covered include design strategy, high-precision mechanical components, sensors and measurement, servo control, design for controllability, control software development, controller hardware as well as automated error detection and recovery.**Credits:** 3.00

MFET 37400 - Manufacturing Integration I

Credit Hours: 3.00. The fundamentals of data communications and local area networks are taught in order to show students how to integrate modern manufacturing systems. Emphasis is on the various levels of communications between shop floor computers, PLCs, robots, and automatic identification equipment. Database technology is used as an integration tool. This course prepares students for the MFET capstone course. **Credits:** 3.00

MFET 39200 - Advanced Projects In Automation, Robotics, And Mechatronics

Credit Hours: 1.00 to 3.00. Hours, subject matter, and credit to be arranged by faculty. Course is for supervised project development, subject to MFET curriculum subcommittee approval. Intended for upper division students. Instructor of permission required. **Credits:** 1.00 to 3.00

MFET 39500 - Smart Manufacturing Enterprise Organization And Operations

Credit Hours: 3.00. This course provides an introduction and overview of dealing with organizational change management needed to address existing cultures within organizations dealing with the digital transformation required to implement a Smart Manufacturing Enterprise. It introduces students to the cultural and organizational barriers that exist and the theories, tools, and best practices used to overcome them.**Credits:** 3.00

MFET 41000 - Introduction To Additive Manufacturing

Credit Hours: 3.00. This course covers topics in additive manufacturing (AM) technologies. Topics include the AM benefits and drawbacks of additive as compared to subtractive manufacturing, additive manufacturing process and material selection, design for additive manufacturing, support structure generation, printing process planning, and quality control techniques, such as monitoring, inspection, and surface modification.**Credits:** 3.00

MFET 44000 - Smart Manufacturing Autonomous Human Robot Systems

Credit Hours: 3.00. This course explores robot cognition with application of intelligent human-robot systems in unstructured manufacturing environments. Topics include intelligent robotics, machine learning, machine vision, and human-robot interaction with particular emphasis on applications for smart manufacturing. Typically offered Fall Spring Summer.**Credits:** 3.00

MFET 44100 - Robotics and IoT Seminar

Credit Hours: 0.00 or 1.00. The Robotics Seminar is a series of lectures from eminent local, national and international researchers in the field of robotics and the internet of things (IoT) and related areas, such as computer vision, autonomy, cyber-physical systems, wearables, etc. **Credits:** 0.00 or 1.00

MFET 44200 - Programming Robots With ROS

Credit Hours: 3.00. Robot Operating Systems (ROS) will be used as a programming platform to explore the topics of computer vision, SLAM (Simultaneous Localization and Mapping), path planning, grasping, and social interaction in robotic systems, as well as programming large systems for physical interaction with the world. Self-contained implementation projects are core to the class. Student knowledge of a procedural programming language, familiarity with robotics, and a rudimentary understanding of matrices is assumed. Typically offered Fall Spring Summer.**Credits:** 3.00

MFET 47100 - Electric Machines

Credit Hours: 3.00. This course provides a comprehensive introduction to electrical machines fundamentals, three-phase circuits, electromagnetic principles, AC and DC motors, transformers, magnetism in motors, energy conversion in electric machines as well as their industrial and commercial applications.**Credits:** 3.00

MFET 48000 - Project Planning For Integration

Credit Hours: 3.00. This is the first of two courses that complete the capstone requirement. The course focus is on the project planning, system design and management activities necessary for the implementation of a successful manufacturing integration project. **Credits:** 3.00

MFET 48100 - Integration Of Manufacturing Systems

Credit Hours: 3.00. This capstone course emphasizes the integration of manufacturing activities into a complete system. The course brings together elements of prior courses including: production processes, planning systems, system integration, and manufacturing controls. Primary course activities are centered around a semester-long team project. **Credits:** 3.00

MFET 49000 - Special Topics In Manufacturing Engineering Technology

Credit Hours: 1.00 to 3.00. Hours, subject matter, and credit to be arranged by faculty. Group instruction in new or specialty areas of Manufacturing Engineering Technology is provided by Technology faculty, subject to MFET curriculum subcommittee approval. **Credits:** 1.00 to 3.00

MFET 49900 - Manufacturing Engineering Technology Independent Project

Credit Hours: 1.00 to 3.00. Hours and subject matter to be arranged by instructor and approved by MFET curriculum committee. Primarily for seventh- and eighth-semester students with special interests. Permission of instructor required. **Credits:** 1.00 to 3.00

MFET 51400 - Product Lifecycle Management

Credit Hours: 3.00. A survey of the graphical knowledge base with business and industry applications that support the product lifecycle management process is presented. Graphical applications used in the development of a product from an initial concept through its disposal are covered. Current and past application topics are reviewed in both theoretical and technological aspects

and are validated through applied research. Emphasis is placed on the interdisciplinary nature of product lifecycle management through industrial case studies. **Credits:** 3.00

MFET 51700 - Product Development Using Virtual Environments

Credit Hours: 3.00. This course presents the concepts of product development using virtual reality and haptic devices in the development and manufacture of products. Students learn how this technology is currently being used in industry and anticipated technological advancements. Some of the major topic areas covered are: virtual reality technologies, product design and development processes, virtual environments and virtual prototyping, 3D modeling, design analysis and visualization, simulation visualization, multimodal user interface in virtual environments, and real-world applications of product development. Knowledge of 3D computer graphics fundamentals. **Credits:** 3.00

MFET 52400 - Model-Based Definition In The Digital Enterprise

Credit Hours: 3.00. This course will explore Model-based definition (MBD), an emerging industry technique that uses 3D CAD models with annotations to communicate information between people and equipment instead of using drawings. This technique results in reduced variability during data translation, more accurate product definition information and wider dissemination of product data through an increasingly digital corporate enterprise. **Credits:** 3.00

MFET 53400 - Technical Documentation In The Digital Enterprise

Credit Hours: 3.00. This course will explore the different ways technical documentation manifests itself within the enterprise to support the digital thread. We will use various industry applications to create and modify technical documentation and explore the processes and applications that facilitate the creation, storage, and configuration of technical documentation. **Credits:** 3.00

MFET 55700 - Smart Manufacturing Enterprise: Exploring The Applied Technologies

Credit Hours: 3.00. The core foundations of digital transformation in manufacturing for making all things digital, making all things smart, and making all things connected to drive business value. **Credits:** 3.00

MFET 63400 - Automation Of Digital Product Development Processes

Credit Hours: 3.00. This course introduces students to advanced computer programming techniques in the context of Computer-Aided Design and Manufacturing by focusing on automation and customization procedures of 3D solid modeling, design, and management tasks. The course emphasizes problem-solving skills and creative thinking by developing solutions to manipulate CAD applications, files and PDM systems programmatically. By the end of the semester, students should be able to identify characteristics and common patterns in tasks that lend themselves to automation and select and evaluate the most appropriate mechanisms to implement different levels of automation. Pre-Requisite: CGT 52000 or equivalent. **Credits:** 3.00

MFET 64200 - Programming Robotics And Cyber-Physical Systems With The Robotics Commons

Credit Hours: 3.00. Robot Operating System (ROS) is an open-source programming platform that allows the sharing of software packages for more in-depth exploration of complex software projects involving robotics and cyber-physical systems. The basic tools of simulation, visualization, computer vision, simultaneous localization and mapping (SLAM), path planning, manipulation, grasping, and social interaction in robotic systems will be presented in the context of advanced projects with a publishable result. Students will develop complex, independent projects as part of the class that will result in a final report in the form of a publication-worthy paper suitable for submission to an international conference. Student knowledge of a procedural programming language, familiarity with robotics, and a rudimentary understanding of linear algebra is assumed. Prerequisites: ECE 56900. **Credits:** 3.00

Mathematics

MA I am requesting a sp - History Of Mathematics

Credit Hours: 3.00. The purpose of this course is to help students understand and appreciate the growth and development of mathematical ideas across various cultures. Students will study the achievements of people who have made significant contributions to the development of both ancient and modern mathematical concepts.**Credits:** 3.00

MA 1530N - College Algebra

Credit Hours: 3.00. MA 15300-15400 is a two-semester version of 15100. Not open to students with credit in MA 15100. Not available for credit toward graduation in the School of Science.**Credits:** 3.00

MA 1540N - Trigonometry

Credit Hours: 3.00. Continuation of MA 15300. Not open to students with credit in MA 15100. Open to students with an "A" or "B" in MA 15200. Not available for credit toward graduation in the School of Science.**Credits:** 3.00

MA 1590N - Precalculus

Credit Hours: 5.00. Algebra and Trigonometry topics designed to prepare students for calculus.**Credits:** 5.00

MA 1601N - Brief Survey Of Calculus I

Credit Hours: 3.00. Sets, limits, derivatives, integrals, and applications.**Credits:** 3.00

MA 1710N - Multidimensional Mathematics

Credit Hours: 3.00. An introduction to mathematics in more than two dimensions. Graphing of curves, surfaces and functions in three dimensions. Two and three dimensional vector spaces with vector operations. Solving systems of linear of equations using matrices. Basic matrix operations and determinants.**Credits:** 3.00

MA 2610N - Multivariate Calculus

Credit Hours: 4.00. Planes, lines, and curves in three dimensions. Differential calculus of several variables; multiple integrals. Introduction to vector calculus. Not open to students with credit in MA 17400 or 27100.**Credits:** 4.00

MA 2660N - Ordinary Differential Equations

Credit Hours: 3.00. First order equations, second and n'th order linear equations, series solutions, solution by Laplace transform, systems of linear equations.**Credits:** 3.00

MA 3510N - Elementary Linear Algebra

Credit Hours: 3.00. Systems of linear equations, matrices, vector spaces, linear transformations, determinants, inner product spaces, eigenvalues, applications. Not open to students with credit in MATH 51100.**Credits:** 3.00

MA 5110N - Linear Algebra With Applications

Credit Hours: 3.00. Real and complex vector spaces; linear transformations; Gram-Schmidt process and projects; least squares; QR and LU factorization; diagonalization, real and complex spectral therorem; Schur triangular form; Joran canonical form; quadratic form.**Credits:** 3.00

MA 5230N - Introduction To Partial Differential Equations

Credit Hours: 3.00. First order quasi-linear equations and their application to physical and social sciences; the Cauchy-Kovalevsky theorem; characteristics, classification, and canonical form of linear equations; equations of mathematical physics; study of the Laplace, wave and heat equations; methods of solution**Credits:** 3.00

MA 5280N - Advanced Mathematics For Engineering And Physics II

Credit Hours: 3.00. Courses MA 527 and 528 constitute a two-semester sequence covering a broad range of subjects useful in early graduate engineering courses. Topics in MA 528 include divergence theorem, Stokes' theorem, complex variables, contour integration, calculus of residues and applications, conformal mapping, and potential theory.**Credits:** 3.00

MA 10800 - Mathematics As A Profession And A Discipline

Credit Hours: 1.00. A seminar course for undergraduate students interested in majoring in an area of mathematics at Purdue. The purpose is to build prospective mathematics majors' awareness of opportunities to enhance their experiences at Purdue and of career paths available for graduates with a good mathematical background. The format of most classes is a presentation and discussion with an invited speaker/guest, including experts on a different aspect of mathematics in our world today. This course is recommended for undergraduates in their first or second year at Purdue. **Credits:** 1.00

MA 13700 - Mathematics For Elementary Teachers I

Credit Hours: 3.00. Designed for prospective elementary school teachers. Problem solving. Numerical reasoning including self-generated and conventional algorithms. Whole and fractional number systems, elementary number theory. (Not available for credit toward graduation in the College of Science.) **Credits:** 3.00

MA 13800 - Mathematics For Elementary Teachers II

Credit Hours: 3.00. Elementary school teachers must understand how multiplication gives rise to exponents and how to represent, interpret, and compute exponents from problem situations. They must also understand how to represent practical situations using algebraic and fractional expressions, and verbally interpret graphs of functions. They have to know basic concepts of probability theory. This course covers conceptual and practical notions of exponents and radicals; algebraic and rational functions, algebraic equations and inequalities, systems of linear equations, polynomial, exponential, and logarithmic functions. Notions of probability. **Credits:** 3.00

MA 13900 - Mathematics For Elementary Teachers III

Credit Hours: 3.00. Geometric, measurement and spatial reasoning in one, two and three dimensions as the basis for elementary school geometry. Metric and non-metric geometry, transformation geometry. (Not available for credit toward graduation in the College of Science.) **Credits:** 3.00

MA 15300 - College Algebra

Credit Hours: 3.00. Exponents and radicals; algebraic and fractional expressions. Equations and inequalities, systems of linear equations. Polynomial, exponential, and logarithmic functions. Not open to students with credit in MA 15900. Not available for credit toward graduation in the School of Science. CTL:IMA 1601 College Algebra **Credits:** 3.00

MA 15555 - Quantitative Reasoning

Credit Hours: 3.00. This course will cover important mathematical ideas, including proportion, weighted averages, linear models, exponential models, basic probability and statistics, and some algebra, by using concrete real-world problems. It will not be a prerequisite for any other mathematics course. **Credits:** 3.00

MA 15800 - Precalculus - Functions And Trigonometry

Credit Hours: 3.00. Functions, Trigonometry, and Algebra of calculus topics designed to fully prepare students for all first semester calculus courses. Functions topics include Quadratic, Higher Order Polynomials, Rational, Exponential, Logarithmic, and Trigonometric. Other focuses include graphing of functions and solving application problems. Not Available for credit toward graduation in the College of Science. Students may not receive credit for both MA 15400(Inactive) and MA 15800. Students may not receive credit for both MA 15900 and MA 15800. **Credits:** 3.00

MA 16010 - Applied Calculus I

Credit Hours: 3.00. Topics include trigonometric and exponential functions; limits and differentiation, rules of differentiation, maxima, minima and optimization; curve sketching, integration, anti-derivatives, fundamental theorem of calculus. Properties of definite integrals and numerical methods. Applications to life, managerial and social sciences. CTL:IMA 1604 Calculus - Short I **Credits:** 3.00

MA 16019 - Applied Calculus I For Technology

Credit Hours: 4.00. This course develops topics from analytical geometry and introduces differentiation and integration. **Credits:** 4.00

MA 16020 - Applied Calculus II

Credit Hours: 3.00. This course covers techniques of integration; infinite series, convergence tests; differentiation and integration of functions of several variables; maxima and minima, optimization; differential equations and initial value problems; matrices, determinants, eigenvalues and eigenvectors. Applications. CTL:IMA 1605 Calculus - Short II **Credits:** 3.00

MA 16100 - Plane Analytic Geometry And Calculus I

Credit Hours: 5.00. Introduction to differential and integral calculus of one variable, with applications. Some schools or departments may allow only 4 credit hours toward graduation for this course. Designed for students who have not had at least a one-semester calculus course in high school, with a grade of "A" or "B". Not open to students with credit in MA 16500. Demonstrated competence in college algebra and trigonometry. **Credits:** 5.00

MA 16200 - Plane Analytic Geometry And Calculus II

Credit Hours: 5.00. Continuation of MA 16100. Vectors in two and three dimensions, techniques of integration, infinite series, conic sections, polar coordinates, surfaces in three dimensions. Some schools or departments may allow only 4 credit hours toward graduation for this course. **Credits:** 5.00

MA 16290 - Data Science Labs: Calculus

Credit hours: 1.00. This course consists of weekly computer laboratories which apply concepts learned in Calculus I and II to data science problems. Main topics covered include function sampling and approximation, numerical differentiation, numerical

integration, Jupyter notebooks, introductory Python programming, object oriented programming, and data acquisition with microcontrollers and sensors. **Credits:** 1.00

MA 16500 - Analytic Geometry And Calculus I

Credit Hours: 4.00. Introduction to differential and integral calculus of one variable, with applications. Conic sections. Designed for students who have had at least a one-semester calculus course in high school, with a grade of "A" or "B", but are not qualified to enter MA 16200 or MA 16600 or the advanced placement courses MA 17300 or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. CTL:IMA 1602 Calculus - Long I **Credits:** 4.00

MA 16600 - Analytic Geometry And Calculus II

Credit Hours: 4.00. Continuation of MA 16500. Vectors in two and three dimensions. Techniques of integration, infinite series, polar coordinates, surfaces in three dimensions. Not open to students with credit in MA 16200. CTL:IMA 1603 Calculus - Long II **Credits:** 4.00

MA 17000 - Introduction To Actuarial Science

Credit Hours: 2.00. (STAT 17000) An introduction to actuarial science from the point of view of practicing actuaries from life insurance, casualty insurance and consulting; introduction to insurance and the mathematical theory of interest; application of spreadsheets to problems related to actuarial science. **Credits:** 2.00

MA 18300 - Professional Practicum I

Credit Hours: 0.00. Professional Practicum. For Cooperative Education students only; must be accepted for the program by the cooperative program coordinator. Permission of department required. **Credits:** 0.00

MA 19000 - Topics In Mathematics For Undergraduates

Credit Hours: 1.00 to 5.00. Supervised reading courses as well as special topics courses for undergraduates are given under this number. Permission of instructor required. **Credits:** 1.00 to 5.00

MA 25000 - Problem Solving In Probability

Credit Hours: 2.00. (STAT 25000) This course is designed to teach techniques for solving problems in probability theory which are relevant to the actuarial sciences. It is intended to help actuarial students prepare for the Society of Actuaries and Casualty Actuarial Society Exam P/1. Credit of Examination is not available for this course. **Credits:** 2.00

MA 26100 - Multivariate Calculus

Credit Hours: 4.00. Planes, lines, and curves in three dimensions. Differential calculus of several variables; multiple integrals. Introduction to vector calculus. Not open to students with credit in MA 17400 or 27100. **Credits:** 4.00

MA 26190 - Data Science Labs: Multivariate Calculus

Credit Hours: 1.00. This course consists of weekly computer laboratories which apply concepts learned in Multivariate Calculus (Calculus III) to data science problems. The students will also practice programming in Python and use sensors and microprocessors to acquire data. Topics covered include representation and perception of color, motion detection in videos, and construction of a planimeter based on Green's theorem. **Credits:** 1.00

MA 26200 - Linear Algebra And Differential Equations

Credit Hours: 4.00. Linear algebra, elements of differential equations. Not open to students with credit in MA 26500 or 26600. **Credits:** 4.00

MA 26500 - Linear Algebra

Credit Hours: 3.00. Introduction to linear algebra. Systems of linear equations, matrix algebra, vector spaces, determinants, eigenvalues and eigenvectors, diagonalization of matrices, applications. Not open to students with credit in MA 26200, 27200, 35000 or 35100. **Credits:** 3.00

MA 26600 - Ordinary Differential Equations

Credit Hours: 3.00. First order equations, second and n'th order linear equations, series solutions, solution by Laplace transform, systems of linear equations. It is preferable but not required to take MA 26500 either first or concurrently. Not open to students with credit in MA 26200, 27200, 36000, 36100, or 36600. **Credits:** 3.00

MA 27101 - Honors Multivariate Calculus

Credit Hours: 5.00. This course is the Honors version of MA 26100, Multivariate Calculus; it will also include a review of infinite series. The course is intended for first-year students who have credit for Calculus I and II. There will be a significant emphasis on conceptual explanation, but not on formal proof. Permission of department is required. **Credits:** 5.00

MA 27300 - Introduction To Financial Mathematics

Credit Hours: 3.00. A mathematical treatment of some of the fundamental concepts of financial mathematics and their application to business situations and basic risk management. Includes discussions of interest rates, discount rates, annuity valuation, bond valuation, cash flow valuation, spot rates, forward rates, Macaulay duration, modified duration, convexity, immunization, and asset-liability management. Provides preparation for the SOA/CAS Actuarial Exam FM/2. **Credits:** 3.00

MA 27900 - Modern Mathematics In Science And Society

Credit Hours: 3.00. The course covers topics in combinatorics and probability applied to real life situations such as the paradoxa of democracy, weighted voting, fair division, apportionment, traveling salesmen, the mathematics of networks, Fibonacci numbers, golden ratio, growth patterns in nature, mathematics of money, symmetry, fractals, censuses and surveys, random sampling, sample spaces, permutations and uniform probability spaces. **Credits:** 3.00

MA 29000 - Topics In Mathematics For Undergraduates

Credit Hours: 1.00 to 5.00. Supervised reading courses as well as special topics courses for undergraduates are given under this number. Permission of instructor required. **Credits:** 1.00 to 5.00

MA 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in mathematics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

MA 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in mathematics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

MA 30100 - An Introduction To Proof Through Real Analysis

Credit Hours: 3.00. An introduction to abstract reasoning in the context of real analysis. Topics may include axioms for the real numbers, mathematical induction, formal definition of limits, density, decimal representations, convergence of sequences and series, continuity, differentiability, the extreme value, mean value and intermediate value theorems, and cardinality. The emphasis, however, is more on the concept of proof than on any one given topic. **Credits:** 3.00

MA 30300 - Differential Equations And Partial Differential Equations For Engineering And The Sciences

Credit Hours: 3.00. This is a methods course for juniors in any branch of engineering and science, designed to follow MA 26200 or MA 26600. Materials to be covered are: linear systems of ordinary differential equations, nonlinear systems, Fourier series, separation of variables for partial differential equations, and Sturm-Liouville theory. **Credits:** 3.00

MA 32500 - History Of Mathematics

Credit Hours: 3.00. The purpose of this course is to help students understand and appreciate the growth and development of mathematical ideas across various cultures. Students will study the achievements of people who have made significant contributions to the development of both ancient and modern mathematical concepts.**Credits:** 3.00

MA 34100 - Foundations Of Analysis

Credit Hours: 3.00. An introductory course in rigorous analysis, covering real numbers, sequences, series, continuous functions, differentiation, and Riemann integration. MA 30100 is helpful but not required. **Credits:** 3.00

MA 34900 - Signals And Systems For Mathematicians

Credit Hours: 3.00. This course introduces the mathematical framework for the description, analysis and processing of signals such as music, speech and images. Main topics covered include signal representations in different bases; continuous-time signal sampling; and signal processing by linear and time-invariant systems. **Credits:** 3.00

MA 34990 - Data Science Labs: Signals And Systems

Credit Hours: 1.00. This course consists in weekly computer laboratories. The laboratories introduce students to the application of concepts learned in Signals and Systems or Fourier Analysis course to Data Science problems. The courses also provide opportunities to practice programming in Python and use sensors and microprocessors to acquire and manipulate data.**Credits:** 1.00

MA 35100 - Elementary Linear Algebra

Credit Hours: 3.00. Systems of linear equations, finite dimensional vector spaces, matrices, determinants, eigenvalues and eigenvector applications to analytical geometry. Not open to students with credit in MA 26500. **Credits:** 3.00

MA 35301 - Linear Algebra II

Credit Hours: 3.00. Theoretical background for methods and results that appear in MA 35100. Inner products, orthogonality, and applications including least squares. **Credits:** 3.00

MA 36200 - Topics In Vector Calculus

Credit Hours: 3.00. Multivariate calculus; partial differentiation; implicit function theorems and transformations; line and surface integrals; vector fields; theorems of Gauss, Green, and Stokes. Credit granted for only one of MA 36200 and MA 51000. **Credits:** 3.00

MA 36600 - Ordinary Differential Equations

Credit Hours: 4.00. An introduction to ordinary differential equations with emphasis on problem solving and applications. The one-hour computer lab will give students an opportunity for hands-on experience with both the theory and applications of the subject. **Credits:** 4.00

MA 37300 - Financial Mathematics

Credit Hours: 3.00. A mathematical treatment of some fundamental concepts of financial mathematics and their application to real world business situations and basic risk management. Includes discussions of valuing investments, capital budgeting, valuing contingent cash flows, yield curves, spot rates, forward rates, short sales, Macaulay duration, modified duration, convexity, and immunization. Provides preparation for the SOA/CAS Actuarial Exam FM/2. **Credits:** 3.00

MA 37400 - Mathematical Foundations For Machine Learning

Credit Hours: 3.00. This course combines data, computation, and inferential thinking to solve challenging problems. In this class, we explore key areas of machine learning including question formulation, statistical inference, predictive modeling, and decision making. Through a strong emphasis on data-centric computing, and quantitative critical thinking, this class covers key principles and techniques of machine learning. These include algorithms for machine learning methods including regression, classification, and clustering; and statistical concepts of measurement error and prediction. **Credits:** 3.00

MA 37500 - Introduction To Discrete Mathematics

Credit Hours: 3.00. Induction, permutations, combinations, finite probability, relations, graphs, trees, graph algorithms, recurrence relations, generating functions. Problem solving in all these areas. Credit granted for only one of MA 27600 and 37500. **Credits:** 3.00

MA 38500 - Introduction To Logic

Credit Hours: 3.00. Propositional calculus and predicate calculus with applications to mathematical proofs, valid arguments, switching theory, and formal languages. **Credits:** 3.00

MA 38600 - Professional Practicum IV

Credit Hours: 0.00. Professional Practicum. Permission of department required. **Credits:** 0.00

MA 39000 - Topics In Mathematics For Undergraduates

Credit Hours: 1.00 to 5.00. Supervised reading courses as well as special topics courses for undergraduates are given under this number. Permission of instructor required. **Credits:** 1.00 to 5.00

MA 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in mathematics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

MA 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in mathematics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

MA 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in mathematics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

MA 41600 - Probability

Credit Hours: 3.00. (STAT 41600) An introduction to mathematical probability suitable as a preparation for actuarial science, statistical theory, and mathematical modeling. General probability rules, conditional probability and Bayes theorem, discrete and continuous random variables, moments and moment generating functions, joint and conditional distributions, standard discrete and continuous distributions and their properties, law of large numbers and central limit theorem. **Credits:** 3.00

MA 41690 - Data Science Labs: Probability

Credit Hours: 1.00. This course consists in weekly computer laboratories. The laboratories introduce students to the application of concepts learned in an introductory Probability course to Data Science problems. This course also provides opportunities to practice programming in Python and use sensors and microprocessors to acquire and manipulate data.**Credits:** 1.00

MA 42100 - Linear Programming And Optimization Techniques

Credit Hours: 3.00. Solution of linear programming problems by the simplex method, duality theory, transportation problems, assignment problems, network analysis, dynamic programming. **Credits:** 3.00

MA 42500 - Elements Of Complex Analysis

Credit Hours: 3.00. Complex numbers and complex-valued functions; differentiation of complex functions; power series, uniform convergence; integration, contour integrals; elementary conformal mapping. **Credits:** 3.00

MA 42800 - Introduction To Fourier Analysis

Credit Hours: 3.00. Topics include: Fourier series, convolutions, kernels, summation methods, Fourier transforms, and applications to the wave, heat, and Laplace equations. **Credits:** 3.00

MA 43200 - Elementary Stochastic Processes

Credit Hours: 3.00. An introduction to some classes of stochastic processes that arise in probabilistic models of time-dependent random processes. The main stochastic processes studied will be discrete time Markov chains and Poisson processes. Other possible topics covered may include continuous time Markov chains, renewal processes, queueing networks, and martingales. **Credits:** 3.00

MA 44000 - Honors Real Analysis I

Credit Hours: 3.00. Real analysis in one and n-dimensional Euclidean spaces. Topics include the completeness property of real numbers, topology of Euclidean spaces, Heine-Borel theorem, convergence of sequences and series in Euclidean spaces, limit superior and limit inferior, Bolzano-Weierstrass theorem, continuity, uniform continuity, limits and uniform convergence of functions, Riemann or Riemann-Stieltjes integrals. **Credits:** 3.00

MA 44200 - Honors Real Analysis II

Credit Hours: 3.00. Real analysis in one and n-dimensional Euclidean spaces--continued from MA 44000. Topics include mappings of Euclidean spaces and their derivatives, multivariable chain rule, inverse function theorem and implicit function theorem, sets with content and integration in n dimensions, the integrability theorem, Jacobian and change of variables theorem, related topics. **Credits:** 3.00

MA 45000 - Algebra Honors

Credit Hours: 3.00. This course, which is essentially the first half of MA 55300, is recommended for students wanting a more substantial background in algebra than is afforded by MA 45300, in particular students intending to do graduate work in science or engineering. Topics include the elements of number theory and group theory; unique factorization in polynomial rings and in principal ideal domains. **Credits:** 3.00

MA 45300 - Elements Of Algebra I

Credit Hours: 3.00. Fundamental properties of integers, polynomials, groups, rings, and fields, with emphasis on problem solving and applications. Not open to students with credit in MA 45000. **Credits:** 3.00

MA 45401 - Galois Theory Honors

Credit Hours: 3.00. This course will give a thorough introduction to Galois theory. Galois theory is a fundamental tool in many areas of mathematics, including number theory and algebraic geometry. This course will increase students' mathematical maturity and prepare them for graduate school. Topics include finite extension fields and their symmetries, ruler and compass constructions, complex roots of unity, solvable groups, and the solvability of polynomial equations by arithmetic and radical operations. This course is intended for third- or fourth-year students who have taken MA 45000 (Algebra Honors) or MA 45300 (Elements of Algebra I). **Credits:** 3.00

MA 46000 - Geometry

Credit Hours: 3.00. This course begins at the high-school level and then moves quickly to intermediate and advanced topics including an introduction to non-Euclidean geometry. Emphasis on proofs. **Credits:** 3.00

MA 46200 - Elementary Differential Geometry

Credit Hours: 3.00. The geometry of curves and surfaces based on familiar parts of calculus and linear algebra. An introduction to the study of differentiable manifolds and Riemannian geometry. **Credits:** 3.00

MA 47201 - Fundamental Long Term Actuarial Mathematics

Credit Hours: 4.00. Mathematical foundation of actuarial science, emphasizing probability models for life contingencies as the basis for analyzing life insurance and life annuities and determining premiums and reserves. This course provides the background for Course MLC of the Society of Actuaries and Course 3L of the Casualty Actuarial Society.**Credits:** 4.00

MA 48100 - Advanced Problem-Solving Seminar

Credit Hours: 3.00. Seminar intended to prepare students for the national Putnam examination in mathematics. There is no formal prerequisite, but students should be familiar with basic elements of Linear Algebra, Analysis, Geometry and Trigonometry. **Credits:** 3.00

MA 48200 - Advanced Short Term Actuarial Mathematics

Credit Hours: 3.00. This course provides comprehensive coverage of a wide range of advanced short-term actuarial analysis techniques including severity and aggregate models, parametric models' estimation and selection, parametric and empirical credibility, and reserving, pricing for short-term insurance coverages. This course prepares actuarial students for the SOA Exam ASTAM: Advanced Short-Term Actuarial Mathematics.**Credits:** 3.00

MA 48400 - Seminar On Teaching College Algebra And Trigonometry

Credit Hours: 3.00. This course is a seminar on the teaching of mathematics for our best undergraduate mathematics education students. It provides supervised teaching experience along with a chance for the students to perfect their knowledge of algebra before going on to be high school teachers. Students who take this class will also teach a section of MA 15300. Permission of instructor required. **Credits:** 3.00

MA 48700 - Professional Practicum V

Credit Hours: 0.00 or 1.00. Professional Practicum. Permission of department required. **Credits:** 0.00 or 1.00

MA 49000 - Topics In Mathematics For Undergraduates

Credit Hours: 1.00 to 6.00. Supervised reading courses as well as special topics courses for undergraduates are given under this number. Permission of instructor required. **Credits:** 1.00 to 6.00

MA 49500 - Advanced Topics In Mathematics For Undergraduates

Credit Hours: 1.00 to 5.00. Advanced topics courses in mathematics for undergraduates are given under this number. Permission of instructor required. **Credits:** 1.00 to 5.00

MA 50300 - Abstract Algebra

Credit Hours: 3.00. Group theory: definitions, examples, subgroups, quotient groups, homomorphisms, and isomorphism theorems. Ring theory: definitions, examples, homomorphisms, ideals, quotient rings, fraction fields, polynomial rings, Euclidean domains, and unique factorization domains. Field theory: algebraic field extensions, straightedge and compass constructions. **Credits:** 3.00

MA 50400 - Real Analysis

Credit Hours: 3.00. Completeness of the real number system, basic topological properties, compactness, sequences and series, absolute convergence of series, rearrangement of series, properties of continuous functions, the Riemann-Stieltjes integral, sequences and series of functions, uniform convergence, the Stone-Weierstrass theorem, equicontinuity, and the Arzela-Ascoli theorem. **Credits:** 3.00

MA 51000 - Vector Calculus

Credit Hours: 3.00. Calculus of functions of several variables and of vector fields in orthogonal coordinate systems. Optimization problems, implicit function theorem, Green's theorem, Stokes' theorem, divergence theorems. Applications to engineering and the physical sciences. Not open to students with credit in MA 36200 or MA 41000. **Credits:** 3.00

MA 51100 - Linear Algebra With Applications

Credit Hours: 3.00. Real and complex vector spaces; linear transformations; Gram-Schmidt process and projections; least squares; QR and LU factorization; diagonalization, real and complex spectral theorem; Schur triangular form; Jordan canonical form; quadratic forms. **Credits:** 3.00

MA 51400 - Numerical Analysis

Credit Hours: 3.00. (CS 514) Iterative methods for solving nonlinear; linear difference equations, applications to solution of polynomial equations; differentiation and integration formulas; numerical solution of ordinary differential equations; roundoff error bounds. **Credits:** 3.00

MA 51800 - Advanced Discrete Mathematics

Credit Hours: 3.00. The course covers mathematics useful in analyzing computer algorithms. Topics include recurrence relations, evaluation of sums, integer functions, elementary number theory, binomial coefficients, generating functions, discrete probability, and asymptotic methods. **Credits:** 3.00

MA 51900 - Introduction To Probability

Credit Hours: 3.00. (STAT 51900) Algebra of sets, sample spaces, combinatorial problems, independence, random variables, distribution functions, moment generating functions, special continuous and discrete distributions, distribution of a function of a random variable, limit theorems. **Credits:** 3.00

MA 52000 - Boundary Value Problems Of Differential Equations

Credit Hours: 3.00. Separation of variables; Fourier series; boundary value problems; Fourier transforms; Bessel functions; Legendre polynomials. **Credits:** 3.00

MA 52100 - Introduction To Optimization Problems

Credit Hours: 3.00. Necessary and sufficient conditions for local extrema in programming problems and in the calculus of variations. Control problems; statement of maximum principles and applications. Discrete control problems. **Credits:** 3.00

MA 52300 - Introduction To Partial Differential Equations

Credit Hours: 3.00. First order quasi-linear equations and their applications to physical and social sciences; the Cauchy-Kovalevsky theorem; characteristics, classification and canonical forms of linear equations; equations of mathematical physics; study of Laplace, wave and heat equations; methods of solution. **Credits:** 3.00

MA 52500 - Introduction To Complex Analysis

Credit Hours: 3.00. Complex numbers and complex-valued functions of one complex variable; differentiation and contour integration; Cauchy's theorem; Taylor and Laurent series; residues; conformal mapping; applications. Not open to students with credit in MA 42500. **Credits:** 3.00

MA 52700 - Advanced Mathematics For Engineers And Physicists I

Credit Hours: 3.00. MA 52700 is not a prerequisite for MA 52800; these courses can be taken independently. Topics in MA 52700 include linear algebra, systems of ordinary differential equations, Laplace transforms, Fourier series and transforms, and partial differential equations. MA 51100 is recommended. **Credits:** 3.00

MA 52800 - Advanced Mathematics For Engineers And Physicists II

Credit Hours: 3.00. MA 52700 is not a prerequisite for MA 52800; these courses can be taken independently. Topics in MA 52800 include divergence theorem, Stokes theorem, complex variables, contour integration, calculus of residues and applications, conformal mapping, and potential theory. MA 51000 is recommended. **Credits:** 3.00

MA 53000 - Functions Of A Complex Variable I

Credit Hours: 3.00. Complex numbers and complex-valued functions of one complex variable; differentiation and contour integration; Cauchy's theorem; Taylor and Laurent series; residues; conformal mapping; special topics. More mathematically rigorous than MA 52500. **Credits:** 3.00

MA 53100 - Functions Of A Complex Variable II

Credit Hours: 3.00. Advanced topics. **Credits:** 3.00

MA 53200 - Elements Of Stochastic Processes

Credit Hours: 3.00. (STAT 53200) A basic course in stochastic models, including discrete and continuous time Markov chains and Brownian motion, as well as an introduction to topics such as Gaussian processes, queues, epidemic models, branching processes, renewal processes, replacement, and reliability problems. **Credits:** 3.00

MA 53800 - Probability Theory I

Credit Hours: 3.00. (STAT 53800) Mathematically rigorous, measure-theoretic introduction to probability spaces, random variables, independence, weak and strong laws of large numbers, conditional expectations, and martingales. **Credits:** 3.00

MA 53900 - Probability Theory II

Credit Hours: 3.00. (STAT 53900) Convergence of probability laws; characteristic functions; convergence to the normal law; infinitely divisible and stable laws; Brownian motion and the invariance principle. **Credits:** 3.00

MA 54200 - Theory Of Distributions And Applications

Credit Hours: 3.00. Definition and basic properties of distributions; convolution and Fourier transforms; applications to partial differential equations; Sobolev spaces. **Credits:** 3.00

MA 54300 - Ordinary Differential Equations And Dynamical Systems

Credit Hours: 3.00. This course focuses on the theory of ordinary differential equations and methods of proof for developing this theory. Topics include basic results for linear systems, the local theory for nonlinear systems (existence and uniqueness, dependence on parameters, flows and linearization, stable manifold theorem) and the global theory for nonlinear systems (global existence, limit sets and periodic orbits, Poincare maps). Permission of instructor required. **Credits:** 3.00

MA 54400 - Real Analysis And Measure Theory

Credit Hours: 3.00. Metric space topology; continuity, convergence; equicontinuity; compactness; bounded variation, Helly selection theorem; Riemann-Stieltjes integral; Lebesgue measure; abstract measure spaces; LP-spaces; Holder and Minkowski inequalities; Riesz-Fischer theorem. **Credits:** 3.00

MA 54500 - Functions Of Several Variables And Related Topics

Credit Hours: 3.00. Differentiation of functions; Besicovitch covering theorem; differentiation of one measure with respect to another; Hardy-Littlewood maximal function; functions of several variables; Sobolev spaces. **Credits:** 3.00

MA 54600 - Introduction To Functional Analysis

Credit Hours: 3.00. Fundamentals of functional analysis. Banach spaces, Hahn-Banach theorem. Principle of uniform boundedness. Closed graph and open mapping theorems. Applications. Hilbert spaces. Orthonormal sets. Spectral theorem for Hermitian operators and compact operators. **Credits:** 3.00

MA 55300 - Introduction To Abstract Algebra

Credit Hours: 3.00. Group theory: Sylow theorems, Jordan Holder theorem, solvable groups. Ring theory: unique factorization in polynomial rings and principal ideal domains. Field theory: ruler and compass constructions, roots of unity, finite fields, Galois theory, solvability of equations by radicals. **Credits:** 3.00

MA 55400 - Linear Algebra

Credit Hours: 3.00. Review of basics: vector spaces, dimension, linear maps, matrices determinants, linear equations. Bilinear forms; inner product spaces; spectral theory; eigenvalues. Modules over a principal ideal domain; finitely generated abelian groups; Jordan and rational canonical forms for a linear transformation. **Credits:** 3.00

MA 55600 - Introduction To The Theory Of Numbers

Credit Hours: 3.00. Divisibility, congruences, quadratic residues, Diophantine equations, the sequence of primes. **Credits:** 3.00

MA 55700 - Abstract Algebra I

Credit Hours: 3.00. Review of fundamental structures of algebra (groups, rings, fields, modules, algebras); Jordan-Holder and Sylow theorems; Galois theory; bilinear forms; modules over principal ideal domains; Artinian rings and semisimple modules. Polynomial and power series rings; Noetherian rings and modules; localization; integral dependence; rudiments of algebraic geometry and algebraic number theory; ramification theory. **Credits:** 3.00

MA 55800 - Abstract Algebra II

Credit Hours: 3.00. A continuation of MA 55700. **Credits:** 3.00

MA 56000 - Fundamental Concepts Of Geometry

Credit Hours: 3.00. Foundations of Euclidean geometry, including a critique of Euclid's "Elements" and a detailed study of an axiom system such as that of Hilbert. Independence of the parallel axiom and introduction to non-Euclidean geometry. **Credits:** 3.00

MA 56200 - Introduction To Differential Geometry And Topology

Credit Hours: 3.00. Smooth manifolds; tangent vectors; inverse and implicit function theorems; submanifolds; vector fields; integral curves; differential forms; the exterior derivative; DeRham cohomology groups; surfaces in E3., Gaussian curvature; two dimensional Riemannian geometry; Gauss-Bonnet and Poincare theorems on vector fields. **Credits:** 3.00

MA 57100 - Elementary Topology

Credit Hours: 3.00. Fundamentals of point set topology with a brief introduction to the fundamental group and related topics, topological and metric spaces, compactness, connectedness, separation properties, local compactness, introduction to function spaces, basic notions involving deformations of continuous paths. **Credits:** 3.00

MA 57200 - Introduction In Algebraic Topology

Credit Hours: 3.00. Singular homology theory; Eilenberg-Steenrod axioms; simplicial and cell complexes; elementary homotopy theory; Lefschetz fixed point theorem. **Credits:** 3.00

MA 57300 - Numerical Solution Of Ordinary Differential Equations

Credit Hours: 3.00. Numerical solution of initial-value problems by Runge-Kutta methods, general one-step methods, and multistep methods; analysis of truncation error, discretization error, and rounding error; stability of multistep methods; numerical solution of boundary- and eigen-value problems by initial-value techniques and finite difference methods.**Credits:** 3.00

MA 57400 - Numerical Optimization

Credit Hours: 3.00. Convex optimization algorithms using modern large-scale algorithms for convex optimization, with a heavy emphasis on analysis including monotone operator, fixed point iteration and duality in splitting methods. The course will cover and focus on the following three parts: smooth optimization algorithms, nonsmooth convex optimization algorithms, and stochastic and randomized algorithms. Permission of department required. Prerequisites: MA 51100 and MA 50400.**Credits:** 3.00

MA 57500 - Graph Theory

Credit Hours: 3.00. Introduction to graph theory with applications. **Credits:** 3.00

MA 58400 - Algebraic Number Theory

Credit Hours: 3.00. Dedekind domains, norm, discriminant, different, finiteness of class number, Dirichlet unit theorem, quadratic and cyclotomic extensions, quadratic reciprocity, decomposition and inertia groups, completions and local fields. **Credits:** 3.00

MA 58500 - Mathematical Logic I

Credit Hours: 3.00. Propositional and predicate calculus; the Gdel completeness and compactness theorem, primitive recursive and recursive functions; the Gdel incompleteness theorem; Tarski's theorem; Church's theorem; recursive undecidability; special topics such as nonstandard analysis. **Credits:** 3.00

MA 59000 - Topics In Mathematics

Credit Hours: 1.00 to 5.00. Supervised reading courses as well as dual-level special topics courses are given under this number. Permission of instructor required. **Credits:** 1.00 to 5.00

MA 59500 - Topics In Mathematics

Credit Hours: 1.00 to 5.00. Special topics courses including dual-level special topics. Permission of instructor required. **Credits:** 1.00 to 5.00

MA 59800 - Topics In Mathematics

Credit Hours: 1.00 to 5.00. Supervised reading courses as well as dual-level special topics courses are given under this number. Permission of instructor required. **Credits:** 1.00 to 5.00

MA 61100 - Methods Of Applied Mathematics I

Credit Hours: 3.00. Banach and Hilbert spaces; linear operators; spectral theory of compact linear operators; applications to linear integral equations and to regular Sturm-Liouville problems for ordinary differential equations. Prerequisite: MA 51100, MA 54400. **Credits:** 3.00

MA 61500 - Numerical Methods For Partial Differential Equations I

Credit Hours: 3.00. (CS 61500) Finite element method for elliptic partial differential equations; weak formulation; finite-dimensional approximations; error bounds; algorithmic issues; solving sparse linear systems; finite element method for parabolic partial differential equations; backward difference and Crank-Nicholson time-stepping; introduction to finite difference methods for elliptic, parabolic, and hyperbolic equations; stability, consistency, and convergence; discrete maximum principles. Prerequisite: MA 51400, MA 52300. **Credits:** 3.00

MA 62000 - Mathematical Theory Of Optimal Control

Credit Hours: 3.00. Existence theorems; the maximum principle; relationship to the calculus of variations; linear systems with quadratic criteria; applications. Offered in alternate years. Prerequisite: MA 54400. **Credits:** 3.00

MA 63100 - Several Complex Variables

Credit Hours: 3.00. Power series, holomorphic functions, representation by integrals, extension of functions, holomorphically convex domains. Local theory of analytic sets (Weierstrass preparation theorem and consequences). Functions and sets in the projective space Pn (theorems of Weierstrass and Chow and their extensions). Prerequisite: MA 53000. **Credits:** 3.00

MA 63800 - Stochastic Processes I

Credit Hours: 3.00. (STAT 63800) Advanced topics in probability theory which may include stationary processes, independent increment processes, Gaussian processes; martingales, Markov processes, ergodic theory. Prerequisite: MA 53900. **Credits:** 3.00

MA 63900 - Stochastic Process II

Credit Hours: 3.00. (STAT 63900) Continuation of MA 63800. **Credits:** 3.00

MA 64200 - Methods Of Linear And Nonlinear Partial Differential Equations I

Credit Hours: 3.00. Second order elliptic equations including maximum principles, Harnack inequality, Schauder estimates, and Sobolev estimates. Applications of linear theory to nonlinear equations. Prerequisite: MA 52300. **Credits:** 3.00

MA 64300 - Methods Of Partial Differential Equations II

Credit Hours: 3.00. Continuation of MA 64200. Topics to be covered are Lp theory for solutions of elliptic equations, including Moser's estimates, Aleksandrov maximum principle, and the Calderon-Zygmund theory. Introduction to evolution problems for parabolic and hyperbolic equations, including Galerkin approximation and semigroup methods. Applications to nonlinear problems. Prerequisite: MA 64200. **Credits:** 3.00

MA 64400 - Calculus Of Variations

Credit Hours: 3.00. Direct methods; necessary and sufficient conditions for lower semicontinuity of multiple integrals; existence theorems and connections with optimal control theory. Prerequisite: MA 54400. **Credits:** 3.00

MA 65000 - Commutative Algebra

Credit Hours: 3.00. The study of those rings of importance in algebraic and analytic geometry and algebraic number theory. Prerequisite: MA 55800. **Credits:** 3.00

MA 66100 - Modern Differential Geometry

Credit Hours: 3.00. Topics chosen by the instructor. Prerequisite: MA 55400. **Credits:** 3.00

MA 66300 - Algebraic Curves And Functions I

Credit Hours: 3.00. Algebraic functions of one variable from the geometric, algebraic, or function-theoretic points of view. Riemann-Roch theorem, differentials. Prerequisite: MA 55800. **Credits:** 3.00

MA 66400 - Algebraic Curves And Functions II

Credit Hours: 3.00. Continuation of MA 66300. Topics chosen by the instructor. Prerequisite: MA 66300. **Credits:** 3.00

MA 66500 - Algebraic Geometry

Credit Hours: 3.00. Topics of current interest will be chosen by the instructor. Prerequisite: MA 65000 or MA 66300. **Credits:** 3.00

MA 68400 - Class Field Theory

Credit Hours: 3.00. Ideles, adeles, L-functions, Artin symbol, reciprocity, local and global class fields, Kronecker-Weber Theorem. Prerequisite: MA 58400. **Credits:** 3.00

MA 69000 - Topics In Algebra

Credit Hours: 1.00 to 3.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 3.00

MA 69200 - Topics Applied Math

Credit Hours: 1.00 to 3.00. Topics in applied math. Permission of instructor required. **Credits:** 1.00 to 3.00

MA 69300 - Topics In Analysis

Credit Hours: 1.00 to 3.00. Topics in analysis. Permission of instructor required. **Credits:** 1.00 to 3.00

MA 69400 - Topics In Differential Equations

Credit Hours: 1.00 to 3.00. Topics In Differential Equations. Permission of instructor required. **Credits:** 1.00 to 3.00

MA 69600 - Topics In Geometry

Credit Hours: 1.00 to 3.00. Topics in geometry. Permission of instructor required. **Credits:** 1.00 to 3.00

MA 69700 - Topics In Topology

Credit Hours: 1.00 to 3.00. Topics in topology. Permission of instructor required. **Credits:** 1.00 to 3.00

MA 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Materials Engineering

ME 59800 - Mechanical Engineering Graduate Seminar

Credit Hours: 0.00. Acquaint graduate students with a broad spectrum of research in various areas of mechanical engineering. Weekly seminars by invitees/researchers from academia, national labs, or industry. Seminar topics provide a mix of subjects, areas and disciplines, and can involve considerable technical depth, a broad overview and/or historical perspectives. Permission of department required. Typically offered Fall Spring.**Credits:** 0.00

MSE 19000 - Introduction To Materials Engineering

Credit Hours: 1.00. An introduction to materials science and engineering. Emphasis on the "processing, structure, properties, performance" relationships that lead to the development of materials for society's needs. Examples drawn from the major materials classes. **Credits:** 1.00

MSE 23000 - Structure And Properties Of Materials

Credit Hours: 3.00. The relationship between the structure of materials and the resulting mechanical, thermal, electrical, and optical properties. Atomic structure, bonding, atomic arrangement; crystal symmetry, crystal structure, habit, lattices, defects, and the use of X-ray diffraction. Phase equilibria and microstructural development. Applications to design.**Credits:** 3.00

MSE 23500 - Materials Properties Laboratory

Credit Hours: 3.00. Laboratory experiments involving usage of standard equipment in the measurement of mechanical, microstructural, thermal, electrical, and optical properties. Introduction to computer-aided data analysis. Experiments are carried out with metal, ceramic, and polymeric materials to illustrate property-structure-processing relationships. **Credits:** 3.00

MSE 25000 - Physical Properties In Engineering Systems

Credit Hours: 3.00. Class connects math, science and engineering practice and applications. Presents foundational aspects of engineering problem solving, use of computer math tools for engineering problem solving, basic engineering statics, dynamics and mechanics, group problem solving approaches, and introductory aspects of design and materials selection. **Credits:** 3.00

MSE 26000 - Thermodynamics Of Materials

Credit Hours: 3.00. Fundamental laws of thermodynamics and their applications to material systems; criteria for equilibrium; reaction and phase equilibria; properties of solutions; thermodynamic origins of phase diagrams.**Credits:** 3.00

MSE 27000 - Atomistic Materials Science

Credit Hours: 3.00. Introductory course with an atomistic view point on material properties. Three primary class sections: bonding crystallography and statistical mechanics. Bonding topics include introduction to quantum mechanics, emphasis on understanding of metallic, ionic and covalent bonding. Crystallography topics include crystal descriptions and symmetry principles. Statistical mechanics development with application to electronic and thermodynamic properties. **Credits:** 3.00

MSE 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in materials engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

MSE 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in materials engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

MSE 33000 - Processing And Properties Of Materials

Credit Hours: 3.00. An introduction to the relationships between the processing of materials and their properties. Heat treating, forming, casting, consolidation, and other more material-specific manufacturing processes. Elucidation of the role of phenomena such as heat flow, mass diffusion, nucleation, interfacial tension, elastic and plastic deformation, precipitation, grain growth. **Credits:** 3.00

MSE 33500 - Materials Characterization Laboratory

Credit Hours: 3.00. The principles of analytical methods for characterization of materials for structure and composition; optical microscopy, scanning electron microscopy, X-ray spectroscopy and diffraction, atomic absorption, emission spectroscopy, and mass spectrometry. Laboratory experiments in X-ray spectroscopy, X-ray diffraction, optical microscopy, and scanning electron microscopy. **Credits:** 3.00

MSE 34000 - Transport Phenomena

Credit Hours: 3.00. Mechanism and rates of heat, mass, and momentum transfer. Macroscopic and differential energy, mass, and momentum balances. Application to systems with phase transformations and chemical reaction.**Credits:** 3.00

MSE 36700 - Materials Processing Laboratory

Credit Hours: 3.00. This laboratory is intended as an intensive experience in processing techniques used for ceramics, metals, and polymers. Sintering of a ceramic, casting and post-processing (work hardening, heat treatment, etc.) of a metal, and preparation and extrusion of a polymer are the suggested processes. The measurements (e.g., powder size, compaction force, temperature, grain size, molecular weight) applicable to the successful processing of the material and the final properties (e.g., hardness, ductility, strength, stiffness) will be emphasized.**Credits:** 3.00

MSE 37000 - Electrical, Optical, And Magnetic Properties Of Materials

Credit Hours: 3.00. An introductory course to provide basic background on the behavior of materials; electronic band structure, electronic and ionic conduction, electronic processes in semiconductors, dielectric, optical, and magnetic properties, and superconductivity; emphasis is on the relation between the properties and the structural aspects of materials. **Credits:** 3.00

MSE 38199 - Professional Practice Co-Op I

Credit Hours: 0.00. To obtain practice with qualified employers within industry, government, or small business. Permission of Department required. **Credits:** 0.00

MSE 38200 - Mechanical Response Of Materials

Credit Hours: 3.00. This course encompasses deformation-based microscopic mechanisms, including dislocation motion, diffusion, and viscoplasticity. Macroscopic mechanical response of metals, ceramics, polymers, and composites will be related to elasticity and plasticity concepts for single crystal, polycrystalline, and amorphous materials. Practical design considerations for deformation will be included as well as an introduction to fracture mechanisms. **Credits:** 3.00

MSE 38299 - Professional Practice Co-Op II

Credit Hours: 0.00. To obtain practice with qualified employers within industry, government, or small business. Permission of Department required. **Credits:** 0.00

MSE 38399 - Professional Practice Co-Op III

Credit Hours: 0.00. To obtain practice with qualified employers within industry, government, or small business. Permission of Department required. **Credits:** 0.00

MSE 39000 - Materials Engineering Seminar

Credit Hours: 0.00. Presentation and discussion of current topics in materials engineering. **Credits:** 0.00

MSE 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in materials engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

MSE 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in materials engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

MSE 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in materials engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

MSE 39699 - Professional Practice Internship

Credit Hours: 0.00. Professional experience in Materials Engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Permission of department required. **Credits:** 0.00

MSE 42000 - Structure And Properties Of Organic Materials

Credit Hours: 3.00. This course presents information on the chemical and physical structure and basic material properties of organic materials, including synthetic plastics and specialty polymers and surfactants as well as select natural materials (e.g., proteins, carbohydrates, lipids). Fundamental concepts from organic chemistry will be presented along with descriptions of how the chemical and physical structures of organic molecules directly impact the properties of bulk materials over multiple length scales, from the molecular-level to the macroscale. This course will prepare students to be successful in higher-level polymer and soft material elective courses in materials engineering. **Credits:** 3.00

MSE 43000 - Materials Processing And Design I

Credit Hours: 3.00. Experience in the initiation and execution of a specific materials project or study involving research, processing, and design; a written proposal on the project prepared by the student under the supervision of an individual faculty member; oral progress report at the end of the semester. **Credits:** 3.00

MSE 44000 - Materials Processing And Design II

Credit Hours: 3.00. Continuation and completion of the materials project or study initiated in MSE 43000 and presentation of a written dissertation on the results and conclusions. Competence in technical writing is emphasized in the preparation of the dissertation. **Credits:** 3.00

MSE 44500 - Materials Engineering Systems Analysis And Design

Credit Hours: 3.00. Integration of materials engineering core coursework with statistical, economic and environmental considerations for analysis and design of systems. Analysis of primary materials processing operations using mathematical and statistical models for predicting interactive effects and process optimization. Specification of materials and processes for mechanical designs, incorporating properties assessment and tradeoffs, cost analysis, and performance optimization with multiple constraints.**Credits:** 3.00

MSE 48900 - Ethics In Engineering Practice

Credit Hours: 3.00. Presentation and discussion of common ethical theories, including ethical egoism, legal positivism, utilitarianism, duties and rights, and virtue ethics. Application of these theories to the practice of engineering, including professionalism, codes of ethics, trust and loyalty, confidentiality, whistle blowing, respect for legitimate authority, risk and reliability, and fraud. Examples of application of ethical theory and case studies drawn from across the engineering profession and include discussion of the interrelated technical and ethical issues. **Credits:** 3.00

MSE 49000 - Directed Studies In Materials Engineering

Credit Hours: 1.00 to 3.00. Supplementary individual instruction for students from other engineering schools enrolled in 30000-50000 level MSE courses. Permission of instructor required. **Credits:** 1.00 to 3.00

MSE 49700 - Selected Topics In Materials Engineering

Credit Hours: 0.00 to 18.00. Topics vary. Permission of instructor required. **Credits:** 0.00 to 18.00

MSE 49900 - Research In Materials Engineering

Credit Hours: 0.00 to 18.00. Available upon prior approval of, and arrangement with, a faculty research advisor. Permission of instructor required. **Credits:** 0.00 to 18.00

MSE 50200 - Defects In Solids

Credit Hours: 3.00. Structures and interactions of point, line, and planar defects in solids, with emphasis on properties of defects. Generic basis of defect energies and interactions, with reference to specific materials and material classes as examples. Types of point defects found in crystals, their origins, interactions, and motion. Overview of dislocation theory and point-defect/dislocation interactions. Structural aspects of surfaces and interfaces, including point and line defect interactions. **Credits:** 3.00

MSE 50500 - Modeling And Simulation Of Materials Processing

Credit Hours: 3.00. Modeling of various materials processes using finite volume techniques, with an introduction to finite difference and finite element methods. Simulation of microstructural evolution using cellular automata. Links between microscopic and macroscopic modeling. Approximate modeling, uncertainty analysis, and sensitivity analysis as aids to numerical simulation. Limitations on numerical modeling in practical problems. Project work drawn from current problems in materials processing. Offered in alternate years. **Credits:** 3.00

MSE 50800 - Phase Transformations In Solids

Credit Hours: 3.00. Description of stress effects on transforming systems. Development of classical models for nucleation and growth and spinodal decomposition. Application of models to discontinuous precipitation, bainite formation, and martensitic transformations. **Credits:** 3.00

MSE 51000 - Microstructural Characterization Techniques

Credit Hours: 3.00. A broad variety of analytical tools will be presented. The intent is to allow the student to make an educated selection of characterization techniques, or critical analysis of published data, for materials and defect analysis. The techniques will be assessed in terms of the probe type and material response, of what device and specimen requirements are typical, and of what data can or cannot be derived from each type of analysis. **Credits:** 3.00

MSE 51200 - Powder Processing

Credit Hours: 3.00. Processing of engineering materials from powders. Synthesis of metals, ceramics, and polymers in powder form. Characteristics of particulates. Behavior of collections of particles; surface forces, particle agglomeration and dispersion, gelation, particle packing. Consolidation of powders; mechanics of dry flow and compaction, slurry rheology, shaping processes. Densification and microstructural development; geometry, thermodynamics, and kinetics of sintering, liquid-phase sintering, reaction densification, infiltration. Powder processing of composites. **Credits:** 3.00

MSE 51700 - Materials For Hypersonics

Credit Hours: 3.00. This course will include a brief history of hypersonic flight and design, along with a description of the aerothermal environment, to provide motivation for the use of ceramic materials as thermal protection systems and window materials. The classroom approach is to develop a fundamental understanding of materials structure, forming and sintering, and properties (mechanical and thermal) of ceramics, and then apply that knowledge for hypersonic applications such as ultra-high temperature ceramics (UHTCs including ZrB2), ceramic matrix composites (including Cf/SiC, SiCf/SiC, and Carbon/Carbon), and materials requirements for RF and IR radomes and windows. Permission of instructor required.**Credits:** 3.00

MSE 51800 - Failure Analysis

Credit Hours: 3.00. Introduction to failure analysis and prevention. Concepts of materials failure, root cause analysis, manufacturing aspects of failure, techniques for identifying failure, fracture, corrosion, wear, and case studies. Also includes business and entrepreneurship aspects. **Credits:** 3.00

MSE 52000 - Steel And Aluminum Alloys: Processing, Structure And Properties

Credit Hours: 3.00. Steel and aluminum alloy processing will be studied to provide fundamental understanding of how the final properties are influenced by processing from the extraction of metal from ore, through shaping by casting, hot-working and cold-working, and heat treatment for control of microstructure. This understanding will enable the student to go beyond comparisons of standard handbook values and recognize the fundamental metallurgical phenomena leading to differences in performance among the main alloy classifications. By examining the relationships among processing, microstructure, and properties, the course will provide the "know-how" for specifying, designing, and manufacturing with steels and aluminum alloys.**Credits:** 3.00

MSE 52300 - Physical Ceramics

Credit Hours: 3.00. Physical and chemical processes responsible for microstructure development in modern ceramic materials, and the relationship between microstructures and physical properties. The material covered is divided into three parts: solid state processes, including structural defects, diffusion, sintering and grain growth, reaction rates, nucleation and growth, and microstructure development; mechanical and thermal behavior, including deformation, strength, thermal properties, and thermal and compositional stresses; and electrical and magnetic behavior, including electrical conductivity, dielectric properties, and magnetic properties. Offered in alternate years. **Credits:** 3.00

MSE 52400 - Mechanical Behavior Of Polymers

Credit Hours: 3.00. This course will focus on the mechanical properties and behaviors of polymeric materials. The course will utilize fundamental solid and fluid mechanics to understand the response of bulk polymers (solid and liquid, above and below T_g). The impact of deformation rate and temperature on the mechanical response of polymers will be covered in detail. The course will start with an overview of linear elastic mechanics, move to rubber elasticity, and then viscoelasticity (concentrating on time-temperature superposition). We will also cover fluid dynamics and the rheology of non-Newtonian fluids. We will conclude with a section on deformation, yield, and fracture mechanisms (focusing on those phenomena that are unique to polymers such as rubber cavitation, drawing, and crazing). **Credits:** 3.00

MSE 52500 - Struct-Property Relationships Of Engineering Polymers

Credit Hours: 3.00. Structure-property relationships developed for commodity and engineering resins. Focus on connecting bonding and polymer structure (i.e., molecular weight, tacticity, crystallinity as it regards spherulites) to mechanical (yield phenomena and fracture) and thermomechanical behavior (viscoelasticity). Thermal characterization techniques, including DSC, TGA, TMA, and DMTA. Flow of polymer melts related to common melt processing techniques (i.e., extrusion and injection molding). Offered in alternate years. **Credits:** 3.00

MSE 52700 - Introduction To Biomaterials

Credit Hours: 3.00. This course aims to introduce students to Biomaterials concepts: structure, properties, and applications. The class will cover the main classes of materials: metals, ceramics and polymers in the context of their use in medicine as implant materials, drug delivery vehicles, and as tissue engineering scaffolds. Permission of instructor required. **Credits:** 3.00

MSE 53000 - Materials Processing In Manufacturing

Credit Hours: 3.00. Examination of the production/synthesis of engineering materials and the subsequent processing steps required to obtain a desired shape and microstructure. The course covers four major categories of materials processing: primary processing or materials synthesis, solidification processing, deformation processing, and powder processing, and provides specific examples from the processing of polymers, metals, and ceramics. The goal is to connect fundamental principles of materials processing to manufacturing processes. Credit will not be given for both MSE 5300 and MSE 36700. **Credits:** 3.00

MSE 53100 - Quantitative Analysis Of Microstructure

Credit Hours: 3.00. A review will be presented of basic probability theory and statistical analysis, with particular emphasis on terms and definitions of a microstructure. The properties accessible to quantification, the basic stereological relationships and the mathematical foundations, and the microstructural tools needed to quantify the structure will be emphasized. The last one-third of the course will cover applications of quantitative metallography to problems in failure analysis, solidification, heat treatment, phase equilibria, and deformation behavior. Offered in alternate years. **Credits:** 3.00

MSE 53500 - Lean Manufacturing Of Materials

Credit Hours: 3.00. This course provides perspectives on materials processing and product innovation with an economic lens on efficiency and elimination of waste. It includes an historical perspective of manufacturing via the transition from mass to lean production in the automotive industry; and extends manufacturing and product development in context of emerging trends in automation (e.g., control and PAT, I4.0), modular design, supply chain, and sustainability. The class covers lean tools, focusing on value stream analyses and optimization using simulations. As an elective, the course accommodates a range of student interest profiles. It includes both individual and interest-based group assignments. The mix of students adds to the effectiveness of group exercises. A term paper enables individuals to do a deeper dive into specific interests. Overall, the course has shown to be adaptable over a broad range of students representing a variety of departments and professional backgrounds. **Credits:** 3.00

MSE 53600 - Solidification Of Castings

Credit Hours: 3.00. A study of solidification of metal in molds involving the characteristics of liquid-solid phase transformations, sand and metal thermal behavior, macroscopic structures, mechanical properties, and casting defects. **Credits:** 3.00

MSE 54700 - Introduction To Surface Science

Credit Hours: 3.00. Classical thermodynamics of surfaces: surface tension, surface excess properties, and surface segregation. Atomic structure of surfaces and surface reconstruction. Electronic structure of surfaces, surface states, and the electronic structure/properties of interfaces. Adsorption, surface diffusion, and clustering of adsorbates. Chemical reactions at surfaces. Offered in alternate years. **Credits:** 3.00

MSE 54800 - Deposition Processing Of Thin Films And Coatings

Credit Hours: 3.00. Processing and microstructural development of thin films and layered structures. Includes vapor, liquid, and reactive processing, as well as layer modification by annealing and beam techniques. Offered in alternate years. **Credits:** 3.00

MSE 55000 - Properties Of Solids

Credit Hours: 3.00. Critical examination of fundamental concepts of physical properties of solids and the relation of these properties to thermal and mechanical treatments. Approach is atomistic rather than electronic, and an emphasis is made to connect the fundamental knowledge of solid state physics to actual processing of materials and to a qualitative understanding of current research in the area of materials science. Offered in alternate years. **Credits:** 3.00

MSE 55500 - Deformation Mechanisms In Crystalline Solids

Credit Hours: 3.00. Focuses on the mechanisms for deformation and fracture of metal, intermetallic, and ceramic materials, with particular emphasis on high temperature properties. The industrial success of superalloys, dispersion-strengthened alloys, stainless steels, composites, and thermal barrier coatings will serve as the basis for exploring the relationship between composition, microstructure, and component application in high temperature performance. Topics included are alloying effects on dislocation climb and glide, grain boundary and lattice diffusion, and dynamic recrystallization. The interactions between environment and thermal and mechanical cycling also will be considered. Design tools for prediction and evaluation of component life will be investigated in detail, including an exploration of deformation mechanism maps. Offered in alternate years. **Credits:** 3.00

MSE 55600 - Fracture Of Materials

Credit Hours: 3.00. The failure and fracture of materials under applied stress are the focal points of this course, with particular emphasis on the material characteristics that influence fracture. The initial subjects covered in this course will include introductions to linear elastic fracture mechanics (LEFM) and elastic plastic fracture mechanics (EPFM). Subsequently, the strength and toughness of metals, ceramics, and polymers will be explored with regard to processing property relationships and microstructure. Special topics will include fracture mechanism maps, Weibull statistics, toughening mechanisms, and failure analysis. This course is distinct from a course on fracture mechanics in that the fundamental materials aspects of fracture are of paramount importance. Offered in alternate years. **Credits:** 3.00

MSE 55900 - Phase Equilibria In Multicomponent Systems

Credit Hours: 3.00. A detailed examination of the thermodynamics of phase equilibria in multicomponent systems, experimental methods of determining these equilibria by measurements of thermodynamic activity and graphical method of representing the equilibria. This is followed by an examination of theoretical models of the behavior of solutions and an examination of the extent to which observed phenomena can be understood and predicted in terms of the models. Offered in alternate years. **Credits:** 3.00

MSE 56000 - The Production Of Inorganic Materials

Credit Hours: 3.00. Examination of the production of inorganic materials of engineering importance (metals, ceramics, and glasses) from ore concentrates, raw materials, and recycled materials. Individual stages in the extraction, refining, and syntheses processes are examined from the viewpoints of thermodynamics and kinetics, and alternative production routes are compared and contrasted. Topics covered include carbothermic and metallothermic reduction of oxide concentrates, smelting and conversion of sulfide mattes, electrolysis and electrowinning from aqueous solutions and molten salts, distillation and vacuum refining, glass-forming, and the synthesis of carbide and nitride ceramics. Offered in alternate years. **Credits:** 3.00

MSE 56200 - Soft Materials

Credit Hours: 3.00. Soft materials are an important and diverse class of materials that share the common trait of being easily deformable by external stresses, electric or magnetic fields or even thermal fluctuations. These materials are the foundation of important technologies that are used in everyday life including ceramic and pharmaceutical processing (tablet formation), cosmetics (hand creams), cleaning products, foods (milk, mayonnaise) and bio-technologies (drug delivery). The aim of this class is to gain a fundamental understanding of the physical and chemical underpinnings of common soft materials systems and how they are used to engineer technologically relevant materials and structures. **Credits:** 3.00

MSE 56700 - Polymer Synthesis

Credit Hours: 3.00. Analyze properties of polymers and correlate them to chemical structure. Apply methods and mechanisms of polymer chemistry to industrial and laboratory synthesis. Examine the kinetic and design factors that control polymer structures. Offered in alternate years.**Credits:** 3.00

MSE 57000 - Introduction To Materials Modeling And Informatics

Credit Hours: 3.00. This course provides an introduction at the graduate level to theory and methods for simulating the structure and properties of materials. The course will provide a broad initial overview of many atomistic modeling techniques, followed by a detailed study of density functional theory (DFT) over several weeks, then a few lectures on classical molecular dynamics (MD) and Monte Carlo (MC) simulations, and finishing with an introduction to materials informatics techniques which rely on learning from materials data. Students will obtain an essential understanding of quantum and classical theory and become acquainted with practical methods for running DFT, MD and MC simulations, as well as combining such simulations with simple machine learning and data science methods for materials design. Existing and new tools on nanoHUB, access to open-source simulation software, and writing simple Python code will be utilized for all necessary coursework and exercises. Permission of department required.**Credits:** 3.00

MSE 57400 - Sports Engineering And Entrepreneurship

Credit Hours: 3.00. This course provides an introduction at the graduate level to sports engineering and entrepreneurship. Students will be immersed in the state-of-the-art of industry and interact with renown experts in the field. This course is a comprehensive exploration of the key areas of sports engineering (digitalization, equipment and apparel, fan experience, data, etc.) with an emphasis on the future of the industry. The course includes the development of a business plan for a start-up in sports engineering, encouraging students to critically think about where they see opportunities for innovation based on knowledge gained in the course. This is not only for students looking to start their own business, but for any student interested in working in sports engineering field. Permission of instructor required.**Credits:** 3.00

MSE 57500 - Transport Phenomena In Solids

Credit Hours: 3.00. Energetics and kinetics of phase changes in metals and alloys. Nucleation and growth models, with special emphasis on the role of crystal defects. Selected topics in multicomponent diffusion. Offered in alternate years. **Credits:** 3.00

MSE 57600 - Corrosion

Credit Hours: 3.00. Rate-controlling steps in electrode processes; activation, ohmic, and concentration polarization; passivation; potentiostatic studies and alloy design; applications to engineering systems. Offered in alternate years. **Credits:** 3.00

MSE 57700 - Materials Science Of Rechargeable Batteries

Credit Hours: 3.00. This course is aimed at junior/senior undergraduate and graduate students interested on developing an understanding on the Materials Science of Rechargeable Batteries. The focus is on electrochemical materials, its non-idealities (e.g., transport limitations, failure mechanisms), and its application to energy storage devices, such as batteries and fuel cells, particularly for portable electronics and hybrid/electric vehicles. This course will deliver an introduction to basic electrochemistry, principles of electrochemical devices, and electroactive materials as used in such systems. Current trends and directions in the field of battery technology will be outlined. Permission of department required. **Credits:** 3.00

MSE 58100 - Scanning Electron Microscopy Skills

Credit Hours: 1.00. Components and operation of the scanning electron microscope (SEM). Limits to resolution; signals, detectors, and imaging modes; and interpretation of results. Laboratory sessions emphasize the practical operation of the instrument and culminate in a test of student skills. This course must be completed before undertaking any SEM research in the School of Materials Engineering. Weeks 1 - 5. Permission of instructor required. **Credits:** 1.00

MSE 58200 - Transmission Electron Microscopy Skills

Credit Hours: 1.00. Principal components and operation of the transmission electron microscope (TEM). Limits to resolution; imaging and diffraction modes; and interpretation of results. Laboratory sessions emphasize the practical operation of the instrument and culminate in a test of student skills. This course must be completed before undertaking any TEM research in the School of Materials Engineering. Weeks 6 - 10. Permission of instructor required. **Credits:** 1.00

MSE 58300 - Energy-Dispersive X-Ray Microanalysis Skills

Credit Hours: 1.00. Theory of X-ray generation, components and operation of the energy dispersive X-ray spectrometer (EDS); limits to resolution; qualitative, semi-quantitative and fully quantitative analysis; and interpretation of results. Laboratory sessions emphasize the practical operation of the instrument and culminate in a test of student skills. Weeks 11 - 15. Permission of instructor required. **Credits:** 1.00

MSE 58500 - Magnetic Materials: Physical Properties And Applications

Credit Hours: 3.00. This course provides an introduction of the basic physical and structural properties that determine the functionality of magnetic materials and devices. Starting from basic concepts on the physics of magnetism, materials synthesis and device fabrication, the functional requirements of magnetic materials for diverse applications will be discussed. Magnetic material properties depend on the electronic structure of the constituent elements and their electronic interactions. These interactions are controlled by their atomic arrangement, microstructure, defects, and strain fields that distort the local atomic order. Furthermore, the role of reduced dimensionality on the physical and functional properties of nanoscale materials will be discussed.**Credits:** 3.00

MSE 58600 - Experimental Characterization Of Advanced Composite Materials

Credit Hours: 3.00. The characterization of advanced composite materials is a combined lecture/laboratory course in which polymeric composite laminates will be fabricated of carbon fiber epoxy and subjected to classical test methods appropriate to the determination of the anisotropic, thermoelastic properties. Properties measured will include thermal expansion coefficients,

anisotropic elastic constants, biaxial strength properties and interlaminar fracture strengths. The autoclave processing of composite laminates will be discussed and the consolidation, degree of cure and glass transition temperature of the polymeric matrix will be modeled. Microscopic analysis of the composite will be carried out to observe microstructure and measure composition fractions. Lectures will precede each experiment. **Credits:** 3.00

MSE 58900 - Archaeology And Materials

Credit Hours: 3.00. This course provides instruction in the methods and theories used by archaeologists and materials scientists to study ancient and historic technology. The course will focus on the analysis and interpretation of archaeological artifacts and provide opportunities for hands-on learning. Permission of department required. **Credits:** 3.00

MSE 59700 - Selected Topics In Materials Engineering

Credit Hours: 0.00 to 18.00. Hours and credits to be arranged. Permission of instructor required. **Credits:** 0.00 to 18.00

MSE 60000 - Materials Engineering Fundamentals

Credit Hours: 3.00. Fundamental relationships between the internal structure, properties and processing in all classes of engineering materials. Comprehensive coverage spanning physical, chemical, thermal, mechanical, electrical, magnetic, and optical responses. The course is intended for materials researchers from all backgrounds, as well as engineers working in product design, development and manufacturing who seek a deeper understanding of the full spectrum of engineering materials. **Credits:** 3.00

MSE 64000 - Transmission Electron Microscopy And Crystal Imperfections

Credit Hours: 3.00. Theory and application of TEM to problems in materials science and engineering. Principles of electron diffraction and microscopy are reviewed with the emphasis on the relationship between real and reciprocal space. Diffraction theory of imperfect crystals will be introduced. A primary part of the course will be a discussion of image contrasts in terms of atomistic structures of key crystal imperfections, including dislocations and grain boundaries. Experimental applications and image simulations will be included to amplify theoretical concepts. Offered in alternate years. Permission of instructor required.**Credits:** 3.00

MSE 67000 - Atomistic View of Materials: Theory, Modeling And Simulations

Credit Hours: 3.00. In this course students will be introduced to the fundamental physics required to describe materials in terms of electrons and atoms, learn how these processes relate to macroscopic behavior and become familiar with advanced modeling and simulation techniques that enable quantitative predictions. Students will gain hands-on experience with several simulation tools, including ab initio calculations using density functional theory, molecular dynamics simulations and other advanced modeling techniques. Pre-Requisites: BS degree in materials, mechanical, chemical, electrical or aerospace engineering or in physics or chemistry. Permission of department and instructor required.**Credits:** 3.00

MSE 69000 - Seminar In Materials Engineering

Credit Hours: 0.00. Required of all MSE graduate students. **Credits:** 0.00

MSE 69600 - Graduate Professional Practice

Credit Hours: 0.00. Professional practice in Industry. Restrictions: MSE graduate students only. Permission of instructor required. **Credits:** 0.00

MSE 69700 - Selected Topics In Materials Engineering

Credit Hours: 0.00 to 18.00. Hours and credits to be arranged. Prerequisite: two upper-division mathematics courses: one on linear algebra and one on abstract algebra. Permission of instructor required. **Credits:** 0.00 to 18.00

MSE 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

MSE 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Mechanical Engineering

ME 19800 - PMEA Leadership Program

Credit Hours: 1.00. A weekly seminar that includes topics such as leadership, professional skills, teamwork, and the Mechanical Engineering culture. Students will utilize these skills while representing Mechanical Engineering to current and prospective students, alumni, donors, and other visitors to the school. **Credits:** 1.00

ME 19900 - How Stuff Works

Credit Hours: 1.00. An introduction to Mechanical Engineering for First-Year Engineering students interested in exploring a career in ME. The course is student led and involves a mix of presentations from successful mechanical engineers about their chosen careers coupled with fun hands-on experiences related to better understand how everyday products work from a mechanical engineering perspective. A variety of common products are disassembled, evaluated, and reassembled to understand the underlying engineering design and fabrication fundamentals. Little or no mechanical experience is required. **Credits:** 1.00

ME 20000 - Thermodynamics I

Credit Hours: 3.00. First and second laws of thermodynamics, entropy, reversible and irreversible processes, properties of pure substances. Application to engineering problems. **Credits:** 3.00

ME 22001 - Fundamentals Of Energy Materials

Credit Hours: 3.00. This course examines the chemistry and structure of materials and their correlation with various electrochemical properties including their suitability for use in conversion and storage of electrochemical energy, energy related materials, and chemical and renewable energy sources.**Credits:** 3.00

ME 22501 - Mechanical Engineering Laboratory I

Credit Hours: 1.00. Experiments in thermodynamics, parametric design and component fabrication. Typically offered Fall Spring.**Credits:** 1.00

ME 22510 - Energy Engineering Laboratory I

Credit Hours: 1.00. Experiments on testing of thermodynamics, parametric design and electrochemistry.**Credits:** 1.00

ME 24000 - Basic Engineering Mechanics

Credit Hours: 4.00. This course is an introductory mechanics course in energy engineering, covers force systems and couples, equilibrium, centroids, friction, kinematics, kinetics of particles & rigid body, Newton's second law, energy, and momentum methods; equations of motions, and application to machine elements. Permission of department required.**Credits:** 4.00

ME 25001 - Mechanical Engineering Laboratory II

Credit Hours: 1.00. Experiments on data analysis, hands-on programming with devices and fabrication. Typically offered Fall Spring.**Credits:** 1.00

ME 25010 - Energy Engineering Laboratory II

Credit Hours: 1.00. Experiments on testing of thermodynamics, parametric design and electrochemistry.**Credits:** 1.00

ME 26000 - Sustainable Energy

Credit Hours: 3.00. The objective of this course is to familiarize the students with various forms of available energy. The concept of these energies in terms of efficiency, raw material, safety, economy and environmental impact will be introduced. Permission of department required.**Credits:** 3.00

ME 26201 - Design, Ethics, And Entrepreneurship

Credit Hours: 2.00. Basic concepts of the design process. Innovative engineering design of real life applications. Engineering ethics topics. Fundamentals of Entrepreneurship. Design projects focus on open-ended problems. Design modeling, simulation, documentation and communication. Implementation and use of modern computer tools in solving design problems and completing team design projects in the area of Energy Engineering. Typically offered Fall Spring.**Credits:** 2.00

ME 26300 - Introduction To Mechanical Engineering Design, Innovation And Entrepreneurship

Credit Hours: 3.00. The product design process. Development of product design specifications using customer inputs, benchmarking, product/market research and patent review. Concept generation and evaluation using brainstorming, functional decomposition, modeling and decision matrices. Detailed product design including assembly, economic analysis, CAD, and bill of materials. Oral and written design reviews. Key skills developed include teamwork, communication, project planning, innovation, design, and entrepreneurship. **Credits:** 3.00

ME 27000 - Basic Mechanics I

Credit Hours: 3.00. Vector operations, forces and couples. Free body diagrams, equilibrium of a particle and of rigid bodies. Distributed forces. Centers of gravity and centroids. Friction. Trusses, frames, and machines. Internal reactions resulting from axial, shear, torsional, and bending loading. Stress and strain analyses and elementary failure criteria.**Credits:** 3.00

ME 27200 - Mechanics of Materials

Credit Hours: 3.00. Kinematic and dynamic analysis of linkages and mechanical systems. Analytical and graphical approaches to analysis. Vector loop and relative velocity/acceleration solutions. Design and analysis of cams and gears. Static and dynamic balancing. Design for strength of various machine components. Reliability principles. Design documentation and communication. Laboratory experiments on mechanical design and strength. Typically offered Fall Spring Summer.**Credits:** 3.00

ME 27400 - Basic Mechanics II

Credit Hours: 3.00. Review and extension of particle motion to include energy and momentum principles. Planar kinematics of rigid bodies. Kinetics for planar motion of rigid bodies, including equations of motion and principles of energy and momentum. Three-dimensional kinematics and kinetics of rigid bodies. Linear vibrations, with emphasis on single-degree-of-freedom systems. **Credits:** 3.00

ME 28500 - Industrial Practice I

Credit Hours: 0.00. Professional practice of engineering in industry. Comprehensive written report of this experience required. For cooperative program students only. **Credits:** 0.00

ME 28600 - Industrial Practice II

Credit Hours: 0.00. Professional practice of engineering in industry. Comprehensive written report of this experience required. For cooperative program students only. **Credits:** 0.00

ME 29000 - Global Engineering Professional Seminar

Credit Hours: 1.00. Forum on contemporary issues in the global profession of mechanical engineering. Professionalism and ethics. Interactions with engineering faculty and with professionals outside the University. Quizzes on assigned readings in the areas of globalization, cultural difference and collaborating across cultural boundaries. Individually developed professional profiles describe technical interests and convey awareness of ethical responsibilities in global context. **Credits:** 1.00

ME 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in mechanical engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ME 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in mechanical engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ME 29601 - Experimental Courses

Credit Hours: 0.00 to 6.00. Experimental classes offered at the freshman or sophomore level on a temporary basis to test the viability of offering the course on a permanent basis. **Credits:** 0.00 to 6.00

ME 29700 - Mechanical Engineering Sophomore Projects

Credit Hours: 0.00 to 6.00. Projects or special topics of contemporary importance can be studied under the Mechanical Engineering Projects course. Interested students should seek a faculty advisor by meeting with individual faculty members who work in their area of special interest. Students submit a summary report. Permission of instructor required. **Credits:** 0.00 to 6.00

ME 30000 - Thermodynamics II

Credit Hours: 3.00. Properties of gas mixtures, air-vapor mixtures, applications. Thermodynamics of combustion processes, equilibrium. Energy conversion, power, and refrigeration systems. **Credits:** 3.00

ME 30800 - Fluid Mechanics

Credit Hours: 3.00. Continuum description, velocity field, fluid statics, manometers, basic conservation laws for systems and control volumes, dimensional analysis. Bernoulli's equation along a streamline and with head losses. Flow over submerged bodies, boundary layers. Viscous flows in pipes, turbomachinery, system performance. One-dimensional gas dynamics. **Credits:** 3.00

ME 30801 - Fluid Mechanics Laboratory

Credit Hours: 1.00. This course is the lab component of an already established ME 30900 Fluid Mechanics (4 cr) course, which is now being split into an ME 30800 (3 cr) Fluid Mechanics lecture course, and the material covered in this new ME 30801 (1 cr) Fluid Mechanical Laboratory. The content of both of these courses remains unchanged. The splitting of the lab from the lecture will enable better enrollment load balancing in the existing ME undergraduate laboratory facilities. Details of this new laboratory are outlined in the appended material below. **Credits:** 1.00

ME 31002 - Fundamentals Of Fluid Mechanics

Credit Hours: 3.00. Continua, velocity fields, fluid statics, basic conservation laws for systems and control volumes, dimensional analysis. Euler and Bernoulli equations, viscous flows, boundary layers, flows in channels and around submerged bodies, and one-dimensional gas dynamics. Typically offered Fall Spring.**Credits:** 3.00

ME 31401 - Fundamentals Of Heat And Mass Transfer

Credit Hours: 3.00. Fundamental principles of heat transfer by conduction, convection, and radiation; mass transfer by diffusion and convection. Application to engineering situations. Typically offered Fall Spring.**Credits:** 3.00

ME 31500 - Heat And Mass Transfer

Credit Hours: 4.00. Fundamentals of heat transfer by conduction, convection, and radiation; mass transfer by convection. Relevance to engineering applications. **Credits:** 4.00

ME 31600 - Fluid Mechanics

Credit Hours: 3.00. Continua, velocity fields, fluid statics, basic conservation laws for systems and control volumes, dimensional analysis. Euler and Bernouilli equations, viscous flows, boundary layers, flows in channels and around submerged bodies, and one-dimensional gas dynamics.**Credits:** 3.00

ME 32300 - Mechanics Of Materials

Credit Hours: 3.00. Integrated approach to mechanics of materials emphasizing mechanics fundamentals as applied to machine design applications. Stress and strain in machine elements; mechanical properties of materials; extension, torsion, and bending of members; thermal stress; pressure vessels; static indeterminacy, stress transformation, Mohr's circle. **Credits:** 3.00

ME 32301 - Mechanics Of Materials Laboratory

Credit Hours: 1.00. Experimental methods and techniques employed for the measurement of mechanical properties and evaluation of mechanical structures. Application of mechanics of materials and fundamental concepts to measuring and analyzing mechanical structures. A laboratory design project on mechanical structures. **Credits:** 1.00

ME 32501 - Mechanical Engineering Laboratory III

Credit Hours: 1.00. Experiments on testing of Mechanics of Materials and Fluid Mechanics. Typically offered Fall Spring.**Credits:** 1.00

ME 32510 - Energy Engineering Laboratory III

Credit Hours: 1.00. Experiments on testing of Fluids Mechanics and energy engineering.**Credits:** 1.00

ME 32700 - Engineering Economics

Credit Hours: 3.00. (ECE 32700) Engineering Economics is designed as an overview of economics with a focus on how it relates to the practice of engineering. Topics include interest formulas, rate of return, life cost analysis, depreciation, taxes, and cash flow. Typically offered Fall Spring Summer.**Credits:** 3.00

ME 33000 - Modeling and Analysis of Dynamic Systems

Credit Hours: 3.00. Introduction to dynamic engineering systems; electrical, mechanical, fluid, and thermal components; linear system response; Fourier series and Laplace transform. Typically offered Fall Spring Summer.**Credits:** 3.00

ME 33010 - Modeling And Measurements Of Dynamic Systems

Credit Hours: 3.00. This course will cover the fundamentals of instrumentation, measurement, and dynamic systems modeling. Design, selection, and usage of the instrumentation systems and the interpretation of experimental results are also introduced. Basic concepts of measurements methods, measurement system response, assessment, uncertainty analysis of measured data, sensors, signal conditioning, recording / display devices, digital techniques, instrument interface, and measurement theories on stress and strain, temperature, pressure, fluid flow and velocity will also be covered. Additionally, fundamentals of dynamic systems including mechanical, electrical, and electromechanical systems will be introduced. Laplace transform, block diagram, transient and frequency response of linear first and second order system will be covered as well.**Credits:** 3.00

ME 34001 - Instrumentation And Measurement Systems

Credit Hours: 2.00. Modeling and formulation of differential equations for dynamic systems, including mechanical vibratory systems, thermal systems, fluid systems, electrical systems, and instrumentation systems. Analysis of dynamic systems and measuring devices including transient response and frequency response techniques, mechanical systems, transducers, and operational amplifiers. Consideration of readout devices and their responses to constant, transient, and steady-state sinusoidal phenomena. Calibration and data analysis techniques are introduced. Both analog and digital computation are included. Typically offered Fall Spring.**Credits:** 2.00

ME 34400 - Introduction To Engineering Materials

Credit Hours: 3.00. Introduction to the structure and properties of engineering materials, including metals, alloys, ceramics, plastics, and composites. Characteristics and processing affecting behavior of materials in service.**Credits:** 3.00

ME 34600 - Renewable Energy Systems And Design

Credit Hours: 3.00. This course is designed to introduce the system and design of energy conversion and storage devices for renewable energy sources. Students will first learn about energy sources available on earth including kinetic, solar, and chemical. Next, the course will provide students with a review of the thermodynamic concepts behind energy constant and energy transfer via an energy conversion device. Finally, this course will tie together concepts of renewable energy sources and thermodynamics teaching students about design elements for energy conversion and storage devices, in which renewable energy sources are converted and stored. Permission of Instructor required.**Credits:** 3.00

ME 35001 - Mechanical Engineering Laboratory IV

Credit Hours: 1.00. Experiments on testing of Dynamic Systems, Heat & Mass transfer, and Materials. Typically offered Fall Spring.**Credits:** 1.00

ME 35010 - Energy Engineering Laboratory IV

Credit Hours: 1.00. Experiments on testing of heat and mass transfer, and energy engineering.**Credits:** 1.00

ME 35200 - Machine Design I

Credit Hours: 4.00. Introduction to the principles of design and analysis of machines and machine components. Design for functionality, motion, force, strength, and reliability. Review of fatigue failure theories and analysis of fatigue stresses. Laboratory experience provides open-ended projects to reinforce the design process. **Credits:** 4.00

ME 35400 - Machine Design

Credit Hours: 3.00. Design, analysis, and selection of machine components for fluctuating loading. Application of design fundamentals to mechanical components and integration of components to form systems. Open-ended design projects reinforce the design process. **Credits:** 3.00

ME 35401 - Machine Design Laboratory

Credit Hours: 1.00. Physical experiments on static and fatigue failure of mechanical parts. Application of failure theories to design of mechanical components and systems. Open-ended design projects to reinforce the design process. **Credits:** 1.00

ME 36300 - Principles And Practices Of Manufacturing Processes

Credit Hours: 3.00. Manufacturing processes for engineering materials, both metallic and non-metallic. Fundamentals of manufacturing processes with a "hands-on" laboratory sequence. Analysis and design of processes for various engineering materials and their link to engineering design. Hands-on experiences through laboratory experiments and demonstrations. Not open to students with credit in IE 37000. **Credits:** 3.00

ME 36500 - Measurement And Control Systems I

Credit Hours: 3.00. The fundamentals of dynamic system modeling are reviewed with special reference to measurement systems. Analytical and experimental techniques of general importance in systems engineering are presented, including sensor utilization in feedback control. Engineering measurement fundamentals, including digital and frequency domain techniques noise and error analysis are covered.**Credits:** 3.00

ME 37200 - Design Of Mechanisms

Credit Hours: 3.00. Kinematic and dynamic analysis of linkages and mechanical systems. Analytical and graphical approaches to analysis. Vector loop and relative velocity/acceleration solutions. Design and analysis of cams and gears. Static and dynamic balancing. Design documentation report writing and communication.**Credits:** 3.00

ME 37500 - Measurement And Control Systems II

Credit Hours: 3.00. This course provides an introduction to modeling electrical, mechanical, fluid, and thermal systems containing elements such as sensors and actuators used in feedback control systems. Modeling techniques based on physical laws and principles are used to generate subsystem and system transfer functions. Closed-loop system analysis will include the use of proportional, integral, and derivative elements to control system response. **Credits:** 3.00

ME 38199 - Professional Practice Co-Op I

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Professional Practice students only. Permission of department required. **Credits:** 0.00

ME 38299 - Professional Practice Co-Op II

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Professional Practice students only. Permission of department required. **Credits:** 0.00

ME 38399 - Professional Practice Co-Op III

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Professional Practice students only. Permission of department required. **Credits:** 0.00

ME 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in mechanical engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ME 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in mechanical engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ME 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in mechanical engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

ME 39600 - Professional Internship II

Credit Hours: 0.00. Professional experience in mechanical engineering. Program coordinated by school with cooperation of participating employers. Students submit a summary report. **Credits:** 0.00

ME 39699 - Professional Practice Internship

Credit Hours: 0.00. Professional experience in mechanical engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Permission of department required. **Credits:** 0.00

ME 39700 - Selected Topics In Mechanical Engineering

Credit Hours: 0.00 to 6.00. Topics of contemporary importance or of special interest in Mechanical Engineering. Permission of instructor required.**Credits:** 0.00 to 6.00

ME 40600 - Robust Design, Standards And Contemporary Issues

Credit Hours: 1.00. The role of standards, robust design and lifelong learning in engineering design. Application to contemporary issues. Typically offered Fall Spring.**Credits:** 1.00

ME 40700 - HVAC Design

Credit Hours: 3.00. The fundamentals required to design and analyze HVAC systems used in buildings. This includes the fundamentals of the thermodynamics of HVAC systems and buildings, the thermodynamics of moist air (psychometrics), calculating building heating / cooling loads, application of HVAC equipment to buildings, HVAC component analysis, energy reduction strategies. Application to real building designs.**Credits:** 3.00

ME 41300 - Noise Control

Credit Hours: 3.00. Fundamentals of acoustic waves. Psychoacoustics and theories of hearing. Environmental and building acoustics. Measurement methods and common instrumentation. Noise control methods. Machinery noise. Community reaction. Legal aspects. Design-oriented semester project. Course work in differential equations. **Credits:** 3.00

ME 41400 - Thermal-Fluid Systems Design

Credit Hours: 3.00. Application of basic heat transfer and fluid flow concepts to design of thermal-fluid systems. Emphasis on design theory and methodology. Design experience in thermal-fluid area such as piping systems, heat exchangers, HVAC, and energy systems. Design projects are selected from industrial applications and conducted by teams.**Credits:** 3.00

ME 41500 - Energy Systems Engineering

Credit Hours: 3.00. Application of Thermodynamics, fluid mechanics, and heat transfer fundamentals to the design of energy systems. Applications include thermal regulation in buildings, electronic equipment, energy generation, conversion, and storage, manufacturing processes, and combustion processes. Beyond the fundamentals, this course will focus on design and analysis techniques, including analysis of energy costs, economics, and environmental issues. **Credits:** 3.00

ME 41800 - Engineering Of Environmental Systems And Equipment

Credit Hours: 3.00. Design and analysis of systems and equipment used in conditioning buildings. Review of fundamentals in thermodynamics, heat transfer, fluid mechanics, economics, non-linear equation solving, optimization. Analysis of building heating and cooling requirements for design and annual energy use. Design and selection of equipment. **Credits:** 3.00

ME 42501 - Mechanical Engineering Laboratory V

Credit Hours: 1.00. Experiments on testing of Mechanical Measurements and Control Systems. Typically offered Fall Spring.**Credits:** 1.00

ME 42510 - Energy Engineering Laboratory V

Credit Hours: 1.00. Experiments on testing of mechanical measurements, control systems and alternative energy systems.**Credits:** 1.00

ME 43000 - Power Engineering

Credit Hours: 3.00. Rankine cycle analysis, fossil-fuel steam generators, energy balances, fans, pumps, cooling towers, steam turbines, availability (second law) analysis of power systems, energy management systems, and rate analysis. **Credits:** 3.00

ME 43300 - Principles Of Turbomachinery

Credit Hours: 3.00. Unified treatment of principles underlying fluid mechanic design of hydraulic pumps, turbines and gas compressors. Similarity and scaling laws. Cavitation. Analysis of radial and axial flow machines. Blade element performance. Radial equilibrium theory. Centrifugal pump design. Axial compressor design.**Credits:** 3.00

ME 43400 - Gas Turbines For Power And Propulsion

Credit Hours: 3.00. Basic operating principles and analysis of performance characteristics of gas turbine engines for aircraft and vehicular propulsion and stationary power. Turbojet, turbofan, turboshaft cycle analysis. Analysis of flow through compressors, turbines, combustors, inlets, nozzles, and regenerators. Component matching and off-design performance. Coursework in thermodynamics and fluid mechanics. **Credits:** 3.00

ME 44000 - Automotive Prime Movers: Green Engines And Clean Fuel

Credit Hours: 3.00. Internal combustion engines (ICE), hybrid engines (HE), fuel-cell engines (FCE), and alternative/renewable fuels. ICEs topics- engines with advanced combustion systems such as clean diesels, direct-injection spark-ignition engines (DISI), and low-temperature combustion (LTC) compression-ignition. HE topics- different components of hybrid engines and the powertrain design. FCE topics- fundamentals of fuel cells and automotive applications. Clean fuel topics- biofuels, hydrogen, and natural gas, as well as, other cleaner fossil fuels for automotive applications. Well-to-wheel energy and cost analysis of prime mover designs/fuels. **Credits:** 3.00

ME 44400 - Computer-Aided Design And Prototyping

Credit Hours: 3.00. Introduction to advanced computer-aided design (CAD) for product design, modeling, and prototyping. Individual use and team-based environment to design and prototype a functional and marketable product. Projects include use of the advanced design tools to produce a working prototype that is manufacturable. Application to design, manufacturing, and analysis. **Credits:** 3.00

ME 44700 - Compressible Flow And Renewable Kinetic Energy

Credit Hours: 3.00. This course is designed to introduce compressible flow, turbomachines and design of kinetic energy conversion and storage devices for wind, wave and tidal renewable energy sources. Students will first learn about compressible flow, turbomachines concepts and kinetic energy sources available on earth. Next, the course will provide students with analysis, design parameters and control renewable kinetic energies.**Credits:** 3.00

ME 45500 - Vehicle Design And Fabrication

Credit Hours: 3.00. Open-ended project course to design and build competitive prototype vehicles. Integration of design concept formulation, engineering analysis and testing, and prototype fabrication. Product development activities in a hands-on setting. Design constraints imposed by manufacturing limitations, funding constraints and market competition. Permission of instructor required.**Credits:** 3.00

ME 45900 - Mechanism And Machine Theory

Credit Hours: 3.00. Introduction to the principles of the analysis and design of mechanisms and machinery. Design for functionality, motion constraints, inertia force effects, and static and dynamic balancing. **Credits:** 3.00

ME 46200 - Capstone Design

Credit Hours: 3.00. Concurrent engineering design concept is introduced. Application of the design is emphasized. Design problems from all areas of mechanical engineering are considered.**Credits:** 3.00

ME 46300 - Engineering Design

Credit Hours: 3.00. Application of the design process to the design of various engineering components and systems. Mathematical modeling in design is emphasized. Design problems from all areas of mechanical engineering are considered. **Credits:** 3.00

ME 47500 - Automatic Control Systems

Credit Hours: 3.00. Controller design in frequency domain with introduction to digital systems and control. **Credits:** 3.00

ME 48200 - Control System Analysis and Design

Credit Hours: 3.00. (MSTE 36000) Classical feedback concepts, root locus, Bode and Nyquist techniques, state-space formulation, stability, design applications. Students may not receive credit for both ECE 38200 and ME 48200. Typically offered Fall Spring.**Credits:** 3.00

ME 48900 - Introduction To Finite Element Analysis

Credit Hours: 3.00. Introduction to finite element analysis with focus on linear elasticity and heat transfer. Matrix analysis and assembly of solutions. Strong form and weak form as a general solution process for differential equations. **Credits:** 3.00

ME 49200 - Technology And Values

Credit Hours: 3.00. The impact of science and technology on personal and societal value systems. The special responsibility of engineers. Practical methods for using human values to guide future technological developments. Societal problems considered: warfare, energy, overpopulation, resource depletion, and environmental degradation. Interdisciplinary approaches stressed. Offered in alternate years. **Credits:** 3.00

ME 49601 - Experimental Courses

Credit Hours: 1.00 to 6.00. Experimental classes offered at the junior or senior level on a temporary basis to test the viability of offering the course on a permanent basis. **Credits:** 1.00 to 6.00

ME 49700 - Mechanical Engineering Projects

Credit Hours: 1.00 to 6.00. Projects or special topics of contemporary importance or of special interest outside the scope of the standard undergraduate curriculum. Interested students seek a faculty advisor in their area of special interest and together prepare a brief description of the work to be undertaken. Permission of instructor required. **Credits:** 1.00 to 6.00

ME 49800 - Research In Mechanical Engineering I

Credit Hours: 0.00 to 6.00. Individual research projects for students with honors classification. Requires prior approval of, and arrangement with, a faculty research advisor. Honors classification. Permission of instructor required. **Credits:** 0.00 to 6.00

ME 49900 - Research In Mechanical Engineering II

Credit Hours: 0.00 to 6.00. Continuation of ME 49800. Requires submission of a written thesis, public presentation, and oral defense of the research project. Honors Classification. Permission of instructor required. **Credits:** 0.00 to 6.00

ME 50000 - Advanced Thermodynamics

Credit Hours: 3.00. The empirical, physical basis of the laws of thermodynamics. Availability/exergy concepts and applications. Properties and relations between properties in homogeneous and heterogeneous systems. The criteria of equilibrium. Application to a variety of systems and problems, including phase and reaction equilibrium. Offered in alternate years. **Credits:** 3.00

ME 50100 - Statistical Thermodynamics

Credit Hours: 3.00. The molecular interpretation of thermodynamic equilibrium. Development of the partition function. Introduction to quantum mechanics and molecular spectroscopy. The Maxwell-Boltzmann formulation of statistical mechanics and applications to ideal gases, solids, radiation, and laser diagnostics. The Gibbs formulation of statistical mechanics and application to real gases. Kinetic theory and applications to transport properties and chemical kinetics. Offered in alternate years. **Credits:** 3.00

ME 50101 - Energy Assessment Of Industrial Processes

Credit Hours: 3.00. The course provides and analyzes methodologies for improving energy efficiency in the manufacturing sector. The manufacturing equipment and processes will be analyzed in terms of energy consumption and optimization. It provides the technical and analytical foundation for students on assessing industrial processes to evaluate measures for optimizing energy efficiency in industrial, electrical, motor drive, compressed air, process heating, process cooling, lighting, space conditioning, combined heat and power systems. This course is designed for students who are interested in energy efficiency. Permission of instructor required. Typically offered Fall Spring.**Credits:** 3.00

ME 50102 - Energy Management Principles

Credit Hours: 3.00. This course provides energy management principles for industrial applications. Various energy management methods, commitments, and strategies for continuous improvement as well as international standards will be analyzed and integrated. This course emphasizes real world applications including: critiquing utility rates structure and assessing costs; characterizing and quantifying energy saving opportunities at industrial facilities; determining investment payback scenarios and considerations. Permission of instructor required. Typically offered Spring.**Credits:** 3.00

ME 50103 - Industrial Energy Assessment: Tools And Applications

Credit Hours: 3.00. This course synthesizes advanced energy efficiency, energy auditing, and energy assessment methods and practices. Several types of industrial audits will be analyzed with respect to the methods, tools (hand and software), and industrial application. Topics include: the audit process for energy, industrial productivity, and waste stream audits; audit components:

energy bill analysis and economic analysis: audit system mechanics related to building envelop, electrical system, HVAC system, waste heat recovery, lighting, cogeneration, and other prevalent industrial systems; and measurement instrumentation issues for each industrial system. Students will enhance learning from a class project, which requires completion of an industrial scale energy audit. Permission of instructor required. Typically offered Spring.**Credits:** 3.00

ME 50104 - Powertrain Integration

Credit Hours: 3.00. The holistic view of powertrain development that includes engine, transmission, and driveline is now well accepted. Current trends indicate an increasing range of engines and transmissions in the future with, consequently, a greater diversity of combinations. This course discusses engines, transmissions, and drivelines in relation to their interfaces with chassis systems. This course also explores various aspects of powertrain integration. Novel concepts relating, for example, to continuously variable transmissions (CVTs) and hybridization as well as approaches to modeling, analysis, and simulation will be discussed. Permission of instructor required. Typically offered Spring.**Credits:** 3.00

ME 50105 - Hybrid And Electric Transportation

Credit Hours: 3.00. This course will cover fundamentals of hybrid electric and battery electric transportation systems with particular emphasis on automotive vehicles. It will cover powertrain configurations of Hybrid Electric Vehicle (HEV), Plug-in Hybrid Electric Vehicle (PHEV), and Battery Electric Vehicle (BEV). The principal element of the powertrain of these vehicles will be discussed: Battery, Electric Motor, Engine, Transmission. This course will cover design concepts for HEV / PHEV and BEV powertrain. Optimal methods of component sizing via appropriate modeling and analysis methodologies will also be introduced. An introduction to power electronic components and microprocessor based controllers for these powertrains will also be given. An in-depth coverage, including optimal energy management, will be given on the energy and power management of HEV / PHEV and BEV powertrain once the design is complete. Introduction of various concepts and terminologies, the state of the art development, energy conversion and storage options, modeling, analysis, system integration and basic principles of vehicle controls will be covered as well. Upon completion of this course, students should be able to follow the literature on these subjects and perform modeling, design, analysis and development work in this field. A field demonstration of a PHEV will be used to further enhance the learning experience in this course. Permission of department reqjuired. Prerequisite: ME 48200/ECE 38200. Typically offered Spring.**Credits:** 3.00

ME 50106 - Industrial Energy Audit

Credit Hours: 1.00 or 2.00. Students enrolled in this course will investigate, evaluate, conjecture, formulate and author during their participation in professional energy audits at multiple manufacturing sites. Students earn one credit during the fall semester and two credit hours during the spring semester of this two-part course. Permission of instructor required.**Credits:** 1.00 or 2.00

ME 50300 - Micro-And-Nano-Scale Energy Transfer Processes

Credit Hours: 3.00. Transport of energy in natural and fabricated micro- and nano-scale structures. Physical nature of energy transport by three carriers-electrons, phonons, and photons. Bulk material properties (e.g., thermal/electrical conductivity) are derived from statistical particle transport theories. Effects of spatial confinement on bulk properties are quantified. Contemporary interdisciplinary engineering applications. **Credits:** 3.00

ME 50400 - Automotive Control

Credit Hours: 3.00. Basic engine operation; lambda control, speed control, knock control, fuel injection timing control, ignition control of SI engines; driveline modeling, automatic transmission control, clutch phasing control; wheel model, complete vehicle model; observers, friction coefficient estimators, tire contact patch force estimators; anti-lock brake control, traction control, yaw stability control; drive-by-wire systems. The distance offering of this course originates from the IUPUI campus, is offered through streaming video via ProEd, and may be made available at the West Lafayette campus.**Credits:** 3.00

ME 50500 - Intermediate Heat Transfer

Credit Hours: 3.00. Heat and mass transfer by diffusion in one-dimensional, two-dimensional, transient, periodic, and phase change systems. Convective heat transfer for external and internal flows. Similarity and integral solution methods. Heat, mass, and momentum analogies. Turbulence. Buoyancy-driven flows. Convection with phase change. Radiation exchange between surfaces and radiation transfer in absorbing-emitting media. Multimode heat transfer problems. **Credits:** 3.00

ME 50600 - Two-Phase Flow And Heat Transfer

Credit Hours: 3.00. Basic two-phase flow equations, homogeneous model, drift-flux model, flow regimes, pressure drop in two-phase flow. Nucleation and bubble dynamics, pool boiling, subcooled boiling, forced convection boiling, critical heat flux in pool boiling, critical heat flux in forced convection boiling, minimum heat flux, film boiling, post dryout heat transfer. Flow instabilities, choking in two-phase flow, film and dropwise condensation. Applications to heat exchangers. Special boiling and two-phase flow problems. Offered in alternate years. **Credits:** 3.00

ME 50601 - Design Optimization Methods

Credit Hours: 3.00. In this course, the general theory of optimization, concepts and problem statement are presented. Methods for minimization of a function of one or n-variables with and without constraints are discussed. Response surface methods and design of experiments are shown to significantly reduce analysis time. Applications using a commercial software package to solve typical engineering design optimization problems are demonstrated. Uncertainty in the design process is introduced. In addition to engineering, the methods studied can be applied to a variety of diverse disciplines such as finance, investment portfolio management, and life sciences. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

ME 50700 - Laser Processing

Credit Hours: 3.00. Introduces background knowledge in laser science and laser technology and fundamentals involved in laser processing and manufacturing. The following topics are discussed: laser fundamentals, industrial laser systems and processes, and the laser-induced thermal, thermo-mechanical, and thermo-acoustic effects. The course also discusses emerging areas of laser applications, such as microscale laser processing, ultrafast laser processing, and the related energy transport analyses. Laboratory and video demonstration sessions are used to enhance the overall understanding of the course materials. Offered in alternate years. **Credits:** 3.00

ME 50800 - Heat Trans In Biological Systems

Credit Hours: 3.00. Introduction to applications of heat transfer in living systems to students who have general interests in biomedical engineering. Fundamental concepts of biology and engineering involved in these applications are introduced. Regulation of blood flow under external thermal stimuli and its effect on heat transfer are discussed. Clinical applications of heat transfer, including cancer therapy and gene therapy. Prerequisite: first course in fluid or aerodynamics. Offered in alternate years. **Credits:** 3.00

ME 50801 - Orthopaedic Tissue Mechanics

Credit Hours: 3.00. Orthopaedic tissues, such as bone, cartilage, tendon and ligament, serve functions that are largely mechanical in nature and that are critical for our health. This course is structure around classical topics in mechanics of materials and their applications in biomechanics and musculoskeletal tissues. Primary emphasis will be on the mechanical behavior of tissues, including elastic and failure properties as well as more advanced topics such as anisotropy, nonlinearity, viscoelasticity, poroelasticity, damage and fatigue. Importantly, the theories used to describe these mechanical properties were originally developed for advanced engineering materials such as fiber composites, polymers, elastomers, hydrogels, etc. Thus, while the theories will be presented in the context of biological materials, potential applications are much broader. Tissue microstructure and its importance to the material properties will be covered. Mechanics of whole bones and implants (composite and asymmetric

beam theories) and the mechanical function of native and artificial joints (contact mechanics, lubrication and wear) may also be discussed, time permitting. Some homework assignments will emphasize the use of experimental data to develop and test theoretical models via nonlinear curve fitting and optimization using Matlab. Students will receive an introduction to tissue mechanics literature to better understand how the concepts presented in class are used in the research setting.**Credits:** 3.00

ME 50900 - Intermediate Fluid Mechanics

Credit Hours: 3.00. Fluid properties. Basic laws for a control volume. Kinematics of fluid flow. Dynamics of frictionless incompressible flow and basic hydrodynamics. Equations of motion for viscous flow, viscous flow applications, boundary layer theory. Wall turbulence, lift and drag of immersed bodies.**Credits:** 3.00

ME 51000 - Gas Dynamics

Credit Hours: 3.00. Flow of compressible fluids. One-dimensional flows including basic concepts, isentropic flow, normal and oblique shock waves, Rayleigh line, Fanno line, and simple waves. Multidimensional flows including general concepts, small perturbation theory for linearized flows and method of characteristics for nonlinear flows. Prerequisite: first course in fluid or aerodynamics. **Credits:** 3.00

ME 51100 - Heat Transfer In Electronic Systems

Credit Hours: 3.00. This course covers both traditional and more innovative methods for heat extraction in electronic systems and the effectiveness and applicability of these methods over a wide range of scales. Special emphasis is given to industry-related applications with experts often attending and presenting material as part of class instruction. **Credits:** 3.00

ME 51201 - Energy Storage Devices And Systems

Credit Hours: 3.00. The basic concepts and components of primary and rechargeable batteries; Faraday's Law: electrode process and kinetics; electric double layer; electroanalytical techniques; battery standard, operation, and other considerations; materials for Li-ion batteries; next generation high energy rechargeable lithium batteries; batteries for electric vehicles and hybrid electric vehicles; and battery for the electrodes, electrolytes, temperature range and operation of different types of batteries. Permission of instructor required. Typically offered Fall Spring.**Credits:** 3.00

ME 51300 - Engineering Acoustics

Credit Hours: 3.00. The simple oscillator. Lumped acoustical elements. Electro-mechanical-acoustical analogies. Wave motion in strings and membranes. Introduction to linear acoustics through derivation of the wave equation and simple solutions. Plane and spherical waves. Acoustic intensity. Plane wave transmission through fluid layers and simple barriers. Sound absorption. Modeling of acoustical sources: monopoles, dipoles, quadrupoles. Mechanisms of sound generation and directionality. Sound propagation in one-dimensional systems (e.g., ducts and mufflers). Introduction to room acoustics. **Credits:** 3.00

ME 51400 - Fundamentals Of Wind Energy

Credit Hours: 3.00. Basic operating principles and analysis of performance characteristics of gas turbine engines for aircraft and vehicular propulsion and stationary power. Turbojet, turbofan, turboshaft cycle analysis. Analysis of flow through compressors, turbines, combustors, inlets, nozzles, and regenerators. Component machine and off-design performance. Inspection trip to industrial plan required.**Credits:** 3.00

ME 51800 - Analysis Of Thermal Systems

Credit Hours: 3.00. Modeling and optimization of thermal systems with a focus on heat-pumping equipment, such as vapor compression, absorption, and some advanced heat-pumping cycles. Students combine the use of thermodynamics, heat transfer, fluid mechanics, and numerical methods to develop and apply mathematical models for the analysis and optimization of specific equipment. Offered in alternate years. **Credits:** 3.00

ME 52000 - Imaging-Based Computational Hemodynamics For Cardiovascular Assessment

Credit Hours: 3.00. Image-based computational hemodynamics is a newly-emerged computational technique for non-invasive and patient-specific assessment of cardiovascular diseases based on medical imaging data. In this course, students will learn (1) concepts and principles of cardiovascular circulation in the human body and imaging modalities for cardiovascular diseases; (2) image-based computational modeling methods for quantification of hemodynamics (velocity, pressure, and wall-shear stress) in human vessels based on CT/MRI and Doppler ultrasound imaging data; and (3) computational analysis to assess the severity of cardiovascular diseases. Team projects to non-invasively assess the severity of arterial stenosis in renal, iliac, and coronary arteries via quantification of trans-stenotic pressure gradient and/or fractional flow reserve will provide first-hand experience of how computational modeling and analysis can contribute to medical innovation and advanced precision medicine.**Credits:** 3.00

ME 52200 - Indoor Environmental Analysis And Design

Credit Hours: 3.00. Review of current trend of building and indoor environment design. Theory of thermal comfort, indoor air quality, visual comfort, and acoustic comfort. Introduction of experimental techniques and advanced computer tools for indoor environment analysis and design. **Credits:** 3.00

ME 52301 - Nanosystems Principles

Credit Hours: 3.00. (ECE 52301) This is the introductory course in the nanosystems area. It introduces students to the principles and applications of nanosystems. The course begins with an introduction to the nanometer scale phenomena. It then introduces students to the basic elements resulting in nanosystems: nanoscale materials, processes, and devices. It also provides students with a basic understanding of the tools and approaches that are used for the measurement and characterization of nanosystems, and their modeling and simulation. Moreover, the course covers the applications of nanosystems in a wide range of industries, including information technology, energy, medicine, and consumer goods. The course concludes with a discussion of the societal and economical significance of these applications, including benefits and potential risks. Typically offered Fall Spring Summer.**Credits:** 3.00

ME 52500 - Combustion

Credit Hours: 3.00. Physical and chemical aspects of basic combustion phenomena. Chemical energetics and equilibrium. Basic chemical kinetics, chain reactions, and explosions. Chain and thermal ignition. Homogeneous combustion models. Detonations and deflagrations. Laminar flame speed and flame extinction. The Shvab-Zeldovich formulation of the multicomponent conservation equations. Diffusion flames and droplet combustion. Introduction to turbulent combustion. **Credits:** 3.00

ME 52600 - Spray Applications And Theory

Credit Hours: 3.00. Theory of spray formation and evolution as well as treating a host of spray applications. Topics include drop size distributions, breakup of liquid sheets and ligaments, drop formation and breakup, drop motion and the interaction between a spray and its surroundings, drop evaporation, nozzle internal fluid mechanics, external spray characteristics, nozzle performance, and experimental techniques relevant to these subjects. Applications include: (1) agricultural sprays, (2) consumer products, (3) gas turbine combustion, (4) heat transfer, (5) internal combustion engines, (6) paints and coatings, (7) pharmaceutical and medicinal sprays, and (8) spray drying. Offered in alternate years. **Credits:** 3.00

ME 52601 - Integrated Nanosystems Processes And Devices

Credit Hours: 3.00. (ECE 52601) This course covers processes and devices associated with integrated nanosystems. Integrated nanosystems refer to systems which consist of integrated micro-, meso-, and/or macro-scale parts, and their core components are realized by nano-scale materials, processes, and devices. The course, while covering processes which result in integrated nanosystems, will focus on the theory and operation of select electronic, electromechanical, and biomedical devices which are used for information technology, sensing, medical, and other applications. The lectures will be complemented by hands-on laboratory experience. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

ME 52900 - Sustainable Energy Options And Analysis

Credit Hours: 3.00. This course develops an understanding of the current energy situation and impacts of energy choices on economics and sustainability metrics. A range of different technologies and approaches are presented for meeting future energy needs. Students learn how to assess the potential for alternative energy technologies in terms of economic and sustainability metrics and gain experience in assessing different energy technologies for specific case studies. **Credits:** 3.00

ME 53100 - Characteristics Of Particles, Powders, And Compacts

Credit Hours: 3.00. Familiarize students with the properties and methods used to characterize the mechanical behavior of particles, powders, and compacts, with the intention of using these properties for process and performance design. Students work with a subset of the measurement methods in a laboratory setting. Students successfully completing the course will be able to define and describe the significant properties of particles, powders, and compacts; describe and demonstrate techniques used to measure these properties; and demonstrate how these properties are useful in product and manufacturing performance. Offered alternate years. **Credits:** 3.00

ME 53101 - Particle, Powder, And Compact Characterization

Credit Hours: 2.00. The goal of this course is to familiarize students with the properties and methods used to characterize the physical and mechanical behavior of particles, granules, and compacts with the intention of using these properties for process and performance design. **Credits:** 2.00

ME 53102 - Particle, Powder, And Compact Characterization Laboratory

Credit Hours: 1.00. The goal of this laboratory course is to train students on state-of-the-art laboratory equipment used to measure the mechanical properties of particles, granules, powders, and compacts. **Credits:** 1.00

ME 53300 - Turbomachinery II

Credit Hours: 3.00. Aerodynamic analysis and design of axial flow and radial flow gas compressors and gas turbines. Blade element performance (deflection, profile and shock losses, etc.). Meridional flow analysis for general radial equilibrium. Secondary flow and end-wall boundary layer models. Centrifugal compressor modeling. Unsteady flow, rotating stall, and surge. **Credits:** 3.00

ME 53500 - Design And Modeling Of Fluid Power Systems

Credit Hours: 3.00. Introduction to fluid power technology. Design of hydraulic systems for mobile and industrial application for functionality, cost and energy efficiency. Modeling strategies for fluid power systems. Labs and class projects are given to reinforce the design and modeling learning projects. **Credits:** 3.00

ME 53501 - Introduction To Systems Engineering

Credit Hours: 3.00. This course offers an examination of the principles of systems engineering and their application across the system life cycle. Special emphasis is given to concept exploration, requirements analysis and development, analysis of alternatives, preliminary design, integration, verification, and system validation. The students will use the international space station (on-orbit modules) for practical application of the principles introduced in this course. This is the first of two courses in systems engineering and is a prerequisite to the Systems & Specialty Engineering course. Both courses use the same text book and have a 15% overlap of the text material. Permission of instructor required. Typically offered Fall.**Credits:** 3.00

ME 53502 - Systems And Specialty Engineering

Credit Hours: 3.00. This course offers an examination of the interaction between the principles of systems engineering and the design for specialty engineering areas. The focus of their interactions is viewed across the system life cycle. Special emphasis is given to contributions of the specialties to the essential knowledge development needed for concept exploration, requirements analysis and development, trade-offs and decisions with uncertainty, preliminary design, system integration, verification, and system validation. Students will use the international space station and its support systems for practical application of the principles introduced in this course. Permission of instructor required. Typically offered Fall Spring.**Credits:** 3.00

ME 53503 - Model-Based Systems Engineering

Credit Hours: 3.00. This course focuses MBSE or Model-Based Systems Engineering (i.e. the model-based version of Systems Engineering) with an emphasis on its intelligent implementation using SysML graphical language for systems representation. The other two pillars for implementing MBSE are also covered: a methodology (OOSEM) and a tool (Cameo Systems Modeler). The coursework incorporates theoretical concepts learned in earlier systems engineering classes and is structured around the Object Modeling Group's SysML which is used in modeling systems. SysML's application to real-life projects and businesses to define, track and visualize various aspects of a system is investigated. Case studies from a variety of disciplines - including engineering and healthcare - are used as teaching tools.**Credits:** 3.00

ME 53504 - Systems Driven Product Development

Credit Hours: 3.00. Integrated Model-Based Systems Driven Product (and Process) Development, or SDPD (Systems Driven Product Development) is a methodology and framework for integrating system behavioral modeling with downstream design and manufacturing practices to plan multi-domain, complex, systems. SDPD is an implementation of MBE (Model-based Engineering) which integrates MBSE (Model-based Systems Engineering) and PLM (Product Lifecycle Management) to create the "Digital Twin" of a product/process and support the digital transformation resulting in the digital enterprise of Industry 4.0 (4th Industrial Revolution). The course covers key concepts and definitions pertaining to SDPD including MBSE, PLM, Digital Manufacturing, Digital Twin, Digital Thread, Industry 4.0, Interoperability, Traceability, Validation/Verification, Optimization, and Predictive Analytics. State-of-the-art engineering software tools are taught and used by students to design, optimize and verify multi-domain complex products (or systems) following the SDPD methodology. The graduate level project consists of a comprehensive implementation of SDPD methodology in real-life/industry relevant design and optimization of complex (multi-domain) systems.**Credits:** 3.00

ME 53800 - Air Breathing Propulsion

Credit Hours: 3.00. (AAE 53800) Analysis of operating characteristics of turbojet, turbofan, turboshaft, afterburning, and ramjet propulsion systems. Analysis and design of inlet, diffuser, combustor, compressor, turbine, and nozzle. Component matching and off-design performance. Inlet distortion, nozzle-afterbody, and installation losses. Mission analysis. **Credits:** 3.00

ME 53900 - Introduction To Scientific Machine Learning

Credit Hours: 3.00. Introduction to the fundamentals of predictive modeling for advanced undergraduates and graduate science and engineering students that work in the intersection of data and theory.**Credits:** 3.00

ME 54000 - Internal Combustion Engines

Credit Hours: 3.00. Spark-ignition and compression-ignition engine processes. Study of the fundamentals of turbulence, boundary, layers, liquid atomization, sprays, combustion, and pollutant formation as applied to engines. Engine after treatment. Modeling of engine flows, sprays, combustion, and pollutants. Offered in alternate years. **Credits:** 3.00

ME 54100 - Engineering Design: A Decision-Based Perspective

Credit Hours: 3.00. Multi-objective decision making under risk and uncertainty; Group decision making; Sequential decision making; Model-based and data-driven decision making; Heuristics and biases in design decision making. Applications to engineering design including estimation of customer preferences, simulation-based design, and sustainable design. **Credits:** 3.00

ME 54200 - Introduction To Renewable Energy

Credit Hours: 3.00. An introductory course on renewable energy. Students will learn the fundamental principles of the various renewable energy options and their applications and costs. After taking this course, students will be familiar with the economic and societal impact of renewable energy systems, and be able to participate in the design or selection of renewable energy systems. Typically offered Fall.**Credits:** 3.00

ME 54510 - Advanced Finite Element Analysis

Credit Hours: 3.00. Theory of the course covers various algorithms for linear, non-linear and time-depended problems: equilibrium, propagation, and eigenvalue problems, transient problems, Galerkin method, iterative methods. Applications of the course cover the advanced topics with problems chosen from solid mechanics, heat transfer, and fluid dynamics. Commercial FEA packages ANSYS is applied to solve various engineering problems. Permission of department required. **Credits:** 3.00

ME 54600 - CAD/CAM Theory And Advanced Applications

Credit Hours: 3.00. Theory of CAD/CAM. Geometric modeling for seamless CAD/CAM integration. Solid modeling data structure design/manipulation. CAD and CAM tools with a focus on product development integration and automation. Machining theory, automated CNC machining, and process control. CAD/CAM applications using programming languages and open architecture kernel for modeling. Projects involve CAD/CAM aspects for advanced engineering. Typically offered Fall Spring.**Credits:** 3.00

ME 54800 - Fuel Cell Science And Engineering

Credit Hours: 3.00. Fundamental principles of fuel cell science and engineering (fuel cell reactions, charge and mass transport in fuel cells, water transport management, and materials development in the fuel cells, fuel cell system designs and integrations), current state-of-the-art fuel cell technology and the current technical challenges on the development of fuel cells, codes and standards for safe handling of fuel cells. Permission of instructor required. Typically offered Fall Spring.**Credits:** 3.00

ME 55000 - Advanced Stress Analysis

Credit Hours: 3.00. Studies of stresses and strains in three-dimensional problems. Failure theories and yield criteria. Stress function approach to two-dimensional problems. Bending of nonhomogeneous asymmetric curved beams. Torsion of bars with noncircular cross sections. Energy methods. Elastic stability. Introduction to plates. Students may not receive credit for both ME 55000 and CE 57000. Typically offered Spring.**Credits:** 3.00

ME 55100 - Finite Element Analysis

Credit Hours: 3.00. An introduction to the basic principles of finite element method. Weak variational form of boundary-value problems. Finite element formulation of one- and two-dimensional boundary-value problems. Time-dependent problems. Computer implementation. Examples are chosen from heat transfer, solid mechanics, and fluid mechanics areas. Typically offered Fall.**Credits:** 3.00

ME 55200 - Advanced Applications of Finite Element Method

Credit Hours: 3.00. Various algorithms for nonlinear and time-dependent problems in two and three dimensions. Emphasis on advanced applications with problems chosen from fluid dynamics, heat transfer, and solid mechanics areas. Independent project required. Typically offered Spring.**Credits:** 3.00

ME 55300 - Product And Process Design

Credit Hours: 3.00. Fundamental principles of product and process design to produce a marketable product, develop a preliminary business strategy, and construct an operational prototype. Overview of relevant principles related to product and process design. Market analysis, design parameters, manufacturing prototype plan, production process plan, and a business strategy developed in teams. Broad overview of the entire product development process, including patents, commercialization of new technologies, and the highly interdisciplinary nature of product design through industry guest lectures. Impact of information technologies and the Internet on product design, prototyping, marketing, and customization. Product prototype is required. Design and product software information technology service-type concepts. Permission of instructor required. **Credits:** 3.00

ME 55400 - Intellectual Property For Engineers

Credit Hours: 1.00. Survey of the law of patents, trade secrets, trademarks, and copyrights, with special emphasis on the process of defining inventions broadly and diversely. Obtaining, registering, licensing, and litigation of intellectual property. **Credits:** 1.00

ME 55401 - Design For IP Protection And Commercialization

Credit Hours: 3.00. Present topics of intellectual property (IP) such as copyright, trademark, and trade secret, topics directed to patents including a through introduction to subject matter eligibility, novelty, and non-obviousness as well as topics related to enablement and written description requirements of a patent and how each of these concepts can affect design choices. Learn how to navigate patent databases. Develop patentable designs, as well as designs that do not infringe on existing IP. Learn about technology commercialization from an IP perspective.**Credits:** 3.00

ME 55600 - Lubrication, Friction & Wear

Credit Hours: 3.00. Science, technology, and application of lubricated interacting surfaces in relative motion. Advanced analysis techniques and hands-on exposure to modern experimental methods provide an enhanced understanding of fundamental principles of lubrication, friction, and wear. Basics of design and analysis of machine components operating in the presence of air and liquid lubricants. Rolling fatigue, friction and wear models, and measurement techniques. Offered in alternate years. **Credits:** 3.00

ME 55700 - Design For Manufacturability

Credit Hours: 3.00. Introduction to manufacturing concerns, such as efficient design, producibility, and quality, which must be considered early in the engineering design process. Topics include the product development cycle, manufacturing process selection, tolerancing, quality function deployment (QFD), design for assembly (DFA), quality control techniques, Taguchi's robust design methodology, life cycle engineering, and reliability. Laboratory projects in the area of tolerancing, assembly, and manufacturability are included along with a project from industry in which the students can disassemble, analyze, and redesign a product while obtaining feedback from industry concerning manufacturability. **Credits:** 3.00

ME 55800 - Composite Materials

Credit Hours: 3.00. Portential applications of composite materials. Basic concepts of fiber reinforced composites. Manufacturing, micro- and macro-mechanics, and static analysis of composite laminates. Performance (fatigue and fracture) and their application to engineering design. Typically offered Fall Spring.**Credits:** 3.00

ME 55801 - Composite Materials For Automotive Applications

Credit Hours: 3.00. This course focuses on development of low-cost carbon fiber for automotive applications, mechanical properties of advanced pore morphology foam composites, automotive composite structures for crashworthiness, crashworthiness analysis of composite, hybrid structures consisting of sheet metal and fiber reinforced plastics for structural automotive and design solutions to improve crash-box impact efficiency for racing applications.**Credits:** 3.00

ME 55802 - Design And Analysis Of Materials And Structures In Lightweight Vehicles

Credit Hours: 3.00. This course focuses on materials, their properties, processing technology and design and materials selection issues pertinent to designing lightweight vehicles. It will provide first-hand knowledge and experience of working with these advanced materials. It starts with a broad review of the materials scenario and design considerations for lightweight automotive structures. It is then divided into to major parts: materials, and design and manufacturing.**Credits:** 3.00

ME 55900 - Micromechanics Of Materials

Credit Hours: 3.00. Prediction of the macroscopie behavior of materials from their microstructure and the design of new materials. Microstructure-property relationships between the macroscopie material behavior and microscopic structure. Application to traditional structure as well as to new engineering materials. Adapting emerging constitutive relations into structure analyses. Introduction of this new approach to materials, its applications in predictive analysis tools, and its importance in simulation-based engineering. **Credits:** 3.00

ME 56000 - Kinematics

Credit Hours: 3.00. Geometry of constrained plane motion with applications to linkage design. Type and number synthesis, size synthesis. Path curvature, inflection circle, cubic of stationary curvature. Finite displacements, three and four separated positions. Graphical, analytical, and computer techniques.**Credits:** 3.00

ME 56200 - Advanced Dynamics

Credit Hours: 3.00. Dynamics of multi-degrees-of-freedom mechanical systems. Holonomic and nonholonomic constraints. Lagrange's equations of motion. Hamilton's principle for holonomic systems. Kinematics and kinetics of rigid body motion, including momentum and energy methods. Linearized equations of motion. Classification of vibratory systems - gyroscopic, circulatory forces. Stability of linear systems - divergence and flutter. Applications to gyroscopes, satellite dynamics, etc. Typically offered Spring.**Credits:** 3.00

ME 56300 - Mechanical Vibrations

Credit Hours: 3.00. Review of systems with one degree for freedom. LaGrange's equations of motion for multiple degree of freedom systems. Introduction to matrix methods. Transfer functions for harmonic response, impulse response, and step response. Convolution integrals for response to arbitrary inputs. Principle frequencies and modes. Applications to critical speeds, measuring instruments, isolation, torsional systems. Introduction to nonlinear problems. **Credits:** 3.00

ME 56500 - Vehicle Dynamics

Credit Hours: 3.00. Modeling of wheeled vehicles to predict performance, handling, and ride. Effects of vehicle center of mass, tire characteristics, traction and slip, engine characteristics, and gear ratios on performance. Suspension design. Steady state and transient handling models of four-wheeled vehicles and car-trailer systems to determine oversteer and understeer characteristics, critical speeds, and stability. Multi-degree-of-freedom ride models, including tire and suspension compliance. Computer simulations. Current research topics in vehicle vibration isolation.**Credits:** 3.00

ME 56802 - Ceramic Materials

Credit Hours: 3.00. Fundamental concepts of ceramic materials. Atomic structure, bonding the transport of charged defects and their relationships to conductivity in ceramics, phase diagrams and glasses. Solid state processes, including sintering and grain growth. Physical properties including mechanical, thermal, magnetic, dielectric, and optical properties. Application to energy and biomedical applications. Typically offered Fall Spring Summer.**Credits:** 3.00

ME 56900 - Mechanical Behavior Of Materials

Credit Hours: 3.00. A study of load and environmental conditions that influence the behavior of materials in service. Elastic and plastic behavior, fracture, fatigue, low and high temperature behavior. Fracture mechanics. Failure analysis case studies emphasis on design.**Credits:** 3.00

ME 57000 - Machine Design

Credit Hours: 3.00. Analysis of stresses and deflections due to complicated loading. Investigation of specific design problems through application of theory of elasticity, failure criteria, energy approach, and numerical methods. Individual design project. Typically offered Fall.**Credits:** 3.00

ME 57100 - Reliability Based Design

Credit Hours: 3.00. Basic concepts of probability and random variables. Time-dependent reliability models. Strength-based reliability and interference theory. Weakest-link and fail-safe systems. Extremal distributions. Monte Carlo methods. Maintainability and availability. Fault tree analysis. Quality control and reliability. Offered in alternate years. **Credits:** 3.00

ME 57101 - Probabilistic Engineering Design

Credit Hours: 3.00. This course presents probabilistic methodologies for engineering design under uncertainty. It is intended for students who are interested in statistical/probabilistic methods for engineering analysis and design. The outcomes of the course are 1) an ability to model uncertainties in engineering applications, 2) an ability to performance basic statistics, risk, and reliability analyses, and 3) an ability to integrate probabilistic design with simulations, optimization, Design for Six Sigma, and Design of Experiments. The course is lecture and project based.**Credits:** 3.00

ME 57200 - Analysis And Design Of Robotic Manipulators

Credit Hours: 3.00. Introduction to the analysis and design of robotic manipulators. Topics include: kinematic configurations, forward and inverse position solution, velocity and acceleration, path planning, workspace analysis, force and torque solutions, rigid body dynamics, motors and actuators, robot design, sensors and controls, computer simulation, and graphical animation. **Credits:** 3.00

ME 57201 - Analysis And Design Of Robotic Manipulators

Credit Hours: 3.00. The basic components of robotic systems; selection of coordinate frames; homogeneous transformations; solutions to kinematics of manipulator arms; velocity and force-torque relations; dynamic equations using Euler-Lagrange

formulation; motion planning; obstacle avoidance; controller design using torque method; and classical controllers for manipulators. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

ME 57301 - Air Pollution And Emission Control

Credit Hours: 3.00. This course is designed to integrate the real-world problem solving experience into the course curriculum through project / lab environment. Students will study the air pollution sources and fundamental mechanisms of their impact on the environment and human health, and how automotive emission can be measured and controlled. In particular, measurement of particulate emission deposited in a diesel particulate filter will be studied. Here the students will have a chance to optimally design the sensor components. The course topics are chosen in this context so that they align with the local industry / lab well. Topics in emission control technologies, including sensors, control mechanisms, remedial systems will be taught and combined into the course projects that students will complete over the course of a semester. Typically offered Fall Spring Summer.**Credits:** 3.00

ME 57401 - Additive Manufacturing

Credit Hours: 3.00. During this course, students evaluate the engineering aspects and physical principles of available AM technologies (binder and material jetting, sheet lamination, vat photopolymerization, directed energy deposition, powder bed fusion, and material extrusion technologies) as well as these technologies' most relevant applications and criteria in order to successfully select the AM technology that is best suited for the embodiment of a particular design (material compatibility, interface issues, strength requirements). The topics of this course are grouped into three modules: (1) AM Technologies (2) Design for AM (3) AM Process Planning. During the first module (50% of the course), the historical development of AM is examined and then the underlying physical principles of current AM technologies are evaluated. The second module (25% of the course) focuses on investigating the mathematical principles and technical aspects of design optimization methods for AM (including topology optimization). The third module (25% of the course) incorporates product evaluation (mechanical properties and dimensional accuracy), process optimization, and applications. Students taking this course will create original products using CAD/CAE systems and topology optimization tools. Students will hone skills on image post-processing, segmentation, vectorization, and generation of STL files. Students also will execute tasks using several 3D printers and manipulate different AM technologies including material extrusion, vat photopolymerization, and powder-bed fusion. They will also have the opportunity to visit local industries in the areas of manufacturing, design, and materials.**Credits:** 3.00

ME 57500 - Theory And Design Of Control Systems

Credit Hours: 3.00. Covers the analysis and design of control systems from both a classical and modern viewpoint, with emphasis on design of controllers. Classical control design is reviewed, including both root locus and Bode domain design methodologies. The state space representation is introduced, along with notions of stability, controllability, and observability. State feedback controllers for pole placement and state observers are discussed with emphasis in their frequency domain implications. **Credits:** 3.00

ME 57600 - Computer Control Of Manufacturing Processes

Credit Hours: 3.00. Fundamental elements for manufacturing process control are presented with advanced control theories, modeling and analysis of actuators, controller architecture, interfacing and programming. Emphasis is on computer integrated manufacturing with computer numerical control of machine tools, automation via programmable logic controllers, motion control, process control examples, and manufacturing process monitoring. Hands-on experience is attained through laboratory experiments with state-of-the-art equipment. **Credits:** 3.00

ME 57700 - Human Motion Kinetics

Credit Hours: 3.00. Study of kinetics related to human motion. Review of human anatomy and anthropometric data. Planar and three-dimensional kinematic analysis of gross human motion. Detailed kinematic studies of human joints. Newton-Euler and

Lagrangian methods for joint torques. Muscle force and power analysis. Studies on walking, jumping, cycling, and throwing exercises. **Credits:** 3.00

ME 57800 - Digital Control

Credit Hours: 3.00. Introduction to, and overview of, the field of digital control. Prior knowledge of continuous control techniques is assumed. Topics include mathematical background from residue theory through integral transforms; sampled data systems, including A/D, D/A, and hold properties, aliasing, and Z transforms. Digital control design via continuous, discrete, and state space design techniques. Implementation considerations, including nonlinear effects. Mechanical engineering examples. **Credits:** 3.00

ME 57900 - Fourier Methods In Digital Signal Processing

Credit Hours: 3.00. Fundamentals of signal processing associated with Fourier analyzer systems are presented. Emphasis is on amplitude accuracy and frequency resolution properties necessary for reliable experimental methodologies in system identification, spectrum estimation, and correlation analysis. Deterministic, as well as random, data analyses are presented. Students are required to develop algorithms that significantly expand the utility of Fourier analyzer systems. **Credits:** 3.00

ME 58000 - Nonlinear Engineering Systems

Credit Hours: 3.00. Methods of analysis for nonlinear ordinary differential equations arising in engineering systems. Review of linear systems. Stability concepts. Phase plane methods. Perturbation and averaging methods of analysis. Self-excited and parametrically-excited systems. Relaxation oscillations. Systems with more than one degree of freedom. **Credits:** 3.00

ME 58100 - Numerical Methods In Mechanical Engineering

Credit Hours: 3.00. The solution of problems arising in mechanical engineering using numerical methods. Topics include nonlinear algebraic equations, sets of linear algebraic equations, eigenvalue problems, interpolation, curve fitting, ordinary differential equations, and partial differential equations. Applications include fluid mechanics, gas dynamics, heat and mass transfer, thermodynamics, vibrations, automatic control systems, kinematics, and design. **Credits:** 3.00

ME 58400 - System Identification

Credit Hours: 3.00. Theory and application of System Identification methods. Connecting the world of mathematical models to experimental data - least squares methods and difference equation models. Background in probability and analysis: algebra of random variables, law of large numbers, central limit theorem. The ARMA family of models; mapping physics models to generalized ARMAX forms (linear and nonlinear); mapping the parameter estimation problem to the least squares problem (batch and recursive), and numerical solution techniques. Model (in)validation, optimal identification criteria, experiment design and data preprocessing considerations. Issues of signal-to-noise ratio, persistency of excitation, sampling frequency, data accuracy and data sizes. **Credits:** 3.00

ME 58600 - Microprocessors In Electromechanical Systems

Credit Hours: 3.00. Architecture of microcomputers; operating systems, logic functions, logic circuit design; I/O structure and interfacing; assembly language, manual assembly; software and hardware interrupts; data acquisition, serial and parallel communications; the role of high-level languages. Laboratory experiments on applications to electrical, mechanical, and thermofluid systems. **Credits:** 3.00

ME 58700 - Engineering Optics

Credit Hours: 3.00. Fundamentals of geometrical and physical optics as related to problems in engineering design and research. Characteristics of imaging systems; properties of light sources; optical properties of materials. Diffraction, interference, polarization, and scattering phenomena as related to optical measurement techniques. Introduction to lasers and holography. (Laboratory work can be undertaken for additional credit by special arrangement.). **Credits:** 3.00

ME 58800 - Mechatronics - Integrated Design Of Electro-Mechanical Systems

Credit Hours: 3.00. Electronic and interfacing techniques for design and control of electro-mechanical systems. Basic digital and analog design with applications to electro-mechanical interfacing via hands-on laboratory experience. Commonly used actuators and sensors and corresponding interfacing techniques. Realistic and integrated product development experience provided through a comprehensive final project where working prototypes are built to defined specifications. **Credits:** 3.00

ME 58901 - Optimal Design Of Mechatronic Systems: Robots And Interactive Structures

Credit Hours: 3.00. This course will introduce the fundamentals of transformation of knowledge from art/design to engineering/technology applications. Different variant forms of free form design, in relation to various structural topologies common in engineering and technology applications and related optimization techniques will be discussed. This course will utilize the epistemology of studio practice implicit in the artistic process in order to acquire embodied knowledge. Reasoning innovative process can be taught through the crafting of mechanical structures while experiencing bodily interactions with the nature of materials and tools. Thus, this course introduces a range of design principles and critical studio practice methodologies while working with a range of variable materials and aims to help students grow in their creative thinking. It will integrate mechatronic modeling / simulation, optimal design, and hands-on fabrication of robotic systems (sensors, actuators, electric circuits, and embedded controllers) and interactive structures in a makerspace environment. Permission of instructor required. Typically offered Fall Spring Summer.**Credits:** 3.00

ME 59100 - Mechanical Engineering Project

Credit Hours: 1.00 to 3.00. Individual advanced study in various fields of mechanical engineering. May be repeated for up to 6 credit hours. Students registered for this course must have weekly meeting with the instructor for at least an hour. Permission of department required.**Credits:** 1.00 to 3.00

ME 59500 - Special-Topic Minicourses

Credit Hours: 1.00. A series of one-credit-hour courses on special topics offered as ME 59500, 59500, etc. These special-topic minicourses will provide an opportunity for introducing students to topics of contemporary importance or special interest that fall outside the scope of the curriculum. Information about current offerings may be obtained from the schedule of classes or the mechanical engineering registration deputy. **Credits:** 1.00

ME 59700 - Advanced Mechanical Engineering Projects I

Credit Hours: 0.00 to 6.00. Projects or special topics of contemporary importance or of special interest that are outside the scope of the standard graduate curriculum can be studied under the Mechanical Engineering Projects course. Interested students should seek a faculty advisor by meeting with individual faculty members who work in their area of special interest and prepare a brief description of the work to be undertaken in cooperation with their advisor. Permission of instructor required. **Credits:** 0.00 to 6.00

ME 59999 - PMP Professional Development

Credit Hours: 1.00 to 3.00. Projects or special topics in professional development as it relates to ME. Permission of department required.**Credits:** 1.00

ME 60101 - Computational Modeling Of Turbulence

Credit Hours: 3.00. This course consists of three parts. The first part is on the fundamentals of turbulence inlcuding turbulence concepts, statistical description, and Kolmogorov hypothesis. The second part covers major practical modeling concepts and formulations such as direct numerical simulation (DNS), large eddy numercial simulation (LES), and Reynolds averaged Navier-stokes simulation (RANS). The third part is team project related to turbulence computation with applications in environment, industry, biomechanics for visualizing and experiencing turbulence. Prerequisite: Intermediate Fluid Mechanics (ME 50900) or consent of instructor. Typically offered Fall Spring.**Credits:** 3.00

ME 60500 - Convection Of Heat And Mass

Credit Hours: 3.00. Heat and mass transfer in moving fluid media; free, forced, and mixed convection for internal and external flows; differential and integral treatments of boundary layer problems; convection analogies for heat, mass, and momentum transfer; combined heat and mass transfer with chemical reactions; special topics and applications to electronic cooling, materials processing, transpiration and film cooling. Prerequisite: ME 31500. **Credits:** 3.00

ME 60600 - Radiation Heat Transfer

Credit Hours: 3.00. Thermodynamics and physics of radiation and its interaction with interfaces and matter; radiation characteristics of surfaces and radiation properties of solids, liquids, and gases; analysis of radiation exchange between real and idealized surfaces; fundamentals of radiation transfer in absorbing, emitting, and scattering media; interaction of radiation with conduction and convection; remote temperature sensing and applications to selected problems involving combined energy transfer mechanisms. Offered in alternate years. Prerequisite: ME 31500. **Credits:** 3.00

ME 60601 - Optimal Design Of Complex Mechanical Systems

Credit Hours: 3.00. The objective of this research course is to prepare students to address mechanical systems design and innovation challenges through appropriate advanced optimal design methodologies. This course will focus on current design approaches, which are rapidly expanding in research and industrial applications, but are not commonly included in engineering curricula. The course also focuses on the theoretical aspects of multi-objective optimization, global approximation methods (metamodel-based optimization), and applications in mechanical engineering systems. Students of this research course will acquire an understanding of state-of-the-art analysis and optimization tools through hands-on experience and the involvement in research projects. The research experiential learning will prepare students to design innovative mechanical systems and to increase their problem solving capabilities through the use of effective design methodologies. Pre-requisite or co-requisite: ME 50601. Permission of instructor required. Typically offered Fall Spring.**Credits:** 3.00

ME 60800 - Numerical Methods In Heat, Mass, And Momentum Transfer

Credit Hours: 3.00. Governing conservation equations and their classification according to numerical properties. Discretization by Taylor series, weighted residual, and control volume methods. Solution of systems of algebraic equations. Discretization and solution of the convection-diffusion equation. Methods of solving the equations governing fluid flow. Mathematical modeling of turbulence, combustion, and radiation. Prerequisite: ME 50500, ME 58100. **Credits:** 3.00

ME 61000 - Boundary Layer Theory

Credit Hours: 3.00. Fundamentals of continuum fluid mechanics; Navier-Stokes equations. Laminar flow; boundary-layer concept; similarity solutions; transformation methods; integral and finite difference solution techniques for general pressure gradients. Should be preceded by intermediate fluid mechanics. **Credits:** 3.00

ME 61100 - Principles Of Turbulence

Credit Hours: 3.00. Methods of description and basic equations for turbulent flows. Isotropic and homogeneous turbulence, energy spectra, and correlations. Introduction to measurements. Transition theory and experimental evidence. Wall turbulence, engineering calculations of turbulent boundary layers. Free turbulent jets and wakes. Prerequisite: ME 61000. **Credits:** 3.00

ME 61200 - Continuum Mechanics

Credit Hours: 3.00. A unified and exact mathematical treatment of the mechanics of solids and fluids. Cartesian tensor algebra and calculus; stress tensor, principle stresses and invariants; material and spatial coordinates, deformation gradient, strain and stretch tensors; balance of mass, momentum, and energy; constitutive equations of elasticity, hyperelasticity, viscous fluids and viscoelasticity. **Credits:** 3.00

ME 61201 - Continuum Mechanics

Credit Hours: 3.00. This course will cover the formal, consistent and unified mathematical treatment of the mechanics of continuous solids and fluids. Topics covered include the kinematics of deformation, the concept of stress, and the conservation laws for mass, momentum and energy. This is followed by an introduction to constitutive theory with applications to well-established models for viscous fluids and elastic solids. The concepts are illustrated through the solution of tractable initial boundary-value problems.**Credits:** 3.00

ME 61300 - Advanced Engineering Acoustics

Credit Hours: 3.00. An extension of ME 51300. Sound transmission between two media. Acoustic resonators and application to muffler theory. Structural radiation and sound. Acoustical measurements and signal processing: sound intensity, surface intensity, coherence and cepstral techniques. Numerical acoustics: finite element analysis, boundary integral equation analysis and statistical energy analysis. Advanced topics. Prerequisite: ME 51300. **Credits:** 3.00

ME 61400 - Computational Fluid Dynamics

Credit Hours: 3.00. Application of finite difference methods, finite element methods, and the method of characteristics for the numerical solution of fluid dynamics problems. Incompressible viscous flows: vorticity transport equation, stream function equation, and boundary conditions. Compressible flows: treatment of shocks, implicit and explicit artificial viscosity techniques, and boundary conditions. Computational grids. Prerequisite: ME 50900 or ME 58100. **Credits:** 3.00

ME 61500 - Aeroacoustics

Credit Hours: 3.00. (AAE 61500) Quantitative measures of sound (decibel scales, spectra, energetics of acoustic motions, and measurement techniques). The wave theory of sound (basic equations and properties, sound propagation in homogeneous and inhomogeneous media, one-, two- and three-dimensional sound fields and distributed sources). Effects of source movement. Aerodynamic noise generation - acoustic analogy (Lighthill's equation and Ffowcs Williams-Hawkings equation). Introduction to Computational Aeroacoustics (CAA). Noise from turbulent shear flows (jet noise, cavity noise, and noise from flow over objects). Noise from turbomachinery, propellers, and rotors. Prerequisite: ME 30900 or ME 51300 or AAE 51100. **Credits:** 3.00

ME 61700 - Applied Thermal Physics And Molecular Spectroscopy

Credit Hours: 3.00. The fundamentals of statistical mechanics, kinetic theory, and molecular spectroscopy will be taught in order to predict and characterize the behavior of non-equilibrium gases using optical and laser diagnostics. This material will be taught within the context of applications involving combustion, plasmas, propulsion, energetic materials, shock waves and laser radiation. Pre-requisite: Thermodynamics I, ME 20000 or Heat Transfer 1, ME 31500 or Chemistry 1, CHM 12500. **Credits:** 3.00

ME 62000 - Combustion Of Energetic Materials

Credit Hours: 3.00. Students will learn the concepts of how to approach research in the area of Energetic Materials (EM) based on an understanding of the fundamental principles. Students will learn how energetic materials are fabricated, safety used, as well as understand life cycle issues, homogeneous & heterogenous combustion, and advanced energetic material concepts. Multiphase combustion phenomena will be introduced and emphasized. They will apply these concepts to a literature review and group research project, as well as that includes applying thermochemistry and chemical kinetic software. In addition, six hands-on labs are performed. This material will be covered in the context of real-world applications, with an emphasis on energetic materials, combustion, propulsion, explosives, pyrotechnics, and detonation phenomenon. Pre-requisite: ME 52500 or AAE 53900 or consent of instructor. **Credits:** 3.00

ME 62500 - Advanced Combustion

Credit Hours: 3.00. Coupling of the energy, species, and mass conservation equations with the momentum equation. Statistical treatment of turbulence and the problems of interactions of turbulence with chemistry, radiation, and two-phase flows. Critical study of at least 10 seminal and recent contributions in the combustion literature. Offered in alternate years. Prerequisite: ME 52500. **Credits:** 3.00

ME 64000 - Structural Acoustics

Credit Hours: 3.00. Waves in fluids and structures, dispersion relations, sound radiation from structures, radiation efficiency, radiation from concentrated forces, effect of fluid loading on wave propagation, transmission of sound through barriers, effect of panel lining, enclosures, acoustically induced vibration of structures and numerical calculation of fluid-structure interaction. Offered in alternate years. Prerequisite: ME 51300, ME 56300. **Credits:** 3.00

ME 65000 - Computational Fracture Mechanics

Credit Hours: 3.00. Advanced concepts of methods for the analysis of cracks, of crack propagation and damage evolution. Prediction of the macroscopic behavior of structures as it emerges from the presence of defects such as cracks, voids, or delamination. Linear elastic and nonlinear fracture problems. Rate independent and rate dependent problems. Methods in computational fracture mechanics where material separation emerges as an outcome of the boundary value problem. Demonstrations of how mechanical design can take advantage of the methods of computational fracture mechanics by introducing such concepts into structural analyses. Applications of computations in predictive analysis and its importance in simulation-based engineering. Prerequisites: AAE 55800 or ME 48900, or similar courses in finite element analysis or ME 57000 or ME 61200 or AAE 55300, or similar courses on advanced solid mechanics. Recommended but not required: CEE 597-109 or AAE 65400. **Credits:** 3.00

ME 65100 - Advanced Finite Element Method For Solids

Credit Hours: 3.00. This course is designed to teach students advanced finite element techniques for solid mechanics stress and heat transfer analysis. Those include: techniques for modeling beams, plates and 2D/3D continua with material non-linearity, material plasticity and geometric non-linearity; heat transfer; modeling thermos-mechanical systems; frequency domain, time domain and quasi-static solutions; modeling of frictional contact; modeling rigid-bodies. Applications of the modeling techniques taught in this course will be introduced, including: modal analysis; stress-analysis with material and geometric non-linearity; structural dynamics with material and geometric non-linearity; frictional contact problems; metal forming and crash analysis. Prerequisites: ME 55100 and ME 58100. Graduate Standing. Permission of instruction required. Typically offered Spring.**Credits:** 3.00

ME 65500 - Computational Mechanics Of Materials

Credit Hours: 3.00. Prediction of the mechanical behaviors of engineering materials employing computational methods, at atomistic, discrete, and continuum levels. Continuum and discrete models for material deformation in brittle and ductile materials. Atomistic models for fracture in nanomaterials. Applications to engineering structures on the macro-micro and nanoscale.**Credits:** 3.00

ME 66400 - Vibrations Of Continuous Systems

Credit Hours: 3.00. Theory of small oscillations of continuous systems. Love's equations for thin shells, reduction to special cases of shallow shells, plates, beams, etc. Initial stresses; influence of shear; thermal excitation. Initial value problems; forced vibrations; structural damping. The dynamic Green's function, impedance concepts; variational approaches. Experimental procedures, scaling, composite, and stiffened shells. Prerequisite: knowledge of one degree of freedom system vibrations. **Credits:** 3.00

ME 67500 - Multivariable Control System Designs

Credit Hours: 3.00. Fundamentals of the frequency response loop shaping methodology for the analysis and design of robust multivariable control systems will be presented. Emphasis is on suitable extensions of the classical Bode-Nyquist design techniques to systems with not only uncertain parameters but also multiple inputs and outputs. Instrument and environmental signal level constraints on the performance of control systems will be critically evaluated. Students are required to develop ability to handle open-ended design issues involving significant multiobjective performance trade-offs. Prerequisite: ME 57500. **Credits:** 3.00

ME 67700 - Nonlinear Feedback Controller Design

Credit Hours: 3.00. Controller design and analysis of nonlinear feedback systems. Topics include the design of linear/nonlinear feedback controllers. Describing Function (DF) techniques for design, Popov and Generalized Circle Criterion for closed-loop stability, functional analysis and Volterra series approaches, and introduction to existing nonlinear controller design tools. Offered in alternate years. Prerequisite: ME 67500. **Credits:** 3.00

ME 68000 - Bifurcations And Chaos

Credit Hours: 3.00. Basic concepts in stability of systems, nonlinear dynamical systems, and bifurcation theory. Algebraic and geometric techniques for local bifurcation analysis. Models governed by difference, ordinary, and particle differential equations. Examples from mechanical, structural, chemical, and electrical systems. Models of chaotic behavior. Techniques for prediction of chaos. Routes to chaos. Offered in alternate years. Prerequisite: ME 58000. **Credits:** 3.00

ME 68100 - Finite And Boundary Element Methods

Credit Hours: 3.00. The solution of problems in mechanical engineering using the generalized numerical techniques; the finite element method and the boundary element method. Topics include reformulation of partial differential equations into appropriate form for each method. The development and implementation of code and solution of problems. Applications include: acoustics, fluid dynamics, heat transfer, design, mechanics and biomechanics. Prerequisite: ME 58100. **Credits:** 3.00

ME 68700 - Laser Diagnostics For Reacting Flows

Credit Hours: 3.00. The principles of spectroscopic laser diagnostics including absorption, fluorescence, and Raman scattering techniques. Theory of the interaction of laser radiation with atomic and molecular resonances. Lasers and detectors for optical diagnostics. Offered in alternate years. Prerequisite: ME 50100. **Credits:** 3.00

ME 68900 - Adaptive Control

Credit Hours: 3.00. Theory and application of adaptive control of linear systems in both continuous and discrete time domain. Real-time parameter estimation algorithms, direct and indirect adaptive methods, deterministic self-tuning regulators, Lyapunov stability theory, input-output stability, model-reference adaptive control, stability and convergence of adaptive algorithms, robustness, and implementation issues, with laboratory experiments and demonstrations. Offered in alternate years. Prerequisite: ME 57500. **Credits:** 3.00

ME 69000 - Individual Study In Mechanical Engineering

Credit Hours: 0.00 to 18.00. Individual study in advanced areas not currently available through formal course offerings within the University. Course plan must be approved by professor in charge prior to registering for the course. Written report and presentation of a departmental seminar based on material studied are required at the end of the semester. Permission of instructor required. **Credits:** 0.00 to 18.00

ME 69100 - Mechanical Engineering Graduate Seminar

Credit Hours: 0.00. Acquaint graduate students with a broad spectrum of research in various areas of mechanical engineering. Weekly seminars by invitees/researchers from academia, national labs, or industry. Seminar topics provide a mix of subjects, areas and disciplines, and can involve considerable technical depth, a broad overview and/or historical perspectives. **Credits:** 0.00

ME 69600 - Advanced Professional Internship

Credit Hours: 0.00. Advanced professional experience in mechanical engineering. The program is coordinated by the school with cooperation of participating employers. Students submit a summary report. Prerequisite: Master's student standing. **Credits:** 0.00

ME 69700 - Advanced Mechanical Engineering Projects II

Credit Hours: 1.00 to 6.00. Projects or special topics of contemporary importance or of special interest that are outside the scope of the standard graduate curriculum can be studied under the Mechanical Engineering Projects course. Interested students should seek a faculty advisor by meeting with individual faculty members who work in their area of special interest and prepare a brief description of the work to be undertaken in cooperation with their advisor. Prerequisite: Doctoral student standing. Permission of instructor required. **Credits:** 1.00 to 6.00

ME 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

ME 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Mechanical Engineering Technology

MET 09000 - Industrial Applications Of Mechanical Engineering Technology

Credit Hours: 1.00 to 3.00. This course includes specialized topics, skills, and applied problem-solving associated with mechanical engineering technology. The level of coverage varies according to the audience. Varied topics may be offered under this title. Does not carry credit toward degree requirements in Mechanical Engineering Technology. **Credits:** 1.00 to 3.00

MET 10200 - Production Design And Specifications

Credit Hours: 3.00. The design, evaluation, and documentation of engineering specifications required of manufacturability and assembly are introduced. Emphasis is on CAD-based details, assemblies, design layouts, equipment installations, and related industrial practices.**Credits:** 3.00

MET 11100 - Applied Statics

Credit Hours: 3.00. Force systems, resultants and equilibrium, trusses, frames, beams, and shear and moments in beams are studied. Typically offered Fall Spring Summer.**Credits:** 3.00

MET 11300 - Mechanics Applications

Credit Hours: 1.00. Concepts of mechanics are applied to structures, machine components, and frames. Stresses and deformations resulting from axial, shear, torsional, and flexural loads are considered. Kinematics and kinetics of motion are introduced. **Credits:** 1.00

MET 14300 - Materials And Processes I

Credit Hours: 3.00. An overview of structures, properties, processing, and applications of metals and ceramics commonly used in industry is presented. Problem solving skills are developed in the areas of materials selection, evaluation, measurement, and testing. **Credits:** 3.00

MET 14400 - Materials And Processes II

Credit Hours: 3.00. An overview of structures, properties, processing, and applications of polymers, composites, laminates, biomaterials, green materials, nanomaterials, and pharmaceuticals commonly used in industry is presented. Problem solving skills are developed in the areas of material selection, evaluation, measurement, and testing. **Credits:** 3.00

MET 16000 - Analytical And Computational Tools In MET

Credit Hours: 3.00. The skills needed to solve technical problems in mechanical engineering technology are developed. Instruction is given in analytical and computational problem-solving techniques. The electronic calculator, the factor-label method of unit conversions, engineering graphs, and the computer are used to solve problems. Computer emphasis is on spreadsheet analysis, graphics, and generation of technical reports through the integrated use of software packages. Credit will not be granted for MET 16000 and MET 16200 or MET 16300. Typically offered Fall Spring.**Credits:** 3.00

MET 16200 - Computational Analysis Tools In MET

Credit Hours: 1.00. Instruction is given in analytical and computational problem-solving techniques. The electronic calculator, the factor-label method of unit conversions, and engineering graphs are used to solve technical problems in mechanical engineering technology. Credit will not be granted for both MET 16000 and 16200. **Credits:** 1.00

MET 16400 - Computing In Engineering Technology

Credit Hours: 3.00. Fundamental programming concepts are introduced using an interpreted high level programming language. Programming topics such as variable types, arrays, input/output tasks, and conditional and repetition executions will be applied to address technical problems seen in the first two years of engineering technology curricula. **Credits:** 3.00

MET 20400 - Production Drawing

Credit Hours: 3.00. Application of principles of engineering drawing to design layout, detail, and assembly. A 2D PC CAD-centered laboratory. Typically offered Fall Spring Summer.**Credits:** 3.00

MET 21100 - Applied Strength Of Materials

Credit Hours: 4.00. The principles of strength, stiffness, and stability are introduced and applied primarily to mechanical components. **Credits:** 4.00

MET 21102 - Applied Strength Materials Lab

Credit Hours: 1.00. This laboratory course focuses on testing of materials to determine their physical and mechanical properties. Students will verify physical testing through computer analysis using appropriate computer application and prepare reports from data secured from such tests and analysis.**Credits:** 1.00

MET 21300 - Dynamics

Credit Hours: 3.00. Kinematics and kinetics principles of rigid-body dynamics are introduced. Emphasis is on the analysis of bodies in plane motion. **Credits:** 3.00

MET 21400 - Machine Elements

Credit Hours: 3.00. The methods developed in statics, dynamics, and strength of materials are applied to the selection of basic machine components. The fundamental principles required for the selection of individual elements that compose a machine are developed. Selected course topics are included as computer exercises. **Credits:** 3.00

MET 22000 - Heat And Power

Credit Hours: 3.00. Heat/Power is an introduction to the principles of thermodynamics and heat transfer. Basic thermodynamic processes are used to evaluate the performance of energy-based systems such as internal combustion engines, power plants, and refrigeration equipment.**Credits:** 3.00

MET 22010 - Heat-Power Laboratory

Credit Hours: 1.00. Laboratory course that introduces the principles of thermodynamics and heat transfer through energy systems. Permission of department required. **Credits:** 1.00

MET 23000 - Fluid Power

Credit Hours: 3.00. This course consists of the study of compressible and incompressible fluid statics and dynamics as applied to hydraulic and pneumatic pumps, motors, transmissions, and controls. **Credits:** 3.00

MET 24500 - Manufacturing Systems

Credit Hours: 3.00. This course surveys the manufacturing processes and tools commonly used to convert cast and molded, formed, and joined materials into finished products. It includes the fundamentals of material removal, measurement, statistical quality control, assembly processes, process planning and optimization, CNC programming and automated manufacturing. Typically offered Fall Spring Summer.**Credits:** 3.00

MET 27300 - Study Abroad For Innovators

Credit Hours: 3.00. Students will learn the rich history of inventions and technologies of the country, from early ages to the present. An Engineering Challenge activity provides students an opportunity to design and build a product. Students also learn and experience culture including arts, sports and sporting events, food and drinks, and politics. Lectures and field visits are required. Permission of department required. Permission of instructor required. **Credits:** 3.00

MET 28400 - Introduction To Industrial Controls

Credit Hours: 3.00. This course examines the concepts, devices, and common practices associated with modern industrial control systems. Common industrial control devices are studied. Students learn how to wire, program, and troubleshoot programmable logic controller (PLC) based control systems. PLC applications focus on interfacing and controlling a variety of electromechanical devices such as motors and pneumatic actuators. Industrial safety practices and procedures are emphasized throughout the course. **Credits:** 3.00

MET 29000 - Special Topics In MET

Credit Hours: 1.00 to 3.00. Hours, subject matter, and credit to be arranged by faculty. Group instruction in new or specialty areas of Mechanical Engineering Technology is provided by MET faculty, subject to MET curriculum subcommittee approval. **Credits:** 1.00 to 3.00

MET 29900 - Mechanical Engineering Technology

Credit Hours: 1.00 to 3.00. Independent project or laboratory work is conducted under the supervision of appropriate MET faculty. Hours and subject matter must be arranged by instructor and approved by MET curriculum subcommittee. Permission of instructor required. **Credits:** 1.00 to 3.00

MET 30200 - CAD In The Enterprise

Credit Hours: 3.00. Theory and practice of management, use and integration of computer-aided design systems, and related engineering tools and practices are studied as they are applied in the industrial enterprise. Emphasis is on course projects.**Credits:** 3.00

MET 31000 - Computer-Aided Machine Design

Credit Hours: 3.00. Introduction to the use of specialized programs to analyze machine components such as shafts, linkages, springs, and cams. Use of finite element analysis to analyze mechanical systems. Typically offered Fall.**Credits:** 3.00

MET 31100 - Experimental Strength Of Materials

Credit Hours: 3.00. Selected advanced topics from the areas of mechanics of materials, structures, stress analysis, and strain measurements are considered. Basic electronic strain gage circuits and instrumentation are presented, with emphasis on transducer applications. **Credits:** 3.00

MET 31300 - Applied Fluid Mechanics

Credit Hours: 3.00. The fundamental principles of fluid mechanics are developed, including properties of fluid, pressure, hydrostatics, dynamics of fluid flow, friction losses, and sizing of pipes. Emphasis is on problem solving.**Credits:** 3.00

MET 31400 - Applications Of Machine Elements

Credit Hours: 3.00. The methods developed in statics, dynamics, and strength of materials are applied to the selection of basic machine components (gears, shafts, bearings, chain and belt drives, clutches and brakes, and motors). **Credits:** 3.00

MET 31500 - Applied Mechanism Kinematics And Dynamics

Credit Hours: 3.00. Displacements, velocities, and accelerations are determined using graphical, semi-graphical, and numerical analyses of rotational and translational motions of common mechanisms such as linkages, cams, gears, screws, and chains as well as their loading.**Credits:** 3.00

MET 31601 - Mechanics Of Machine Design

Credit Hours: 3.00. Concepts of stress and strain analysis under combined loadings are introduced. Analyses emphasize use of von Mises stress, Mohr's circle, static failure theories, and fatigue failure criteria. Structural joints and buckling are also analyzed. **Credits:** 3.00

MET 31700 - Machine Diagnostics

Credit Hours: 3.00. A broad spectrum of equipment behavior is introduced through the study of four major operating parameters: vibration, noise, temperature, and lubrication. Emphasis is placed on measurement and analysis of data using diagnostic instrumentation and techniques found in modern process and manufacturing plants. Typically offered Fall Spring Summer.**Credits:** 3.00

MET 31800 - Applied Room Acoustics

Credit Hours: 3.00. Concepts of acoustics are applied to rooms, automotive applications, speakers, musical instruments, audio electronics, and other areas of interest. Modeling and design skills are developed through applied labs and a semester project. Lectures and mathematical exercises are combined with hands-on labs and a semester project to link abstract and physical concepts. As part of the semester project, a special fee will be assessed to be used towards materials for the semester project. **Credits:** 3.00

MET 32000 - Applied Thermodynamics

Credit Hours: 3.00. Following a review of fundamental concepts, advanced power and refrigeration cycles are analyzed. Applications such as gas mixtures, air-vapor mixtures, and chemical reactions of combustion processes are presented. **Credits:** 3.00

MET 32800 - CAD/CAM For Mechanical Design Drafting

Credit Hours: 3.00. Basic operation of mechanical design-drafting. A PC CAD (2D and 3D) laboratory-centered course introducing the basic steps involved in the geometric design of mechanical parts. This class provides an overview and continues into a detailed investigation of parametric modeling. Parametric modeling concepts will be applied to problems using standard industrial practices. Students must possess a solid background in engineering or technical graphics. Typically offered Fall Spring Summer.**Credits:** 3.00

MET 33400 - Advanced Fluid Power

Credit Hours: 3.00. Hydraulic and pneumatic circuits and their steady state and time-variant behavior as it affects the selection and design of components and systems used in fluid power transmission and motion control are studied. Emphasis is placed on

industrial and mobile applications, but the principles also apply to aerospace, marine, and other fluid power systems. **Credits:** 3.00

MET 33800 - Manufacturing Processes

Credit Hours: 4.00. Course covers basic fabrication and material removal manufacturing processes. Areas studied include casting, forging, material joining, forming, basic metal removal mechanisms, automated manufacturing processes, dimensional metrology for quality control and manufacturing process planning. The course emphasizes the selection and application of the various manufacturing processes. Permission of department required. Typically offered Fall Spring.**Credits:** 4.00

MET 34500 - Welding Processes

Credit Hours: 3.00. Welding processes, equipment, and weldments are studied. An in-depth look is taken into welding processes, welding problems, quality control, inspection methods, welding filler metals, welding equipment, and weldment design. **Credits:** 3.00

MET 34600 - Advanced Materials In Manufacturing

Credit Hours: 3.00. Metals, polymers, ceramic, and composite materials are studied. Crystal structure, molecular behavior, and the effects of various processes on material properties are considered. Course emphasizes the development and control of material properties to meet engineering requirements and specifications. **Credits:** 3.00

MET 34800 - Engineering Materials

Credit Hours: 4.00. An overview of structures, properties and applications of metals, polymers, ceramics, and composite materials is presented. Problem-solving skills are developed in material selection, evaluation, measurement, and testing. Laboratory activities include testing various properties of different materials, and the selection of materials for engineering application. Permission of department required. Typically offered Fall Spring.**Credits:** 4.00

MET 34900 - Stringed Instrument Design And Manufacture

Credit Hours: 3.00. Concepts, knowledge, and skills in experimental mechanics, production processes, and design are integrated to manufacture a working musical instrument. Production concerns such as fixture design, process variability, and validation testing comprise key course elements.**Credits:** 3.00

MET 35000 - Applied Fluid Mechanics

Credit Hours: 3.00. The fundamentals of fluid mechanics including properties of fluid, pressure, hydrostatic force on submerged areas; kinematics and dynamics of fluid flow; friction losses and sizing of pipe. Typically offered Spring.**Credits:** 3.00

MET 36000 - Heating, Ventilating, And Air-Conditioning

Credit Hours: 3.00. A study of heat losses, heat-producing equipment, and cooling equipment in addition to the design of the direct systems. Includes controls and cost estimating for commercial, industrial, and residential systems. Codes and standards are emphasized throughout the course. Typically offered Spring.**Credits:** 3.00

MET 38200 - Controls And Instrumentation For Automation

Credit Hours: 3.00. Study of the procedures and techniques essential to industrial measurement and transmission of data is provided in the areas of microprocessor control, process control, and automated testing. Concepts of hysteresis, repeatability, weighted signals, span, suppression, range, and closed loop control are emphasized. Typically offered Fall Spring Summer.**Credits:** 3.00

MET 39200 - Laboratory Assistant In Engineering Technology

Credit Hours: 0.00 to 3.00. Hours, subject matter, and credit to be arranged by faculty. Intended for upper division students. Course content meets the MET Professional Experience requirement. Permission of department and instructor required. **Credits:** 0.00 to 3.00

MET 40000 - Mechanical Design

Credit Hours: 3.00. Theory and practice in mechanical design are presented. Modern design methodologies will be studied. The integrative methods discussed in this course reflect the current industry trend to perform product design and development in cross-functional teams. Emphasis is on multiple open-ended projects. **Credits:** 3.00

MET 40100 - Capstone Projects I

Credit Hours: 3.00. This course deals with the planning for capstone projects. Methods to develop engineering requirements to meet project needs and formal design techniques are studied. Planning and design alternatives to meet cost, performance, and user-interface goals are emphasized. System tests and measurements are considered. Project planning, scheduling, and management techniques are studied. Different design approaches are compared. **Credits:** 3.00

MET 40200 - Capstone Projects II

Credit Hours: 3.00. This is the second of two courses in a capstone project sequence. Project management and system engineering methods are applied to solving an engineering problem. Permission of instructor required. **Credits:** 3.00

MET 41100 - Introduction To The Finite Element Method

Credit Hours: 3.00. The finite element method is introduced, with emphasis on modeling and interpretation of results. Linear static problems are solved using commercial FEA software, and FEA results are verified through laboratory tests and/or theoretical calculations. Topics include trusses, frames, plane stress/strain, torsion, 3D structures, buckling, and natural frequency/mode shape analyses. **Credits:** 3.00

MET 41400 - Design Of Mechanical Projects

Credit Hours: 3.00. Application of the fundamental principles of mechanical, hydraulic, and electrical technology to the design of mechanical systems. Discussion of the design process and continuation of topics in the design of machine elements. A semester design project is required. Typically offered Spring.**Credits:** 3.00

MET 42100 - Air Conditioning And Refrigeration

Credit Hours: 3.00. Heat gains and losses, heat-producing equipment, cooling, and refrigeration equipment are studied. System design is presented, including controls and instrumentation for commercial, industrial, and residential systems. **Credits:** 3.00

MET 42200 - Power Plants And Energy Conversion

Credit Hours: 3.00. The theories and skills learned from prerequisite coursework are applied to the analysis and design of power plants and their systems and to selected technologies of energy conversion. Industrial procedures and methods are emphasized. **Credits:** 3.00

MET 42600 - Internal Combustion Engines

Credit Hours: 3.00. Introduces the operating principles of internal combustion engines with emphasis on performance, efficiency, and emissions. Students will evaluate engine performance through geometric, kinematic, and thermodynamic analysis. Introduces advanced thermodynamic cycles and trends in internal combustion engine technology. **Credits:** 3.00

MET 43200 - Hydraulic Motion Control Systems

Credit Hours: 3.00. Hydraulic feedback motion control systems, types, and applications are studied. Simulation and performance of closed loop control systems with single and multiple signal paths are emphasized. Dynamic system performance is predicted and evaluated. System parameters including accuracy, response speed, fluid compressibility effects, load disturbances, and nonlinear behavior of the components are studied. **Credits:** 3.00

MET 43600 - Pneumatic Motion Control Systems

Credit Hours: 3.00. The application of pneumatic motion control systems to industrial motion control and robotics is studied. Circuit design with control logic of both fluid and electronic types is stressed, as applied to pneumatic point-to-point and proportional controls. Control designs are implemented, tested, and evaluated in the laboratory. **Credits:** 3.00

MET 44200 - Plastics Manufacturing Systems

Credit Hours: 3.00. Basic control theory, heat transfer, machine design principles, and basic polymer science are applied to analysis and design of polymer manufacturing systems. Emphasis is placed on thermoplastics processes such as extrusion and injection molding. Projects include design of new machinery, major renovations of existing processes, and automation of processes. **Credits:** 3.00

MET 44301 - Joining Processes

Credit Hours: 3.00. Topics cover joining technologies such as fastening, welding, brazing/soldering, adhesive, and diffusion bonding processes of metals, ceramics, plastics, and composites. The materials, processes, destructive and non-destructive evaluation, and design aspects of these technologies as well as current production practices will be presented. Emphasis will be placed on identification and optimization of key processing parameters. Students will be exposed to commonly used technologies, equipment, and methods for joint design, formation, testing, and optimization to better understand key parameters and process variables, and their influence on optimum joint designs. **Credits:** 3.00

MET 44400 - Applied Metallurgy

Credit Hours: 3.00. Metals used in common engineering applications are studied to determine how their properties are achieved. Photomicrographic and other methods are employed to investigate the alloying, hotworking, coldworking, and heat treating processes of these metals. Detection, identification, and diagnosis of metal failure are included. **Credits:** 3.00

MET 44500 - Applied Metalcasting

Credit Hours: 3.00. This course applies metalcasting principles from concept through final product. Students design and optimize essential elements of casting systems using both simulation and fabrication methods and testing.**Credits:** 3.00

MET 45100 - Manufacturing Quality Control

Credit Hours: 3.00. (MFET 45100) Quality control practices used in manufacturing industries; management, statistical control charts, reliability, sampling plans, economics, computer methods, and test equipment are presented and applied. Credit will not be granted for both MET 45100 and MFET 45100 . **Credits:** 3.00

MET 45200 - Advanced GD&T Concepts Applied To Product Quality

Credit Hours: 3.00. This course explores the theory and application of Geometric Dimensioning and Tolerance (GD&T) to measurement systems and the programming necessary to insure product quality. **Credits:** 3.00

MET 48200 - Mechatronics

Credit Hours: 3.00. Fundamental concepts and applications of practical mechatronics are presented, with emphasis on product design, systems integration, and functional relationships between mechanical structure, sensor data, precision actuators, power resources, embedded microcontrollers, control logic, and drives. Students gain hands-on experience with mechatronics components and measurement equipment which is applied in a team-based design-build mechatronics system project. Typically offered Fall Spring Summer.**Credits:** 3.00

MET 49000 - Special Topics In MET

Credit Hours: 1.00 to 3.00. Group instruction in new or specialty areas of mechanical engineering technology is provided by MET faculty, subject to MET curriculum subcommittee approval. Hours, subject matter, and credit to be arranged by faculty. **Credits:** 1.00 to 3.00

MET 49900 - Mechanical Engineering Technology

Credit Hours: 1.00 to 6.00. Independent project or study of a special topic is conducted under the supervision of appropriate MET faculty. Hours and subject matter must be arranged with the instructor and approved by the MET curriculum subcommittee before enrolling in the course. Permission of instructor required. **Credits:** 1.00 to 6.00

MET 50300 - Applied Optimization

Credit Hours: 3.00. This course will introduce technology graduate students and senior undergraduates to the basic concepts of optimization methods with particular emphasis on applications in product and process design. Unconstrained nonlinear problems will be presented and solved using steepest descent and conjugate directions. Constrained problems will be solved using exterior penalty functions. Permission of department required. **Credits:** 3.00

MET 50700 - Organizational Environmental Quality

Credit Hours: 3.00. The principles of organizational environmental quality characterization, regulatory management, and engineering control will be covered. The health effects realized by significant exposures to potential indoor and outdoor organizational environmental pollutants from all media types (water, soil, air, artifact) will be elucidated. A special emphasis will be placed on how to develop a sound foundation for designing appropriate engineering control technologies such as ventilation and filtration. Permission of department required. **Credits:** 3.00

MET 51500 - Mechanics For Engineering And Technology

Credit Hours: 2.00. Evaluation of static and dynamic systems through the application of mechanics principles. Course will focus on aircraft applications and associated human factors. Topics to be covered include analysis of force equilibrium, kinematics with constant and varying acceleration, kinetics, work, energy, impulse and momentum. **Credits:** 2.00

MET 52700 - Technology From A Global Perspective

Credit Hours: 3.00. Introduction to the challenges faced by the practicing technologist when working and interacting with international technical personnel, both here and abroad, including history, standards, education, and practice of technology outside the United States. Permission of department required. **Credits:** 3.00

MET 53000 - Facilities Engineering Technology

Credit Hours: 3.00. A study of the application of the engineering sciences and technology to the solution of problems associated with mechanical and electrical systems in buildings. Emphasizes commercial and industrial facilities. Identifying energy conservation measures for both mechanical and electrical systems and evaluating their economic impact are an important focus of the course. **Credits:** 3.00

MET 53500 - Optimization Of Metalcasting Design

Credit Hours: 3.00. The course focuses on optimal design of metalcastings to fit structural requirements (applied loads) and to assure sound manufacturability (castability). Students are expected to learn the general principles of design optimization through hands-on laboratory exercises based on the application of finite element and computational fluid dynamics software. **Credits:** 3.00

MET 54600 - Industrial Applications Of Computer Integrated Manufacturing

Credit Hours: 3.00. A study of the development of CIM (computer integrated manufacturing) from the application of basic automation to a fully integrated system for the operation of the business enterprise. Emphasis is placed on the technology, systems, and human resources, which are integrated to accomplish the objectives of the company. Permission of instructor required. **Credits:** 3.00

MET 54900 - Micro And Nanomachining

Credit Hours: 3.00. Micro and nanomachining introduces technology students of many disciplines to discover how machining processes enable the development of MEMS and NEMS products and services. The focus of this course is to develop an understanding of machining processes at the micro and nanoscales. **Credits:** 3.00

MET 58100 - Workshop In Mechanical Engineering Technology

Credit Hours: 0.00 to 8.00. Advanced study of technical and professional topics. Emphasis is on new developments relating to technical, operational, and training aspects of industry and technology education. **Credits:** 0.00 to 8.00

MET 59000 - Special Problems In Mechanical Engineering Technology

Credit Hours: 1.00 to 6.00. Independent study of a special problem under the guidance of a member of the staff. Does not substitute for either M.S. thesis or M.S. project credit. Permission of instructor required. **Credits:** 1.00 to 6.00

MET 59800 - Directed MS Project

Credit Hours: 1.00 to 3.00. A formal investigation of a particular problem under the guidance of the advisory committee. Not applicable to a thesis option plan of study. Enrollment during at least two consecutive terms for a total of three credits is required. Permission of instructor required. **Credits:** 1.00 to 3.00

MET 64500 - Design And Control Of Rehabilitation And Assistive Robots

Credit Hours: 3.00. This course focuses on studying the fundamentals of the design and control of rehabilitation and assistive robots and evaluating their performances. Topics in multiple areas, including robotics, biomechanics, controls, and mechatronics, are included in this course. Specifically, the students study various applicable control methods, including impedance control for the physical interaction of humans and robots. Additionally, the students conduct gait experiments and analyze the data to determine the gait parameters relevant to the design of lower leg assistive and rehabilitation robots, including human joint impedance. Supportive topics such as user intent recognition and relevant instrumentation are also discussed. Prerequisites: MFET 44200 or ECE 56900 or ME 57200.**Credits:** 3.00

MET 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Medicinal Chemistry and Molecular Pharmacology

MCMP 49000 - Special Topics

Credit Hours: 1.00 to 3.00. A course for superior students to be used in relation to, and to supplement, an existing course; an in-depth approach to topics of current interest, utilizing the original literature as prime source material. A laboratory project may be included. Permission of instructor required. **Credits:** 1.00 to 3.00

MCMP 51400 - Biomolecular Interactions: Theory And Practice

Credit Hours: 1.00 to 4.00. Theory and applications of biophysical and bioanalytical methods for the identification and qualification of biological and pharmaceutical samples. Methods to be discussed include chromatography, electrophoresis, optical spectroscopy, mass spectrometry, electrochemical methods, radiochemical analysis, ultracentrifugation, calorimetry and surface plasmon resonance. Physical measurements, such as binding equilibrium, kinetics and macromolecular structure will be discussed. While fundamentals of each technique will be discussed, a major focus will be on the application and integration of presented methods for the analysis of biological problems. The course will be organized into four general topic areas around the theme of medicinal analysis, and variable credit will be available based on a student's interest in the four topic areas (i.e., 1 credit per topic area). Students should register for 1 credit hour, and the variable credit option will be discussed and determined at the first class period. Permission of instructor required. **Credits:** 1.00 to 4.00

MCMP 54400 - Drug Classes And Mechanisms

Credit Hours: 3.00. The course will integrate basic principles of medicinal chemistry and pharmacology to achieve an understanding of drug mechanisms as applied to autonomic/endocrine, cardiovascular/renal, CNS, and chemotherapy/infectious diseases. The course will apply concepts from organic chemistry, biochemistry, anatomy, physiology, and principles of drug action to describe how drugs are used to treat the symptoms and causes of disease.**Credits:** 3.00

MCMP 57000 - Basic Principles Of Chemical Action On Biological Systems

Credit Hours: 3.00. Detailed description of modern pharmacology with emphasis on the mechanism of drug action and approaches used to understand their therapeutic and toxic effects. Topics include receptor theory and signal transduction,

pharmacokinetics and pharmacogenetics with emphasis on current concepts in molecular pharmacology. Permission of instructor required. **Credits:** 3.00

MCMP 59800 - Introduction To Research

Credit Hours: 1.00 to 3.00. Introduction to research in synthetic and analytical medicinal chemistry, pharmacognosy, and natural products under the direction of a member of the graduate faculty. Permission of instructor required. **Credits:** 1.00 to 3.00

MCMP 61700 - Molecular Targets: Neuro Function And Dysfunction

Credit Hours: 2.00. The application of basic scientific principles from medicinal chemistry and molecular pharmacology, and new discoveries in biology, to the development of new drugs to treat psychiatric disorders and diseases of the central nervous system. Important examples of drug targets, and small molecules (either currently approved drugs or those under investigation) that target them, are discussed. Classes of drug target examples discussed include: G protein-coupled receptors, neurotransmitter transporter proteins, and ion channels. Processes of neurosecretion and neurodegenerative processes will also be discussed, as well as target validation and examples of the use of genetic models to identify CNS targets. Prerequisites: MCMP 57000. This course is offered even numbered years. **Credits:** 2.00

MCMP 61800 - Molecular Targets: Cancer

Credit Hours: 2.00. The application of basic scientific principles from medicinal chemistry and molecular pharmacology, and new discoveries in biology, to the development of new anti-cancer drugs. Important examples of drug targets and small molecules (either currently approved drugs or those under investigation) that target them, are discussed. Classes of drug targets discussed include: kinases, small monomeric G proteins, prenyltransferases, transcription factors, nuclear receptors, cell cycle proteins, cytoskeletal proteins, and topoisomerases. Prerequisites: MCMP 57000. **Credits:** 2.00

MCMP 62500 - Grant Writing

Credit Hours: 1.00. Strategies for preparation of grant proposals; generating ideas for proposals and peer review. Lecture and laboratory periods will alternate each week (i.e., lecture week one, laboratory week two). Permission of department required. **Credits:** 1.00

MCMP 69000 - Special Topics In Medicinal Chemistry And Molecular Pharmacology

Credit Hours: 0.00 to 6.00. Special topics, projects, or laboratory exercises in selected areas of medicinal chemistry and molecular pharmacology. Permission of instructor required. **Credits:** 0.00 to 6.00

MCMP 69600 - Seminar In Medicinal Chemistry And Molecular Pharmacology

Credit Hours: 0.00 or 1.00. Faculty and student participation in discussion of current research and developments in synthetic medicinal products, quality control, instrumentation, biosynthesis, and structure elucidation of natural products. **Credits:** 0.00 or 1.00

MCMP 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

MCMP 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Medieval and Renaissance Studies

MARS 22000 - Introduction To Medieval And Renaissance Studies

Credit Hours: 3.00. An introduction to the interdisciplinary study of the Middle Ages and Renaissance. **Credits:** 3.00

MARS 42000 - Medieval And Renaissance Studies Seminar

Credit Hours: 3.00. An interdisciplinary seminar in some aspect of medieval and Renaissance studies. Permission of instructor required. **Credits:** 3.00

Military Science and Leadership

MSL 10100 - Introduction To The Army

Credit Hours: 1.00 to 2.00. An introduction to the army, the profession of arms, and basic soldier skills. Students learn what it means to be a professional in the U.S. Army. The overall focus is introducing them to the Army Leadership Requirements Model and the Reserve Officers' Training Corps (ROTC) program, its purpose in the Army, and its advantages for the student. Other topics include map reading, land navigation, fieldcraft, first aid, and individual/team movement techniques.**Credits:** 1.00 to 2.00

MSL 10200 - Foundations Of Leadership

Credit Hours: 1.00 to 2.00. An introduction to the personal challenges and competencies that are critical for effective leadership. Topics include critical thinking, time management, goal setting, and communication. The course emphasizes the communications process and the importance for leaders to develop essential skills to effectively communicate in the Army. Basic squad-level tactics will be reinforced.**Credits:** 1.00 to 2.00

MSL 20100 - Leadership And Ethics

Credit Hours: 2.00 to 3.00. An examination of leadership and ethics through the study and analysis of famous leaders. Army values and ethics and their relationship to the Law of Land Warfare is stressed. Emphasizes the philosophy of military service and how military leaders can apply values and ethics to a variety of situations they might encounter in the Army.**Credits:** 2.00 to 3.00

MSL 20200 - Army Doctrine And Decision Making

Credit Hours: 2.00 to 3.00. The course explores using analytical techniques, creative-thinking skills, and the Army problem-solving process to help with situational decision making. Troop-leading procedures (TLP) and operational orders (OPORD) are used to explain Army Doctrine and symbology. Topics include using unified land operations, offensive operations, and defensive operations in squad-level tactics.**Credits:** 2.00 to 3.00

MSL 30100 - Training Management And The Warfighting Function

Credit Hours: 3.00 to 4.00. Examines how the Army operates through warfighting functions. Emphasizes planning, preparing, and executing training for small-unit tactics.**Credits:** 3.00 to 4.00

MSL 30200 - Applied Leadership In Small Unit Operations

Credit Hours: 3.00 to 4.00. An examination of the fundamentals of direct-level leadership and small-unit tactics at the platoon level in preparation for Cadet Summer Training Advance Camp. Emphasizes the planning, coordinating, navigating, motivating, and leading a platoon to execute a mission.**Credits:** 3.00 to 4.00

MSL 35000 - American Military History And Leadership

Credit Hours: 3.00. This course provides a historical perspective for the decisions made by American military leaders. In addition, the course examines the external political and social environments within which the military, and in particular its leaders, operate. Emphasis is placed on using common themes that relate to the American experience in war to determine how periods of peace and war challenged the nation and influenced the development of its military policy. This course is required for Army ROTC cadets but it open for all students on campus. **Credits:** 3.00

MSL 40100 - The Army Officer

Credit Hours: 3.00 to 4.00. An examination of Army officer development to include planning, resourcing, and assessing training at the small-unit level. Topics include counseling subordinates, evaluating performance, values and ethics, career planning, legal responsibilities, and programs that support Army officers in these endeavors.**Credits:** 3.00 to 4.00

MSL 40200 - Company Grade Leadership

Credit Hours: 3.00 to 4.00. This course explores the roles and responsibilities of company-grade Army officers with respect to unified land operations. Emphasizes the knowledge, skills and abilities required of junior officers in preparation for commissioning.**Credits:** 3.00 to 4.00

MSL 49000 - Directed Studies In Military Science

Credit Hours: 1.00 to 3.00. Individual readings, topics, or projects in military science appropriate for advanced undergraduate students. Permission of instructor required. **Credits:** 1.00 to 3.00

Motorsports Engineering

MSPE 27200 - Introduction To Motorsports

Credit Hours: 3.00. This course provides an introduction to the Motorsports Industry, including careers available, the organization and history of the industry, and technology development that has occurred due to the industry. A student project is required.**Credits:** 3.00

MSPE 29000 - Motorsports Engineering Seminar

Credits: 1.00

MSPE 29700 - Computer Model For Motorsports

Credit Hours: 1.00. This course covers basic computer aided design and 3D modeling of systems as needed for the motorsports industry. Permission of department required.**Credits:** 1.00

MSPE 29701 - Computer Modeling For Motorsports

Credit Hours: 2.00. An introductory course detailing methods for designing and modeling motorsports components using Computer Aided Design (CAD) software.**Credits:** 2.00

MSPE 29800 - Programming And Computer Modeling For Motorsports

Credit Hours: 2.00. Introductory course detailing methods for creating virtual models of objects and systems for design, analysis and optimization of motorsports components. Virtualization methods include object-oriented programming techniques for creating mathematical models, and solid modeling techniques for visualizing objects as three-dimensional representations. The methods introduced through this course lay the foundation for advanced courses in vehicle design, simulation, and analysis. Admission to MSPE program required.**Credits:** 2.00

MSPE 29900 - Motorsports Engineering Directed Study

Credit Hours: 1.00 to 3.00. This is a directed study course for students wishing to pursue additional motorsports studies under the direction of a faculty advisor. Permission of instructor required.**Credits:** 1.00 to 3.00

MSPE 31201 - Business of Motorsports

Credit Hours: 3.00. This course covers the unique aspects of the motorsports industry, especially race teams, including organizations, budgeting, marketing, and sponsorships through an examination of literature and guest speakers.**Credits:** 4.00

MSPE 31700 - Motorsports Practicum II

Credit Hours: 1.00. This course engages students in a hands-on experiential learning opportunity in which they participate in the design, fabrication, assembly, and preparation of a race vehicle just as they might when engaged with a professional motorsports organization.**Credits:** 1.00

MSPE 32000 - Motorsports Design I

Credit Hours: 3.00. This course explores the design concepts and approaches of the Motorsports Industry, creating connectivity between the couress of the first two years of the Motorsports Engineering BS Program and preparing students for internships in the industry. Permission of instructor required.**Credits:** 3.00

MSPE 33001 - Data Acquisition For Motorsports I

Credit Hours: 2.00. This course introduces students to motorsports data acquisition systems and the associated hardware and software that are comprised therein. A hands-on lab component is included int he class where in students learn how to specify a motorsports data system, understand vehicle network communication and build a motorsport industry standard data acquisition wiring harness.**Credits:** 2.00

MSPE 33100 - Data Acquisition For Motorsports II

Credit Hours: 3.00. This course explores the appliaction of vehicle dynamics principles to motorsport vehicles. Students will utilize engineering software tools to develop motorsport engineering worksbooks for vehicle performance analysis. Driver performance analysis and race strategy topics are introduced to provide the student with the full fundamentals of race engineering.**Credits:** 3.00

MSPE 34000 - Dynamic Signals And Systems

Credit Hours: 3.00. Introduction to dynamic engineering systems and continuous-time and discrete-time signals, mechanical electromechanical components, linear system response, Fourier and Laplace Transforms. The course is designed to teach the student the basic concept for modeling the behavior of dynamic systems.**Credits:** 3.00

MSPE 35000 - Computer Aided Design And Manufacturing

Credit Hours: 3.00. This course provides the basis for the computer-aided engineering and analysis skills needed in the Motorsports Industry. The ability to visualize and conceptualize a real part in the physical world and produce graphical representations of it in 2D and 3D in Solidworks or an equivalent is a primary objective. Further skills to be developed include the ability to produce large assemblies of such parts with appropriate tolerancing, free form surfacing, casting shapes and casting machining, 2D drawings for use in 3D sheet metal fabrication including shrink and stretch, use of 3D models to facilitate Finite Element Analysis, Conversation of CAD model to programming of CAM machining.**Credits:** 3.00

MSPE 41000 - Motorsports Internship

Credit Hours: 1.00 to 3.00. A semester or summer of external, full-time, related career experiences designed to enhance the student's preparedness for entering an initial or second career. Permission of department required.**Credits:** 1.00 to 3.00

MSPE 41400 - Motorsports Design II

Credit Hours: 3.00. This is the culminating course in the Motorsports Engineering Plan of Study, tying together concepts from all the other courses in the curriculum, and requires a capstone design project representative of a real world project with the Motorsports Industry.**Credits:** 3.00

MSPE 41700 - Motorsports Practicum III

Credit Hours: 1.00. This course engages students in a hands-on experiential learning opportunity in which they participate in the design, fabrication, assembly, and preparation of a race vehicle just as they might when engaged with a race team in the motorsports industry. Students will be expected to show mastery of at least 12 of the 12 skills outlined in the Course Objectives.**Credits:** 1.00

MSPE 41800 - Advanced Motorsports Practicum

Credit Hours: 1.00. This course engages students in a hands-on experiential learning opportunity in which they participate in the design, fabrication, assembly, and preparation of a race vehicle just as they might when engaged with a race team in the motorsports industry. Students will be expected to show mastery beyond the 12 skills outlined in the course objectives. Permission fo instructor required.**Credits:** 1.00

MSPE 42600 - Internal Combustion Engines

Credit Hours: 3.00. This course covers the fundamentals of internal combustion engine design and operation, with a focus on high performance.**Credits:** 3.00

MSPE 43100 - Race Engineering

Credits: 3.00

MSPE 47200 - Vehicle Dynamics

Credit Hours: 3.00. This course develops students understanding in the mathematical model development of the motorsports vehicle. Students will utilize these models to understand how key vehicle parameters influence vehicle performance in the longitudinal and lateral direction. **Credits:** 3.00

MSPE 48200 - Motorsports Aerodynamics

Credit Hours: 3.00. Study of fluid flow and aerodynamics as applied to race car design and Computational Fluid Dynamics (CFD) Analysis.**Credits:** 3.00

MSPE 49000 - Motorsports Engineering Independent Study

Credit Hours: 1.00 to 3.00. This is an independent study course for students wishing to pursue advanced studies under the direction of a faculty advisor. Permission of instructor required.**Credits:** 1.00 to 3.00

MSPE 49700 - Motorsports Design Project

Credit Hours: 3.00. This is an independent study version of the MSPE 41400 culminating course in the Motorsports Engineering Plan of Study, tying together concepts from all the other courses in the curriculum, and requires a capstone design project representative of a real world project within the Motorsports Industry. Permission of instructor required.**Credits:** 3.00

MSPE 49900 - Motorsports Engineering Special Topics

Credit Hours: 1.00 to 3.00. This is a special topics course for students wishing to pursue advanced studies under the direction of a faculty advisor. Permission of instructor required.**Credits:** 1.00 to 3.00

MSPE 57200 - Vehicle Dynamics

Credit Hours: 3.00. Vehicle dynamics is the study of behavior of vehicles in motion. The study is one of the most important activities in the Vehicle design and development cycle to design vehicles which drive well and are comfortable to ride in. The course focuses on the development of advanced mathematical engineering models that represent the behavior of automotive vehicles and vehicle subsystems. Topical emphasis is focused on rectilinear performance, steady state handling behavior, tire models and suspension models.**Credits:** 3.00

MSPE 57400 - Advanced Vehicle Dynamics

Credit Hours: 3.00. An investigation into advanced topics in the field of vehicle dynamics. This course covers the principles and applications of vehicle handling dynamics from an advanced perspective in depth. The methods required to analyze and optimize vehicle handling dynamics are presented, including tire compound dynamics, vehicle planar dynamics, vehicle roll dynamics, full vehicle dynamics, and in-wheel motor vehicle dynamics. The provided vehicle dynamic model is capable of investigating drift, sliding, and other over-limit vehicle maneuvers. This is an ideal course for postgraduate and research students and engineers in motorsports, mechanical, automotive, transportation, and ground vehicle engineering.**Credits:** 3.00

MSPE 57800 - Composite Materials For Automotive Applications

Credit Hours: 3.00. This course focuses on development of low-cost carbon fiber for automotive appliactions, mechanical properties of advanced composities, automotive composite structures for crashworthiness, crashworthiness analysis of composite, hybrid structures consisting of sheet metal and fiber reinforced plastics for structural automotive and design solutions to improve crash-box impact efficiency for racing applications.**Credits:** 3.00

MSPE 57900 - Design And Analysis Of Materials And Structures In Lightweight Vehicles

Credit Hours: 3.00. The materials for the construction of automobiles are changing from mostly low carbon steels to a combination of steels, light alloys, such as aluminum and magnesium alloys, and polymer matrix composites. Many of these materials are already used in today's vehicles, albeit in smaller volumes. Future vehicles, which will have to be much lighter in weight for improved fuel economy and reduced environmental pollution, will contain much larger volumes of these materials. The selection of materials will not only be influenced by their weight reduction potential, but also by factors such as safety, durability, processing, joining, recycling and cost. This course focuses on materials, their properties, processing technology and design and materials selection issues pertinent to designing lightweight vehicles. It will provide first-hand knowledge and experience of working with these advanced materials. It starts with a broad review of the materials scenario and design considerations for lightweight automotive structures. It is then divided into two major parts: materials, and design and manufacturing. The materials part contains topics on advanced steels, aluminum alloys, magnesium alloys and polymer matrix composites. It will provide information on material properties, processing characteristics and application examples. The design and manufacturing part contains information on manufacturing processes for light alloys, joining, crash worthiness considerations, recycling and life-cycle issues.**Credits:** 3.00

MSPE 58200 - Motorsports Aerodynamics

Credit Hours: 3.00. A study and adaptation of fluid flow and aerodynamics as applied to motorsports design and performance optimization. This course is designed to reinforce student's understanding of aerodynamics as it pertains to a race car. This course breaks down the differences between actual air flow while driving / racing versus air flow within a wind tunnel, and how these flows are different. It discusses how to evaluate those flows, and determine if they need to be improved. It discusses ways to improve the aero on race cars.**Credits:** 3.00

MSPE 58400 - Advanced Motorsports Aerodynamics

Credit Hours: 3.00. This advanced course is designed to adapt the secrets of the rapidly developing field of high-speed vehicle design. From F1 to Indy Car, Advanced drag simulation and Sedan racing, this course provides clear advanced explanations for students and engineers who want to improve their design skills and to interpret how their favorite race cars aerodynamics is designed. It differentiates how aerodynamics win races, why downforce is more important than streamlining and drag reduction, designing wings and venturis, plus wind tunnel designs and more. Appraises the development process of advanced motorsports aerodynamics engineering. Extensive use of CFD in the development of race car aerodynamics.**Credits:** 3.00

MSPE 59200 - Motorsports Simulations

Credit Hours: 3.00. A course on mathematical modeling and computer simulation of mechanical systems offering a complete tool for modeling and simulation of integrated and complex systems for use within automotive and motorsports applications. Complex multi-disciplinary systems modeling and analysis problems will be solved, using a modeling and simulation environment for complex systems analysis such as Dymola's Modelica simulation technology. Dymola is a complete environment for model creation, testing, simulation and post-processing. Equal emphasis is placed on model development and simulation via Dymola GUI interface. Models range from simple spring-mass-damper system to whole vehicle models will be covered.**Credits:** 3.00

MSPE 59700 - Selected Topics In Motorsports Engineering

Credit Hours: 1.00 to 6.00. Topics of contemporary importance or of special interest that are outside the scope of the standard graduate curriculum can be offered temporarily under the selected topics category until the course receives a permanent number.**Credits:** 1.00 to 6.00

MSPE 59800 - Motorsports Engineering Projects

Credit Hours: 1.00 to 3.00. Individual research projects of contemporary importance or of special interest that are outside the scope of the standard graduate curriculum can be studied under the Motorsports Engineering Projects course.**Credits:** 1.00 to 3.00

MSPE 59900 - Motorsports Advanced Internship

Credit Hours: 1.00 to 3.00. Graduate-level based course, in an off-campus internship position.**Credits:** 1.00 to 3.00

MSPE 69800 - Research MS Thesis

Credit Hours: 1.00 to 6.00. Research credit for students in thesis option.**Credits:** 1.00 to 6.00

Music History and Theory

MUS 101LN - Beginning Guitar Class

Credit Hours: 1.00 to 3.00. Classical guitar instruction in a class situation for non-music majors.**Credits:** 1.00 to 3.00

MUS 105ZN - Traditions In World Music

Credit Hours: 3.00. Explore the diversity of musical traditions found throughout the world by studying the various means of transmission, musical instruments, musical meaning, musical sound, as well as the rituals, any myths commonly associated with an assortment of music cultures. No prior music experience required. Offered through the Web.**Credits:** 3.00

MUS 111ZN - Introduction To Music Theory

Credit Hours: 3.00. A study of fundamentals of the language and notation of music: listening, music reading and writing, and the elements of music as used in a variety of genres. Open to all students interested in a general background in music. Recommended for singers, instrumentalists, and keyboard players.**Credits:** 3.00

MUS 201ZN - History Of Rock And Roll Music

Credit Hours: 3.00. A survey of the major trends, styles, and genres of rock music from the earliest recordings to the present day, focusing on the work of the artist and groups who have proven to be of the most enduring significance.**Credits:** 3.00

MUS 10100 - Discovery Forum

Credit Hours: 0.00. Discovery Forum is a weekly gathering where music majors and faculty perform, share research, compositions, arrangements or other related topics associated with music today. It is a forum where new approaches and ideas about music can be presented. No prior coursework required.**Credits:** 0.00

MUS 11200 - Fundamentals Of Music

Credit Hours: 3.00. Fundamentals of music notation, ear training, and music reading. **Credits:** 3.00

MUS 13200 - Music Theory I

Credit Hours: 3.00. Course comprises instruction in melodic and harmonic processes in tonal music; development of analytic, listening and piano techniques with musical equipment. Music reading ability is required, verified through Placement Exam. **Credits:** 3.00

MUS 13300 - Music Theory II

Credit Hours: 3.00. A variety of styles and forms of music serve to exemplify melodic and harmonic processes and voice-leading practices in diatonic tonal music. Activities include analytic reading of musical scores, developing musical listening skills, and acquiring functional piano techniques. **Credits:** 3.00

MUS 16100 - Class Piano And Musicianship I

Credit Hours: 3.00. A study of essential keyboard skills that include reading beginning level piano pieces, major and minor scales, transposition, sight reading and adding chords to a given melody. The musicianship includes essential aural skills: rhythmic dictation, interval and chord identification, and rhythmic and melodic dictation. **Credits:** 3.00

MUS 16200 - Class Piano And Musicianship II

Credit Hours: 3.00. A continuation of MUS 16100 that includes reading intermediate level piano pieces, sight reading, scales, transposition and adding chords to a melody. The musicianship component includes intermediate level aural skills, rhythmic and melodic dictation, intervals, chordal and harmonic dictation. **Credits:** 3.00

MUS 17100 - Jazz Improvisation I

Credit Hours: 2.00. This course is an introduction to the development of beginning jazz improvisational and theoretical skills for all instrumentalists and vocalists. Fundamentals theoretical and musicianship skills are addressed through practical application, guided listening, dictation, transcription, harmonic and rhythmic analysis, and performance of standard jazz repertoire. **Credits:** 2.00

MUS 23200 - Music Theory III

Credit Hours: 3.00. Analytic study of art music and popular music representative of diatonic and chromatic tonal processes. Activities include analytic reading of musical scores, developing musical listening skills, and acquiring functional piano techniques. Creative applications are encouraged. **Credits:** 3.00

MUS 23300 - Music Theory IV: Contemporary Music

Credit Hours: 3.00. A study of the music of the 20th century and beyond. Class activities are focused on analysis of music representative of various genres. **Credits:** 3.00

MUS 25000 - Music Appreciation

Credit Hours: 3.00. The traditions, forms, and styles of classical music. Other types of music may be examined as well. (Students may register through the Continuing Education Student Learning Center at the Tech Statewide locations via distance education.) CTL:IFA 1330 Music Appreciation **Credits:** 3.00

MUS 27000 - Computer Skills In Music

Credit Hours: 3.00. Learn essential music technology skills that include computer based music notation practices, fundamentals of music synthesis and sequencing and basic recording practices. **Credits:** 3.00

MUS 27100 - Jazz Improvisation II

Credit Hours: 2.00. This course is a continuation of MUS 17100, Jazz Improvisation I. Students will continue to develop their jazz improvisation skills that include scale development, pattern playing, guided listening, dictation, transcription skills, harmonic, melodic and rhythmic studies as well as performing standard jazz repertoire. Students should have at least two years of previous experience in band, orchestra, choir, or piano study prior to enrolling in this course. Students will be required to perform in class. Prerequisites for this class are MUS 13200, Music Theory I and MUS 17100, Jazz Improvisation I or consent of the department.**Credits:** 2.00

MUS 29200 - Music, Media, And Technology

Credit Hours: 3.00. This course explores the broad dimensions of technology and media as they impact music and society. Elements of recorded and live music making and performance will be analyzed. An attempt will be made to become more aware of other technologies that hold promise for performance, entertainment, and distribution. The end goal of this course is to have each student become a reflective music consumer, producer, and curator, curious about technological possibilities of media and music, willing to explore its many dimensions. **Credits:** 3.00

MUS 32100 - Songwriting

Credit Hours: 3.00. This course is an introduction to contemporary songwriting. Topics covered will include the study of contemporary chord progressions, melodic development, essential songwriting forms and lyric writing. Students will analyze and compose original songs that will cover a wide range of musical styles and genres including folk, country, pop, rock, jazz and hip-hop. Students interested in Art Song composition should take MUS 34100 or 34200, Composition I-II. Prerequisites include MUS 13200, Music Theory I and MUS 27000, Computer Skills in Music or consent of department.**Credits:** 3.00

MUS 32400 - Teaching Music In The Elementary School

Credit Hours: 3.00. Develops basic musicianship through singing, playing instruments, reading and writing music, listening and moving to music. Surveys music teaching methods and materials. Includes lesson planning, experiences in teaching, and observation of children in music classes. **Credits:** 3.00

MUS 32800 - Jazz Theory, Composition And Arranging

Credit Hours: 3.00. This course is an introduction to contemporary jazz theory, composition and arranging practices. Topics covered will include the study of chord and scale constructions, substitutions, analyzing and building harmonic progressions, modal functions, identifying various styles and idioms, and writing for combo and big band. Students will learn how to compose in various jazz styles and score their works for small and large ensembles. Prerequisites: MUS 13300, Music Theory II and MUS 27000, Computer Skills in Music or consent of instructor.**Credits:** 3.00

MUS 34100 - Music Composition I

Credit Hours: 3.00. Learn essential musical composition skills common in the 20th and 21st Centuries through various writing and analytical projects. **Credits:** 3.00

MUS 34200 - Music Composition II

Credit Hours: 3.00. A continuation of Music Composition I with emphasis upon musical techniques after WWII through various writing and analytical assignments. Permission of instructor required. **Credits:** 3.00

MUS 34500 - History Of Rock Music

Credit Hours: 3.00. This course is a survey of the major trends, styles, and genres of rock music from the earliest recordings to the present day. It focuses on the work of the artists and groups who have proven to have the most enduring significance.**Credits:** 3.00

MUS 35100 - Studio Piano

Credit Hours: 2.00. Students will study and perform selected piano or digital keyboard literature with the focus on improving their technical and interpretive performance skills. Students will also learn about particular historical, analytical or technical issues related to work(s) studied.**Credits:** 2.00

MUS 35200 - Studio Voice

Credit Hours: 2.00. Students will study and perform selected works for voice from a wide range of styles, and genres within a masterclass setting. The instructor will demonstrate important issues related to voice performance and work with the students in both private and group settings. Students will be required to perform works in class. This course may be repeated. **Credits:** 2.00

MUS 36000 - Singing For The Theatrical Stage

Credit Hours: 2.00. A workshop/lab in which students explore how to sing musical theater repertoire for the stage. Students will learn about musical theater auditioning, character analysis and development through song, and performance on stage as a singing actor. The course will have both in-class and out-of-class performance opportunities as well as research experiences that use performance-based methods to explore oneself in social contexts (autoethnography). It is recommended that students have at least two years of singing experience prior to taking this course. Exceptions may be made with instructor's approval. The course may be repeated.**Credits:** 2.00

MUS 37000 - Introduction To Instrumental And Choral Conducting

Credit Hours: 3.00. This course is an introduction to instrumental and choral conducting. Topics covered will include the study of essential skills necessary to lead vocal and instrumental ensembles that will involve warmup techniques, choral and instrumental tone production, baton and directing patterns, ensemble organizational leadership and score analysis. Prerequisites include MUS 13300, Music Theory II or consent of the department.**Credits:** 3.00

MUS 37500 - Selected Topics In Music

Credit Hours: 3.00. A study of a specific genre in music (symphony, opera, chamber music, etc.) or the works of a single composer. **Credits:** 3.00

MUS 37600 - World Music

Credit Hours: 3.00. Exploration of musical traditions around the globe through lectures, readings, recordings, DVDs, and performances. Students will discover how cultural traditions, life rituals, arts, and other traditions influence each region's expression of music. **Credits:** 3.00

MUS 37800 - Jazz History

Credit Hours: 3.00. A historical and stylistic study of jazz. **Credits:** 3.00

MUS 38100 - Music History I: Antiquity To Mozart

Credit Hours: 3.00. Survey of the development of Western European music history from antiquity to Mozart. **Credits:** 3.00

MUS 38200 - Music History II: Beethoven To The Present

Credit Hours: 3.00. Survey of the development of Western European music history from Beethoven to the present.**Credits:** 3.00

MUS 38300 - Digital Audio Recording And Production I

Credit Hours: 3.00. This course is an introduction to digital audio recording and production practices. Topics covered will include design and structure of sound studios, musical sequencing and recording, microphones, fundamentals of sound reinforcement, and sound editing. Students will be required to develop music recording projects.**Credits:** 3.00

MUS 38400 - Digital Record And Production II

Credit Hours: 3.00. This course is a continuation of MUS 38300, Digital Audio Recording and Production I. Topics covered will include advanced musical sequencing, multitrack audio recording, audio signal processing, mixing, mastering and advanced audio and digital production. Students will be required to develop music recording and production projects.**Credits:** 3.00

MUS 49000 - Guided Reading In Music

Credit Hours: 1.00 to 6.00. For students with specialized needs and interests in the field. Permission of instructor required. **Credits:** 1.00 to 6.00

MUS 59000 - Special Problems In Music

Credit Hours: 1.00 to 4.00. An individualized and intensive study of any aspect of music required by the student's plan of study. Permission of instructor required. **Credits:** 1.00 to 4.00

Natural Resources and Environmental Science

NRES 12100 - Stepping Stones To Environmental Science

Credit Hours: 1.00. Intended to expose first-year students to emerging environmental problems and innovative solutions, to support their transition to Purdue through a sense of community and increased engagement, and to provide students access to faculty in the environmental sciences in a small group setting. Activities include field trips, hands-on learning, study halls, and meals together. Enrollment is restricted to members of the environmental science learning community. Department permission required. **Credits:** 1.00

NRES 12500 - Environmental Science And Conservation

Credit Hours: 3.00. (AGRY 12500, EAPS 12500, FNR 12500) Introduction to environmental science and conservation includes topics in ecological principles, conservation and natural resource management, human impacts on the environment, toxic waste disposal, climate change, energy, air and water pollution, environmental geology and geologic hazards. **Credits:** 3.00

NRES 20000 - Introduction To Environmental Careers

Credit Hours: 1.00. This course offers an introduction to general developments and practices in the environmental arena. A presentation of environmental careers and aspects of those careers that may affect job satisfaction and commitment is the main focus of the course. Included is an overview of coursework that benefits particular careers. The course is designed to introduce students to the specialized environmental areas in which they may choose to work. **Credits:** 1.00

NRES 23000 - Survey Of Meteorology

Credit Hours: 3.00. (EAPS 22100) An introductory course for both science and non-science students. A general study of the atmosphere, basic meteorological principles, and weather systems. Relationships of the changing atmosphere to climate, ozone depletion, and other contemporary issues. **Credits:** 3.00

NRES 25500 - Soil Science

Credit Hours: 3.00. (AGRY 25500) Differences in soils; soils genesis; physical, chemical, and biological properties of soils; relation of soils to problems of land use and pollution; soil management relative to tillage, erosion, drainage, moisture supply, temperature, aeration, fertility, and plant nutrition. Introduction to fertilizer chemistry and use. Not available to students who have taken AGRY 27000. **Credits:** 3.00

NRES 27000 - Landscape-Level Planning

Credit Hours: 1.00. The main objective of this course is to teach students about natural resources planning with an emphasis on critical skills for developing landscape level management plans. This one credit course uses guest speakers, lectures, in-class activities, group presentations and take-home assignments to facilitate student learning. **Credits:** 1.00

NRES 33700 - Environmental Hydrology

Credit Hours: 3.00. (AGRY 33700) This course is designed to provide undergraduate students with both the basics of how water moves through the environment and current theories as to how hydrologic response is modified by environmental change at a variety of temporal and spatial scales. **Credits:** 3.00

NRES 33800 - Environmental Field Skills

Credit Hours: 1.00. (AGRY 33800) This laboratory course is designed to provide hands-on examples of the hydrologic concepts covered in the AGRY 33700 Environmental Hydrology class and with practical experience in hydrologic field techniques. **Credits:** 1.00

NRES 38010 - Hazardous Waste Handling

Credit Hours: 3.00. This course trains individuals to stop the release or potential releases of hazardous substances. They have a more aggressive role than first responders at the operations level by approaching the point of the release to plug, patch, or otherwise stop it or manage offensive operations. This course satisfies the OSHA standards for completion of the 40-hour Hazardous Waste Operator/Emergency Response Technician certification, 29CFR1910.120. Topics covered include implementing an employer's emergency response plan; classification and identification of unknown materials using field survey instruments; functioning within the Incident Command System; specialized chemical protective equipment; hazard and risk assessment techniques; advanced product control operations; decontamination procedures; proper termination procedures; and basic chemical and toxicological terminology. **Credits:** 3.00

NRES 38500 - Environmental Soil Chemistry

Credit Hours: 4.00. (AGRY 38500) Designed as an upper level introductory course covering environmental soil chemistry concepts in the framework most applicable to inorganic and organic chemical contamination of soil and water resources and intended for students in environmental science fields that may not have a strong chemistry and/or mathematics background. **Credits:** 4.00

NRES 39300 - Interdisciplinary Approaches To Environmental And Sustainability Studies

Credit Hours: 3.00. This course is the lynchpin of the undergraduate Certificate in Environmental and Sustainability Studies. It will present a series of case studies, core concepts, and problem questions that integrate the following three academic approaches: 1) Human Dimensions and Environment/Sustainability, 2) Engineering and Environment/Sustainability, and 3) Environmental/Sustainability Sciences. **Credits:** 3.00

NRES 40000 - Natural Resources And Environmental Science Study Abroad

Credit Hours: 0.00 to 8.00. Utilized to record credits earned through participation in Purdue study abroad programs with cooperating foreign universities. **Credits:** 0.00 to 8.00

NRES 41000 - Research In Natural Resources And Environmental Science

Credit Hours: 1.00 to 3.00. Supervised individual research. NRES 41000 provides the opportunity to participate in independent undergraduate research with the goal of learning how to design, execute, and report research. Students will properly and permanently record their information in a timely fashion and learn how to examine, analyze, and interpret their results. One credit hour corresponds to one how of laboratory preparation and three hours of laboratory research. Total credits in NRES 41000 and NRES 41100 may not exceed six credits. Permission of instructor required. **Credits:** 1.00 to 3.00

NRES 42000 - Environmental Internship Reporting

Credit Hours: 1.00. Reporting on participation in government, industrial, or other internship program. Permission of department required. **Credits:** 1.00

NRES 45000 - Soil Conservation And Water Management

Credit Hours: 3.00. (AGRY 45000) Principles of soil conservation with emphasis on control of soil erosion by wind and water; impact of soil management decisions on environment; soil-water-plant relations, includes agronomic aspects of water management for both irrigation and drainage. **Credits:** 3.00

NRES 48000 - Hazardous Waste Certification Renewal

Credit Hours: 0.00. Upon completion of this course, students will be able to 1) analyze a response scene to stop the release or potential releases of hazardous substances, and 2) connect knowledge and awareness to meet OSHA requirements (29 CFR 1910.120) for working on projects that involve the handling of hazardous materials. Students successfully completing all requirements will receive their 40-hour HAZWOPER Certification. **Credits:** 0.00

NRES 48500 - Environmental Communications

Credit Hours: 3.00. This is an interactive learning course in science and environmental communication with a strong emphasis on development of practical writing and communication skills for students who will become professionals in environment or natural resources. The public primarily obtains environmental information through the media, as such, scientists need to develop the understanding and skills necessary to engage with a range of audiences through the design of effective communication

products. This course provides a unique balance of communication theory and skills training in which students develop the confidence to meaningfully communicate environmental issues. **Credits:** 3.00

NRES 49700 - Current Topics In Environmental Sciences

Credit Hours: 2.00. This course is part of the NRES capstone experience and helps students examine contemporary environmental issues through the diverse disciplinary lenses they have been exposed to through their NRES coursework. **Credits:** 2.00

NRES 49800 - Individual Studies In Environmental Science

Credit Hours: 1.00 to 3.00. An opportunity for upper-level undergraduates to focus their interests and knowledge on an environmentally related problem. Arrangements must be made with a Natural Resources and Environmental Science Program faculty member before registration. Permission of instructor required. **Credits:** 1.00 to 3.00

NRES 57200 - Stakeholder Involvement In Landscape Management

Credit Hours: 2.00. Engaging the public in natural resource decision-making is an increasingly important and complex task. This course provides an overview of how to include diverse stakeholders in decision-making, collaboration, and conflict resolution through readings, class discussions, and role-plays. **Credits:** 2.00

Naval Science

NS 11000 - Introduction To Naval Science

Credit Hours: 3.00. This course is a general introduction to the USN and USMC that emphasizes organizational structure, warfare components and assigned roles/missions of USN/USMC. It covers all aspects of naval service from its relative position within the DoD to the specific warfare community/career paths and includes basic elements of leadership and USN and USMC core values. The course provides students with initial exposure to many elements of naval culture and provides the conceptual framework/working vocabulary for students to use on summer cruise.**Credits:** 3.00

NS 20200 - Naval Science Laboratory

Credit Hours: 2.00. This lab is designed to develop students morally, mentally, and physically and to imbue in them the highest ideals of duty, honor, and loyalty. Topics shall cover general Navy/Marine Corps mission and policies, force protection, operational security, watch standing, physical fitness, nutrition, stress management, and other professional development subjects not normally included in the curriculum of the Naval Science Courses. Laboratory periods may also be used on an occasional basis to supplement the Naval Science Courses and provide additional time for projects, such as navigation chart work. Open to Naval ROTC students only.**Credits:** 2.00

NS 21200 - Naval Ships Systems II (Weapons)

Credit Hours: 3.00. This course outlines the theory and employment of weapons systems. Students explore the processes of detection, evaluation, threat analysis, weapon selection, delivery, guidance, and explosives. Fire control systems and major weapons types are discussed, including capabilities and limitations. The physical aspects of radar and underwater sound are described. Facets of command, control, communications, computers, and intelligence are explored as a means of weapons system integration. The tactical and strategic significance of command and control warfare and information warfare is discussed.**Credits:** 3.00

NS 21300 - Sea Power And Maritime Affairs

Credit Hours: 3.00. This course is a study of the U.S. Navy and sea power's influence on history and the political process. Students will explore the major events, attitudes, personalities, and circumstances that have imbued the U.S. Navy with its proud history and rich tradition. It deals with issues of national imperatives in peacetime, as well as war, varying maritime philosophies that were interpreted into naval strategies/doctrines, budgetary concerns that shaped force realities, and the pursuit of American diplomatic objectives. It concludes with a discussion of the Navy's strategic and structural changes at the end of the Cold War and its new focus, mission, and strategy in the post-September 11, 2001 world.**Credits:** 3.00

NS 21400 - Naval Leadership And Management

Credit Hours: 3.00. Introduces the student to many of the fundamental concepts of leading Sailors and Marines, which shall be expanded upon during the continuum of leadership development throughout NROTC. It develops the elements of leadership vital to the effectiveness of Navy/Marine Corps officers by reviewing the theories and parameters of leadership and management within and outside of the Naval Service and progressing through values development, interpersonal skills, management skills, and application theory. Practical applications are explored through the use of experiential exercises, readings, case studies, and laboratory discussions.**Credits:** 3.00

NS 31000 - Naval Navigation

Credit Hours: 3.00. This course is an in-depth study of the theory, principles, procedures, and application of plotting, piloting, and electronic navigation, as well as an introduction to maneuvering boards. Students learn piloting techniques, the use of charts, the use of visual and electronic aids, and the theory of operation of both magnetic and gyrocompasses. Students develop practical skills in plotting and electronic navigation. Other topics include tides, currents, effects of wind/weather, voyage planning, and an application and introduction to the international/inland rules of navigation.**Credits:** 3.00

NS 31100 - Naval Operations And Seamanship

Credit Hours: 3.00. This course is a continued study of relative motion, formation tactics, and ship employment. It includes introductions to naval operations and operations analysis, ship behavior and characteristics in maneuvering, applied aspects of ship handling, afloat communications, naval command and control, naval warfare areas, and joint warfare.**Credits:** 3.00

NS 33000 - Evolution Of Warfare

Credit Hours: 3.00. The purpose of Evolution of Warfare is to imbue students with an understanding of the origins of modern warfighting theory through an analysis of historical philosophies, domains, tactics and technology. Through a study of military history, students explore the timeless fundamentals of armed conflict as well as the central role of innovation. They will apply these fundamental warfighting concepts to historic amphibious and expeditionary operations through guided analysis and decision games. **Credits:** 3.00

NS 35000 - Naval Ship Systems-Engineering

Credit Hours: 3.00. In this course, students learn detailed ship design, hydrodynamic forces, stability, propulsion, electrical theory and distribution, hydraulic theory and ship control, and damage control. The course includes basic concepts of theory/design of steam, gas turbine, diesel, and nuclear propulsion.**Credits:** 3.00

NS 41300 - Naval Leadership And Ethics

Credit Hours: 3.00. This course completes the final preparations of ensigns and second lieutenants for service in the Navy and Marine Corps. The course integrates an intellectual exploration of Western moral traditions and ethical philosophy with a variety of topics, such as military leadership, core values, professional ethics, the UCMJ and Navy regulations, and discussions relating to the roles of enlisted members, junior and senior officers, command relationships, and the conduct of warfare. The course provides midshipmen with a foundation of moral traditions, combined with a discussion of actual current and historical events in

the Navy and Marine Corps, to prepare them for the roles and responsibilities of leadership in the Naval Service of the 21st century. Permission of instructor required.**Credits:** 3.00

NS 44000 - Fundamentals Of Maneuver Warfare

Credit Hours: 3.00. The purpose of this course is to introduce the student to the foundational concepts and history of the USMC as the premier maneuver warfighting organization. It is a theoretical class that utilizes both historical examples from previous military operations as well as current doctrine, developing an individual who is both a critical thinker and scholar in the profession of arms. The goal is to educate the student to read military history analytically.**Credits:** 3.00

Nuclear Engineering

NUCL 11000 - Introduction To Energy Engineering

Credit Hours: 1.00. This course, designed for first-semester freshmen, reviews and discusses the history of energy use by the world, the relation between energy usage and quality of life, the social impact of energy use, and the environmental constraints on energy usage. In particular, the role that engineering disciplines play in solving energy problems will be discussed. The full impact that the various energy alternatives have on economic and environmental issues will be reviewed in order to provide a rational basis for energy choices for the future. **Credits:** 1.00

NUCL 12000 - Freshman Research Project

Credit Hours: 1.00. In this course, the student performs a small independent project in nuclear engineering under direct faculty supervision. **Credits:** 1.00

NUCL 20000 - Introduction to Nuclear Engineering

Credit Hours: 3.00. A course designed to acquaint students with the field of nuclear engineering and design. Concepts of fission, fusion, radioactivity, and neutron physics are introduced. Modern applications of nuclear technology, including nuclear medicine, food preservation, space reactors and propulsion. **Credits:** 3.00

NUCL 20500 - Nuclear Engineering Undergraduate Laboratory I

Credit Hours: 2.00. A laboratory course designed for the study of the properties of radiation, radioactive material, and radiation detectors. The hazards of radiation and safe handling techniques are emphasized. **Credits:** 2.00

NUCL 27300 - Mechanics Of Materials

Credit Hours: 3.00. Analysis of stress and strain; equations of equilibrium and compatibility; stress-strain laws; extension, torsion, and bending of bars; membrane theory of pressure vessels; combined loading conditions; transformation of stresses and principal stresses; elastic stability, elected topics. **Credits:** 3.00

NUCL 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in nuclear engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

NUCL 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in nuclear engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

NUCL 29800 - Sophomore Seminar

Credit Hours: 0.00. Career areas in nuclear engineering, job opportunities, areas of related study, topics of current interest, orientation, professional ethics, and responsibility. **Credits:** 0.00

NUCL 30000 - Nuclear Structure And Radiation Interactions

Credit Hours: 3.00. Review of atomic properties and introduction to nuclear models. Discussion of radioactive decay and the interaction of nuclear radiation and reaction products with matter. Energetics and cross-sections of nuclear reactions with applications to problems typical of nuclear engineering. **Credits:** 3.00

NUCL 30500 - Nuclear Engineering Undergraduate Laboratory II

Credit Hours: 2.00. Continuation of NUCL 20500. Experiments with scintillation detectors, multichannel analyzers, neutron detectors, the subcritical pile, and the reactor will be performed. Measurements will be made to demonstrate neutron activation analysis techniques, neutron slowing down, neutron flux distributions, and the effects of control rods on neutron fluxes. **Credits:** 2.00

NUCL 31000 - Introduction To Neutron Physics

Credit Hours: 3.00. Development of diffusion theory for neutrons. Neutron interactions and development of one-group neutron diffusion theory with point, plane, and fission sources. Application to one- and two-region reactors. Introduction to buckling, multiplication constants, critical size, neutron slowing down, and resonance capture. Applications using two-group theory. **Credits:** 3.00

NUCL 32000 - Introduction To Materials For Nuclear Applications

Credit Hours: 3.00. Nuclear environments and materials selection for nuclear applications, bonding, crystal structure and symmetry, defects and irradiation, chemical thermodynamics, phase equilibria, phase transformations, and corrosion in nuclear systems and design. **Credits:** 3.00

NUCL 32500 - Nuclear Materials Laboratory

Credit Hours: 3.00. Nuclear materials laboratory that evaluates various characterization techniques and technologies, tensile properties, hardness, fracture toughness, microstructures, X-ray diffraction, electron microscopy, mechanical properties of thin-films, NDE techniques and data acquisition in materials characterization techniques. **Credits:** 3.00

NUCL 35000 - Nuclear Thermal-Hydraulics I

Credit Hours: 3.00. The first of an integrated two-course sequence introducing the concepts of nuclear reactor thermal transport and associated hydraulics with applications to design and safety. Macroscopic balances, dimensional analysis, and flow measurement. Fluid behavior, momentum transfer, and applications to reactor systems and design. **Credits:** 3.00

NUCL 35100 - Nuclear Thermal-Hydraulics II

Credit Hours: 3.00. Emphasis is given to the fluid transport of heat from reactor fuel elements. Heat transfer in fluids, analogies, and applications to reactor coolant channel analysis. Two-phase flow and convective boiling. Radiative heat transfer. Applications to safety analysis and reactor design. **Credits:** 3.00

NUCL 35500 - Nuclear Thermohydraulics Laboratory

Credit Hours: 3.00. Laboratory course corresponding to NUCL 35000 and NUCL 35100. Various fluid flow and heat transfer phenomena applied to nuclear reactor systems and design. **Credits:** 3.00

NUCL 38199 - Professional Practice Co-Op I

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Professional Practice students only. Permission of department required. **Credits:** 0.00

NUCL 38299 - Professional Practice Co-Op II

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Professional Practice students only. Permission of department required. **Credits:** 0.00

NUCL 38399 - Professional Practice Co-Op III

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Professional Practice students only. Permission of department required. **Credits:** 0.00

NUCL 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in nuclear engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

NUCL 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in nuclear engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

NUCL 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in nuclear engineering. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

NUCL 39699 - Professional Practice Internship

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. Permission of department required. **Credits:** 0.00

NUCL 39800 - Junior Seminar

Credit Hours: 0.00. Continuation of NUCL 29800. **Credits:** 0.00

NUCL 40200 - Engineering Of Nuclear Power Systems

Credit Hours: 3.00. Principles and practice of power plant systems with design applications; thermal cycles, heat transport, mechanical designs, control, safety analysis, shielding analysis, fuel cycles; resources, optimization, options, waste management. Fusion and alternate energy sources. **Credits:** 3.00

NUCL 41000 - Introduction To Reactor Theory And Applications

Credit Hours: 3.00. Intermediate treatment of reactor theory and its relevance to routine design engineering calculations, including introduction to transport theory, criticality evaluation, multi-group theory, isotopic depletion, and concludes with short overview of multi-level reactor design calculations, critical experiments, and treatment of neutronic uncertainties. List of Topics: Derivation of Boltzmann transport equation, and its reduction to steady state and time dependent diffusion equation. Introduction to multi-group theory, and evaluation of group parameters in both wide and narrow resonance approximations. Introduction to homogenization theory, and evaluation of lattice parameters. Evaluation of criticality condition for bare and reflected reactor geometries. Development of discretization techniques for the time-dependent multi-group diffusion theory equation. Reactor kinetics, reactivity coefficients and reactivity balance equation. Flowchart of multi-level reactor design calculations. Introduction to critical experiments and startup reactor physics test. Sources and treatment of uncertainties in reactor calculations. **Credits:** 3.00

NUCL 42001 - Radiation Interaction With Materials And Applications

Credit Hours: 3.00. Fundamental of radiation interaction with materials and applications, types of radiation and radiation sources, physical mechanisms of radiation interaction with solids, radiation damage, ion mixing, applications in nuclear fission and fusion reactors, applications in materials synthesis. **Credits:** 3.00

NUCL 44900 - Senior Design Proposal

Credit Hours: 1.00. The course outcome is the writing and presentation of a proposal for the senior design project, NUCL 45000. The tasks include the selection of project design topics (various nuclear engineering components and systems designs), the selection of teams, introduction to design process, team management, communication, and engineering ethics, literature and patents survey, initiation of design activities and familiarization with design tools (for example software). **Credits:** 1.00

NUCL 45000 - Design In Nuclear Engineering

Credit Hours: 3.00. Application of the design process to the project design topics identified in NUCL 44900. The design process usually includes, but not limited to, mathematical modeling in design, neutronic, thermal-hydraulics and safety studies, risk assessment, economics, policy and regulation, environmental impact. **Credits:** 3.00

NUCL 46000 - Introduction To Controlled Thermonuclear Fusion

Credit Hours: 3.00. Energy resources and the potential role of nuclear fusion. Ignition and breakeven conditions for fusion power plants. Particle and energy confinement in linear and toroidal magnetic fields. Review of magnetic and inertial confinement experiments and conceptual reactor configurations. **Credits:** 3.00

NUCL 47000 - Fuel Cell Engineering

Credit Hours: 3.00. The principles of electromechanical energy conversion for a single fuel cell, fuel cell stack, process engineering in the fuel and oxidizer supply systems. Principles, components, operation and performance for alkaline, phosphoric

acid, solid polymer, molten carbonate and solid oxide fuel cells. Provides broad insight into science, technology, system design, and safety concerns in design and operation of fuel cells. **Credits:** 3.00

NUCL 48000 - Nuclear Engineering Technical Communications

Credit Hours: 3.00. This course makes students aware of the importance of communication skills-written, oral, graphical and interpersonal-in a successful nuclear engineering career and gives them the opportunity to develop and practice those skills. Students will learn how to access, evaluate, use and synthesize relevant technical literature. In addition, through the writing and speaking assignments, students develop team work skills, gain an understanding of professional and ethical responsibilities of engineering, learn to write a simple propose and learn about selected contemporary global economic, social and political issues, particularly with respect to nuclear topics. **Credits:** 3.00

NUCL 49000 - Independent Study In Nuclear Engineering

Credit Hours: 1.00 to 6.00. Projects or research of contemporary importance or special interest. Interested students seek a faculty advisor in their area of special interest and together prepare a brief description of the work to be undertaken. May be taken for 1-6 credits in Fall, Spring, or Summer. May be repeated as many times as desired, but only 6 credits may be counted for the technical elective requirement. Permission of instructor required.**Credits:** 1.00 to 6.00

NUCL 49700 - Selected Topics In Nuclear Engineering

Credit Hours: 1.00 to 3.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 3.00

NUCL 49800 - Senior Seminar

Credit Hours: 0.00. Lectures to acquaint the senior students with professional ethics, job opportunities, graduate schools, continuing study, and services of professional societies. **Credits:** 0.00

NUCL 50100 - Nuclear Engineering Principles

Credit Hours: 3.00. A first course for graduate students desiring a nuclear engineering sequence and an elective for students in science or engineering. The course is structured in four parts: (1) Nuclear structure and radiation, biological effects and medical applications of radiation. (2) Basics of neutron and reactor physics, neutron diffusion and reactor criticality. (3) Nuclear materials and waste. (4) Reactor systems and safety. **Credits:** 3.00

NUCL 50200 - Nuclear Engineering Systems

Credit Hours: 3.00. Engineering aspects of nuclear power. Materials of construction; fuel and fuel cycles; heat removal; radiation shielding; economics; and nuclear power systems. Permission of instructor required. **Credits:** 3.00

NUCL 50300 - Radioactive Waste Management

Credit Hours: 3.00. Will familiarize students with the nature of the risks associated with radioactive waste and the history, regulations, and worldwide status for the safe storage of various types of radioactive waste. The sources, characteristics, and magnitudes of radioactive wastes are described, and the current and proposed engineered waste management systems are examined along with the analysis of their associated risks. **Credits:** 3.00

NUCL 50400 - Nuclear Engineering Experiments

Credit Hours: 3.00. A laboratory course that, when coupled with NUCL 50100, produces a sequence that contains both the theoretical and engineering aspects of nuclear engineering. Topics include radiation detection and analysis, neutronics, and nuclear reactor experiments. **Credits:** 3.00

NUCL 51000 - Nuclear Reactor Theory I

Credit Hours: 3.00. Methodologies of neutron flux calculations, diffusion and slowing down theory, flux separation, material buckling, resonance absorption, Doppler effect, 2-group and multi-group theories, and reactivity balances for design and operation. Introduction to reactor kinetics, delayed neutrons, point reactor kinetics, transient behavior, load changes, reactivity feedback, and safety implications. **Credits:** 3.00

NUCL 51100 - Reactor Theory And Kinetics

Credit Hours: 3.00. Advanced methodologies for neutron flux calculation, nodal methods, introduction to transport theory, transport correction, multigroup theory, and introduction to the generation of group constants. Reactor kinetics, perturbation theory, adjoint fluxes, reactivity calculation from perturbation theory, reactivity coefficients due to Doppler effect, temperature and density changes, void coefficient, and energy and power coefficients. Microkinetics, theory of reactivity measurements, approximate methods: prompt jump approximation, and prompt kinetics. Transients with feedback, safety implications, and spatial kinetics. **Credits:** 3.00

NUCL 51200 - Computers In Reactor Analysis

Credit Hours: 3.00. The application of computational methods in reactor systems analysis. Theory behind modern numerical methods (e.g. SOR, Conugate Gradient, etc.) for solving large, sparse systems on linear equations that result from the discretization of elliptical and parabolic partial differential equations. Applications include the multigroup, multi-dimensional neutron transport equation and two-phase flow fluid dynamics. Extensive use of MATLAB, FORTRAN, and UNIX(tm). No written exams, and the majority of problem sets are performed as group projects. Knowledge of FORTRAN required. **Credits:** 3.00

NUCL 52000 - Radiation Effects And Reactor Materials

Credit Hours: 3.00. Introduction to radiation effects in solids and a survey of nuclear reactor materials. Radiation interaction mechanisms and effects on properties. Reactor material characteristics, selection criteria, testing, and economic considerations. **Credits:** 3.00

NUCL 55100 - Mass, Momentum, And Energy Transfer In Energy Systems

Credit Hours: 3.00. Formulations for analyzing complicated thermal-hydraulic phenomena in energy systems. Derivation of two-phase flow field equations and constitutive relations. Thermal-hydraulic modeling of nuclear reactor systems. Analyses of nuclear reactor safety related phenomena based on conservation principles. **Credits:** 3.00

NUCL 55200 - Thermal-Hydraulics And Reactor Safety

Credit Hours: 3.00. Applications of thermal-sciences to nuclear reactor safety design and risk assessment. Emphasis on illustrating the use of basic principles in quantitative safety assessments of practical and current interest. The basic topics revolve around multiphase transients and applications which include study of accident analysis and its applications to licensing for light water reactor systems and for liquid metal fast breeder reactor. **Credits:** 3.00

NUCL 55300 - Nano-Macro Scale Applications Of Nuclear Technology

Credit Hours: 3.00. Introduction of the principles of nuclear science and engineering for addressing industrial and scientific issues ranging from sub-nano-to-macro scales. Areas to be covered include: propulsion, high-energy density materials, supercooling, medical applications, sonoluminescence, novel detection systems for special nuclear and contraband materials, and advanced nuclear fusion power systems. **Credits:** 3.00

NUCL 55500 - Thermal Hydraulics Measurement And Instrumentation

Credit Hours: 3.00. Measurement techniques in fluid flow, heat transfer, and multi-phase flow. The principle and practice of measurement of temperature, flow, level, pressure, and void fraction (in two-phase flow systems) as applied to nuclear reactor systems. Instrument error and measurement errors, and data acquisition system using PC. Hands-on experience in the laboratory with instruments. **Credits:** 3.00

NUCL 56000 - Introduction To Fusion Technology

Credit Hours: 3.00. Introduction to electricity and magnetism, magneto-fluid-mechanics and plasma physics. Thermonuclear reactions, power balances, macroscopic and microscopic instabilities. Principles of operation and conceptual design of Tokamaks, Mirror, Theta-Pinch, and Laser-Driven fusion reactors. **Credits:** 3.00

NUCL 56300 - Direct Energy Conversion

Credit Hours: 3.00. Review of energy sources and study of the basic processes of direct energy conversion and their applications to energy utilization, based on both conventional and nuclear energy conversion schemes. Conventional schemes include thermoelectric, photovoltaic, thermionic, magnetohydrodynamic generators, fuel cell systems, etc.; and nuclear energy conversion schemes correspond to nuclear radiation and fusion energy conversion. Permission of instructor required. **Credits:** 3.00

NUCL 57000 - Fuzzy Approaches In Engineering

Credit Hours: 3.00. Presentation of the mathematical fundamentals of fuzzy logic theory and a survey of engineering applications. Fuzzy sets; the extension principle; fuzzy numbers; fuzzy relations and composition; linguistic descriptions; implication operators and fuzzy algorithms are formally developed. Applications emphasize the engineering utilization of approximate reasoning to diagnostics, control, safety, and decision-making problems. **Credits:** 3.00

NUCL 57500 - Neural Computing In Engineering

Credit Hours: 3.00. Mathematical fundamentals of computing with neural networks. Survey of engineering applications. Computational metaphors from biological neurons. Artificial neural networks modeling of complex, nonlinear and ill-posed problems. Emphasizes engineering utilization of neural computing to diagnostics, control, safety, and decision-making problems. **Credits:** 3.00

NUCL 58001 - Essential Communication Skills For Nuclear Engineering

Credit Hours: 3.00. Essential communications skills for engineers with emphasis on communicating subject matter specific to the nuclear engineering field. Includes instruction, practice, and detailed feedback on written, oral, and graphical communications. Students learn to access, evaluate, and synthesize technical literature and practice skills necessary to prepare a literature review. Ethics and professional responsibilities, along with contemporary global economic, social and political issues are among the topics discussed. The only prerequisite is admission to the graduate program in Nuclear Engineering. **Credits:** 3.00

NUCL 59000 - Independent Study In Nuclear Engineering I

Credit Hours: 1.00 to 6.00. Independent study projects. Interested students seek a faculty instructor in their area of special interest and prepare a brief description of the independent project to be undertaken. May be taken for 1-6 credits in Fall, Spring, or Summer. May be repeated as many times as desired, but only a maximum of 6 credits may be counted for the degree program requirement. Permission of instructor required.**Credits:** 1.00 to 6.00

NUCL 59700 - Selected Topics In Nuclear Engineering I

Credit Hours: 1.00 to 3.00. Development of individual research and study projects. Permission of instructor required.**Credits:** 1.00 to 3.00

NUCL 61000 - Nuclear Reactor Theory II

Credit Hours: 3.00. This course covers advanced reactor physics topics including the neutron transport theory, slowing down and resonance escape, and generalized perturbation theory. The neutron transport theory is the fundamental theory describing the neutron flux behaviors in nuclear systems. The slowing down and resonance escape calculations are essential for generating the multi-group cross sections required in the whole-core neutron transport calculations. The generalized perturbation theory is a powerful method for determining the changes in response parameters due to the variations in nuclide densities and microscopic cross sections. Prerequisites: NUCL 51000 and advanced engineering mathematics covering complex analysis, partial differential equations, and integral equations. **Credits:** 3.00

NUCL 61200 - Applied Reactor Analysis

Credit Hours: 3.00. Reactor physics analysis of existing reactors and critical experiments through the use of digital computers and reactor programs. One-, two-, and three-dimensional solutions of the diffusion and transport equations. Calculation methods for lifetime effects on excess reactivity, power distribution, breeding ratio, and temperature, void, and Doppler coefficients of reactivity. Fuel shuffling and safety calculations for fuel handling and storage. Concurrent Prerequisite: NUCL 61000. **Credits:** 3.00

NUCL 62000 - Advanced Topics In Radiation Damage

Credit Hours: 3.00. Materials phenomena unique to nuclear reactor environments are examined quantitatively. The relation between these phenomena and the structure and properties of engineering materials is discussed. Coupled phenomena are considered in relation to materials modeling codes. Prerequisite: NUCL 42000 and NUCL 52000 (or other related/similar courses). **Credits:** 3.00

NUCL 64000 - Fast Reactor Theory

Credit Hours: 3.00. Course is designed to teach reactor physics specific to fast spectrum reactors and the associated computational methods. Topics include breeding and actinide burning capabilities, core design implications, and reactivity feedback mechanisms. Computational methods will be specific to fast reactor physics analysis and include the fast neutron spectrum calculation, group constant generation and reactivity feedback calculations for Doppler, thermal expansions, and sodium void. Prerequisites: NUCL 51100 and advanced engineering mathematics covering complex analysis, partial differential equations, and integral equations. **Credits:** 3.00

NUCL 65000 - Thermal Hydraulics For Nuclear Reactor Safety

Credit Hours: 3.00. Safety philosophy, levels and goals of safety. Approaches used for nuclear reactor safety for the protection of public health. Design basis accidents. Engineered safeguards and inherent safety features. Fundamentals of safety related thermal-hydraulic phenomena and their integration into a methodology for containment assessment. Prerequisite: ME 50500. **Credits:** 3.00

NUCL 65100 - Dynamics Of Nuclear Thermal-Hydraulics System

Credit Hours: 3.00. This course discusses and analyzes various two-phase flow instabilities important for nuclear reactor systems. For the interfacial stabilities, Kelvin-Helmholtz and Rayleigh-Taylor instabilities as well as flooding and flow reversal instabilities are addressed. For the static instabilities, flow excursion instability that can reach the critical heat flux condition is analyzed relative to fast reactor and high flux research reactors. For the dynamic instabilities the density wave instabilities are discussed in detail. The characteristic equation is obtained and how to determine the stability of the system is discussed. Both the encirclement theory and the D-Partition stability boundary theory are explained. In addition, each student's research is studied through presentations, questions and discussions. Permission of instructor required. Prerequisites: NUCL 55100 and NUCL 55200. **Credits:** 3.00

NUCL 65500 - Two-Phase Flow Computational Fluid Dynamics Applications

Credit Hours: 3.00. The course guides the student to two-fluid model solutions using computational fluid dynamics (CFD). Topics include: review of the two-fluid model, review of elliptic and parabolic partial differential equations, description of numerical algorithms, and two-phase flow channel and jet flows. Prerequisite: NUCL 56000. **Credits:** 3.00

NUCL 66000 - Magnetic Confinement Fusion

Credit Hours: 3.00. Applications of plasma physics for analysis and design of plasma configurations in fusion reactors. Topics include beam-driven fusion systems, plasma heating and ignition via neutral beams and RF wave heating, plasma waves, kinetic and fluid descriptions of plasmas, and energy transport; blanket neutronics for tritium breeding, energy conversion, and reactor design considerations. Prerequisite: NUCL 56000. **Credits:** 3.00

NUCL 66100 - Inertial Confinement Fusion Technology

Credit Hours: 3.00. Inertially confined thermonuclear fusion reactions and energy gains; laser-plasma interactions; hydrodynamic compression; energy transports including electron thermal conduction and radiation transport; beam transport and instabilities; driver energy deposition and the driver development for lasers, particle beams and accelerators; and target designs. Approval of Instructor required. Prerequisite: NUCL 56000 or equivalent. **Credits:** 3.00

NUCL 69000 - Independent Study In Nuclear Engineering II

Credit Hours: 1.00 to 6.00. Independent research projects. Interested students seek a faculty instructor in their area of special interest and prepare a brief description of the independent project to be undertaken. May be taken for 1-6 credits in Fall, Spring, or Summer. May be repeated as many times as desired, but only maximum of 6 credits may be counted for the degree program requirement. Permission of instructor required. **Credits:** 1.00 to 6.00

NUCL 69600 - Nuclear Engineering Seminar

Credit Hours: 0.00. Discussion by graduate students and invited speakers of their research projects and topics of interest in nuclear engineering. Prerequisite: Master's student standing and Nuclear Engineering majors only. **Credits:** 0.00

NUCL 69700 - Selected Topics In Nuclear Engineering II

Credit Hours: 1.00 to 3.00. Courses on topics of contemporary importance or special interest in nuclear engineering. Hours and credits to be arranged. Permission of instructor required. **Credits:** 1.00 to 3.00

NUCL 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

NUCL 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Nuclear Pharmacy

NUPH 49000 - Special Topics

Credit Hours: 1.00 to 3.00. An honors course for superior students to be used in relation to, and to supplement, an existing course; an in-depth approach to topics of current interest utilizing the original literature as prime source material. A laboratory project may be included. Permission of instructor required. **Credits:** 1.00 to 3.00

NUPH 49100 - Introduction To Nuclear Pharmacy

Credit Hours: 1.00. This course will serve as an introduction to nuclear pharmacy practice and serve as the first course in the nuclear pharmacy elective series. Successful completion of the nuclear pharmacy series can be used to meet the 200 hour didactic training requirement set forth by the Nuclear Regulatory Commission (NRC) towards achieving Authorized User status. This course will provide basic information about the profession of nuclear pharmacy, as well as an introduction to radioactive material and radiation safety concepts. The course will conclude with guest lectures from practitioners in several different areas of nuclear pharmacy practice to provide information about the different areas of practice available to nuclear pharmacists. **Credits:** 1.00

NUPH 49200 - Basics Of Nuclear Pharmacy Practice

Credit Hours: 1.00. This course emphasizes some of the daily tasks performed by nuclear pharmacists when working in the nuclear pharmacy. **Credits:** 1.00

NUPH 49300 - Regulatory Considerations For Nuclear Pharmacy Practice

Credit Hours: 2.00. This is the second course in the nuclear pharmacy series, with an emphasis on the regulatory oversight of nuclear pharmacy practice. While the previous course dealt with radiation safety issues, this course outlines how these safety skills relate to the regulatory requirements set forth by the various regulatory agencies. **Credits:** 2.00

NUPH 49400 - Clinical Aspects Of Nuclear Pharmacy Practice

Credit Hours: 2.00. This course will be offered as a lecture course with some interactive discussion and problem solving applications. In addition, students will be required to complete several distance learning activities that relate to/enhance the materials that will be covered in the lecture period. This course is the final course in the NUPH series that can be used to count toward the 200 hours of didactic training required for Authorized Nuclear pharmacist (ANP) status. **Credits:** 2.00

NUPH 49500 - Applied Nuclear Pharmacy

Credit Hours: 2.00. This is an elective course that consists of lecture, laboratory, and distance education components which will count as part of the 200 hours of didactic training required for Authorized Nuclear Pharmacist (ANP) status. This course focuses on the preparation, dispensing and clinical applications of radiopharmaceutical products. **Credits:** 2.00

NUPH 49600 - Case Studies In Clinical Nuclear Medicine

Credit Hours: 1.00 or 2.00. Introduction to the clinical applications of radiopharmaceutical drug products and the associated practice of nuclear medicine, through analysis of a series of current clinical case studies. Factors examined include: patient medical history, with emphasis on recent diagnostic procedures and pharmacotherapy; radiopharmaceutical selection, dosage, and preparation; possible contraindications for the nuclear medicine procedure and associated interventional agents; diagnostic findings; and the impact of study outcome on subsequent patient treatment. Permission of instructor required. **Credits:** 1.00 or 2.00

NUPH 69000 - Special Problems

Credit Hours: 0.00 to 18.00. Individual investigations in the applications of radionuclides to research and nuclear pharmacy. Hours and credits to be arranged. Permission of instructor required. **Credits:** 0.00 to 18.00

NUPH 69600 - Seminar In Nuclear Pharmacy

Credit Hours: 0.00 or 1.00. Selected topics in nuclear pharmacy, radiopharmaceutical chemistry, health physics, and radiation biology, presented by staff, students, and invited speakers. **Credits:** 0.00 or 1.00

Nursing

NUR 10800 - Introduction To Nursing

Credit Hours: 1.00. Introduce students entering the nursing profession to foundations of the baccalaureate nursing curriculum, including concepts, competencies, mandatory requirements and responsibilities within the profession. Students are introduced to the rigor of the curriculum and begin to build a sense of community within the Purdue School of Nursing. **Credits:** 1.00

NUR 10900 - Introduction To Nursing II

Credit Hours: 1.00. Using knowledge acquired in NUR 10800 students will examine the profession of nursing and their role and responsibilities within the profession. Topics to be discussed include informatics and technology, the importance of professional communication in oral and written form, the global image of nursing, wellness and self-care, and preparation for progression into the sophomore year. Permission of department required. **Credits:** 1.00

NUR 21400 - Introduction To Pathophysiology

Credit Hours: 3.00. An introduction to pathophysiological alterations in major regulatory mechanisms of the body. Provides a foundation for understanding general nursing practice, various diagnostic procedures, and selected therapeutic regimens. **Credits:** 3.00

NUR 21801 - Health Assessment And Essentials Of Nursing Practice I

Credit Hours: 5.00. Focuses on the beginning concepts and principles for the professional nurse while developing fundamental skills in a nursing process framework. Through lecture and clinical learners begin to apply skills in communication and assessment. Emphasis is placed on developing physical examination skills, obtaining health histories and performing client centered safe nursing care to meet basic healthcare needs in diverse populations across the lifespan. **Credits:** 5.00

NUR 21901 - Pathopharmacology I

Credit Hours: 3.00. An introduction to the study of underlying changes in primary physiologic regulatory mechanisms affecting homeostasis, metabolic processes, immune response, circulation, renal elimination, fluid/electrolyte and acid/base balance,

sensory perception and alteration in comfort and the pharmacotherapies utilized as treatment for alterations and disease states. This introductory knowledge provides the foundation for the understanding and practice of general nursing. **Credits:** 3.00

NUR 22001 - Essentials Of Nursing Practice II

Credit Hours: 5.00. Continues to expand on the professional nursing role supported by fundamental concepts and principles of the nursing process in lecture and clinical settings. Learners apply communication, assessment and nursing skills while caring for the needs of clients in diverse populations across the lifespan. **Credits:** 5.00

NUR 22101 - Pathopharmocology II

Credit Hours: 3.00. An introduction to the study of underlying changes in primary physiologic regulatory mechanisms affecting respiratory, hematologic, endocrine, neurologic, neuromuscular, gastrointestinal and reproductive function and the pharmacotherapies utilized as treatment for alterations and disease states. This course builds on the learning objectives from Pathopharmacology I to provide the foundation for the understanding and practice of general nursing. **Credits:** 3.00

NUR 22201 - Population Health

Credit Hours: 2.00. A comprehensive introduction to population health concepts and practices through examination of philosophy, purpose, functions, activities and tools. Multiple determinants (genetics, cultural, social, and behavioral factors) that influence population health and illness are explored including the contribution of these factors to health disparities. Population-focused initiatives for health promotion and disease prevention are examined within the context of local to global public health systems. **Credits:** 2.00

NUR 22301 - Foundations Of Research And Evidence-Based Practice

Credit Hours: 3.00. Students gain foundational competencies for evidence-based practice (EBP), including computer literacy, information literacy, and professional communication. Students learn the principles of research process and identify strengths and limitations of research articles in relation to EBP in nursing and healthcare. **Credits:** 3.00

NUR 22401 - Nursing Practice Foundations I: Health Assessment

Credit Hours: 4.00. Designed for second degree students, this course focuses on the beginning concepts and principles for the professional nurse while developing fundamental skills in a nursing process framework. Through lecture and clinical experience, learners begin to apply skills in communication and assessment. Emphasis is placed on developing physical examination skills, obtaining health histories and performing client-centered, safe nursing care to meet basic healthcare needs in diverse populations across the lifespan. **Credits:** 4.00

NUR 22501 - Nursing Practice Foundations II: Fundamentals

Credit Hours: 4.00. Designed for second degree students, this course continues to expand on the professional nurse role supported by fundamental concepts and principles of the nursing process in lecture and clinical settings. Learners apply communication, assessment and nursing skills while caring for the needs of clients in diverse populations across the lifespan. **Credits:** 4.00

NUR 22601 - Topics In Nursing Research And Evidence-Based Practice

Credit Hours: 3.00. Introduces foundational competencies for evidence-based practice (EBP), including computer literacy, information literacy, and professional communication. The principles of research process and strengths and limitations of research articles in relation to EBP in nursing and healthcare are identified. **Credits:** 3.00

NUR 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in nursing. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

NUR 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in nursing. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

NUR 31401 - Health Alterations In Adults I

Credit Hours: 6.00. One of two courses focusing on providing nursing care to adults with an emphasis on the application of the nursing process to assist diverse populations reach their optimal level of well-being as they experience health care across the delivery system continuum. Emphasis will be on promoting clinical reasoning skills, integrating best practices, and ensuring patient safety. The course concentrates on adults experiencing alterations in tissue integrity related to surgical interventions, cellular division, reproductive function, elimination, nutrition and sensory function that typically result in hospitalization. **Credits:** 6.00

NUR 31501 - Nursing Of Childbearing Families

Credit Hours: 5.00. Promotes the development of nursing skills when caring for families and their newborns during uncomplicated and/or complicated childbearing experiences within a variety of clinical settings. Emphasizes the study and application of the nursing process, integrating evidence based practice while meeting the health and safety needs of diverse childbearing families. **Credits:** 5.00

NUR 31601 - Integration Seminar I

Credit Hours: 1.00. In this course, students will be challenged to identify appropriate nursing interventions for patients with a combination of medical and obstetrical diagnoses. Through the course activities the students will be challenged to look at healthcare from a patient perspective. **Credits:** 1.00

NUR 31701 - Health Alterations In Adults II

Credit Hours: 6.00. One of two courses focusing on providing nursing care to adults with an emphasis on the application of the nursing process to assist diverse populations reach their optimal level of wellbeing as they experience health care across the delivery system continuum. Emphasis will be on promoting clinical reasoning skills, integrating best practices, and ensuring patient safety. The course concentrates on adults experiencing alterations in health related to oxygenation, circulatory dynamics, endocrine regulation, neurological regulation, immune regulation and musculoskeletal dynamics that typically result in hospitalization. **Credits:** 6.00

NUR 31801 - Psychiatric And Mental Health Nursing

Credit Hours: 5.00. Focuses on providing nursing care that supports mental health and the care of persons with mental illness while providing a conceptual integration of the nursing process, theories, and research from the biopsychosocial sciences and humanities. Demonstrates the relevance of psychiatric-mental health nursing concepts to all areas of professional practice. **Credits:** 5.00

NUR 31901 - Integration Seminar II

Credit Hours: 1.00. In this course, students will be challenged to identify appropriate nursing interventions for patients with a combination of medical and psychiatric diagnoses. Through the course activities, the students will be challenged to look at healthcare from a patient perspective. **Credits:** 1.00

NUR 33001 - Nursing Peer Mentors

Credit Hours: 2.00. Peer mentorship role to assist students entering the nursing profession to develop an understanding of the foundations of the baccalaureate nursing curriculum, including concepts, competencies, mandatory requirements, and responsibilities within the profession. To help students acclimate to college and begin to build a sense of campus community and community within the Purdue School of Nursing. Important attributes of a peer mentor are the desire to develop and help others, an openness to spending time with diverse individuals who may not share a common background, values, or goals, and a willingness to share failures and personal experiences to provide valuable opportunities for learning. A peer mentor should have a growth mindset and learning attitude, skill in developing others through active listening, asking open-ended questions, self-reflection, and providing feedback, and the ability to commit time and energy to the mentoring relationship. Permission of department required. **Credits:** 2.00

NUR 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in nursing. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

NUR 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in nursing. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

NUR 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in nursing. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

NUR 39699 - Professional Practice Internship

Credit Hours: 0.00. Program coordinated by Nursing with cooperation of participating employers and the Office of Professional Practice. Students will submit summary reports and company evaluations related to the experience. Professional Practice students only. Permission of department required. **Credits:** 0.00

NUR 39801 - International Special Topics

Credit Hours: 1.00 to 6.00. Course taken during an international experience that is recognized by the University. Permission of department required. **Credits:** 1.00 to 6.00

NUR 39900 - Special Topics

Credit Hours: 0.00 to 3.00. Hours, credit, and subject matter to be arranged by faculty. **Credits:** 0.00 to 3.00

NUR 40200 - Public Health Nursing

Credit Hours: 3.00. Grounded in the historical tenets of public health nursing, this course builds on the knowledge from nursing and public health science to address the heath promotion and illness prevention of culturally diverse aggregates. **Credits:** 3.00

NUR 40300 - Public Health Nursing Clinic

Credit Hours: 2.00. This course is a synthesis of nursing practice and public health science. Health promotion, health maintenance, health teaching and counseling, and coordination of care are utilized in providing population-focused care to individuals, families, and groups in the community. A select caseload of clients, as well as special projects, are assigned to develop student skills in the practice of public health nursing. **Credits:** 2.00

NUR 41001 - Issues In Professional Nursing

Credit Hours: 2.00. Promotes the use of critical thinking, clinical reasoning, and active learning to analyze contemporary issues related to professional nursing practice. Issues and key trends surrounding social determinants of health policy and economics, regulatory agencies, political action, cultural diversity, practice competency, nursing informatics and ethics are used as a framework. Permission of department required. **Credits:** 2.00

NUR 41200 - Pediatric Nursing

Credit Hours: 3.00. A study of the factors influencing health promotion, protection, and maintenance of infants, children, and adolescents. Family theory; growth and development; primary healthcare; and acute, chronic, and terminal conditions are examined. **Credits:** 3.00

NUR 41300 - Pediatric Nursing - Clinic

Credit Hours: 2.00. Experience is provided in caring for healthy, at risk, acutely, and chronically ill infants, children, and adolescents and their families. **Credits:** 2.00

NUR 41401 - Pediatric Nursing

Credit Hours: 5.00. Explores factors influencing the health and wellness of children and families. Students will apply principles, concepts and research from the health and human sciences to the care of children and families across the health-illness continuum. A structured clinical component focuses on clinical reasoning and evidence based practice. Students will provide family centered care to healthy, at risk and ill children across a variety of clinical settings. **Credits:** 5.00

NUR 41501 - Public Health Nursing

Credit Hours: 5.00. Utilize health promotion, maintenance, education and disease prevention in coordinating and providing population-focused care to individuals, families and aggregates in the community. A variety of clinical settings are used to offer students a broad, comprehensive perspective of public health nursing, a field that synthesizes content from nursing, social and public health sciences. Collaboration with the community and implementation of population-focused interventions foster critical thinking and independent decision making in the delivery of nursing care. **Credits:** 5.00

NUR 41601 - Management Of Clients With Complex Health Issues

Credit Hours: 2.00. Focuses on nursing care of adults, children, and families with complex healthcare needs. Challenges students to use critical thinking and clinical reasoning to identify, prioritize, and evaluate nursing care interventions for clients with complex healthcare issues. **Credits:** 2.00

NUR 41701 - Leadership In Nursing

Credit Hours: 3.00. Studies the components of nursing leadership and management functions with an emphasis on critical thinking, problem solving, communication, and team building within the context of experiential problem-based group projects. This course will provide specific practice and evaluation of strategic and financial planning, conflict management, delegation, and complex change. Competencies to be gained, at a novice level, include professional communication, sound ethical and legal judgments within personal and organizational frameworks, leadership skills in the management and evaluation of others, and an understanding of the drivers of healthcare change and finances. **Credits:** 3.00

NUR 41801 - Clinical Capstone And Issues In Professional Practice

Credit Hours: 4.00. Promotes the use of critical thinking, clinical reasoning, and active learning to analyze contemporary issues related to professional nursing practice. Issues surrounding political action, socio-legal concerns, cultural diversity and ethics in nursing practice are used as a framework. A supportive and structured clinical component in a real-world setting encourages the learner to focus on refining clinical, leadership, and time-management skills in the delivery of care to diverse groups of clients across the lifespan. The clinical component assists the learner to transition from the role of students to novice nurse. **Credits:** 4.00

NUR 41901 - Professional Nursing: Evolution As A Clinician And Leader

Credit Hours: 3.00. Incorporate the use of critical thinking, clinical reasoning, and active learning in analyzing contemporary issues related to professional nursing practice and obtaining professional nursing licensure. Issues surrounding political action, socio-legal concerns, cultural diversity and ethics in nursing practice are used as a framework. **Credits:** 3.00

NUR 42001 - Transition To Professional Nursing Practice

Credit Hours: 4.00. This course challenges students to use critical thinking and clinical reasoning to identify, prioritize and evaluate nursing interventions for clients with complex healthcare issues. Students interact with members of the healthcare team and clinical faculty to practice effective leadership, delegation and supervision of nursing students in clinical environments. **Credits:** 4.00

NUR 43001 - NCLEX Review

Credit Hours: 2.00. The NCLEX-Prep is a pre-graduation comprehensive review of nursing content implemented in the senior year. The course is utilized as supplemental to assist with overall content review. Students will use their ATI account to access the content and will be assigned an ATI educator. The course is used to assist students to prepare for the ATI Comprehensive Predictor (Program Exit Exam), and NCLEX (National Council Licensure Examination). **Credits:** 2.00

NUR 43700 - Clinical Leadership Development

Credit Hours: 2.00 or 3.00. Senior nursing students in collaboration with nursing faculty refine leadership behaviors in a clinical setting. **Credits:** 2.00 or 3.00

NUR 50000 - Theoretical Constructs In Nursing

Credit Hours: 3.00. This course examines the integration of theory/conceptual relationships in the development of nursing knowledge. Students explore ways in which nurses in advanced practice incorporate theoretical knowledge in the implementation of the advanced practice in nursing role. Students analyze the clinical relevance of mid-range and practice theories. Students examine the relationship of theoretical constructs to research and praxis through concept analysis, theory evaluation, and

discussion of the application of theory to practice. This course examines ways in which theoretical thought is embedded in evidence-based nursing practice. **Credits:** 3.00

NUR 50100 - Foundations Of Advanced Practice In Nursing

Credit Hours: 2.00. This course builds on the knowledge and experiences that students possess when beginning their advanced practice in nursing education. Students explore their assumptions about advanced practice in nursing, its historical context and definitions of the various advanced practice roles, conceptual underpinnings and role competencies. Students develop an appreciation for how evidence based practice influences advanced practice in nursing. They develop skills that include using information communication technologies, identifying problems, posing questions that lead to evidence sources, searching and differentiating among various sources and types of evidence. **Credits:** 2.00

NUR 50200 - Pharmacotherapeutics For Advanced Practice Nursing

Credit Hours: 3.00. Course includes pharmacodynamics, pharmacokinetics, and pharmacotherapeutics of broad categories of pharmacologic agents. Students apply these principles and also consider the role of best available evidence and patient preferences as a basis for managing pharmacologic regimens. Students review regulations relevant to prescriptive authority for advanced practice nurses. **Credits:** 3.00

NUR 50300 - Advanced Health Assessment

Credit Hours: 3.00 (West Lafayette, Fort Wayne); 4.00 (Calumet). Students develop advanced, evidence-based health assessment skills that build on their current knowledge and abilities. Major concepts of the course include comprehensive and focused history taking and advanced physical assessment. Students relate underlying physiologic mechanisms with normal and abnormal findings from the history and physical assessment. The course provides a basis for designing a culturally sensitive and evidence-based plan of care within the situational context of the individual. **Credits:** 3.00 to 4.00

NUR 50500 - Sociocultural Influences On Health

Credit Hours: 2.00 to 3.00. This course examines the influences of cultural and sub-cultural variables on health and health care delivery. Students analyze and apply appropriate theoretical perspectives and current research to design evidence-based strategies that ground clinical decision making in advanced practice nursing. Students use the National Standards on Culturally and Linguistically Appropriate Services (CLAS) as the basis for providing culturally competent care. As students apply principles of culturally competent communication they are encouraged to develop insight and an attitude of resistance to stereotyping. Students gain an understanding of the context of vulnerable and marginalized populations through the analysis of social, cultural, and economic influences that impact health and illness. **Credits:** 2.00 to 3.00

NUR 50700 - Physiologic Concepts For Advanced Practice Nursing

Credit Hours: 4.00. Students examine the principles of physiologic function at all levels of organization from cells to organ systems as they affect human function. The course uses homeostasis as a model to account for regulatory and compensatory functions in health. Students develop the necessary theoretical and empirical foundation for subsequent understanding of the diagnosis and management of human responses to disease and non-disease based etiologies. **Credits:** 4.00

NUR 51000 - Research And Evidence Based Nursing Practice

Credit Hours: 3.00. This course focuses on both the generation of primary evidence through an in-depth examination of the research process and its critical use in evidence based practice. Students systematically search, appraise and interpret the best available evidence that informs advanced practice nursing and health related disciplines.**Credits:** 3.00

NUR 51100 - Health Promotion For Advanced Practice In Nursing

Credit Hours: 2.00 to 3.00. Students analyze health promotion/disease prevention, and health education frameworks combined with best available evidence as a foundation for advanced practice in nursing. Students promote the health of diverse client populations by incorporating the Healthy People goals, clinical practice guidelines, risk assessment, epidemiological data and evidence based screening tools into nursing practice. In collaboration with selected clients and/or families, students implement health coaching/teaching through the integration of family, health promotion and health literacy theories. **Credits:** 2.00 to 3.00

NUR 51200 - Clinical Applications In Pharmacotherapeutics

Credit Hours: 1.00. This course applies information from NUR 50200 to the care of clients through the use of case studies. Emphasis is placed on incorporating information from pharmacology, physiology, and physical assessment.**Credits:** 1.00

NUR 51300 - Health Promotion In Special Populations

Credit Hours: 3.00. Examination of wellness and health promotion issues unique to three special populations: clients in rural areas, women, and adolescents. Legal and ethical issues related to practice with special populations is addressed. Evidence-based standards will be utilized.**Credits:** 3.00

NUR 51400 - Clinical Application In Pharmacotherapeutics For Pediatric Nurse Practitioners

Credit Hours: 1.00. Applies information from NUR 50200, Pharmacotherapeutics in Primary Care, to the care of infants, children, and adolescents through the use of case studies. Emphasis is placed on incorporating information from pharmacology, physiology, and physical assessment. **Credits:** 1.00

NUR 51500 - Health Promotion In Pediatric Populations

Credit Hours: 3.00. Examines wellness and health promotion issues unique to children from birth through adolescence. Concepts of growth and development are integrated into health promotion activities. Legal and ethical issues related to practice with children and adolescents are addressed. Evidence-based practice standards will be utilized.**Credits:** 3.00

NUR 51601 - Clinical Applications In Pharmacology Family Nurse Practitioner

Credit Hours: 1.00. This course applies information from Pharmacotherapeutics in primary care (NUR 50200) to the care of infants, children, adolescents and adults through the use of case studies. Emphasis is on incorporating from pharmacology, physiology and physical assessment.**Credits:** 1.00

NUR 51700 - Doctor Of Nursing Project Seminar, Doctor Of Nursing Practice

Credit Hours: 0.00. This seminar will allow the student to begin contemplating and organizing their thoughts in developing the DNP project. In this seminar, the student will be introduced to the requirements for the DNP project and begin to cultivate feasible project questions that have an impact in clinical care, obtain feedback and network with peers.**Credits:** 0.00

NUR 52200 - Psychopharmacology Across The Lifespan

Credit Hours: 2.00. Signs and symptoms of all major psychiatric disorders and the medications used to treat them across the life-span are discussed. Classes of psychiatric medications are considered; including indications, therapeutic uses, neurophysiological mechanism of action and side effects. **Credits:** 2.00

NUR 52500 - Informatics In Nursing

Credit Hours: 3.00. Integrates nursing science with computer technology and information science to identify, gather, and manage information. Emphasis on technology based health applications with support clinical, administrative, research, and educational decision making enhancing the efficacy of nursing endeavors. **Credits:** 3.00

NUR 52800 - Acute Illness: Pediatric Health Practice

Credit Hours: 3.00. A developmentally organized course to provide knowledge and experience to care for acute episodic illnesses of children and adolescents in primary healthcare settings. Examines pathophysiological alterations and clinical management. Students will synthesize knowledge of developmental, physiological, psychological, and sociocultural factors in the assessment and management of acute illness. The focus is on differential diagnosis, clinical management, and child and family education within the context of primary care. Health promotion models, and biopsychosocial, developmental, and cultural theories are integrated throughout the course. Individual, family, and group intervention strategies are addressed. **Credits:** 3.00

NUR 52900 - Acute Illness: Pediatric Health Preceptorship

Credit Hours: 3.00. Assists students to develop and broaden clinical judgment and skills. Content includes the study of primary health care of children and adolescents with acute conditions and the impact of those conditions on family members. The focus is on growth and development, assessment, differential diagnosis, clinical decision making, management, and patient and family education within the context of primary care. Professional issues, collaboration and scope of practice, and advocacy are emphasized. Clinical seminars focus on variations of child health in the context of health promotion and advanced assessment.**Credits:** 3.00

NUR 53200 - Acute Illness: Adult Health Practice

Credit Hours: 3.00. Examination of pathophysiological alterations and clinical management of acute conditions in adolescents and adults. Students will synthesize knowledge of physiological, psychological, and sociocultural factors in the assessment and management of acute illness. Focus is on the differential diagnosis, clinical management, patient and family education within the context of primary care. Health promotion models, as well as biopsychosocial and cultural theories are integrated throughout the course. The adult nurse practitioner role is analyzed in the context of caring for persons with acute conditions.**Credits:** 3.00

NUR 53300 - Acute Illness: Adult Health Preceptorship

Credit Hours: 3.00. This course assists students to develop and broaden clinical judgment and skills. Content includes the study of primary care of adolescents and adults with acute conditions and the impact of those conditions on family members. Focus is on assessment, deferential diagnosis, clinical decision making and management, as well as patient and family education within the context of primary care. The adult nurse practitioner role is analyzed in the context of caring for persons with acute conditions. Professional issues, collaboration and scope of practice, and advocacy are emphasized.**Credits:** 3.00

NUR 53800 - Psychiatric Mental Health Nurse Practitioner Roles And Psychotherapeutic Framework And Modalities

Credit Hours: 2.00. Scope and standards of practice for psychiatric mental health advanced practice nursing is set forth in this course. Content includes Psychiatric Mental Health Nurse Practitioner (PMHNP) functioning based on the state practice act as well as additional functions of the PMHNP including providing integrative therapy interventions, community interventions, case management, consultation and liaison services, clinical supervision, and policy development. Students will explore principles of evidence-based psychotherapy interventions including individual and group therapy, family and play therapy, and demonstrate competency in two forms of psychotherapeutic interventions.**Credits:** 2.00

NUR 53900 - Psychiatric Mental Health Nurse Practitioner Roles And Therapeutic Modalities Preceptorship

Credit Hours: 2.00. Psychotherapeutic frameworks and modalities are analyzed within the role of the PMHNP. Students participate in the application of individual and group psychotherapeutic interventions in a clinical setting by a PMHNP or therapist/clinical social worker.**Credits:** 2.00

NUR 54200 - Chronic And Commonly Recurring Conditions: Adult Health Practice

Credit Hours: 3.00. Examination of pathophysiological alterations and clinical management of chronic conditions and illnesses in adolescents and adults. Students will synthesize knowledge of physiological, psychological, and sociocultural factors in the assessment and management of chronic conditions. Focus is on the differential diagnosis, clinical management, and patient and family education within the context of primary care. Chronic illness and health promotion models, as well as biopsychosocial and cultural theories are integrated throughout the course. Individual, family, and group intervention strategies are addressed. The adult nurse practitioner role is analyzed in the context of caring for persons with acute conditions.**Credits:** 3.00

NUR 54300 - Chronic Illness: Adult Preceptorship

Credit Hours: 3.00. This course assists students to develop and broaden clinical judgment and skills. Content includes the study of chronic illness and recurring conditions in adolescents and adults and the impact of those conditions on family members. Focus is on the differential diagnosis, clinical decision making and management, as well as patient and family education within the context of primary care. The adult nurse practitioner role is analyzed in the context of caring for persons with chronic conditions. Professional issues, collaboration, scope of practice and advocacy are emphasized.**Credits:** 3.00

NUR 54400 - Advanced Practice Psychiatric Mental Health Nursing Across The Lifespan

Credit Hours: 3.00. Evidence-based treatment methods including principals of psychopharmacology and psychotherapeutic modalities across the life span are examined, evaluated and implemented in clinical practice. Factors, such as culture, neurobiology, developmental level and gender that impact disease expression, therapeutic approaches and treatment response are explored. Mental health assessment including standardized psychiatric assessment tools, including Mental Status Exam, Mood Disorder Questionnaire, Patient Health Questionnaire (PHQ-9), Columbia-Suicide Severity Rating Scale (C-SSRS), DSM V and ICD is presented. In addition, developmental and functional level, and cultural influences are included. Substance use assessment skills and substance use interventions will be examined including how substance use impacts psychiatric symptom expression and response to treatment. Legal and ethical implications of care will be discussed.**Credits:** 3.00

NUR 54500 - Advanced Practice Psychiatric Mental Health Nursing Across The Lifespan I Preceptorship

Credit Hours: 3.00. Students engage in the PMHNP role in a clinical setting under the supervision of a Psychiatric Mental Health Nurse Practitioner (PMHNP) or MD. Students implement and evaluate mental health assessment skills, evidenced based treatment interventions and evaluate effectiveness integrating principals of neurobiology, culture, developmental and functional abilities.**Credits:** 3.00

NUR 55200 - Chronic Illness And Commonly Recurring Conditions: Pediatric Health Practice

Credit Hours: 3.00. Examines pathophysiological alterations and clinical management of chronic conditions and illnesses in children and adolescents. Students will synthesize knowledge of developmental, physiological, psychological, and sociocultural factors in the assessment and management of chronic conditions. The focus is on the differential diagnosis, clinical management, and child and family education within the context of primary health care. Chronic illness and health promotion models, as well as

biopsychosocial, developmental, and cultural theories are integrated throughout the course. Individual, family, and group intervention strategies are addressed.**Credits:** 3.00

NUR 55300 - Chronic Illness And Commonly Recurring Conditions: Pediatric Health Preceptorship

Credit Hours: 3.00. Assists students to develop and broaden clinical judgment and skills. Content includes the study of chronic illness and recurring conditions in children and adolescents and the impact of those conditions on family members. The focus is on growth and development, differential diagnosis, clinical decision making and management, and child and family education within the context of primary care. The pediatric nurse practitioner role is analyzed in the context of caring for children with chronic conditions. Professional issues, collaboration, scope of practice, and advocacy are emphasized.**Credits:** 3.00

NUR 57600 - Advanced Practice Psychiatric Mental Health Nursing Across The Lifespan II

Credit Hours: 3.00. The practice of Psychiatric Mental Health Nurse Practitioner (PMHNP) is further expanded to include identification and management of the complex patient across the life span. Explore how co-morbid health conditions impact psychiatric disorders and treatment response. Differentiate psychiatric diagnoses, personality disorders, social, family and cultural influences, developmental disorders and how these factors impact treatment. Apply a variety of approaches including inter-and intra-professional resources, and psychopharmacological interventions to the management of complex patients. Legal and ethical implications of care are discussed.**Credits:** 3.00

NUR 57700 - Advanced Practice Psychiatric Mental Health Nursing Across The Lifespan II Preceptorship

Credit Hours: 3.00. Students engage in the Psychiatric Mental Health Nurse Practitioner (PMHNP) role in a clinical setting under the supervision of a PMHNP or Medical Doctor. Students continue to develop and broaden clinical judgment, psychiatric assessment skills, and evidenced-based treatment interventions while considering cultural influences, and developmental and functional abilities. Focus is on assessment, differential diagnosis, clinical decision-making and management, as well as patient and family education within the context of mental health.**Credits:** 3.00

NUR 59800 - Master's Capstone

Credit Hours: 1.00 or 3.00. Students apply research principles through problem identification, proposal development, implementation, and evaluation of a clinical problem. Students synthesize principles of health assessment and advanced practice nursing through a clinical research project. The project may be an evaluation study or part of an ongoing faculty research project. **Credits:** 1.00 or 3.00

NUR 59900 - Special Topics/Independent Study In Nursing

Credit Hours: 0.00 to 6.00 (West Lafayette, Calumet) 1.00 to 6.00 (Fort Wayne). Special topics in nursing are critically examined. Hours, credit, and subject matter are determined by the staff. Permission of instructor required. **Credits:** 0.00 to 6.00

NUR 60400 - PhD Seminar

Credit Hours: 0.00. This seminar is taken by Ph.D. nursing students each semester to integrate themselves to the academic and professional roles of the Ph.D. prepared nurse. This seminar will facilitate students to share their research ideas and progress through networking and collegial discourse. It also provides a low-stake forum where students can give and receive feedback on each other's research. Seminar goals include improving students' presentation and writing skills, teaching how to give constructive criticism, and advising on the academic and professional job market.**Credits:** 0.00

NUR 61100 - Primary Care Of The Young Family

Credit Hours: 3.00. Prepares family nurse practitioner students to assume responsibility for the coordination and delivery of culturally appropriate health services to childbearing and childrearing families. Students apply theory and research to the management of pregnancy, well-child care, stable chronic conditions, and acute episodic illnesses commonly encountered in primary care settings. The course emphasizes a sound conceptual basis for practice and an appreciation for evidence-based care. Students continue to integrate health promotion and health maintenance into the primary care of young families. **Credits:** 3.00

NUR 61300 - Primary Care Of The Young Family Practicum

Credit Hours: 3.00. Students progress in their ability to master the competencies of the family nurse practitioner, using critical thinking and diagnostic reasoning skills. Students apply knowledge of clinical research, pharmacology, physiology, and conceptual frameworks to the primary care of childbearing and childrearing clients and families. Prerequisite: NUR 50000, NUR 51100. **Credits:** 3.00

NUR 61500 - Primary Care Of The Young Family Preceptorship

Credit Hours: 3.00. This course assists students to develop and broaden clinical judgment and skills. Content includes the study of primary care of the young family with acute and chronic conditions, and the impact of those conditions on family members. Focus is on assessment, differential diagnosis, clinical decision-making and management, as well as patient and family education within the context of primary care. The Family Nurse Practitioner role is analyzed in the context of caring for the young family with acute and chronic conditions. Professional issues, collaboration and scope of practice, advocacy are emphasized. Prerequisites: NUR 50700 and NUR 50200 and NUR 50300 and NUR 51600 and NUR 51100 and NUR 51300. Co-requisite: NUR 61100.**Credits:** 3.00

NUR 62200 - Primary Care Of The Aging Family

Credit Hours: 3.00. Prepares family nurse practitioner students to assume responsibility for the coordination and delivery of culturally appropriate health services to middle-aged and older families. Students learn to manage stable chronic conditions and acute episodic illnesses commonly encountered in primary care settings. The course emphasizes the conceptual basis for practice and an appreciation for evidence-based care. Students continue to integrate health promotion and health maintenance into the primary care of older clients and their families. **Credits:** 3.00

NUR 62300 - Primary Care Of The Aging Family Practicum

Credit Hours: 3.00. Students progress in their ability to master the competencies of the family nurse practitioner, using critical thinking and diagnostic reasoning skills. Students apply knowledge of clinical research, pharmacology, physiology, and conceptual frameworks to the primary care of middle-aged and older clients and families. Prerequisite: NUR 61300. **Credits:** 3.00

NUR 62400 - Evidence-Based Practice

Credit Hours: 3.00. This course focuses on discovery and utilization of evidence-based care to produce the best outcomes for patients. The student develops a problem statement, performs a comprehensive literature search, and critically evaluates the evidence to determine best practice and formulate recommendations. The implementation of evidence-based practice (EBP) practical strategies, and analysis of components of EBP are examined throughout the course. Prerequisite: and either an undergraduate or graduate statistics course within the last five years. is recommended. **Credits:** 3.00

NUR 62500 - History, Ethics, And Innovations In Health-Care Delivery Systems

Credit Hours: 3.00. Broadens and refines the student's view of the current health-care delivery system by providing an analysis from an historical perspective, of the forces that have shaped the system, including scientific discoveries, technological advances, social justice issues and the development of health professions and institutions. Nursing knowledge is influenced by these multiple factors; thus, the course provides students with tools to lead others in meeting the many challenges the health-care system brings. A chronological and topical format is used, which investigates policy and societal trends affecting health care, the nursing and medical professions, and professional practice. Changes in the roles of health-care providers and consumers are assessed from economic, social, organizational, political, ethical, legal, and technological perspectives. **Credits:** 3.00

NUR 62600 - Applied Biostatistics For Outcome Evaluation

Credit Hours: 3.00. This course applied biostatistical methods commonly used in epidemiologic research to large data sets. Students learn to use statistical software to compute descriptive, bivariate, and multivariate statistics. Students translate statistical findings into conclusions relevant to the delivery of health care. Prerequisites: NUR 51000 and an undergraduate statistics course within the last five years.**Credits:** 3.00

NUR 62700 - Primary Care Of The Aging Family Preceptorship

Credit Hours: 3.00. This course assists students to develop and broaden clinical judgment and skills. Content includes the study of primary care of the aging family with acute and chronic conditions and the impact of those conditions on family members. Focus is on assessment, differential diagnosis, clinical decision-making and management, as well as patient and family education within the context of primary care. The Family Nurse Practitioner role is analyzed in the context of caring for the aging family with acute and chronic conditions. Professional issues, collaboration and scope of practice, advocacy are emphasized. Prerequisites: NUR 50700 and NUR 50200 and NUR 50300 and NUR 51600 and NUR 51100 and NUR 51300. Co-requisite: NUR 62200. **Credits:** 3.00

NUR 63100 - Family Nurse Practitioner Preceptorship Clinical Synthesis

Credit Hours: 2.00 to 3.00. This course assists students to integrate clinical knowledge and skills from prior course work when providing care to patients across the lifespan. The Family Nurse Practitioner role is analyzed in the context of caring for patients of all ages with acute and chronic conditions. Focus is on assessment, differential diagnosis, clinical decision-making and management, as well as patient and family education within the context of primary care. Prerequisites: NUR 50700 and NUR 50200 and NUR 50300 and NUR 51600 and NUR 51100 and NUR 51300. Co-requisite: NUR 61100 and NUR 61500 and NUR 62200 and NUR 62700.**Credits:** 2.00 to 3.00

NUR 63200 - Health Policy: Local To Global

Credit Hours: 3.00. This course provides an overview of health policy not only in the context of health care policy, but also the broader concepts of policies which affect health outside of the realm of health care delivery. Social, ethical, cultural, economic, and political issues that affect the delivery of health and nursing services are critically analyzed. Roles of health care providers and consumers of health care services, as well as government and entrepreneurial interest are examined. Emphasis is placed on the impact of policy decisions and advocacy on professional nursing practice, health services, health equity. **Credits:** 3.00

NUR 64000 - Human Factors In Healthcare Engineering

Credit Hours: 3.00. This course provides a foundation for healthcare professionals in the application of human factors, ergonomics, theories, and principles to improve the healthcare system. The interaction between humans and artifacts, environments, culture, and social structures as they apply to patient safety and healthcare system improvement issues are presented. Prerequisites: NUR 51000 or equivalent. Undergrad Statistics course within the past five years. **Credits:** 3.00

NUR 64100 - Principles Of Epidemiology

Credit Hours: 3.00. This course will provide the student with an introduction to epidemiology - the study of the distribution and determinants of health status. This course focuses on application of epidemiologic descriptive and analytic study as it relates to the distribution and determinants of health status. Topics will include the scope and history of epidemiology, basic quantitative methods and measures used in the field, and an introduction to the design and implementation of epidemiological studies. The course will also include the examination of cases from infectious disease, various forms of applied epidemiology (e.g., clinical and field epidemiology), surveillance/screening tests, types of epidemiological studies, concepts of disease transmission, and causality. Prerequisites: At least one undergraduate or graduate level statistics course. Permission of department required.**Credits:** 3.00

NUR 64200 - Systems Approaches In Healthcare

Credit Hours: 3.00. Students are introduced to the fundamentals of systems engineering tools and approaches through hands on problem solving exercises. Systems Engineering tools/methods are applied to a clinical problem. Upon completion of this course, the participants will have had exposure to system engineering tools and approaches such as process mapping, bottle-neck analysis, queuing, lean engineering, simulation, optimization, dealing with uncertainty, what-if analysis, quality control and performance monitoring techniques.**Credits:** 3.00

NUR 65500 - Advanced Practice In Nursing Seminar

Credit Hours: 1.00. Students analyze movements and trends that influence advanced practice in nursing. Students dialogue with peers on issues related to advanced practice, nursing as a profession and discipline, healthcare and other related topics of interest. Prerequisite: NUR 60100, NUR 60300, NUR 61300. **Credits:** 1.00

NUR 65600 - Healthcare Organization, Policy And Economics

Credit Hours: 3.00. Students use theories to understand the various models that influence health care policy and organize health care delivery. Students investigate the processes of analyzing and forming health policy. The reciprocal relationship between evidence-based practice and health care policy is explored. Students examine health care economics from a micro and macro perspective and their impact on health care delivery systems. Students also explore issues such access to health care, health care quality, and cost. Prerequisite: NUR 50100. **Credits:** 3.00

NUR 65700 - FNP Practicum: Clinical Synthesis

Credit Hours: 2.00. This is the final clinical capstone course in a sequence of clinical courses designed to prepare graduate nursing students for FNP practice. Students synthesize and apply theoretical and empirical knowledge in primary-care settings with culturally diverse clients and families. Emphasis is given to the clinical management of a wider spectrum of clients and to the more complex, co-morbid conditions seen in family practice. Prerequisite: NUR 62300 .Corequisite: NUR 65500, NUR 65600. **Credits:** 2.00

NUR 67300 - DNP Health Policy Residency

Credit Hours: 2.00. This residency course provides an opportunity for students to gain greater understanding of how public policy affects state, national, and international health-care delivery systems and resources. Students will interact with top policy makers at the local, state, national, and/or international level to explore the many forces, including political, economic, social, and technological, that influence current policy and the policy-making process. Prerequisite: NUR 65600.**Credits:** 2.00

NUR 67400 - Quality Initiatives, Leadership And Advanced Practice Nursing

Credit Hours: 2.00. This course develops concepts of the guiding principles of quality, system and leadership initiatives in the Nurse Practitioner Role. The students explore principles and techniques of health coaching, interprofessional team work, delegation and prioritization that can be used in various healthcare settings. Potential quality initiatives will be identified and an

improvement plan will be developed using various quality initiatives modalities in the healthcare system to improve quality care, safety and patient outcomes. Permission of department required.**Credits:** 2.00

NUR 67500 - Role Transition And Synthesis

Credit Hours: 2.00. This course provides an integration of core, cognate, and specialty knowledge, with an emphasis on role transition and synthesis. Focuses on internal and external healthcare organizational factors at the local, state, national, and international levels. Seminars explore role issues, licensure, credentialing, finances, legislation, healthcare policy, legal issues, ethics, cultural diversity, evidence-based practice, emerging trends in the management of acute and chronic conditions of adults, and independent and collaborative practice. Prerequisite: NUR 53200, NUR 53300. Corequisite: NUR 54200, NUR 54300, NUR 59800. **Credits:** 2.00

NUR 67800 - Healthcare Economics And Finance

Credit Hours: 3.00. This class will provide an introduction to the application of health economics principles as it relates to various health care systems, health care stakeholders and health policy issues in the United States. The course will explore the allocation and distribution of resources in the health care industry and the nature of the constantly changing relationship between health care and its major constituencies. Topics include the demand for health care, access to care, health care parity, health care reimbursement, economic evaluation, health care delivery models, and health care professionals' services.**Credits:** 3.00

NUR 68000 - DNP Cognate Residency: Direct Practice/Systems Management I

Credit Hours: 3.00. This is the first in a series of two courses that applies knowledge and skill to improve healthcare outcomes in systems. The emphasis is the application of engineering principles to health care including human factors, systems analysis and design, and optimal use of information technology and simulation. Residency activities provide students with opportunities to participate in professional service activities, attend institutes and conferences to expand their area of research or clinical interest and/or develop significant scholarly pursuits. The focus is on creating change in the healthcare system through analysis, synthesis, critique, and application of evidence-based practice to support accessible high quality, safe, efficient, and effective health care. Prerequisites: NUR 68700. **Credits:** 3.00

NUR 68001 - PhD Cognate Residency

Credit Hours: 3.00. The PhD Cognate includes experiential learning that provides preliminary preparation for conducting the PhD Dissertation Proposal. The course will incorporate guidelines for ethical conduct of human studies, research-based studies, and evaluation of evidence-based literature for study design. The course will assist students to develop the project reflective of previous courses, evidence, project feasibility, theoretical frameworks, appropriate methodology and data analysis.**Credits:** 3.00

NUR 68100 - DNP Cognate Residency: Direct Practice/Systems Management II

Credit Hours: 3.00. This is a second in a series of two courses that applies knowledge and skill to improve healthcare outcomes in systems. The emphasis is the advanced application of engineering principles to health care including human factors, systems analysis and design, and optimal use of information technology and simulation. Students assume a leadership role in the application process utilizing skills acquired in DNP Residency: Direct Practice Management I. Residency activities provide students with opportunities to participate in professional service activities, attend institutes and conferences to expand their area of research or clinical interest and/or develop significant scholarly pursuits. The focus is on providing leadership in creating change in the healthcare system through analysis, synthesis, critique, and application of evidence-based practice to support accessible high quality, safe, efficient, and effective health care and systematic evaluation of outcomes. Clinical sites for the DNP Residency may include collaboration with experts in local, state, national, and international healthcare agencies. Residency activities are selected by the student under the guidance of the faculty advisor and preceptor, DNP program director, and approved by the director of graduate programs in nursing. Prerequisite: NUR 68700. **Credits:** 3.00

NUR 68300 - DNP Cognate Residency: Public Health/Homeland Security Practice I

Credit Hours: 3.00. This is the first in a series of two courses that provides an opportunity to explore a public health topic of interest under the direction of a faculty member. The focus is on implementation of an evidence-based practice model and evaluation of their effectiveness in improving community health outcomes. Residency activities provide opportunities to utilize research and evidence-based practice to expand the knowledge base needed for the development, implementation, and evaluation of programs to meet the public health needs of specific communities with risk assessment analysis. Students will assess, plan, and evaluate the preparedness and response to mass casualty disasters or other public health concerns. Prerequisites: NUR 51000 and NUR 63200. Concurrent Prerequisites: NUR 62400 and NUR 62600. **Credits:** 3.00

NUR 68500 - DNP Cognate Residence: Public Health/Homeland Security Practice II

Credit Hours: 3.00. This is the second in a series of two courses that provides an opportunity to further explore a public health topic of interest under the direction of a faculty member. The focus is on implementation of an evidence-based practice model and advanced application of evaluation techniques in establishing their effectiveness in improving community health outcomes. Residency activities provide ongoing opportunities to refine research and evidence-based practice to expand the knowledge base needed for the development, implementation, and evaluation of programs to meet the public health needs of the community and systems of care. Emphasis is on providing leadership in incorporating assessment of health needs of specific communities with risk assessment analysis to implement models to improve community outcomes. Students assume a leadership role as they assess, plan, and evaluate the preparedness and response to mass casualty disasters or other public health concerns. Residency sites may be local, state, national, and/or international settings. Residency activities are selected by the students under the guidance of the faculty advisor and preceptor, DNP program director, and approved by the director of graduate programs in Nursing. Prerequisite: NUR 68300. **Credits:** 3.00

NUR 68700 - Doctor Of Nursing Practice (DNP) Practice Inquiry: Evidence-Based Practice I

Credit Hours: 3.00. This course is first of a two part series that provides the opportunity to develop, implement and evaluate an evidence-based inquiry project. Students gain competence in activities aimed at improving the healthcare practice and systems, outcome evaluations, translation of research into practice, participation in interdisciplinary and collaborative research, and dissemination of research results. Total clinic hours 192. Prerequisites: NUR 51000, NUR 62600, NUR 62400 and Cognate Residencies. **Credits:** 3.00

NUR 68900 - Doctor Of Nursing Practice (DNP) Practice Inquiry: Evidence-Based Practice II

Credit Hours: 3.00. This course is second in the series that provides the opportunity to develop, implement and evaluate an evidence-based inquiry project. Students gain competence in activities aimed at improving the healthcare practice and systems, outcome evaluations, translation of research into practice, participation in interdisciplinary and collaborative research, and dissemination of research results. Total clinic hours 192. Prerequisites: NUR 68700 and Cognate Residencies. **Credits:** 3.00

NUR 69010 - Research Seminar

Credit Hours: 1.00. The Seminar in Nursing Research is a discussion-based course intended to socialize the nursing student to the role of an independent scholar. Discussion concentrates upon current topics and issues in nursing research, with an emphasis on targeting the most supportive trajectories for individual student research foci. Admission to the Nursing PhD program or instructor permission. This is one of the first courses taken by PhD students and may be open to graduate students outside the School of Nursing with permission from the instructor. **Credits:** 1.00

NUR 69020 - Leadership Seminar

Credit Hours: 1.00. The nurse as leader is deconstructed and reconstructed within the realms of scientific knowledge, theory, education, and healthcare delivery. Nurse leaders as members of collaborative teams and the influence of nursing intelligence on research teams are examined. Historical and societal influences affecting nurse leaders are examined, including media portrayals of nursing, transformational leadership, critical theory and feminist theory. Models of leadership are explored within the context of scientific work; the student is challenged to evaluate themselves as present and future leaders and members of nursing's academe. Admission to the Nursing PhD program or instructor permission. This is one of the first courses taken by PhD students and may be open to graduate students outside the School of Nursing with permission from the instructor. **Credits:** 1.00

NUR 69030 - Communication Seminar

Credit Hours: 1.00. Original research findings, using a global framework, are analyzed. The effectiveness of communication to implement and evaluate programs designed to promote innovative change in healthcare is critiqued. Communication as a mechanism to develop pathways to ensure accuracy of scientific information transfer, and as a necessary component of policy and major public health events is appraised. Admission to the Nursing PhD program or instructor permission. This is one of the first courses taken by PhD students and may be open to graduate students outside the School of Nursing with permission from the instructor. **Credits:** 1.00

NUR 69040 - Collaboration Seminar

Credit Hours: 1.00. Principles of collaboration to generate scientific knowledge, which is used to improve nursing and healthcare practice, education, policy, and outcomes, are discussed. Evidence generated from transdisciplinary teams is analyzed with attention given to specific professions contributions and roles. The specific role of the nurse scientist and the value of nursing intelligence within the context of collaborative projects are discussed. Best practices in collaboration as exemplified by select research teams are presented. Admission to the Nursing PhD program or instructor permission. This is one of the first courses taken by PhD students and may be open to graduate students outside the School of Nursing with permission from the instructor. **Credits:** 1.00

NUR 69050 - Implementing Theory In Healthcare Research

Credit Hours: 3.00. Historical and contemporary social, ethical, educational, scientific, and professional influences on the development of theoretical knowledge in nursing and health research are analyzed. Various methods of theory development are reviewed. Selected biological/physiological, behavioral, and health service theories that form the basis of nursing science are critically evaluated. Skills needed for theory analysis and theory development are emphasized. The role of theoretical knowledge to innovation in nursing science and healthcare is presented. Scientific bridges between theoretical frameworks and research methods are appraised. Selected nursing and healthcare scientists communicate the theoretical aspects of their programs of research with an emphasis on collaboration between disciplines. Admission to the Nursing PhD program or instructor permission. This is one of the first courses taken by PhD students and may be open to graduate students outside the School of Nursing with permission from the instructor. **Credits:** 3.00

NUR 69060 - Innovative Care/Innovations In Healthcare Delivery

Credit Hours: 3.00. Historical, ethical, financial, and social influences on contemporary innovations in healthcare practices and delivery systems are analyzed. The genesis and diffusion of both micro- and macro-level innovations are reconstructed with the use of theories, organizational and transdisciplinary factors, and effective processes. Quality of care issues are synthesized utilizing innovations in care and health delivery systems as a framework. With innovative care and innovations in healthcare delivery systems as frameworks, quality of care issues are appraised. Selected exemplars of successful innovations, with an emphasis on strategies to evaluate dissemination and impact, are analyzed. Admission to the Nursing PhD program or instructor permission. This is one of the first courses taken by PhD students and may be open to graduate students outside the School of Nursing with permission from the instructor. **Credits:** 3.00

NUR 69100 - Health Care Research Methods

Credit Hours: 3.00. This course advances knowledge and skill in quantitative research methods for health program evaluation, population health, healthcare quality improvement, and other healthcare research applications. Topics include design of experimental, quasi-experimental, and observational studies; primary data collection through surveys and other techniques; use of clinical, administrative, and other secondary data sources; and data analysis strategies appropriate to each design and type of data. The course addresses basic issues of sampling, measurement, and validity and reliability, as well as practical issues that arise in healthcare research. **Credits:** 3.00

NUR 69200 - Applied Statistics In Healthcare Research

Credit Hours: 3.00. This course advances knowledge and skills in statistical approaches for analyzing complex healthcare data. It focuses on statistical analysis in contexts such as evidence-based practice, quality improvement, evaluation, and behavioral and population health. Topics include probability and descriptive statistics, nonparametric statistics, risk and odds ratios, sensitivity and specificity, logistic and multinomial regression, multiple linear regression, general linear models, survival and time-to-event analysis, and mixed effect modeling. The course will provide hands-on experience in statistical analysis of healthcare data. Prerequisites: Introductory course in statistics or biostatistics at the advanced undergraduate or graduate level. **Credits:** 3.00

NUR 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Nutrition Science

NUTR 10500 - Nutrition In The 21st Century

Credit Hours: 1.00. Overview of the discipline of nutrition science including undergraduate and professional opportunities, research and critical thinking requirements. **Credits:** 1.00

NUTR 10600 - Introduction To The Profession Of Dietetics

Credit Hours: 1.00. Overview of the dietetics profession, including standards, ethics, educational and employment opportunities, and professional credentialing. Spring semester offered only through distance learning. **Credits:** 1.00

NUTR 10700 - Introduction To Nutrition Science

Credit Hours: 1.00. An overview of professional opportunities for nutrition scientists. Introduces tools and resources available for becoming a nutrition scientist. **Credits:** 1.00

NUTR 12500 - Food Safety Certification And Career Development

Credit Hours: 1.00. Training in ServSafe food safety certification program. **Credits:** 1.00

NUTR 20200 - Principles Of Food Preparation And Nutrition

Credit Hours: 4.00. Chemical, physical, microbiological, and nutritional principles of food preparation. Functions and sources of nutrients, their relationship to a healthy lifestyle and incorporating the benefits into marketing of foodservice. **Credits:** 4.00

NUTR 20500 - Food Science I

Credit Hours: 3.00. Chemical and physical composition of foods: their changes during processing, storage, and preparation. **Credits:** 3.00

NUTR 24500 - Rookie Experience In Sports Nutrition

Credit Hours: 1.00. For students without prior experience within the specialty dietetics practice of sports nutrition, this course provides traditional and experience-based learning in a Division I Collegiate sports setting. Guest speakers will present on various aspects of the athletics work setting. Basics of sports nutrition are taught and students must pass an exam to progress to NUTR 34500, Continuing Experience In Sports Nutrition. Written application and interview process required prior to instructor approval. Permission of Instructor required. **Credits:** 1.00

NUTR 29700 - Introduction To Honors Research

Credit Hours: **2.00.** Introduces students to the design and implementation of an honors research project.**Credits:** 2.00

NUTR 30300 - Essentials Of Nutrition

Credit Hours: 3.00. Basic nutrition and its application in meeting nutritional needs of all ages. Credit not given for both FN 30300 and FN 31500. CTL: Human Nutrition **Credits:** 3.00

NUTR 31500 - Fundamentals Of Nutrition

Credit Hours: 3.00. Basic principles of nutrition and their application in meeting nutritional needs during the life cycle. **Credits:** 3.00

NUTR 33000 - Diet Selection And Planning

Credit Hours: 3.00. Diet selection for health maintenance in culturally diverse populations based on current dietary guides with utilization of the computer for diet evaluation. **Credits:** 3.00

NUTR 33200 - Nutrition Counseling

Credit Hours: 3.00. Develop communication skills and counseling techniques necessary to elicit nutrition-related behavior changes in individuals. **Credits:** 3.00

NUTR 34000 - Field Experience In Nutrition, Fitness And Health

Credit Hours: 1.00 to 3.00. Field experience in NFH-related setting that provides an opportunity for the application of the classroom experience. For NFH majors only. The student secures his/her own field experience, which must be approved by the NFH program coordinator in order to receive academic credit. **Credits:** 1.00 to 3.00

NUTR 34500 - Continuing Experience In Sports Nutrition

Credit Hours: 1.00. Traditional and experience-based learning within the specialty dietetics practice of sports nutrition in a Division I Collegiate sports setting. Guest speakers will present on various aspects of the athletics work setting. Students must pass an exam given in NUTR 24500, Rookie Experience In Sports Medicine, to enroll. Permission of Instructor required. **Credits:** 1.00

NUTR 35000 - Dietetics Practicum In Quantity Food Production

Credit Hours: 1.00 to 3.00. Supervised on-the-job experience related to the food service management in health care facilities, schools, community programs, etc. Student is responsible for arrangement and approval of the experience through the supervising food service manager or dietitian and the course instructor. Permission of instructor required. **Credits:** 1.00 to 3.00

NUTR 36500 - Physiology And Nutrition During The Life Cycle

Credit Hours: 3.00. Physiology and Nutrition During the Life Cycle explores the life stages of pregnancy, childhood, adulthood and older adulthood from physiological, social, and behavioral perspectives, focusing on the biological underpinnings of special nutritional needs for each life stage for optimal growth and development, maturation, aging, and overall health and well-being. **Credits:** 3.00

NUTR 37500 - Foods And Nutrition Internship

Credit Hours: 1.00 to 4.00. Food science or nutrition professionally related work experience in industry, institutions, or business. Permission of instructor required. **Credits:** 1.00 to 4.00

NUTR 39000 - Independent Undergraduate Research

Credit Hours: 1.00 to 3.00. Individual research projects undertaken with faculty supervision. Permission of instructor required. **Credits:** 1.00 to 3.00

NUTR 39100 - Independent Study

Credit Hours: 1.00 to 3.00. Independent scholarly activity undertaken with faculty supervision. Permission of instructor required. **Credits:** 1.00 to 3.00

NUTR 39200 - Undergraduate Instruction In Nutrition

Credit Hours: 1.00 to 5.00. Problems dealing with various aspects of nutrition. Permission of instructor required. **Credits:** 1.00 to 5.00

NUTR 39700 - Directed Honors Research

Credit Hours: 1.00 to 3.00. Directed independent honors research for Honors College and Department of Nutrition Science Honors Program students. Students must select a faculty advisor for the course. Permission of instructor required. **Credits:** 1.00 to 3.00

NUTR 39800 - International Special Topics

Credit Hours: 1.00 to 3.00. Course taken during an international experience that is recognized by the University. **Credits:** 1.00 to 3.00

NUTR 40000 - Executive In The Classroom

Credit Hours: 1.00. Lecture and discussion, featuring industrial and business executives in food-related areas. Emphasis is placed on careers in the food industry. **Credits:** 1.00

NUTR 41100 - Dietetics Career Planning

Credit Hours: 1.00. This course will prepare students to successfully apply and interview for dietetics supervised practice experience, jobs and graduate programs. **Credits:** 1.00

NUTR 41500 - Practicum In Nutrition, Fitness, And Health

Credit Hours: 2.00. Application of nutrition and exercise knowledge and skills by performing assessments, interpreting data, designing and implementing programs, documenting progress, and counseling of an adult client. **Credits:** 2.00

NUTR 42400 - Communication Techniques In Foods And Nutrition

Credit Hours: 3.00. Communication of foods and nutrition information to lay and professional audiences through oral, written, and mass media channels. **Credits:** 3.00

NUTR 42600 - Laboratory In Community Nutrition

Credit Hours: 3.00. Application of previous knowledge and communication skills in nutrition of community settings, such as school nutrition, health facilities, and federal or state nutrition programs. **Credits:** 3.00

NUTR 43000 - Public Health Nutrition

Credit Hours: 2.00. Assessment of nutritional needs of the community and the programs that service these needs. **Credits:** 2.00

NUTR 43600 - Nutritional Assessment

Credit Hours: 2.00. Nutrition assessment in humans, including anthropometric, biochemical, clinical, and dietary assessment. **Credits:** 2.00

NUTR 43700 - Macronutrient Metabolism In Human Health And Disease

Credit Hours: 3.00. Metabolism of the macronutrients, carbohydrate, lipids and protein in humans integrating physiology, biochemistry, and nutrition with a focus on maintaining optimal health and preventing disease. **Credits:** 3.00

NUTR 43800 - Micronutrient And Phytochemical Metabolism In Human Health And Disease

Credit Hours: 3.00. Metabolism of the micronutrients and phytochemicals in humans integrating physiology, biochemistry and nutrition with a focus on maintaining optimal health and preventing disease. **Credits:** 3.00

NUTR 44200 - Foodservice Systems Management

Credit Hours: 3.00. Systems approach to foodservice management. Foodservice operations based on nutritional goals of the target market. Food sanitation and safety, management of human resources, and supervision. Emphasis on applications to health-care facilities.**Credits:** 3.00

NUTR 44300 - Laboratory In Foodservice Systems Management

Credit Hours: 9.00. Application of knowledge relating to foodservice. Responsibilities may include communication skills and tasks equivalent to supervising foodservice operations. **Credits:** 9.00

NUTR 45300 - Food Chemistry

Credit Hours: 4.00. Application of fundamental laws and concepts of chemistry, physics, and biology to the properties, composition, and storage of foods. **Credits:** 4.00

NUTR 45400 - Food Chemistry Laboratory

Credit Hours: 2.00. From this course, students should be able to: Assess and interpret analytical and sensory properties of food; Assess how chemical structures and reactions influence sensory and analytical properties of food; Demonstrate and explain physical and chemical reactions in foods/beverages during preparation and processing techniques; Explain chemical function of food additives; Design, report on, and critique food experiments using the scientific method. **Credits:** 2.00

NUTR 46100 - Laboratory In Medical Nutrition Therapy

Credit Hours: 10.00. Application of previous knowledge and communication skills of medical nutrition therapy in the hospital/patient care setting to ultimately include responsibilities equivalent to staff relief. **Credits:** 10.00

NUTR 46500 - Laboratory In Engagement

Credit Hours: 3.00. Culminating experiences in community nutrition, foodservice, medical nutrition therapy, public health, research and/or nutrition related business. Placements will be arranged based on individual student's preferred track in long-term care facilities, hospitals, public health or community agencies, and/or business and industry. **Credits:** 3.00

NUTR 48000 - Medical Nutrition Therapy I

Credit Hours: 4.00. Nutrition assessment in humans and introduction to the nutrition care process. Application of the nutrition care process to various disease states.**Credits:** 4.00

NUTR 48100 - Medical Nutrition Therapy II

Credit Hours: 3.00. Application of the Nutrition Care Process in various disease states and conditions to prepare students for supervised practice programs. **Credits:** 3.00

NUTR 48800 - Topics In Nutrition, Fitness, And Health

Credit Hours: 3.00. This course critically evaluates the interrelationships between nutrition and exercise and their impact on physical performance and health. Concepts combining nutritional sciences and exercise physiology will be presented. Emerging science and controversies in the current literature will be discussed. **Credits:** 3.00

NUTR 49000 - Independent Undergraduate Research

Credit Hours: 1.00 to 4.00. Independent research projects undertaken with faculty supervision. Permission of instructor required. **Credits:** 1.00 to 4.00

NUTR 49100 - Independent Study

Credit Hours: 1.00 to 4.00. Independent scholarly activity undertaken with faculty supervision. Permission of instructor required. **Credits:** 1.00 to 4.00

NUTR 49200 - Undergraduate Instruction In Nutrition

Credit Hours: 1.00 to 5.00. Problems dealing with various aspects of nutrition. Permission of instructor required. **Credits:** 1.00 to 5.00

NUTR 49500 - Undergraduate Seminar In Foods And Nutrition

Credit Hours: 1.00. Instruction and application of concepts for effective oral presentations in the field of nutrition sciences. **Credits:** 1.00

NUTR 49600 - Evaluation Of Nutrition Science Research

Credit Hours: 3.00. Evaluation of nutrition science research as it relates to health and disease. **Credits:** 3.00

NUTR 49700 - Honors Research Project

Credit Hours: 1.00 to 3.00. The completion of the independent honors research project for Honors College and Department of Nutrition Science Honors Program students. Must have an approved Honors Project Proposal. Permission of instructor required.**Credits:** 1.00 to 3.00

NUTR 51100 - Applied Nutrition Counseling

Credit Hours: 3.00. Field experience in one-on-one nutrition counseling that requires application of prior learning of theory, knowledge and skills. **Credits:** 3.00

NUTR 51200 - Dietary Supplements

Credit Hours: 2.00. Provides advanced training to evaluate concepts and issues of dietary supplement use in various populations. Students develop critical thinking skills through activities such as case studies to make appropriate recommendations for nutrition supplementation.**Credits:** 2.00

NUTR 51300 - Food Chemistry

Credit Hours: 2.00. Application of fundamental laws and concepts of chemistry, physics, and biology to foods and the sensory and analytical properties of food. Evaluation of the validity of health controversies related to food ingredients. Completion of a food additive assessment.**Credits:** 2.00

NUTR 51400 - Food Chemistry Laboratory

Credit Hours: 2.00. Application of fundamental laws and concepts of chemistry, physics, and biology to foods and eating. Experiments with food will be designed, reported and critiqued using the scientific method.**Credits:** 2.00

NUTR 51500 - Nutrition Pathophysiology

Credit Hours: 2.00. A review of the underlying nutritional components and pathophysiology of common human diseases/disorders and current approaches for the prevention, management, and treatment of nutrition-related diseases. Building upon previous coursework in micronutrient and macronutrient metabolism, the focus is on the metabolic disturbances occurring with diseases such as diabetes, GI diseases, obesity kidney diseases, cardiovascular disease, and anemia.**Credits:** 2.00

NUTR 51600 - Eating Disorders And Healthy Weight Management

Credit Hours: 3.00. An evidence-based, application-focused exploration of the continuum of healthy eating to eating disorders and the factors that influence body weight. This includes review of each eating disorder diagnosis from an interdisciplinary perspective with emphasis on the role of the registered dietitian nutritionist in prevention, identification, treatment, and recovery.**Credits:** 3.00

NUTR 52100 - Advanced Medical Nutrition Therapy

Credit Hours: 3.00. Application of the Nutrition Care Process in various disease states and conditions to prepare students for supervised practice. **Credits:** 3.00

NUTR 52200 - Advanced Nutrition Communications

Credit Hours: 3.00. Provides advanced training and skill development to effectively implement and evaluate food and nutrition communication to lay and professional audiences through oral, written, and mass media channels. Permission of department required.**Credits:** 3.00

NUTR 52300 - Trends In Nutrition & Dietetics

Credit Hours: 2.00. Analysis and discussion of current trends in dietetics practice and nutrition including such topics as nutrigenomics, informatics, sustainability, agricultural practices, food policies, and global health. Permission of department required. **Credits:** 2.00

NUTR 52900 - Basic Bone Biology

Credit Hours: 3.00. This course is designed to present the fundamentals of bone biology. The course objectives are designed to provide learners with a solid framework for understanding mechanisms, diseases, and treatments associated with the musculoskeletal system as they advance in their education and training.

- Approximately 45 hours of lecture will help the learner achieve the objectives outlined. Lectures will be given to present information and tie into information learners have acquired or will acquire in other courses (e.g. biomechanics, physiology, molecular biology, etc.) to assist them in combining all of their courses and research experiences together into one interdisciplinary learning experience.
- Directors will attend and supervise the scheduled lecture sessions if they are not providing the lecture content, and they will be available during these times to answer questions. However, it is expected that students take additional time outside of scheduled class time to further learning.
- Materials for the learners will be posted on the course's website. These materials will include:
- Lecture notes and PowerPoints: Each lecturer will post his/her lecture notes and associated PowerPoint slides prior to the lecture.
- Additional information: As the course progresses, instructors may come across additional information that they may find useful for student learning of the material. These materials will be posted for students to utilize as they see fit.

** Materials found on other sites (e.g. social networking sites) will not be official course materials, so use at your own risk.*

** Course offered every other spring***Credits:** 3.00

NUTR 53100 - Ethical Practice And Professionalism In Dietetics

Credit Hours: 1.00. Evaluation of concepts and issues of ethical practice in the dietetics profession and the application of the Scope/ Standards of Practice for Nutrition and Dietetics Practitioners and the Code of Ethics for the Nutrition and Dietetics Profession. Permission of department required.**Credits:** 1.00

NUTR 53200 - World Food Problems

Credit Hours: 3.00. (AGEC 53200) This course focuses on the multi-disciplinary challenges that exist in meeting the food and nutrition needs of a growing world population. The course aims to instill an appreciation of the importance of economics, food production and technology, trade, culture, communication, political processes and institutions, demography and related factors in determining adequate food availability and health globally. Permission of instructor required. **Credits:** 3.00

NUTR 53300 - Community Nutrition Experience

Credit Hours: 3.00. Application of previous knowledge and communication skills in nutrition of community settings, such as school nutrition, health facilities, and federal or state nutrition programs. **Credits:** 3.00

NUTR 53400 - Human Sensory Systems And Food Evaluation

Credit Hours: 3.00. Overview of human chemosensory (taste, smell, chemesthetic) mechanisms and function, as well as procedural and statistical methods for evaluating the sensory responsiveness of people and the sensory properties of foods. **Credits:** 3.00

NUTR 53500 - Leadership In Dietetics

Credit Hours: 1.00. Evaluation of concepts and development of skills relevant to leadership in dietetics including staff development, budgeting, strategic planning, quality improvement, regulatory compliance and embracing human diversity.**Credits:** 1.00

NUTR 53900 - Foodservice Systems Management Experience

Credit Hours: 4.00. Application of previous knowledge and communication skills in foodservice facilities. Student's performance will ultimately include responsibilities equivalent to staff relief. Must have ServSafe Certification (manager level) prior to enrollment. **Credits:** 4.00

NUTR 54100 - Food Policy And Nutrition

Credit Hours: 3.00. We will explore the nature of contemporary United States food policy and key events throughout history that have shaped what it is today. We will investigate and discuss the roles individuals, corporations, and federal, state, and other government agencies play in creating food policy, and how these stakeholders as well as complex sociological and economic factors influence the way Americans eat. These questions will lead us to consider the future of food and food policy in the United States. Can Americans develop food policy that supports the agricultural economy AND promotes the consumption of healthy foods? Could our agricultural system support this? We will learn about and explore these questions with class discussions, debate, research, guest lectures, relevant documentary films, and thought-provoking readings that present a variety of viewpoints. You will explore current, real-life problems and have an opportunity to develop potential solutions.**Credits:** 3.00

NUTR 54200 - Engagement Experience

Credit Hours: 3.00. Application of previously acquired knowledge and communication skills in a culminating supervised practice experience in one of seven engagement tracks. Placements at professional sites incorporate individual student's preferred track in foodservice, industry, nutrition-fitness-wellness-energy balance, community/public health, long-term care, medical nutrition therapy or research. Students complete a major project demonstrating readiness to practice as an entry-level dietitian. **Credits:** 3.00

NUTR 54300 - Medical Nutrition Therapy Experience

Credit Hours: 4.00. Application of previous knowledge and communication skills of medical nutrition therapy in the hospital/ patient care setting to ultimately include responsibilities equivalent to staff relief. **Credits:** 4.00

NUTR 54400 - Advanced Medical Nutrition Therapy For Special Populations

Credit Hours: 1.00. Application of Medical Nutrition Therapy for special populations including enhanced skills for the practice of dietetics. Lectures and laboratory activities supplement training in various diagnoses and conditions not routinely encountered during supervised practice experiences in NUTR 56100 Medical Nutrition Therapy Experience.**Credits:** 1.00

NUTR 59000 - Special Problems In Nutrition

Credit Hours: 1.00 to 4.00. Individual problems dealing with various aspects of nutrition. Permission of instructor required. **Credits:** 1.00 to 4.00

NUTR 60500 - Nutritional Biochemistry And Physiology I

Credit Hours: 4.00. (ANSC 62500) Integration of biochemical and physiological functions of nutrients in humans and animals emphasizing interactions in bone and gut metabolism and physiology. Permission of instructor required. **Credits:** 4.00

NUTR 60600 - Nutritional Biochemistry And Physiology II

Credit Hours: 2.00. (ANSC 62600) Integration of biochemical and physiological functions of nutrients in humans and animals emphasizing post-absorptive use of nutrients as sources of energy and for the synthesis of macromolecules, emphasizing integrative metabolism in liver, muscle and adipose tissues. Offered weeks 1 - 8. Prerequisite: NUTR 60500. **Credits:** 2.00

NUTR 60700 - Nutritional Biochemistry And Physiology III

Credit Hours: 2.00. (ANSC 62700) Integration of biochemical and physiological functions of nutrients in humans and animals, emphasizing lipid metabolism and transport in the context of cardiovascular function. Offered weeks 9 - 16. Prerequisite: NUTR 60600. **Credits:** 2.00

NUTR 60900 - Food Lipids

Credit Hours: 1.00 to 3.00. (FS 60900) Importance of lipids in the diet and food systems with emphasis on changes occurring during processing, preparation, and storage. Nomenclature, physical attributes, and oxidation of lipids as well as properties and characteristics of antioxidants will be major components of the course. Offered in alternate years. Prerequisite: BCHM 56100; Prerequisite: NUTR 45300 or FS 45300. **Credits:** 1.00 to 3.00

NUTR 61200 - Obesity: Behavior, Physiology And Policy

Credit Hours: 2.00. The topics in this course provide a firm conceptual foundation for graduate students interested in issues related to obesity. Topics include issues ranging from molecular to policy: there is a strong emphasis on interdisciplinary approaches and critical thinking as it is a goal to integrate the sophisticated analyses of the physiological, nutritional, developmental, genetic, sensory, socio-economic, and experiential determinants of food and fluid intake. In addition, topics in this course such as health implications of obesity, epidemiology of obesity, endocrine, energy metabolism/integration, and neurochemistry will provide the opportunity for greater interdisciplinary collaborations. **Credits:** 2.00

NUTR 61600 - Special Topics In Ingestive Behavior

Credit Hours: 3.00. Explore, in-depth, important and current issues in ingestive behavior, enhance critical thinking skills, acquire professional skills (e.g. organizational, interpersonal), and develop rapport with scholars in the field. Typically offered in even ending years. **Credits:** 3.00

NUTR 61700 - Ingestive Behavior Seminar

Credit Hours: 1.00. (PSY 61801) Fosters an exchange of ideas and promotes greater familiarity among individuals from different laboratories and departments with interests related to ingestive behavior, and gives students opportunities to build their communication skills and lead/mediate discussions at a high scholarly level. Typically offered in alternate years. **Credits:** 1.00

NUTR 62600 - Advanced Presentation Skills

Credit Hours: 1.00. This course will teach graduate students how to synthesize information from multiple scientific studies and then communicate that information effectively to others in the form of a 40 minute long scientific seminar. The course is designed to provide students with clear guidelines for effective long-form oral communication of scientific information and then give students an opportunity to put those guidelines into practice. Prerequisites: Graduate standing past the first year. NUTR 69400 or equivalent course (determined by instructor review). For PhD students; INP Scientific Writing Course NUTR 62700. For MS students; a statement from the research mentor that the student has a clear thesis topic, that the student has completed the majority of work on the thesis, and that the student has conducted background reading on the thesis topic. **Credits:** 1.00

NUTR 62700 - Scientific Writing In Nutrition Science

Credit Hours: 1.00. The goal of this course is to develop and practice skills for clear scientific writing. The course is designed to introduce and practice the building blocks of scientific writing, including word choice, sentence structure and paragraph structure. In addition, students will be introduced to components of a hypothesis testing biomedical research paper in order to communicate a storyline. In addition, the publication cycle will be discussed. Prerequisites: Graduate standing past the first year. NUTR 60500 and NUTR 60600 and NUTR 60700. Other students can be approved for entry by permission of the instructor. **Credits:** 1.00

NUTR 63000 - Carbohydrates

Credit Hours: 3.00. (FS 63000) Carbohydrates with an emphasis on those of low molecular weight in foods. Structures, reactions, and properties of mono- and oligosaccharides. Introduction to polysaccharides and food gums. Offered in alternate years. Prerequisite: 6 credit hours in Organic Chemistry. **Credits:** 3.00

NUTR 63400 - Nutrition And Cancer Prevention

Credit Hours: 2.00. An in-depth examination of the role of nutrition in cancer prevention. Typically offered in alternate years. **Credits:** 2.00

NUTR 64000 - Human Feeding

Credit Hours: 2.00. Critical review of the genetic, neural, metabolic, endocrine, sensory, cognitive, and cultural determinants of appetite, food selection, and energy balance. Offered in alternate years. Prerequisite: physiology, biochemistry. Masters student standing. **Credits:** 2.00

NUTR 69000 - Interdepartmental Nutrition Program Grant Writing

Credit Hours: 1.00. Fulfillment of grant writing requirements for graduate students enrolled in the Interdepartmental Nutrition Program. Prerequisite: Interdepartmental Nutrition Program graduate students status. Permission of instructor required. **Credits:** 1.00

NUTR 69400 - Introductory Presentation Skills In Nutrition Science

Credit Hours: 1.00. Introductory training and application of concepts for effective communication through oral and poster presentations in the field of nutrition science. **Credits:** 1.00

NUTR 69500 - Interdepartmental Nutrition Program Seminar

Credit Hours: 0.00 or 1.00. Develop and strengthen skills in organization, preparation, and presentation of scientific information relevant to nutrition science to an audience of scientists. **Credits:** 0.00 or 1.00

NUTR 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

NUTR 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Organizational Behavior and Human Resources

OBHR 33000 - Introduction To Organizational Behavior

Credit Hours: 3.00. This course investigates the impact that individuals, groups, and organizational structure have on behavior within organizations for the purpose of applying such knowledge toward improving an organization's effectiveness. Attention is given to such topics as motivation, leadership, group processes, organizational structure, technological innovation, and conflict management. Emphasis is placed on developing management skills and application of organizational behavior theories.**Credits:** 3.00

OBHR 42900 - Labor Relations

Credit Hours: 3.00. The course focuses on employee-employer relations. Attention is given to topics in legal aspects of union organizing and collective bargaining, labor unions history and structure in the United States, labor management negotiations, dispute resolution procedures, international labor relations, and labor-management cooperation. **Credits:** 3.00

OBHR 49000 - Problems In Organizational Behavior

Credit Hours: 1.00 to 4.00. Supervised readings and reports in various subjects. Arrange with instructor before enrolling. Permission of instructor required. **Credits:** 1.00 to 4.00

OBHR 59000 - Problems In Organizational Behavior And Human Resource Management

Credit Hours: 1.00 to 4.00. Advanced study and investigation in a field of organizational behavior and human resource management under the guidance of staff. Permission of instructor required. **Credits:** 1.00 to 4.00

OBHR 60500 - Research Methods I

Credit Hours: 3.00. An introduction to research methods. This seminar examines the use of research methods to develop empirical tests for theoretical and practical issues. It includes readings and discussions on the philosophy of science, reliability, validity, research design, threats to research, ethics, and other issues in research methodology. Students formulate hypotheses and an original research design to test their hypotheses. **Credits:** 3.00

OBHR 60600 - Research Practicum

Credit Hours: 2.00 or 3.00. Independent empirical research in organizational behavior and human resource management, including the submission of a written report. Prerequisite: OBHR 60500. Permission of instructor required. **Credits:** 2.00 or 3.00

OBHR 63300 - Human Resource Management

Credit Hours: 2.00 (West Lafayette) 3.00 (Calumet, North Central). Introduction to human resource management for general managers. Emphasis is on the impact of human resource components (e.g., staffing, rewards, labor relations) on the performance of the firm. Case analyses and computerized databases are used to illustrate major components of human resource decision making. Not open to students with credit in MGMT 63100/MGMT 65310. Prerequisite: Master's student standing and Management majors only. **Credits:** 2.00 to 3.00

OBHR 64600 - Human Resource Information Systems I

Credit Hours: 2.00. Designed to gain an understanding of and appreciation for the use of information systems as a tool for managing human resources. The course will introduce and master, and then apply to HR problems, a set of topical hardware and software solutions. The class project, an HRIS consulting assignment with a major corporation, will commence. Prerequisite: MGMT 65310 or OBHR 63300. **Credits:** 2.00

OBHR 64700 - Teams, Technology And Human Capital

Credit Hours: 2.00. Human capital-people and their collective knowledge, skills and abilities-is the lifeblood of organizations. Today's managers must be equipped to leverage technology effectively, which requires an understanding of how technology alters the social dynamics of work. Drawing on an interdisciplinary, socio-technical framework, this course develops an understanding of the interplay between information and communication technologies and human capital, and applies this knowledge to timely work topics, including change management, knowledge management, virtual and alternative work structures, ethics and fairness, distance leadership and control, security, privacy, and trust. Prerequisite: Master's student standing and Management majors only. **Credits:** 2.00

OBHR 65000 - International Human Resource Management

Credit Hours: 2.00. Explores the international dimensions of human resource management. Focuses on the human resource policies and practices that are adhered to in various regions of the world. The process of expatriating and repatriating managers to and from the U.S. is examined. International issues faced by a manager working for a multinational organization in the U.S. are studied. Prerequisite: MGMT 65310 or OBHR 63300. **Credits:** 2.00

OBHR 65200 - Organizational Development And Consulting

Credit Hours: 2.00. Organizational development (OD) refers to the application of behavioral sciences knowledge and techniques to improve organizational effectiveness (e.g., productivity, quality, service, employee satisfaction, etc.). The course will describe techniques for diagnosing organizations and interventions for improving organizations. Specific interventions will be examined in detail including structural interventions (e.g., organizational design, job design), interpersonal process interventions (e.g.,

process consultation, team building), and human resource interventions (e.g., performance management, career development). The course will attempt to both build knowledge and provide practice in the various techniques. The course will not duplicate material in other current course offerings by this professor, and it will not require prior courses in human resources. **Credits:** 2.00

OBHR 66310 - Leader Communication & Negotiation

Credit Hours: 1.00 to 4.00. The best leaders are effective communicators and negotiators. They know how to use all the levers at their disposal to engage, inform, persuade, inspire, and instill confidence in key stakeholders. They look at each interaction as an opportunity to advance their agenda and/or achieve a specific outcome. This course will examine key internal and external engagement moments through your lens as an individual leader. Students will learn how to map communications best practices to real-world scenarios and make use of frameworks and guidance that will improve their ability to effectively use communications to help teams/organizations navigate issues. Students will also dissect the nature of negotiations, understand frameworks for building strategies for effective negotiations and explores the nature of conflict and conflict resolution.**Credits:** 1.00 to 4.00

OBHR 66410 - Leading Collaboration And Inclusion

Credit Hours: 1.00 to 4.00. This course is a study of teams at work, and the rich and varied experiences of people different in cognition, race, gender, religion, language, ability/disability, age and more. The purpose of the course is to explore diversity within and among teams. The course is grounded in both empirical research and practice. This course focuses on teams in today's modern organizations and global team leadership. **Credits:** 1.00 to 4.00

OBHR 68100 - Managing Behavior In Organizations

Credit Hours: 2.00 to 4.00. Individual and group behavior are the central components of the study of behavior in organizations. Focus is on the managerial application of knowledge to issues such as motivation, group processes, leadership, organizational design structure, and others. The course employs cases, exercises, discussions, and lectures. Prerequisite: Master's student standing and Management majors only. **Credits:** 2.00 to 4.00

OBHR 68300 - Individual Behavior In Organizations

Credit Hours: 1.00 to 3.00. This seminar provides an analysis of theory and research on individual and group behavior in organizations. Readings and discussion focus on motivation, attitudes and job satisfaction, employee participation and turnover, stress, leadership, group processes, and other issues. **Credits:** 1.00 to 3.00

OBHR 68400 - Research In Human Resource Management

Credit Hours: 1.00 to 3.00. Focuses on research methods, theories, and issues in HR management. A doctoral-level course designed for students interested in a research and teaching career in HR or organizational behavior. Objectives are to learn the primary theories and theoretical issues in each major area in HR, to learn the primary research methods and methodological issues, to attain a comprehensive reading list of the literature, to learn about publishing and the article review process, and to develop ideas for potential research projects. **Credits:** 1.00 to 3.00

OBHR 69000 - Advanced Problems In Organizational Behavior And Human Resource Management

Credit Hours: 2.00 to 4.00. Advanced investigation in a specific organizational behavior or human resource field at the graduate level. **Credits:** 2.00 to 4.00

OBHR 69100 - Special Problems In Organizational Behavior And Human Resource Management

Credit Hours: 1.00 to 4.00. Advanced investigation in a specific management field at the graduate level. For students in the master's programs in management who are registered in the master's program summer session. Prerequisite: Master's student standing and Management majors only. Permission of instructor required. **Credits:** 1.00 to 4.00

OBHR 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Organizational Leadership and Supervision

OLS 10000 - Introduction To Organizational Leadership

Credit Hours: 1.00. Transitional course to orient the Organizational Leadership and Supervision freshman to the department and Purdue. **Credits:** 1.00

OLS 27400 - Applied Leadership

Credit Hours: 3.00. Introduction to applied leadership in the context of organizational functions, structures, and operation. **Credits:** 3.00

OLS 29801 - Leadership Seminar I For ET Student Leaders

Credit Hours: 0.00 or 1.00. New student peer leaders in Engineering and Technology will receive training to facilitate a mentoring relationship, lab, and/or recitation within the School of Engineering and Technology's formal and PLTL programs. Selected topics focus on leadership styles, group dynamics, facilitation techniques, collaborative learning techniques, redirecting strategies, and student motivation. Permission of department required.**Credits:** 0.00 or 1.00

OLS 29900 - Organizational Leadership And Supervision

Credit Hours: 1.00 to 3.00. Variable topics in organizational leadership. **Credits:** 1.00 to 3.00

OLS 30200 - Leadership And Economic Aspects Of Sustainability

Credit Hours: 3.00. The main focus of this course is to learn how organizations make sustainability work in their organizations. You will learn about the triple bottom line (environment, social and economic aspects of business decisions) and how to make "sustainability" thrive in an organization. This course will look at how organizations: describe the benefits of sustainability for corporations and society; build a framework for implementing corporate sustainability; lead and design strategies for corporate sustainability; organize, perform evaluations and create reward systems for sustainability; implement social, environmental, and economic measuring systems; improve corporate processes, products, projects for sustainability; and manage reports for sustainability. This course will view various examples of sustainable practices in organizations, such as, Interface, Novartis, CEMEX, DuPont, Timberland, and Chiquita Brands, which are making sustainable practices thrive in their organization. Typically offered Fall.**Credits:** 3.00

OLS 32500 - Meeting Management

Credit Hours: 3.00. An applications-oriented course in presenting technical information and conducting problem-solving and decision-making meetings. Special emphasis on leading and facilitating interactive meetings, as well as structuring information for effective presentations. **Credits:** 3.00

OLS 32700 - Leadership For A Global Work Force

Credit Hours: 3.00. This course is for present and future leaders interested in the increasingly diverse global workforce. The course will present a variety of leadership issues including expatriate assignments, international business strategies and their cultural and managerial impact, and a review of business practices around the world. Typically offered Fall Spring Summer.**Credits:** 3.00

OLS 33100 - Occupational Safety And Health

Credit Hours: 3.00. A presentation of the aspects of occupational safety and health that are essential to the organizational leaders. Special emphasis is placed on developing an understanding of the economic, legal, and social factors related to providing a safe and healthy work environment. **Credits:** 3.00

OLS 34400 - Employee Benefits

Credit Hours: 1.00 to 3.00. This course will promote an understanding of employee benefit programs. Students will learn about the strategic importance of employee benefits and approaches to planning a benefits program while applying the legal, regulatory, and industry influences on employee benefits practices. Typically offered Fall Spring Summer.**Credits:** 1.00 to 3.00

OLS 34500 - Critical Thinking In Organizations

Credit Hours: 3.00. This course focuses on systems thinking and the understanding of research design and measurement theory used in solving organizational and human resource development problems. The emphasis is on applied methodology rather than on statistical issues, with the intent of the student becoming an effective consumer of information. The students will learn how to report findings in a practical and influential manner. Includes the importance of knowledge management issues in organizations. **Credits:** 3.00

OLS 34600 - Critical Thinking And Ethics

Credit Hours: 3.00. A course in complex problem solving and creative thinking with an emphasis on the ethical impacts of these solutions.**Credits:** 3.00

OLS 34800 - Human Resources Analytics

Credit Hours: 1.00 to 3.00. This course provides insight into uses of analytics in Human Resources (HR), why it is important, and how HR analytics add value to organization. Students will explore resources that will align an organization's mission and goals with key metrics and benchmarks. Typically offered Fall Spring Summer.**Credits:** 1.00 to 3.00

OLS 35000 - Creativity In Business And Industry

Credit Hours: 3.00. A study of the ways an individual can become more creative and how they can develop an environment which encourages creativity from employees. **Credits:** 3.00

OLS 35100 - Innovation And Entrepreneurship

Credit Hours: 3.00. An in-depth study of innovation in existing organizations, as well as entrepreneurship in start-up businesses, franchises, family-owned firms, and other business formats. **Credits:** 3.00

OLS 36200 - Cooperative Education Program

Credit Hours: 2.00. Supervised work experience directed toward professional development in supervisory or related leadership positions. Rotational work-study periods planned and coordinated by department staff in conjunction with the student and the employing organization. Permission of instructor required. **Credits:** 2.00

OLS 36400 - Professional Development Program

Credit Hours: 3.00. A survey course covering many professional and personal facets relative to entering the work force upon graduation. Major areas addressed include resume preparation, interviewing techniques, development of job-search plans, social skills, and analysis of career fields and opportunities. **Credits:** 3.00

OLS 36800 - Employment Law

Credit Hours: 3.00. This course covers the regulatory environment of the employment relationship. Topics will include discrimination and Title VII of the Civil Rights Acts of 1964, recruitment and selection, affirmative action, rights of union and nonunion employees, Fair Labor Standards Act, Equal Pay Act, employee benefit plans, unemployment compensation, and right to discharge. Typically offered Fall Spring.**Credits:** 3.00

OLS 37100 - Project Management

Credit Hours: 3.00. This course provides the basics of the project management discipline and allows the student to apply these skills in team-based situations. Typically offered Fall Spring Summer.**Credits:** 3.00

OLS 37500 - Training Methods

Credit Hours: 3.00. Principles, practices, and methods of employee training. Introduction to systematic training program design, development, and evaluation. Emphasis is on the supervisor as a trainer. **Credits:** 3.00

OLS 37600 - Human Resource Issues

Credit Hours: 3.00. Analysis and discussion of case problems concerning typical leadership and personnel situations that impact upon the supervisor/manager. Emphasis directed toward development of attitude, philosophy, analytical ability, and problem-solving skills within the working environment. **Credits:** 3.00

OLS 37800 - Labor And Management Relations

Credit Hours: 3.00. An introduction to, and overview of, the fundamental concepts of labor relations, collective bargaining, and dispute resolution procedures. An international comparative analysis is used to assess some of the legal, economic, and political structures of labor relations. **Credits:** 3.00

OLS 38300 - Human Resource Management

Credit Hours: 3.00. This course teaches an overview of the human resource function in organizations today. Case studies are used to explore applications of human resource principles. Typically offered Fall Spring.**Credits:** 3.00

OLS 38400 - Leadership Process

Credit Hours: 3.00. An in-depth study of a sequence of manager actions that influence employees to achieve desired performance results. How these manager actions are transformed by employees into desired performance is also covered. **Credits:** 3.00

OLS 38500 - Leadership Strategies For Quality And Productivity

Credit Hours: 3.00. Knowledge and applied leadership skills essential for establishing and continuously improving organizational effectiveness by forestalling and solving workplace problems. Typically offered Fall Spring.**Credits:** 3.00

OLS 38600 - Leadership For Organizational Change

Credit Hours: 3.00. Introduction to and overview of fundamental concepts of leading organizational change. Topics include setting the stage for organizational change, implementing organizational change, sustaining organizational change, and the role of the change manager. Concepts and frameworks taught in this course are applicable to change at multiple scales from small enterprises and large corporations to communities and ecosystems. **Credits:** 3.00

OLS 38800 - Leadership Through Teams

Credit Hours: 3.00. The group process, team development and exploration of dynamics that impact group and team performance. **Credits:** 3.00

OLS 39000 - Leadership Theories And Processes

Credit Hours: 3.00. This course integrates knowledge and skills from all associate level OLS courses and allows students to define, reflect upon, and improve their leadership abilities. Typically offered Fall Spring Summer.**Credits:** 3.00

OLS 39801 - Leadership Seminar II For ET Student Leaders

Credit Hours: 0.00 or 1.00. This course introduces ET student peer leaders to the knowledge, attitudes, and inner resources needed to be an effective leader. Students will utilize their first hand experiences to obtain the techniques to improve their leadership skills. Permission of department required.**Credits:** 0.00 or 1.00

OLS 39900 - Special Topics

Credit Hours: 1.00 to 6.00. Hours and subject matter to be arranged by staff. **Credits:** 1.00 to 6.00

OLS 39901 - Special Topics In Project Management

Credit Hours: 3.00. Hours and subject matter to be arranged by faculty/staff. Primarily for upper-division majors with specific interests in project management. Permission of instructor required. **Credits:** 3.00

OLS 44000 - Leading With Integrity

Credit Hours: 3.00. An investigation of ethical problems in business practice. Topics include personal morality in profit-oriented enterprise; codes of ethics; obligations to employees and other stakeholders; truth in advertising; whistle-blowing and company loyalty; regulation, self and government; the logic and future of capitalism. Emphasis on business law and legal impacts on ethical decision making. **Credits:** 3.00

OLS 45000 - Advanced Project Management

Credit Hours: 3.00. An introduction to project management concepts and practices in the context of human resource development projects. **Credits:** 3.00

OLS 45400 - Gender And Diversity In Management

Credit Hours: 3.00. The work force of the future will represent multiple differences including gender, race, culture, ethnicity, physical abilities, and age. Following this broad-based perspective of diversity, this course will focus on using knowledge of diversity to develop the leadership potential of individuals in organizations. Typically offered Summer Fall Spring.**Credits:** 3.00

OLS 45600 - Leadership In A Global Environment

Credit Hours: 3.00. Exploration of leadership strategies for organizations engaged in international business. Includes understanding of cultural differences and diverse business practices, and challenges of competing in a global marketplace. **Credits:** 3.00

OLS 46700 - Service Learning

Credit Hours: 3.00. Service learning is a reflective experience in which students are actively engaged in the community and integrate that experience into the classroom. Permission of instructor required. **Credits:** 3.00

OLS 47600 - Compensation Planning And Management

Credit Hours: 3.00. Planning and implementation of a total compensation system, including job analysis, job evaluation, salary survey and analysis, benefits and development of a structured pay system. Includes behavioral implications and legal compliance issues. **Credits:** 3.00

OLS 47700 - Conflict Management

Credit Hours: 3.00. A study of the methods for dealing with innerpersonal, interpersonal, and political disputes by means generally outside the traditional court system. Students will investigate the theoretical and practical aspects of conflict assessment, negotiation, problem solving, mediation, and arbitration. **Credits:** 3.00

OLS 47900 - Staffing Organizations

Credit Hours: 3.00. An applications-oriented study of key concepts in staffing organizations, including principles and issues in conducting job analysis; preparing job descriptions/specifications; and screening/selecting employees. Special emphasis on the design, validation, and operation of high-volume staffing systems. **Credits:** 3.00

OLS 48400 - Leadership Strategies For Quality And Productivity

Credit Hours: 3.00. A study of how organizational leaders create an environment conducive to high levels of employee self-motivation, quality, and productivity (TQM). Actual case situations are used to illustrate the application of course content. **Credits:** 3.00

OLS 48500 - Leadership For Team Development

Credit Hours: 3.00. An in-depth study of self-directed work teams and team processes in the work setting, with a view to understanding team functions under varying task conditions. Especially emphasized will be the leadership of teams for effective performance and maximum member satisfaction. This course deals extensively with maintenance and task behaviors of team members. **Credits:** 3.00

OLS 48600 - Management Of Change

Credit Hours: 3.00. A survey of the concepts that provide a foundation for the understanding of leadership and its relationship to the management of organizational change, with special emphasis on managing the human side of quality improvement. **Credits:** 3.00

OLS 48700 - Leadership Philosophy

Credit Hours: 3.00. A review of current managerial, education, and development theories and practices; discussions of fundamental social, economic, and political changes affecting business and the art of managing; implications of these changes for individual development and continued growth. **Credits:** 3.00

OLS 48800 - Leadership For Lean Enterprise

Credit Hours: 3.00. A study of how organizational leaders create an environment conducive to lean enterprise. Actual case studies of leadership techniques are used to illustrate the application of course content. **Credits:** 3.00

OLS 48900 - Digital Transformation

Credit Hours: 3.00. This course covers the role of digital transformation and what it means for companies. This course includes practicums in digital transformation, including business transformation strategies, and AI driven insight. **Credits:** 3.00

OLS 49000 - Senior Research Project

Credit Hours: 1.00 to 6.00. Opportunity to study specific problems in the field of personnel, safety, supervision, and training under the guidance of an OLS faculty member. Typically offered Fall Spring Summer.**Credits:** 1.00 to 6.00

OLS 49100 - Internship Program

Credit Hours: 3.00 (West Lafayette and Tech Statewide); 1.00 to 3.00 (Calumet and North Central). A practicum designed to combine University study with work experience directly related to the student's plan of study. Permission of department required. **Credits:** 3.00 or 1.00 to 3.00

OLS 49101 - Internship Experiences

Credit Hours: 2.00. A practicum designed to combine University study with work experience directly related to the student's plan of study. Includes a design of an optimal interning experience as well as a written final paper and oral presentation covering the student's internship experience. Permission of department required. **Credits:** 2.00

OLS 49200 - Individual Research Problems

Credit Hours: 1.00 to 3.00. Supervised individual research on appropriate topics. Hours and subject matter to be arranged by staff. Permission of instructor required. **Credits:** 1.00 to 3.00

OLS 49900 - Special Topics In Organizational Leadership And Supervision

Credit Hours: 1.00 to 3.00. Hours and subject matter to be arranged by staff. Permission of instructor required. **Credits:** 1.00 to 3.00

OLS 50701 - Quantitative Analysis And Analytics For Leaders

Credit Hours: 3.00. This course emphasizes the use of statistical analysis in critical decision making. Specifically, the course focuses on selecting data and running appropriate statistical analyses, synthesizing findings based upon the analyses, making decisions based upon the findings, and using multiple modes to present the data, the findings, and recommendation(s) for action.**Credits:** 3.00

OLS 51500 - Foundations Of Human Resources

Credit Hours: 3.00. A survey course emphasizing the human resource function (and its development) in the context of the work organization. Human resource development topics include exploration of various training and development techniques, the relation of training to organizational strategies, training needs analysis, evaluation of training, and career development. The strategic approach to human resource management also is covered, including what human resource professionals can and should do to help the organization succeed. Permission of Department required. Typically offered Spring.**Credits:** 3.00

OLS 51600 - Diversity, Equity, And Inclusion For Organizational Leaders

Credit Hours: 3.00. This course will assist students in identifying and understanding diversity, equity, and inclusion issues in the workplace. Students will engage with various theories and concepts related to workplace and societal diversity, equity and inclusion and apply them to organizational settings.**Credits:** 3.00

OLS 57100 - Advanced Project Management In Technology

Credit Hours: 3.00. This course helps students learn project management through applying technology project approaches in teams. Using project tools and templates, students learn the technology project life-cycle through actual and simulated situations. The course presents terms and approaches used in industry and allows students to apply methods individually and in teams. Typically offered Fall Spring Summer.**Credits:** 3.00

OLS 57200 - Integration Of Project Management For Leaders

Credit Hours: 3.00. This course emphasizes critical analysis, synthesis, and evaluation of theories and applications of project management knowledge and skills, leadership, communication, and stakeholder engagement. Students integrate theoretical and applied skills in planning, distributing, and managing communication; analyzing and interpreting project organization in context; and applying best practices in team management.**Credits:** 3.00

OLS 57400 - Managerial Training And Development

Credit Hours: 3.00. Review of current managerial education and development theories and practices; discussion of fundamental social, economic, and political changes affecting business and the work of managing; implications of these changes for individual manager development and continued growth. **Credits:** 3.00

OLS 57600 - Advanced Topics In Human Resource Management

Credit Hours: 3.00. Current topics and issues in the legal, behavioral, and technical environment of human-resources management. Topics may include employment practices, labor-management relations, wage and salary administration, treatment of employees on the job, or productivity-improvement programs. Employs seminar format with emphasis on applications research. Course may be offered in traditional, distance, or blended format. **Credits:** 3.00

OLS 57700 - Organization And Administration Of Training And Development

Credit Hours: 3.00. The function and management of training and development in the world of work. **Credits:** 3.00

OLS 57800 - Leadership In International Human Resources

Credit Hours: 3.00. Explores issues and practices in technologically-driven international organizations pertaining to the six major HR functions (recruitment and selection, performance management, training and development, organizational development, compensation and benefits, and labor-employee relations). These are considered in the context of technologically-driven multinational organizations with the United States being the foundation for comparison. The course is strategic in focus. A "best practices" approach, utilizing the case method, is emphasized. **Credits:** 3.00

OLS 57900 - Emerging World-Class Leadership Strategies

Credit Hours: 3.00. Exposes graduate students to the theoretical foundation and empirical research associated with emerging strategies and theories in the study of world-class leadership. The structure of the course is four fold: the discovery of critical leadership skills and behaviors, discovery of critical world-class leadership strategies, encouragement of self analysis, discovery of leadership strengths, and conducting research on leadership issues. Permission of instructor required. **Credits:** 3.00

OLS 58000 - Interpersonal Skills For Leaders

Credit Hours: 3.00. Development and improvement of interpersonal and group dynamic skills for effective leadership in organizations. Emphasis on action learning and real-world application of skills. Course may be offered in traditional, distance, or blended format. Open to all graduate students with special consideration given to senior OLS students with 3.0 GPA and School of Technology graduate students. **Credits:** 3.00

OLS 58100 - Workshop In Organizational Leadership And Supervision

Credit Hours: 0.00 to 8.00. Advanced study of technical and professional topics. Emphasis is on new developments relating to technical, operational, and training aspects of industry and technology education. Course may be offered in traditional, distance, or blended format. Course format may vary, depending upon topic of course. **Credits:** 0.00 to 8.00

OLS 58200 - Leadership And Organizational Change

Credit Hours: 3.00. Explores issues in leadership and organizational change. Included are change theories, utilizing resistance to change, contemporary approaches to change, the future workplace, and researching best practices in organizational change. **Credits:** 3.00

OLS 58300 - Coaching And Mentoring In Organizations

Credit Hours: 3.00. This course explores issues and practices in technologically-driven organizations pertaining to the roles and functions that coaching and mentoring play in employee development. A "best practices" approach, utilizing the case method, is emphasized. Presented from the point of view of a human resource manager/leader, the focus of the course is on identifying coaching opportunities, enhancing communication skills, developing and implementing coaching and mentoring strategies, and evaluating the outcomes of these strategies. Attention is directed to facilitating personal coaching mentoring skills. Course may be offered in traditional, distance, or blended format. Permission of department required. **Credits:** 3.00

OLS 58900 - Leadership And Ethics

Credit Hours: 3.00. An examination of ethical, legal and policy issues facing business and technology leaders. Topics include ethical decision making, corporate social responsibility, codes of ethics, public policies and government regulations, international business practices, technology innovation, risk management in a global environment, and specific areas of law - employment, health and safety, environment, contract, warranties and liabilities, intellectual property, technology law, and international laws

and regulations. Graduate student standing or senior status with consent of instructor. Graduate students without an OLS background may be required to take some leveling course. **Credits:** 3.00

OLS 59000 - Individual Research Problems In Supervision And Personnel

Credit Hours: 1.00 to 6.00. Opportunity to study specific problems in the field of supervision and personnel under the guidance of a qualified faculty member within the department. Does not include thesis work. Permission of instructor required. **Credits:** 1.00 to 6.00

OLS 59800 - Directed MS Project

Credit Hours: 1.00 to 3.00. A formal investigation of a particular problem under the guidance of the advisory committee. Not applicable to a thesis option plan of study. Enrollment during at least two consecutive terms for a total of three credits is required. Permission of instructor required. **Credits:** 1.00 to 3.00

OLS 62300 - Contemporary Organizational Leadership And Supervision Problems

Credit Hours: 3.00. Theory and practice in the development of comprehensive solutions to problems in industrial, technical, and human resource development environments. Solutions based on emerging procedures will be emphasized. Permission of instructor required. **Credits:** 3.00

OLS 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Pharmaceutical Science

PHSC 10000 - Pharmacy Orientation I

Credit Hours: 1.00. This first semester pre-pharmacy course is designed to provide the pre-pharmacy student with an introduction to the profession of pharmacy and to Purdue University College of Pharmacy. The topics presented in this course will allow the pre-pharmacy students to develop informed perspectives on: pharmacy summer employment opportunities for students; pharmacy career opportunities; current pharmacy practice trends; the importance of professionalism, values, and ethics as it pertains to the profession; resume and cover letter development; the College's curriculum, admissions process, and course registration process. **Credits:** 1.00

PHSC 20000 - Introduction To Pharmacy And Admissions Process

Credit Hours: 2.00. A second orientation course to provide students interested in pre-pharmacy an introduction to the profession of pharmacy and to the Purdue University College of Pharmacy. Topics include personal development, academic program and career planning, pharmacy career opportunities, professionalism and ethics, and the Pharm.D. curriculum and the pharmacy admissions process. The course builds on PHPR 10000, but students are not required to have taken that course in order to enroll in this course. **Credits:** 2.00

PHSC 20100 - Bachelor Of Science In The Pharmaceutical Sciences Orientation II

Credit Hours: 1.00. This seminar course is designed to enhance the BSPS student's professional skills career exploration and prepare for post-graduation employment. It provides the academic content to link experiences in professional fields to study in Pharmaceutical Sciences as well as social, economic and intellectual forces that shape views and work experiences. The intent is

to prepare the student to successfully transfer skills to workplace. Typically taken in the junior year. The course builds on IMPH 10000, but students are not required to have taken that course. The course consists of a mix of on-line modules and assignments and in-person class sessions. **Credits:** 1.00

PHSC 20400 - Organic Chemistry I

Credit Hours: 3.00. A study of the compounds of carbon on a functional group basis, with particular emphasis on those organic compounds of pharmaceutically important classes of compounds. This course presents organic chemistry concepts that are essential for understanding various topics in biochemistry and principles of drug action.**Credits:** 3.00

PHSC 20401 - Organic Chemistry I Laboratory

Credit Hours: 1.00. Laboratory experiments to accompany PHSC 20400 performing laboratory experiments involving the methods of purification, reactions, and synthesis of organic compounds.**Credits:** 1.00

PHSC 20500 - Organic Chemistry II

Credit Hours: 3.00. PHSC 20500 is a continuation of PHSC 20400. You will learn the principles of organic chemistry with an emphasis on reactions of pharmaceutically important classes of compounds. This course presents organic chemistry concepts that are essential for understanding various topics in biochemistry and principles of drug action. You will continue to apply the fundamentals learned in general chemistry to the functional classes of compounds that are most important in pharmaceutical and biological chemistry.**Credits:** 3.00

PHSC 20501 - Organic Chemistry II Lab

Credit Hours: 1.00. This course has been designed to help you apply the concepts of organic chemistry and to enhance your understanding of the subject. This lab is an extension of the PHSC 20401 laboratory, and you will continue to use the concepts and techniques that you learned in organic chemistry I.**Credits:** 1.00

PHSC 20800 - Biochemistry For Pharmaceutical Sciences

Credit Hours: 3.00. The overall objectives of this course are to increase students' biomedical understanding and knowledge and their ability to apply that understanding and knowledge. This requires the students in this course to learn and understand the facts, concepts, and formulaic processes, and to become skilled at applying what they have learned. **Credits:** 3.00

PHSC 42200 - Immunology

Credit Hours: 3.00. This course exposes students to the basic principles of immunology, teaches students to use those principles to understand the cause of immunological disease and the basis of immunoprophylaxis and immunotherapy, and provides students with sufficient information to understand the principles and challenges of gene therapy and the application of genomics to future drug development. **Credits:** 3.00

PHSC 42400 - Principles Of Pathophysiology And Drug Action

Credit Hours: 3.00. This course introduces the basic principles of pathophysiology, pharmacodynamics, toxicology and medicinal chemistry necessary to understand the therapeutic use and adverse actions of drugs. The course will integrate and apply concepts of science courses, including organic chemistry, biochemistry, anatomy and physiology into an understanding of the basic fundamentals of disease processes, toxicology and drug actions. Thus, this course will provide students with the basic background necessary to understand and apply pharmacotherapeutics to the practice of pharmacy. **Credits:** 3.00

PHSC 42800 - Dosage Forms I

Credit Hours: 3.00. The purpose of this course is to provide a foundation in the basic concepts of pharmaceutics that are the foundation of drug delivery. The course begins by presenting the molecular basis for aqueous and lipid solubility of drugs, pharmacokinetic principles that are related to dosage forms, mechanisms by which excipients or manufacturing processes affect bioavailability, and chemical kinetics applied to the shelf-life of dosage forms. The pharmaceutics principles are then applied to successively more complex liquid dosage forms: solution, emulsion, and suspension. The excipients that are required to prepare the dosage forms: buffers, preservatives, emulsifiers, suspending agents, wetting agents, etc., and the method of preparing each dosage form in both a compounding and manufacturing setting are covered. **Credits:** 3.00

PHSC 42900 - Dosage Forms II

Credit Hours: 2.00. The purpose of this course is to educate beginning pharmacy students to thoroughly understand the basic physical-chemical principles involved in preparing liquid and semisolid dosage forms and controlled drug delivery systems used in the practice of pharmacy. **Credits:** 2.00

PHSC 46000 - Drug Discovery And Development I

Credit Hours: 3.00. Focuses on the strategies, current methods and technologies used in early stage pre-clinical research to discover, validate and select lead drug candidates. **Credits:** 3.00

PHSC 46100 - Drug Discovery And Development II

Credit Hours: 3.00. The course focuses on the process of drug development from pre-formulation to unit operations. The emphasis is on the scientific principles behind every step in moving from a drug molecule to its products.**Credits:** 3.00

PHSC 48500 - Intercultural And Global Health Issues

Credit Hours: 2.00. This course is designed to meet the University Embedded Outcomes of Intercultural Knowledge, and Global Citizenship and Social Awareness. Students will discuss and develop presentations (verbal and written) about various intercultural and global health issues. **Credits:** 2.00

Pharmacy

PHRM 10000 - Pharmacy Orientation I

Credit Hours: 1.00. This first semester pre-pharmacy course is designed to provide the pre-pharmacy student with an introduction to the profession of pharmacy and to Purdue University College of Pharmacy. The topics presented in this course will allow the pre-pharmacy students to develop informed perspectives on: pharmacy summer employment opportunities for students; pharmacy career opportunities; current pharmacy practice trends; the importance of professionalism, values, and ethics as it pertains to the profession; resume and cover letter development; the College's curriculum, admissions process, and course registration process.**Credits:** 1.00

PHRM 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in pharmacy. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

PHRM 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in pharmacy. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

PHRM 31600 - Drug Abuse/Addiction Education

Credit Hours: 1.00. An overview of alcoholism and other chemical addictions. Students are given the information and experience necessary to present a five-hour drug abuse education program to the public and specifically middle school students. Course is taught by undergraduate pharmacy students with oversight by staff. **Credits:** 1.00

PHRM 38199 - Industrial Practice I

Credit Hours: 1.00. Professional practice of pharmaceutical sciences in industry. Comprehensive written report of this experience required. For cooperative program students only enrolled in the College of Pharmacy. Permission of Department required. **Credits:** 1.00

PHRM 38299 - Industrial Practice II

Credit Hours: 1.00. Professional practice of pharmaceutical sciences in industry. Comprehensive written report of this experience required. For cooperative program students only enrolled in the College of Pharmacy. Permission of Department required. **Credits:** 1.00

PHRM 38399 - Industrial Practice III

Credit Hours: 1.00. Professional practice of pharmaceutical sciences in industry. Comprehensive written report of this experience required. For cooperative program students only enrolled in the College of Pharmacy. Permission of Department required. **Credits:** 1.00

PHRM 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in pharmacy. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

PHRM 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in pharmacy. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

PHRM 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in pharmacy. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

PHRM 39699 - Pharmaceutical Science Internship Experience

Credit Hours: 1.00 to 3.00. Professional practice with qualified employers within the pharmaceutical industry. Pre-approval of enrollment by the BSPS Committee is required as well as completion of a course paper. Department and instructor permission required.**Credits:** 1.00 to 3.00

PHRM 40500 - Mindfulness

Credit Hours: 1.00. The goal of the course is to introduce students to intercultural development, identify stressors in life, and learn simple methods to reduce stress of pharmacy students. This introductory course comprises of class activities/discussions and assignments. *It is very important that respect is demonstrated by being considerate, courteous, and professional, and by maintaining confidentiality of others' information. There are no exams in this course.***Credits:** 1.00

PHRM 41000 - Professional Communications

Credit Hours: 1.00. Professional communications will focus on developing verbal, written, and nonverbal communication skills. The goals of the course are to augment the students' knowledge about soft and hard communications, reinforce necessary skills for interactions and engagement in various healthcare settings, and develop professional and personal confidence. Class participation is expected and the format will be active learning with very few lectures. All pharmacy students are welcome - this course is not intended to focus on any particular group or class. This course comprises of home study and class discussions. *All discussions in class shall remain confidential. There are no exams in this course.* **Credits:** 1.00

PHRM 41900 - Experiential Reflections In The Pharmaceutical Sciences

Credit Hours: 0.00. This course meets the requirement for the experiential component of the BSPS program in the College of Pharmacy. Students will be required to submit a written reflection on a practical experience of a minimum of 8 weeks duration that was accomplished in the past year. This reflection will include a description of the location, duration, and type of practical experiences. Students will provide a summary of key learning through the experience and how it has impacted their career plans. Students will also be required to submit a letter from their practical experience supervisor confirming the dates, place, and nature of the experience. Permission of department and instructor required. **Credits:** 0.00

PHRM 42500 - Pharmacy Leadership And Innovation Forum

Credit Hours: 1.00. This course introduces students to emerging trends and career opportunities in pharmacy and the pharmaceutical sciences through exposure to leaders in professional and corporate environments. **Credits:** 1.00

PHRM 42700 - Conversations About Death And Dying

Credit Hours: 1.00. This course is open to all years of the professional pharmacy program or others with instructor permission. This course provides opportunity for open discussion of the topics of death and dying in the provision of healthcare. **Credits:** 1.00

PHRM 43600 - Biochemistry For Pharmaceutical Sciences II

Credit Hours: 2.00. The overall objective of this course is to expand students' knowledge of biochemistry obtained in the prerequisite one-semester Biochemistry course to understanding advanced aspects of human biochemistry related to pharmaceutical sciences.**Credits:** 2.00

PHRM 43900 - Vulnerable And Underserved Patient Care

Credit Hours: 2.00. The goal of this course is to increase knowledge of the challenges faced by underserved patient populations and ways healthcare providers can assist patients in overcoming these challenges. The course also provides exposure and

experience in patient care provided in two rural federally qualified health centers (FQHCs). Students will be able to challenge preconceived notions that they may have about underserved populations and learn the impact that pharmacists can have in caring for these populations. **Credits:** 2.00

PHRM 44200 - Introduction To The Pharmaceutical Industry

Credit Hours: 2.00. While providing an overview of the pharmaceutical industry, this course focuses on the drug development process, including clinical research, regulatory affairs, pharmacovigilance and marketing. Pharmaceutical company executives serve as guest lecturers and discuss their individual areas of expertise. **Credits:** 2.00

PHRM 45600 - Pharmaceutical Care Of Diabetes

Credit Hours: 1.00. The purpose of this course is for students to obtain a comprehensive knowledge of the pharmaceutical care of diabetes. Students will participate in class discussions related to patient cases and learn about effective communication with patients with diabetes. In class discussions will expose the students to patient case scenarios in which they will gain an appreciation for the complexities involved with diabetes, construct evidence-based treatment plans, and enhance overall understanding of effective diabetes management. This course provides a platform for shaping future pharmacists into excellent caregivers for patients with diabetes. Permission of instructor required. **Credits:** 1.00

PHRM 46400 - Preparing For Postgraduate Residency Program

Credit Hours: 2.00. This elective course will focus on preparing for the pharmacy residency program selection process. The purpose of this course is to discuss various aspects of the selection process, provide students with guidance regarding each step of the process, and provide feedback regarding materials such as curriculum vitaes (CVs), letters of intent, and thank you notes. This course is intended to guide the students through the process using events, which normally occur during the residency search including pre-Midyear preparation, navigating American Society of Health-System Pharmacists (ASHP) Midyear, the post-Midyear application and interview process, and the Match. Permission of instructor required. **Credits:** 2.00

PHRM 46600 - Pharmaceutical Care In Oncology

Credit Hours: 1.00. This course aims to expand students' understanding of hematology and oncology topics. After completion, the student should be able to apply course concepts to actual patient cases. CLPH 49000 will be collaboratively taught by oncology pharmacists and residents from the greater Indianapolis area hospitals. Students will be exposed to relevant topics including current events, supportive care, bone marrow transplant, renal cell carcinoma, specialty pharmacy administration and leadership, oral chemotherapy, palliative care and career paths in oncology pharmacy. **Credits:** 1.00

PHRM 46800 - Clinical Integration And Application

Credit Hours: 2.00. This is an elective class which gives participants more experience working up patient cases with multiple complications and an opportunity to make recommendations to a team. The material for each case will be derived from actual cases and topics will include continuity of care problems, typical problems/diseases seen in hospitalized patients, and a host of other chronic illnesses. During the 3-week class, students will have 1-1.5 hours to work on a patient case in class and address challenges faced in the clinical setting. The second half of class will be used for students to present their recommendations to a "medicine team" (made up of your classmates and teachers). Students will be responsible for creating a pharmacist problem list and making verbal drug therapy recommendations. The majority of the grade will come from in-class participation with other points coming from online quizzes, communication exercises, and follow-up answers from clinical questions. **Credits:** 2.00

PHRM 49000 - Special Topics

Credit Hours: 0.00 to 3.00. Subject matter and method of approach individually directed by instructor. Permission of instructor required. **Credits:** 0.00 to 3.00

PHRM 49500 - Pharmaceutical Research Special Topics

Credit Hours: 1.00 to 3.00. Ongoing involvement in pharmaceutical research. Pharmaceutical research subject matter and method of approach individually directed by instructor. Permission of instructor required. **Credits:** 1.00 to 3.00

PHRM 69500 - Introduction To Pharmaceutical Sciences Research

Credit Hours: 0.50. Introduction of new graduate students to graduate programs, various disciplines, and the research environment in the College of Pharmacy, and prepare them for their graduate studies at Purdue College of Pharmacy. Each meeting is expected to have ~90 minutes presentation(s) and 30 minutes student discussion. Permission of department required. **Credits:** 0.50

PHRM 81000 - Basics Of Immunology

Credit Hours: 1.00. The goal of PHRM 81000 (Basics of Immunology) is to expose the student to the basic principles of immunology and enable the student to use these principles to understand how the immune system combats infections. This goal will be achieved through online recorded lecture and out of class reading assignments and quizzes. The student will be expected to understand basic immunological concepts and apply this knowledge to solving problems involving the integration of the various components of the immune system.**Credits:** 1.00

PHRM 82000 - Professional Skills Laboratory I

Credit Hours: 2.00. Experiments, computer simulations, case studies, and problem sets that actively involve the student in problem-solving, applying and interrelating important concepts from the core courses taught that semester.**Credits:** 2.00

PHRM 82100 - Professional Skills Laboratory II

Credit Hours: 2.00. Continuation of PHRM 82000 with emphasis upon modules that provide laboratory practice experience designed to integrate basic science concepts and practice applications. Small group problem-solving methodology will be utilized as appropriate.**Credits:** 2.00

PHRM 82200 - Pharmacy Skills And Patient Counseling

Credit Hours: 2.00. Pharmacy Skills and Patient Counseling is a two credit hour, required first professional year experiential course combining practical experience in the Purdue University Pharmacy with lecture. Students are monitored by faculty instructors, staff pharmacists and Advanced Pharmacy Practice Experience (APPE) students. Students must have a valid Social Security number the first week of class. **Credits:** 2.00

PHRM 82400 - Principles Of Pathophysiology And Drug Action

Credit Hours: 3.00. This course introduces the basic principles of pathophysiology, pharmacodynamics, toxicology and medicinal chemistry necessary to understand the therapeutic use and adverse actions of drugs. The course will integrate and apply concepts of science courses, including organic chemistry, biochemistry, anatomy and physiology into an understanding of the basic fundamentals of disease processes, toxicology and drug actions. Thus, this course will provide students with the basic background necessary to understand and apply pharmacotherapeutics to the practice of pharmacy. Prerequisite: MCMP 20400, 20500, 20800, and BIOL 20300, 20400 or 30100, 30200. Departmental permission required. **Credits:** 3.00

PHRM 82500 - Integrated Pharmacotherapy I

Credit Hours: 6.00. This course will serve as an integrated approach to the physiology/pathophysiology, medicinal chemistry, pharmacology, pharmacokinetics/ pharmaceutics, and pharmacotherapeutics of the following topics: fluids/electrolyte pharmacotherapy, renal diseases, acid/base disorders, clinical nutrition, autonomic nervous system (ANS), pulmonary diseases, hematology, immunology, and rheumatology. The emphasis of this course is knowledge and skill development. Also in the process of completing the objectives, attitudes toward the role of the pharmacist and patient-related issues will be imparted. **Credits:** 6.00

PHRM 82600 - Introduction To Patient Centered Care

Credit Hours: 4.00. The introductory course teaches students the key communication principles and skills necessary to deliver patient care and interact with other health care professionals. This includes performing basic physical assessments, evaluating patient comprehension, and improving personal communication skills. **Credits:** 4.00

PHRM 82800 - Dosage Forms I

Credit Hours: 3.00. The purpose of Dosage Forms I is to provide a foundation in the basic concepts of pharmaceutics that are the foundation of drug delivery. The course begins by presenting the molecular basis for aqueous and lipid solubility of drugs, pharmacokinetic principles that are related to dosage forms, mechanisms by which excipients or manufacturing processes affect bioavailability, and chemical kinetics applied to the shelf-life of dosage forms. The pharmaceutics principles are then applied to successively more complex liquid dosage forms: solution, emulsion, and suspension. The excipients that are required to prepare the dosage forms: buffers, preservatives, emulsifiers, suspending agents, wetting agents, etc. and the method of preparing each dosage form in both a compounding and manufacturing setting are covered. **Credits:** 3.00

PHRM 82900 - Dosage Forms II

Credit Hours: 2.00. Education in the use of dosage forms to deliver drugs. Collaboration with peers and other members of the health care team regarding the proper use of the various dosage forms so that the desired therapeutic objective is achieved.**Credits:** 2.00

PHRM 83100 - Health Care Systems

Credit Hours: 2.00. This course is envisioned as a primarily didactic course whose main purpose is to provide students with an introduction to the structures and functions of the United States Health Care System. It is also designed to provide the student an opportunity to compare and contrast the methods used in other countries to address the needs of society for provision of health care to its members. **Credits:** 2.00

PHRM 83300 - Introduction To Case Studies

Credit Hours: 1.00. This course will focus on medical terminology, discovery of different sections of a patient chart, exploration of the components of a SOAP note and other documentation types, orientation to the teaching electronic medical record (tEMR), and reinforcement of the Pharmacists' Patient Care Process (PPCP) with a focus on what is unique or different in the care provided by a pharmacist. A primarily online method for content delivery will be utilized. Multiple in person case-based sessions will be incorporated throughout the semester. Material covered is meant to supplement and augment that gained in PHRM 82600, PHRM 82500, and the PPL sequence. **Credits:** 1.00

PHRM 83400 - Pharmaceutical Calculations

Credit Hours: 1.00. Mastery of pharmaceutical calculation skills is vital and PHRM 83400 prepares students to apply calculation problem solving skills to clinical practice. PHRM 83400 prepares students to perform pharmaceutical calculations necessary for prescription/drug order preparation, compounding dosage forms, and medication dosage calculations based on patient specific factors. Pharmacists must perform error-free pharmaceutical calculations. Correct calculations contribute as much to

pharmaceutical care as the newest methods/guidelines for diagnosis, treatment, and prevention. The development of problem solving skills with pharmaceutical calculations is an important component of this course. In addition, practice and repetition of problems is necessary to develop confidence as well as accuracy. Appropriate documentation of work/set up and numerical answers (including units) is required. Approaches to minimize errors and maximize accuracy with pharmaceutical calculations are emphasized. **Credits:** 1.00

PHRM 83500 - Principles Of Pharmacokinetics

Credit Hours: 3.00. This course introduces the theory and concepts of pharmacokinetics and biopharmaceutics. It provides the student with a foundation for more advanced therapeutic concepts in subsequent courses. The learner will develop expertise in quantifying drug absorption, distribution and elimination from concentration vs. time data or urinary drug excretion vs. time data to estimate primary pharmacokinetic parameters. Use of these parameters is required to design and modify individual drug-dosing regimens.**Credits:** 3.00

PHRM 83600 - Biochemistry For Pharmaceutical Sciences II

Credit Hours: 2.00. This course provides instruction in biochemistry that builds on basic knowledge by presenting content on advanced aspects of human biochemistry for students in pharmaceutical sciences. The content emphasizes the integration of biochemical knowledge and the application of biochemical understanding to medically relevant situations including disease etiology, medical diagnosis, disease research, drug discovery, drug and toxin mechanisms of action, and mechanism of drug metabolism. **Credits:** 2.00

PHRM 83800 - Interprofessional Education (IPE) Experience I

Credit Hours: 0.50. An Interprofessional Learning Anchor (IPLA) is a common event or experience in which all P1-P4 students will participate. The purpose of this course is to provide first through fourth professional year pharmacy students with an interprofessional education (IPE) activity, and expose them to concepts related to interprofessional care and practice. This course will also involve interaction and collaboration with students and professionals from other healthcare disciplines (i.e. medicine, nursing, social work, physical therapy, dentistry, and others). This course will feature one to three components offered over the Fall and/or Spring academic semesters. **Credits:** 0.50

PHRM 83900 - Interprofessional Education (IPE) Experience II

Credit Hours: 0.50. An Interprofessional Learning Anchor (IPLA) is a common event or experience in which all P1-P4 students will participate. The purpose of this course is to provide first through fourth professional year pharmacy students with an interprofessional education (IPE) activity, and expose them to concepts related to interprofessional care and practice. This course will also involve interaction and collaboration with students and professionals from other healthcare disciplines (i.e. medicine, nursing, social work, physical therapy, dentistry, and others). This course will feature one to three components offered over the Fall and/or Spring academic semesters.**Credits:** 0.50

PHRM 84000 - Professional Skills Laboratory III

Credit Hours: 2.00. Experiments, simulations, case studies, and problem sets that actively involve the student in problem-solving, applying and interrelating important concepts from the core courses taught that semester.**Credits:** 2.00

PHRM 84100 - Professional Skills Laboratory IV

Credit Hours: 2.00. Experiments, simulations, case studies, and problem sets that actively involve the student in problem-solving, applying and interrelating important concepts form the core courses taught that semester.**Credits:** 2.00

PHRM 84200 - Community Pharmacy IPPE

Credit Hours: 3.00. A 3-credit hour required experiential course in the summer before the 2nd year of professional Doctor of Pharmacy program. Students learn community pharmacy operations and patient counseling skills.**Credits:** 3.00

PHRM 84400 - Integrated Pharmacotherapy II

Credit Hours: 6.00. This course will provide an integrated approach to instruct the students in physiology, pathophysiology, pharmacology, medicinal chemistry, and therapeutics relevant to diseases of the endocrine and cardiovascular systems. When applicable, special emphasis will be placed on presenting the interrelationships between deficits in endocrine function and cardiovascular disease. In addition, students will study and critique current therapeutic approaches and opinions in the application of replacement therapy with natural, synthetic, or recombinant hormone preparations.**Credits:** 6.00

PHRM 84500 - Integrated Pharmacotherapy III

Credit Hours: 6.00. This course will develop knowledge and skills regarding the physiology/ pathophysiology, medicinal chemistry, pharmacology, pharmacokinetics/pharmaceutics, and pharmacotherapy of specific cardiovascular diseases, neurology diseases, and psychiatric disorders.**Credits:** 6.00

PHRM 84700 - Principles Of Pharmacogenomics

Credit Hours: 2.00. This course is designed to introduce the theory and concepts of pharmacogenetics, pharmacogenomics, and precision medicine. The course will provide the student learner broad knowledge for advanced integrated therapeutic strategy based on a patient's genetic information. The learner will develop expertise in informed patient care by selecting the proper drug, dose, and/or dosage form for a specific patient care based on personalized data and pharmacogenomic information. This course offers a platform for shaping next-generation pharmacists into an era of precision medicine.**Credits:** 2.00

PHRM 84800 - Principles Of Drug Information And Literature Evaluation

Credit Hours: 3.00. This course is designed to provide students with the fundamental skills needed for the provision of drug information in pharmacy practice. Emphasis is placed on the evaluation, interpretation, and practical implications of primary medical literature on the delivery of pharmaceutical care. Four recently published clinical trials will be reviewed and discussed throughout the semester to illustrate contemporary issues in the interpretation of biomedical research.**Credits:** 3.00

PHRM 84900 - Population Health Management

Credit Hours: 2.00. This two-credit hour course aims to provide students with the core knowledge and basic skills used in managing the health of populations. Core content will include managed care principles, pharmacist involvement in managed care, and program designs. The course will also provide instruction in the topic areas of pharmacoepidemiology and pharmacoeconomics.**Credits:** 2.00

PHRM 85000 - Immunization Certification

Credit Hours: 1.00. The purpose of the course is to provide immunization training certification for students in the Doctor of Pharmacy program. Certification is awarded based on completion of the Pharmacy-Based Immunization Delivery program content that is provided through the American Pharmacists Association (APhA). All students will be expected to have completed immunization training as a graduation requirement. **Credits:** 1.00

PHRM 85200 - Public Health Pharmacy

Credit Hours: 3.00. The course is designed to provide the pharmacy student with a comprehensive overview of key public health and wellness principles and related to self-care and nonprescription products as they impinge upon the ability of patients to assume active roles and function effectively on their own behalf in health promotion and disease prevention, detection, and treatment.**Credits:** 3.00

PHRM 85400 - Interprofessional Education (IPE) Experience III

Credit Hours: 0.50. An Interprofessional Learning Anchor (IPLA) is a common event or experience in which all P1-P4 students will participate. The purpose of this course is to provide first through fourth professional year pharmacy students with an interprofessional education (IPE) activity, and expose them to concepts related to interprofessional care and practice. This course will also involve interaction and collaboration with students and professionals from other healthcare disciplines (i.e. medicine, nursing, social work, physical therapy, dentistry, and others). This course will feature one to three components offered over the Fall and/or Spring academic semesters.**Credits:** 0.50

PHRM 85500 - Interprofessional Education (IPE) Experience IV

Credit Hours: 0.50. An Interprofessional Learning Anchor (IPLA) is a common event or experience in which all P1-P4 students will participate. The purpose of this course is to provide first through fourth professional year students with an interprofessional education (IPE) activity, and expose them to concepts related to interprofessional care and practice. The course will also involve interaction and collaboration with students and professionals from other healthcare disciplines (i.e., medicine, nursing, social work, physical therapy, dentistry and others). This course will feature one to three components offered over the Fall and/or Spring academic semesters.**Credits:** 0.50

PHRM 86000 - Professional Skills Laboratory V

Credit Hours: 2.00. This course is an interdisciplinary laboratory course that presents a practical application of scientific and clinical knowledge in the context of patient-centered pharmaceutical care.**Credits:** 2.00

PHRM 86100 - Professional Skills Laboratory VI

Credit Hours: 2.00. This course is an interdisciplinary laboratory course that presents a practical application of scientific and clinical knowledge in the context of patient-centered pharmaceutical care. It serves as a one credit hour course. In accordance with university policy, this course may require up to three hours of work weekly outside of the arranged class time.**Credits:** 2.00

PHRM 86200 - Institutional Pharmacy Introductory Pharmacy Practice Experience

Credit Hours: 2.50. A 2.5-credit hour required experiential course in the summer prior to the third year of the professional Doctor of Pharmacy program. Students learn basic institutional pharmacy operations and sterile product compounding.**Credits:** 2.50

PHRM 86400 - Integrated Pharmacotherapy IV

Credit Hours: 6.00. This course will develop knowledge and skills regarding the physiology, pathophysiology, medicinal chemistry, pharmacology, pharmacokinetics, pharmaceutics, and pharmacotherapeutics of oncology and hematologic malignancies, hepatic disorders, gastrointestinal disorders, and women's and men's health. This knowledge will be utilized in subsequent integrated pharmacotherapy modules, skills labs and practice experience that follow.**Credits:** 6.00

PHRM 86500 - Integrated Pharmacotherapy V

Credit Hours: 6.00. This course provides an integrated approach to the physiology, pathophysiology, medicinal chemistry, pharmacology, pharmacokinetics, pharmacodynamics and pharmacotherapeutics of infectious diseases. It covers a vast array of microbiological pathogens, including bacteria, fungi, viruses, mycobacteria, parasites, protozoa and malaria.**Credits:** 6.00

PHRM 86600 - Biotech/Advanced Parenteral Dosage Forms

Credit Hours: 2.00. This course covers the different types of parenteral products derived from biotechnology. The lectures encompass the origin, chemical characteristics and therapeutic use of biopharmaceuticals. This course builds on the concepts and skills gained by the student from taking Dosage Forms II (PHRM 82900) and Professional Program Laboratory II (PHRM 82100).**Credits:** 2.00

PHRM 86700 - Introduction To The Advanced Pharmacy Practice Experience

Credit Hours: 1.00. The Introduction to Advanced Pharmacy Practice Experience (APPE) course was designed to provide students with the tools needed to be successful clerkship students. Students will participate in a variety of activities, including case studies, group work, evaluations and assessment, review of therapeutic topics, and student/preceptor panel interactions. Activities will be supplemented by didactic lecturing for each topic. The activities and lecture topics were selected based on feedback from previous clerkship students, preceptors, and faculty, and are intended to de-mystify the clerkship experience. This course prepares students to enter the clerkship year with the ability to successfully submit required clerkship forms, evaluate preceptors and peers, avoid common clerkship student mistakes, document clinical interventions, review medical charts, and prepare for therapeutic and pharmacokinetic responsibilities.**Credits:** 1.00

PHRM 86800 - Patient Safety And Informatics

Credit Hours: 3.00. This course provides core knowledge and skills needed by pharmacists to promote patient safety and use the tools of healthcare informatics; understand the landscape, epidemiology and culture of patient safety data privacy and security. Case studies will address disclosure of medication errors and reporting adverse events. Informatics tools such as computer order entry, electronic medical record systems, health information exchanges, and decision support will be explained. The use of informatics tools to promote patient safety will be emphasized.**Credits:** 3.00

PHRM 86900 - Practice Management And Marketing Of Professional Services

Credit Hours: 2.00. Introduces essential pharmacy practice managerial skills including personnel management, addressing conflict, CQI, change management and leadership. Builds upon these skills in the development of a business plan to implement an innovative pharmacy service.**Credits:** 2.00

PHRM 87000 - Health Policy Applications

Credit Hours: 1.00. This course will explore policy issues that influence health care. The course will provide students opportunities to apply material from prior courses in Health Systems, Population Health Management, and Public Health as it relates to the impact of health policy. Students will gain an understanding of how policy development must address competing interests and goals, and how policy can influence the scope of pharmacist's professional roles. Timely materials on current policy, current policy debates, and professional advocacy will be discussed.**Credits:** 1.00

PHRM 87100 - Jurisprudence

Credit Hours: 2.00. An in depth study of federal and Indiana laws, regulations, and rules affecting pharmacy practice. Primary emphasis is on Retail and Hospital Pharmacy settings. Lecture is supported by an instructor-created text covering the Food, Drug, and Cosmetic Act (21 USC), the Controlled Substances Act 21 CFR 1300 et. seq. and Indiana Food and Drug law IC 25-26-13 et. seq. and Indiana rules 856 IAC-1-43.**Credits:** 2.00

PHRM 87400 - Interprofessional Education (IPE) Experience V

Credit Hours: 0.50. An Interprofessional Learning Anchor (IPLA) is a common event or experience in which all P1-P4 students will participate. The purpose of this course is to provide first through fourth professional year students with an interprofessional education (IPE) activity, and expose them to concepts related to interprofessional care and practice. The course will also involve interaction and collaboration with students and professionals from other healthcare disciplines (i.e. medicine, nursing, social work, physical therapy, dentistry and others). This course will feature one to three components offered over the Fall and/or Spring academic semesters.**Credits:** 0.50

PHRM 87500 - Interprofessional Education (IPE) Experience VI

Credit Hours: 0.50. An Interprofessional Learning Anchor (IPLA) is a common event or experience in which all P1-P4 students will participate. The purpose of this course is to provide first through fourth professional year students with an interprofessional education (IPE) activity, and expose them to concepts related to interprofessional care and practice. The course will also involve interaction and collaboration with students and professionals from other healthcare disciplines (i.e. medicine, nursing, social work, physical therapy, dentistry and others). This course will feature one to three components offered over the Fall and/or Spring academic semesters. **Credits:** 0.50

PHRM 88000 - Advanced Pharmacy Practice Experience

Credit Hours: 3.00. This final year begins in May and continues through the following April. The 36 weeks of rotation are broken down as follows: 4 weeks Hospital Operations 2, 4 weeks Community Pharmacy Operations 2, 8 weeks Ambulatory rotations, 4 weeks inpatient rotations, and 16 weeks General Electives (4 of which must be additional patient care rotation).**Credits:** 3.00

Pharmacy Practice

PHPR 42700 - Pharmacy Leadership Seminar

Credit Hours: 2.00. This course is specifically designed to mentor enthusiastic leaders and enhance their ability to become an effective leader in the practice of pharmacy. The objective of this course is not to build a leader, rather to augment the characteristics the particular leader possesses. Students have the opportunity to partake in a variety of activities including the development of a proposal with implementation plan to address a current school-wide issue. A variety of outside speakers share their leadership experiences with the class. The course has a maximum enrollment and requires instructor approval to enroll. Students interested in enrolling in the course must submit a course application packet. Students are assessed on written reflections, oral presentation, written reports, and a group project. **Credits:** 2.00

PHPR 45000 - Introduction To Institutional Pharmacy Practice

Credit Hours: 1.00. An overview of the delivery of pharmaceuticals and the provision of clinical and administrative services to patients in institutional settings is presented along with the various roles pharmacists play both within the pharmacy department and the institution. Course content focuses on the provision of services and career development rather than on drug therapy. The course features a series of presentations by practitioners from a variety of practice settings. Enrollment is limited to Doctor of Pharmacy students or by consent of course coordinator. **Credits:** 1.00

PHPR 45500 - Medicare In Pharmacy Practice

Credit Hours: 1.00. Elective course providing an in-depth review of Medicare and related topics beyond that covered in the core curriculum. A service-learning component involving hands-on experience with Medicare beneficiaries is part of the course requirements. **Credits:** 1.00

PHPR 48000 - Self-Care Pharmacy Practice I

Credit Hours: 1.00. This course is specifically designed to provide students with guided experience in the application of knowledge acquired during previous professional course work to the solution of simulated problems which occur in self-care pharmacy practice. Specifically, the course is designed to introduce students to the appropriate selection and use of nonprescription medications and devices for the treatment of minor health complaints by patients. A principle theme throughout the course is that the solution of all self-care problems (i.e., regardless of the context in which they occur) involves the application of the same basic problem-solving process. Course activities, readings and homework assignments will provide students with illustration of how the problem-solving process can be applied to specific self-care situations that arise in practice. Active learning methods will be employed to involve students directly in the actual application of this process to simulated practice problems. Topics: Colds, Coughs, Allergies. **Credits:** 1.00

PHPR 48200 - Self-Care Pharmacy Practice II

Credit Hours: 1.00. This course is specifically designed to provide students with guided experience in the application of knowledge acquired during previous professional course work to the solution of simulated problems which occur in self-care pharmacy practice. Specifically, the course is designed to introduce students to the appropriate selection and use of nonprescription medications and devices for the treatment of minor health complaints by patients. A principle theme throughout the course is that the solution of all self-care problems (i.e., regardless of the context in which they occur) involves the application of the same basic problem-solving process. Course activities, readings and homework assignments will provide students with illustration of how the problem-solving process can be applied to specific self-care situations that arise in practice. Active learning methods will be employed to involve students directly in the actual application of this process to simulated practice problems. Topics: Gastrointestinal Disorders. **Credits:** 1.00

PHPR 48300 - Self-Care Pharmacy Practice III

Credit Hours: 1.00. This course is specifically designed to provide students with guided experience in the application of knowledge acquired during previous professional course work to the solution of simulated problems which occur in self-care pharmacy practice. Specifically, the course is designed to introduce students to the appropriate selection and use of nonprescription medications and devices for the treatment of minor health complaints by patients. A principle theme throughout the course is that the solution of all self-care problems (i.e., regardless of the context in which they occur) involves the application of the same basic problem solving process. Course activities, readings and homework assignments will provide students with illustration of how the problem solving process can be applied to specific self-care situations that arise in practice. Active learning methods will be employed to involve students directly in the actual application of this process to simulated practice problems. Topics: Dermatology. **Credits:** 1.00

PHPR 48400 - Self-Care Pharmacy Practice IV

Credit Hours: 1.00. This course is specifically designed to provide students with guided experience in the application of knowledge acquired during previous professional course work to the solution of simulated problems which occur in self-care pharmacy practice. Specifically, the course is designed to introduce students to the appropriate selection and use of nonprescription medications and devices for the treatment of minor health complaints by patients. A principle theme throughout the course is that the solution of all self-care problems (i.e., regardless of the context in which they occur) involves the application of the same basic problem-solving process. Course activities, readings and homework assignments will provide students with illustration of how the problem-solving process can be applied to specific self-care situations that arise in practice. Active learning methods will be employed to involve students directly in the actual application of this process to simulated practice problems. Topics: Determined by students taking PHPR 48300. **Credits:** 1.00

PHPR 48600 - Beyond Ecstasy

Credit Hours: 1.00. The goal of the course is to augment the students' knowledge about commonly used street drugs including: pharmacology and mechanisms of action; interactions and adverse effects; law enforcement and policing; available support and treatment for addiction, abuse, and misuse; and the role of pharmacists. **Credits:** 1.00

PHPR 48900 - Complementary And Alternative Medicine

Credit Hours: 1.00. This course is intended to expose students in health care fields to alternative health care practices used by people around the world. **Credits:** 1.00

PHPR 49000 - Special Topics

Credit Hours: 1.00 to 3.00. An honors course to be used to relate to, and supplement, an existing course. Subject matter and method of approach individually directed by instructor. Permission of instructor required. **Credits:** 1.00 to 3.00

PHPR 59000 - Special Topics In Pharmacy Practice

Credit Hours: 1.00 to 3.00. Special topics in selected areas of pharmacy practice. Permission of instructor required. **Credits:** 1.00 to 3.00

PHPR 59800 - Introduction To Research

Credit Hours: 1.00 to 3.00. Qualified students will undertake a project in an area of pharmacy practice, clinical pharmacy, or pharmacy administration under a member of the graduate faculty. Permission of instructor required. **Credits:** 1.00 to 3.00

PHPR 66400 - Research Techniques And Proposal Development

Credit Hours: 2.00. A consideration of current trends in pharmacy practice, clinical pharmacy, and pharmacy administration relating to healthcare services and systems. Offered in alternate years. **Credits:** 2.00

PHPR 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

PHPR 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

PHRM 42400 - Principles Of Pathophysiology And Drug Action

Credit Hours: 3.00. This course introduces the basic principles of pathophysiology, pharmacodynamics, toxicology and medicinal chemistry necessary to understand the therapeutic use and adverse actions of drugs. The course will integrate and apply concepts of science courses, including organic chemistry, biochemistry, anatomy and physiology into an understanding of the basic fundamentals of disease processes, toxicology and drug actions. Thus, this course will provide students with the basic background necessary to understand and apply pharmacotherapeutics to the practice of pharmacy.**Credits:** 3.00

PHRM 42800 - Dosage Forms I

Credit Hours: 3.00. The purpose of this course is to provide a foundation in the basic concepts of pharmaceutics that are the foundation of drug delivery. The course begins by presenting the molecular basis for aqueous and lipid solubility of drugs,

pharmacokinetic principles that are related to dosage forms, mechanisms by which excipients or manufacturing processes affect bioavailability, and chemical kinetics applied to the shelf-life of dosage forms. The pharmaceutics principles are then applied to successively more complex liquid dosage forms: solution, emulsion, and suspension. The excipients that are required to prepare the dosage forms: buffers, preservatives, emulsifiers, suspending agents, wetting agents, etc., and the method of preparing each dosage form in both a compounding and manufacturing setting are covered.**Credits:** 3.00

PHRM 46000 - Drug Discovery And Development I

Credit Hours: 3.00. Focuses on the strategies, current methods and technologies used in early stage pre-clinical research to discover, validate and select lead drug candidates.**Credits:** 3.00

PHRM 46100 - Drug Discovery And Development II

Credit Hours: 3.00. The course focuses on the process of drug development from pre-formulation to unit operations. The emphasis is on the scientific principles behind every step in moving from a drug molecule to its products.**Credits:** 3.00

PHSC 43600 - Biochemistry For Pharmaceutical Sciences II

Credit Hours: 2.00. The overall objective of this course is to expand students' knowledge of biochemistry obtained in the prerequisite one-semester Biochemistry course to understanding advanced aspects of human biochemistry related to pharmaceutical sciences.**Credits:** 2.00

Philosophy

PHIL 1110N - Ethics

Credit Hours: 3.00. A study of ethics in relation to personal and societal decision making. Typically addresses such topics as abortion, world hunger, assisted suicide, sexual morality, animal rights, moral education, virtue and character, and environmental ethics.**Credits:** 3.00

PHIL 1500N - Logic

Credit Hours: 3.00. A study of the principles of logic. The course covers a variety of traditional topics, selected for their practical value, within formal and informal logic. Among the topics typically covered are fallacies, syllogisms, causal hypotheses, logic diagrams, argument analysis, and truth-functional reasoning.**Credits:** 3.00

PHIL 11000 - The Big Questions: Introduction To Philosophy

Credit Hours: 3.00. The basic problems and types of philosophy, with special emphasis on the problems of knowledge and the nature of reality. CTL:ISH 1050 Introduction To Philosophy **Credits:** 3.00

PHIL 11005 - I Play, Therefore I Am: Introduction To Philosophy Through Video Games

Credit Hours: 4.00. This course uses video games to demonstrate many of the fundamental problems of philosophy. To better understand the philosophical problems presented in text, students will watch online walkthroughs and live demonstrations of video games in class. Students will also engage with these problems through active learning by occasionally playing video games.**Credits:** 4.00

PHIL 11100 - Introduction To Ethics

Credit Hours: 3.00. A study of the nature of moral value and obligation. Topics such as the following will be considered: different conceptions of the good life and standards of right conduct; the relation of nonmoral and moral goodness; determinism, free will, and the problem of moral responsibility; the political and social dimensions of ethics; the principles and methods of moral judgment. Readings will be drawn both from contemporary sources and from the works of such philosophers as Plato, Aristotle, Aquinas, Butler, Hume, Kant, and J. S. Mill. CTL:ISH 1051 Ethics **Credits:** 3.00

PHIL 11400 - Global Moral Issues

Credit Hours: 3.00. A systematic and representative examination of significant contemporary moral problems with a focus on global issues such as international justice, poverty and foreign aid, nationalism and patriotism, just war, population and the environment, human rights, gender equality, and national self-determination. **Credits:** 3.00

PHIL 11500 - Philosophy: What Are You Going To Do With That?

Credit Hours: 1.00. This course is designed for all philosophy majors, but is open to anyone interested in minor/majoring in philosophy. The format for this course is based on three components: reading and reflection, along with in-class discussion; in-class guest speakers who will address various topics in philosophy as a field, and/or professionalization (both within and outside of academia); and short written exercises, often done in class, which are designed to build up to the final project. Most classes will begin with a guest speaker giving a brief introduction to a particular area or topic within philosophy. Students will have a short reading assigned for each class period that will be discussed with the instructor following the guest's presentation. The course readings will be, as best as possible, related to the area/topic introduced by the guest. Certain classes will be dedicated solely to career/professionalization interests and will feature guests with expertise in these areas. The professionalization experts will help students develop their career goals, identify possible internships and scholarships to pursue while a student at Purdue, and develop career goals for after they have graduated. Finally, certain classes will be dedicated to writing and the development of the final project, which will include a proposed 8-semester path of study, a polished resume/CV, and career/professionalization goals. **Credits:** 1.00

PHIL 12000 - Critical Thinking

Credit Hours: 3.00. This course is designed to develop reasoning skills and analytic abilities, based on an understanding of the rules or forms as well as the content of good reasoning. This course will cover moral and scientific reasoning, in addition to ordinary problem solving. This course is intended primarily for students with nontechnical backgrounds. **Credits:** 3.00

PHIL 15000 - Principles Of Logic

Credit Hours: 3.00. A first course in formal deductive logic; mechanical and other procedures for distinguishing good arguments from bad. Truth-tables and proofs for sentential (Boolean) connectives, followed by quantificational logic with relations. Although metatheoretic topics are treated, the emphasis is on methods. **Credits:** 3.00

PHIL 20600 - Introduction To Philosophy Of Religion

Credit Hours: 3.00. The course encourages critical reflection on traditional and contemporary views about God and other religious ideas. Topics include arguments for God's existence, the problem of evil, understanding the divine attributes, miracles, religious pluralism, and life after death. CTL:ISH 1052 Philosophy Of Religion **Credits:** 3.00

PHIL 20700 - Ethics For Technology, Engineering, And Design

Credit Hours: 3.00. This course is designed to increase your understanding of professional and ethical responsibilities in national, international, and cross-cultural environments, helping you to anticipate, understand, and navigate issues that will likely arise in your working life as an engineer or designer. The focus of the course is on developing the ability to apply a general ethical framework to new and unique situations, including those arising from the global cultural context of modern engineering. The

course covers how this ethical framework should be constituted, and provides practice in applying this a framework to specific, concrete cases. Together, these components work toward your development as a better engineer and a more responsible global citizen. The readings, case studies, and exercises are geared towards the development of a well-researched original case study that you will present to the class, which is informed by your past experiences and future aspirations related to engineering. **Credits:** 3.00

PHIL 20800 - Ethics Of Data Science

Credit Hours: 3.00. As applications of data science permeate more aspects of our lives, new and important ethical issues are arising. However, especially because we are entering uncharted territory, reasoning clearly about the ethical implications of data science isn't easy. This course provides students with the tools for doing so, including a conceptual framework for ethical reasoning in professional settings, as well as a procedure for case-study analysis that allows students to practice employing this conceptual framework. Together, these components help prepare students to be ethical professionals and responsible global citizens.**Credits:** 3.00

PHIL 21900 - Philosophy And The Meaning Of Life

Credit Hours: 3.00. Does life have meaning? If so, in what sense? If not, does this matter? Does the answer depend on the existence of God and an afterlife? What, if anything, makes existence worthwhile? Might the question - 'does life have meaning?' - be malformed? This course explores these and related questions, as well as answers to them, with the aim of teaching students to think critically and rigorously about matters of perennial existential importance. In previous iterations of this course, readings have been chosen from the following writers: Kierkegaard, Nietzsche, Dostoevsky, Kafka, Marcel, Heidegger, Camus, Sartre, Jaspers, de Beauvoir, Ortega, and Merleau-Ponty. **Credits:** 3.00

PHIL 22100 - Introduction To Philosophy Of Science

Credit Hours: 3.00. An introduction to the scope and methods of science and to theories of its historical development. Topics include scientific revolutions, theories of scientific method, the nature of scientific discovery, explanation, and the role of values in scientific change. **Credits:** 3.00

PHIL 22300 - Fate And Free Will

Credit Hours: 3.00. This course encourages critical reflection on the nature and possibility of human freedom in a world like ours that appears to be determined by unchanging causal and physical laws. Topics include the compatibility of free will and determinism, the possibility of moral responsibility without free will, and the incentives (if any) for future planning if our future fate is already sealed. **Credits:** 3.00

PHIL 22500 - Philosophy And Gender

Credit Hours: 3.00. An examination of the beliefs, assumptions, and values found in traditional and contemporary philosophical analyses of women. A range of feminist approaches to knowledge, values, and social issues will be introduced. **Credits:** 3.00

PHIL 22700 - Science And Religion

Credit Hours: 3.00. Are science and religion irrelevant to each other? Or can one of them challenge, support, shape, presuppose, explain-or explain *away*-the other? This course examines how science in general, as well as specific scientific disciplines such as evolutionary biology, physical cosmology, and cognitive science, are related to religion in general, and to particular religious traditions. **Credits:** 3.00

PHIL 23000 - Religions Of The East

Credit Hours: 3.00. (REL 23000) A study of the history, teachings, and present institutions of the religions of India, Southeast Asia, China, and Japan. This will include Hinduism, Jainism, Sikhism, Buddhism, Confucianism, Taoism, Shintoism, and Zoroastrianism. **Credits:** 3.00

PHIL 23100 - Religions Of The West

Credit Hours: 3.00. (REL 23100) A comparative study of the origins, institutions, and theologies of the three major Western religions, Judaism, Christianity, and Islam. **Credits:** 3.00

PHIL 24000 - Social And Political Philosophy

Credit Hours: 3.00. A study of some major social and political philosophers from Plato to contemporary authors. Issues such as justice, rights and freedom, community, and the "globalized" future will be considered. **Credits:** 3.00

PHIL 24100 - Philosophy, Politics, And Economics

Credit Hours: 3.00. Many important issues, such as environmental pollution, global poverty, and the proliferation of nuclear weapons, have philosophical, political, and economic aspects. Accordingly, his interdisciplinary course deals with issues of interest to philosophers, political scientists, and economists alike. Possible topics to be studied include: the basis for political authority, game theory and rational choice, property rights, market advantages and market failures, justice, equality, and freedom.**Credits:** 3.00

PHIL 24200 - Philosophy, Culture, And The African American Experience

Credit Hours: 3.00. The purpose of this course is to consider African American based or inspired conceptions of Western philosophy and new visions of what it is to do philosophy sensitive to culturally rooted diversity. **Credits:** 3.00

PHIL 25501 - Introduction To Cognitive Science: Minds, Brains, And Machines

Credit Hours: 3.00. This will provide an introduction to foundational topics in the philosophy of mind. We will consider the relationship between the mind and the body, and the mental to the physical more generally. We'll ask, and look at some candidate answers to, questions like "What is a mind, and what are its component parts? How does a mind work? How are minds related to brains, and to the physical bodies that they seem to animate and control? How do minds represent the world around them? What is a self? What is the nature of consciousness and subjective experience? Could other animals, aliens, computers, robots or other types of entities have minds, or be conscious? How would we know? How can empirical efforts like the cognitive sciences help shed light on these questions? Could scientific theories of the mind supplant our intuitive conceptions of the mind? If so, what would be the implications?"**Credits:** 3.00

PHIL 25601 - Philosophy And Artificial Intelligence

Credit Hours: 3.00. Just what is it to be artificially intelligent and what will be AIs impact on our future? This course tackles these questions using an interdisciplinary and historically anchored approach beginning with the development of AI to arrive at a more holistic, socially- and ethically-ensconced account of what it means to be artificially intelligent. Will AI agents change the nature of work? Can they be used to regulate individuals and their opportunities through automated algorithms and sorting software? What are the human and environmental costs of a full-throated adoption of AI? This class will arm you with the philosophical and historical background to begin to devise and weigh the creative opportunities and challenges posed by this future. We'll first consider traditional questions and issues in the philosophy of computation, epistemology, ethics and justice before turning to home onto a series of specific challenges that may include issues of AI in equity, AI and the law, AI and gender, AI and labor, AI and policy, the future of AI, and whether we can even design 'ethical' AI. **Credits:** 3.00

PHIL 25701 - Moral Minds: The Nature Of Right And Wrong

Credit Hours: 3.00. This course will explore questions about the nature of morality that lie at the intersection of philosophy and psychology. Is genuine altruism possible, or is everybody selfish deep down? Is moral thinking driven by reason or emotion? Is there such a thing as moral character? Is anyone ever truly responsible for their actions? Do facts about our evolutionary history undermine objective morality? Is empathy...bad? What makes someone a jerk? We'll also think about what happens to moral psychology when it gets plugged into social media algorithms and polarized political environments. **Credits:** 3.00

PHIL 26000 - Philosophy And Law

Credit Hours: 3.00. A discussion of philosophical issues in the law: a critical examination of such basic concepts in law as property, civil liberty, punishment, right, contract, crime and responsibility; and a survey of some main philosophical theories about the nature and justification of legal systems. Readings will be drawn from both law and philosophy. **Credits:** 3.00

PHIL 27000 - Biomedical Ethics

Credit Hours: 3.00. An examination of the moral problems raised by developments in medicine and the biomedical sciences. Topics include abortion, reproductive technologies, euthanasia and physician-assisted suicide, experiments involving human subjects, and health care delivery. **Credits:** 3.00

PHIL 27500 - The Philosophy Of Art

Credit Hours: 3.00. A survey of the principal theories concerning the nature, function, and value of the arts from classical times to the present. **Credits:** 3.00

PHIL 28000 - Ethics And Animals

Credit Hours: 3.00. An exploration through the study of major historical and contemporary philosophical writings of basic moral issues as they apply to our treatment of animals. Rational understanding of the general philosophical problems raised by practices such as experimentation on animals or meat-eating will be emphasized. **Credits:** 3.00

PHIL 29000 - Environmental Ethics

Credit Hours: 3.00. An introduction to philosophical issues surrounding debates about the environment and our treatment of it. Topics may include endangered species, "deep ecology," the scope and limits of cost-benefit analyses, and duties to future generations. **Credits:** 3.00

PHIL 29300 - Selected Topics In Philosophy

Credit Hours: 1.00 to 3.00. A critical examination of some special topic or topics in philosophy. Details concerning topics selected for treatment in a given semester may be obtained in advance from the Department of Philosophy. Sections of this course may sometimes be initiated by students upon petition to the department. **Credits:** 1.00 to 3.00

PHIL 30100 - History Of Ancient Philosophy

Credit Hours: 3.00. A survey of Greek philosophy from its beginning in the Milesian school through the Presocratics to Plato and Aristotle. **Credits:** 3.00

PHIL 30200 - History Of Medieval Philosophy

Credit Hours: 3.00. A survey of the main trends and figures of medieval philosophy, with an emphasis on metaphysics, epistemology, and ethics. Readings (in English translation) may include Augustine, Boethius, Avicenna, Anselm, Abelard, Maimonides, Aquinas, Scotus, Ockham and Suarez. **Credits:** 3.00

PHIL 30300 - History Of Modern Philosophy

Credit Hours: 3.00. Concentrates on the major philosophical writers from the Renaissance to the beginning of the nineteenth century: Descartes, Hobbes, Spinoza, Locke, Leibniz, Berkeley, Hume, Kant. Some in other areas, e.g., Galileo, Newton, Calvin, are also considered. **Credits:** 3.00

PHIL 30400 - Nineteenth-Century Philosophy

Credit Hours: 3.00. A study of the major movements and directions of nineteenth-century philosophy, including such figures as Hegel, Comte, Mach, Schopenhauer, Nietzsche, Mill, Royce and Peirce. **Credits:** 3.00

PHIL 30600 - Twentieth-Century Philosophy

Credit Hours: 3.00. A critical examination of the main currents of contemporary philosophical thought, such as pragmatism, analytic philosophy, phenomenology, and existentialism, and other recent developments. The course will cover selected works of such philosophers as Russell, Wittgenstein, Peirce, Whitehead, Heidegger, and Sartre. **Credits:** 3.00

PHIL 31000 - Classical Chinese Philosophy

Credit Hours: 3.00. In this course, we will survey the classic works of classical Chinese philosophy (c. 600-200 BCE). We will focus on seven major philosophers (and their followers): Kongzi (Confucius), Mozi, Mengzi (Mencius), Zhuangzi, Laozi, Xunzi, and Han Feizi. We will use their work to consider topics such as: the nature and value of morality, the proper role of ritual in human life, whether human nature is good or bad, how one becomes a moral person, the proper role and function of government, and more. In addition to introducing the competing traditions of Confucianism, Mohism, Daoism, and Legalism, the course will help students to develop basic philosophical skills as they develop and defend their own views on these topics. No knowledge of Chinese is expected. **Credits:** 3.00

PHIL 32200 - Philosophy Of Technology

Credit Hours: 3.00. A philosophical examination of the nature and history of technology, as well as its complex impact on humans and the world. **Credits:** 3.00

PHIL 32600 - Business Ethics

Credit Hours: 3.00. Philosophic examination of such topics as morality and self-interest, freedom and coercion, distributive justice, limits of the law, moral and legal rights, fair equality of opportunity, justice between nations. These topics are seen from a new perspective when they are connected to discussions of fair wages and capitalism, legal constraints on manufacturers and advertisers, affirmative-action programs, environmentalism, and multinational corporations. **Credits:** 3.00

PHIL 35000 - Philosophy And Probability

Credit Hours: 3.00. This course introduces the student to mathematical probability and its philosophical applications. Topics may include theories of probability, Hume's problem of induction, Goodman's paradox, and the foundations of scientific reasoning. **Credits:** 3.00

PHIL 35501 - Major Questions In Cognitive Science

Credit Hours: 3.00. The philosophy of cognitive science uses tools from philosophy, psychology, neuroscience, linguistics, and computer science to answer foundational questions about how the mind works. In this course, we'll survey a range of contemporary debates in the philosophy of cognitive science, focusing on topics like the distinction between perception and cognition, the relationship between memory and imagination, the relationship between language and thought, whether there exist basic emotions and more.**Credits:** 3.00

PHIL 40200 - Studies In Medieval Christian Thought

Credit Hours: 3.00. A survey of medieval (and patristic) philosophical theology. Issues include the nature and existence of God, religious language, and doctrines such as the Trinity, Incarnation, and Atonement. Readings (in English translation) will include, among others, Augustine, Boethius, Anselm, and Aquinas. **Credits:** 3.00

PHIL 40300 - Moral Psychology And Climate Change

Credit Hours: 3.00. This course investigates the ethical challenges posed by climate change in conjunction with the deep cognitive and motivational factors that shape our individual and collective responses to it. Current research on human moral psychology is examined, drawing on work from a range of disciplines. Ethical theories concerning the unique moral challenges posed by a threat that spans national borders and human generations are considered. Strategies for addressing climate change that try to avoid our common cognitive foibles, and to leverage what we know about human moral capacities for collective action, are examined. **Credits:** 3.00

PHIL 40600 - Intermediate Philosophy Of Religion

Credit Hours: 3.00. An intensive study of some important problems such as the existence of God, the problem of evil, immortality, or the nature of religion. Or the religious philosophy of some significant thinkers such as Buber, Berdyaev, Tillich, Barth, Maritain, or Chardin may form the content of the course. Subject matter may vary. **Credits:** 3.00

PHIL 41000 - Mock Trial Practicum

Credit Hours: 1.00. This course prepares students to represent Purdue University in American Mock Trial Association competitions by focusing on legal reasoning, argumentation, and advocacy. Mock Trial students will become familiar with the United States' legal system and conduct a trial over a fictional civil or criminal case. Students develop and deliver opening statements, introduce and examine testimonial, physical, and demonstrative evidence, examine and cross examine witnesses, and develop and deliver closing statements. Permission of instructor required. **Credits:** 1.00

PHIL 41100 - Modern Ethical Theories

Credit Hours: 3.00. An examination of the major controversies in the history of modern ethics, including: the place of reason in ethics, the basis of moral obligation, and the relation between science and morals. **Credits:** 3.00

PHIL 41500 - Philosophy Practicum

Credit Hours: 1.00 to 3.00. This course is for philosophy students who are pursuing internship, research opportunities, and professional experience in various fields, industries, and sectors. The aim of this course is for students to apply concepts and skills they have gained in the philosophy curriculum to research and professional experience. The applicable skills students can bring to their internship/research/professional experience include logic, analytical reasoning, critical thinking, written and oral communication, textual analysis, and persuasive argumentation. Students can take the course up to two times for no more than 6.00 total credits. Internships and research positions can be offered remotely or on-site. **Credits:** 1.00 to 3.00

PHIL 42100 - Philosophy Of Science

Credit Hours: 3.00. An examination of central issues in philosophy of science. Topics include theories of explanation, confirmation, reduction, laws, the status of theoretical entities, and the epistemological foundations of scientific theories. **Credits:** 3.00

PHIL 42400 - Recent Ethical Theory

Credit Hours: 3.00. A philosophical examination of significant issues in recent ethical theory and metaethics, such as the nature of value, obligation, virtue, rationality, moral knowledge, the status of ethical sentences, practical applications, and the relationship between ethics and science or religion. **Credits:** 3.00

PHIL 42500 - Metaphysics

Credit Hours: 3.00. A concentrated investigation of some of the basic problems concerning essence, existence, time, space, substance, causality, permanence, and change. Readings and discussions will center on representative metaphysical thinkers. **Credits:** 3.00

PHIL 43200 - Theory Of Knowledge

Credit Hours: 3.00. An analysis of selected texts on knowledge and rationality. Topics such as the following will be considered: foundationalism, coherentism, internalism, externalism, skepticism, contextualism, empiricism, rationalism, analyses of epistemic concepts, and the Gettier problem. **Credits:** 3.00

PHIL 43500 - Philosophy Of Mind

Credit Hours: 3.00. An examination of some central issues in the philosophy of mind. Attention is given to such topics as the knowledge of other minds, the relation between mind and body, the nature of persons, and the analysis of certain relevant concepts such as action, emotion, and perception. Readings are selected primarily from the writings of contemporary philosophers. **Credits:** 3.00

PHIL 44000 - Advanced Topics In Political Philosophy

Credit Hours: 3.00. An examination of central issues in political philosophy. The course will focus on topics such as theories of justice, authority, legitimacy; questions about foundational political values like freedom, equality, and community; and methodological issues concerning ideal versus non-ideal theory, contractualism versus contractarianism; political versus comprehensive liberalism; and nationalism versus cosmopolitanism.**Credits:** 3.00

PHIL 45501 - Studies In Cognitive Science

Credit Hours: 3.00. The subject matter will alternate between an in-depth study of a particular aspect of cognition (e.g., memory, belief, concepts) and a study of a specific explanatory framework in the philosophy of cognitive science (e.g., the computational theory of mind, predictive processing, gene-culture co-evolution).**Credits:** 3.00

PHIL 46500 - Philosophy Of Language

Credit Hours: 3.00. An examination of some of the central issues in the philosophy of language, such as meaning, reference, truth, propositions, and speech acts. **Credits:** 3.00

PHIL 49000 - Advanced Topics In Philosophy

Credit Hours: 1.00 to 3.00. An advanced study of a significant topic in philosophy. **Credits:** 1.00 to 3.00

PHIL 50100 - Studies In Greek Philosophy

Credit Hours: 3.00. The subject matter will alternate between the intensive study of some fairly specific topic in Greek philosophy (e.g., Plato's theory of knowledge, Aristotle's ethics, etc.) and a general study of either the philosophy of Plato or the philosophy of Aristotle. **Credits:** 3.00

PHIL 50200 - Studies In Medieval Philosophy

Credit Hours: 3.00. An intensive study of some central topics in the thought of major medieval philosophers. Subject matter will vary. Philosophers most often studied are Augustine, Thomas Aquinas, Duns Scotus, and Ockham. **Credits:** 3.00

PHIL 50300 - Studies In Early Modern Philosophy

Credit Hours: 3.00. A detailed study of either: 1) one or more central philosophical themes or 2) one or more major figures (typically, but not restricted to, Descartes, Spinoza, Leibniz, Locke, Berkeley, Hume, and/or Kant) in the early modern period. Offered in alternate years. **Credits:** 3.00

PHIL 50500 - Islamic And Jewish Philosophy And The Classical Tradition

Credit Hours: 3.00. A study of representative texts and issues in medieval Islamic and Jewish philosophy. Possible topics include the commensurability of philosophy and (revealed) law, the creation or eternity of the world, the nature of prophecy, the human good, the nature of God, and divine language. **Credits:** 3.00

PHIL 50600 - Advanced Philosophy Of Religion

Credit Hours: 3.00. A detailed critical investigation of some central problems in a philosophical approach to religion. Readings will be selected from leading representatives of traditional theism and various contemporary schools. The thought of the representative thinkers will be analyzed, discussed, and critically evaluated. The problems discussed will be selected from the existence of God, the problem of evil, freedom and determinism, the problem of immortality, and the nature of religious language. Variable content. **Credits:** 3.00

PHIL 50700 - Recent American Philosophy

Credit Hours: 3.00. A detailed examination of the central doctrines of one or more of the following six American philosophers: Peirce, James, Royce, Santayana, Dewey, and Whitehead. **Credits:** 3.00

PHIL 51000 - Phenomenology

Credit Hours: 3.00. A detailed, critical examination of some major issue(s) in phenomenology. Attention will be given to either the historical development or contemporary relevance of phenomenological philosophy. Readings will be drawn from the works of Husserl, Heidegger, Merleau-Ponty, and others. **Credits:** 3.00

PHIL 51400 - Twentieth-Century Analytical Philosophy I

Credit Hours: 3.00. A detailed study of the origins and development of contemporary philosophical analysis, and how it was pursued in movements such as logical atomism, logical positivism, ordinary language philosophy, and others. Readings will

cover a selection of the writings of Frege, Russell, Moore, Wittgenstein, Ayer, Ryle, Austin, and others. Need not be followed by PHIL 51500. **Credits:** 3.00

PHIL 51500 - Twentieth-Century Analytical Philosophy II

Credit Hours: 3.00. The development of philosophical analysis through logical positivism and the various forms of linguistic philosophy. An examination of some of the important writings of Moore, Ayer, Ryle, Wisdom, Austin, and the later Wittgenstein. Need not be preceded by PHIL 51400. **Credits:** 3.00

PHIL 52000 - Existentialism

Credit Hours: 3.00. A detailed exploration and examination of the existentialist movement in modern thought, including its historical roots, its philosophical formulations, and its influence and expression in and relation to art, literature, psychology, social criticism, and religion. Readings will be from at least some of the major existentialists: Kierkegaard, Nietzsche, Jaspers, Heidegger, and Sartre. In addition, texts from existentialist thinkers in other areas will be used. **Credits:** 3.00

PHIL 52400 - Contemporary Ethical Theory

Credit Hours: 3.00. A critical review of twentieth-century developments in ethical and value theory, with particular reference to the dispute between utilitarianism and deontological theories, and to the problem of justification. **Credits:** 3.00

PHIL 52500 - Studies In Metaphysics

Credit Hours: 3.00. An intensive and critical examination of one or more of the basic problems of ontology and cosmology, such as substance, existence, causality, change, time, space, teleology, freedom, and universals. Variable content. **Credits:** 3.00

PHIL 53000 - Deconstructionist And Postmodernist Philosophy

Credit Hours: 3.00. An examination of the main currents of deconstructionist and postmodernist thought in the latter part of the twentieth century. Texts to be studied will be selected from the writings of Heidegger, Derrida, Foucault, Kristeva, Irigaray, Deleuze, Guattari, Lyotard, Baudrillard, and Rorty. **Credits:** 3.00

PHIL 53200 - Studies In Theory Of Knowledge

Credit Hours: 3.00. An intensive examination of selected problems concerning the nature of human knowledge, its scope and limits, its relation to sense-perception and memory. Variable content. **Credits:** 3.00

PHIL 53500 - Studies In Philosophy Of Mind

Credit Hours: 3.00. An intensive study of select topics in the philosophy of mind such as the explanation of human behavior, knowledge of other minds, the relation between mind and body, and the nature of persons. Variable content. **Credits:** 3.00

PHIL 54000 - Studies In Social And Political Philosophy

Credit Hours: 3.00. A detailed study of one or more important concepts in social or political philosophy, such as natural rights, revolution, law, freedom, justice, or political obligation. Variable content. **Credits:** 3.00

PHIL 54500 - Recent Analytic Philosophy

Credit Hours: 3.00. A survey of contemporary developments in analytic philosophy, with emphasis on major issues relevant to the philosophy of language, epistemology, and metaphysics. The course will cover such figures as W.V.O. Quine and Saul Kripke, and such problems as analyticity and necessity, ontological relativity, and the definition of knowledge. **Credits:** 3.00

PHIL 55100 - Philosophy Of The Natural Sciences

Credit Hours: 3.00. A survey of issues and theories in contemporary philosophy of science. Variable content. **Credits:** 3.00

PHIL 55200 - Philosophy Of The Social Sciences

Credit Hours: 3.00. An exploration of the nature of the concepts in the social sciences, and a study of the ways in which they have been and are employed. **Credits:** 3.00

PHIL 55300 - Mathematical Logic

Credit Hours: 3.00. This class is an introduction to various logical foundations of mathematics as well as the basics of logical metatheory.**Credits:** 3.00

PHIL 55500 - Critical Theory

Credit Hours: 3.00. An analysis of either the historical development or the contemporary relevance of critical theory. Primary texts may be selected from the "old" Frankfurt School (Horkheimer, Adorno, Marcuse, Benjamin, Fromm) or from "new" critical theory (Habermas, Wellmer, Honneth, Benhabib, and others). **Credits:** 3.00

PHIL 56100 - Reading Philosophy: Skills And Strategies

Credit Hours: 3.00. Repeatable twice for a maximum of 9 credits. Academic philosophy demands both the ability to read large amounts of texts fluently, carefully, and closely. Furthermore, the abstract nature of philosophical discourse places a large cognitive demand upon readers. This course prepares non-native English speakers philosophy students for these intensive reading demands. The course has three major learning areas: the language skills that students need to read fluently (i.e., the efficient processing of language for general comprehension of meaning); reading strategies that students can use to improve comprehension and learning; and communication about readings, as the close reading of texts is essential to communicating one's ideas both orally and in writing. Students are also supported in their regular philosophy courses. This course is linked to one or more 500+ level philosophy seminars that students in this course are enrolled in. Reading materials, writing activities, and projects for the course are designed to complement tasks and projects required in the linked philosophy seminar. Permission of department required. **Credits:** 3.00

PHIL 56200 - Reading To Argue

Credit Hours: 3.00. Repeatable twice for a maximum of 9 credits. Closely and critically reading philosophical arguments is the first step to composing your own arguments in philosophy. In addition, developing these skills will help you to orally discuss philosophical ideas, both in classroom discussions as well as when giving presentations. This class aims to prepare students for these tasks by developing the skills of close and critical reading in philosophical discourse. All the while, students will continue improving their reading, writing, and speaking skills in the English language through specifically designed language learning components for non-native English speakers. Students are also supported in their regular philosophy courses. This course is linked to one or more 500+ level philosophy seminars that students in this course are enrolled in. Reading materials, writing activities, and projects for the course are designed to complement tasks and projects required in the linked philosophy seminar. Permission of department required. **Credits:** 3.00

PHIL 56300 - Directed Reading: Greek Philosophy Texts And Translations

Credit Hours: 1.00. In this course we shall focus on an important Greek philosophical text in fine detail. We will be working in the original language, not from an English translation. Participants will translate the text at hand and philosophical discussion will follow. Normally a Platonic dialogue or a work of Aristotle will be selected. **Credits:** 1.00

PHIL 56400 - Walk-Along Language Lab

Credit Hours: 1.00. This course is a co-requisite, language-focused class linked to a philosophy seminar. Walk-along courses provide opportunities to shift focus from content to language form and use. Activities and projects for the course are designed to complement tasks and projects required for the seminar. Thus, the purpose of the walk-along course is to help you develop linguistic abilities required to succeed in your coursework. In addition, because of the centrality of writing for philosophy, walk-along courses will predominantly focus on developing your writing skills. Permission of department required. **Credits:** 1.00

PHIL 56500 - Directed Reading: Political Philosophy

Credit Hours: 1.00. A reading group focused run by faculty members aimed at an in-depth exploration of some thread of research emerging in the contemporary literatures.**Credits:** 1.00

PHIL 56700 - Directed Readings In Philosophy Of Mind

Credit Hours: 1.00. A reading group focused run by faculty members aimed at an in-depth exploration of some thread of research emerging in the contemporary literatures.**Credits:** 1.00

PHIL 57100 - Writing To Learn

Credit Hours: 3.00. Repeatable twice for a maximum of 9 credits. Writing on a higher academic level can be especially challenging for non-native English-writers. Thus, this course aims to develop students' graduate-level skillsets in philosophical practices in an English language environment to help them gain confidence and become productive members of the philosophical community. Students will learn writing processes that will aid their ability to effectively compose in English, including developing a thesis statement, outlining, drafting, formatting, and editing. As all four chief skillsets in second-language proficiency development work in tandem and enhance each other, the course will rely on writing, reading, speaking, listening, and presenting work for learning and further developing these advanced language skills. Students are also supported in their regular philosophy courses. This course is linked to one or more 500+ level philosophy seminars that students in this course are enrolled in. Reading materials, writing activities, and projects for the course are designed to complement tasks and projects required in the linked philosophy seminar. Permission of department required. **Credits:** 3.00

PHIL 57200 - Writing To Argue

Credit Hours: 3.00. Repeatable twice for a maximum of 9 credits. Writing is a primary mode of communication in philosophy. This course aims to prepare students for the writing demands of philosophy by having students develop their ability to analyze, interpret, and critique philosophical arguments through written works and, in the process, construct their own philosophical arguments. Students will also learn writing processes that will aid their ability to effectively and clearly compose philosophical arguments, including outlining, drafting, and editing. Finally, the class will also pay attention to genre and rhetorical features of philosophical discourse, such as how philosophers enact criticism and write introductions to research papers. All the while, students will continue improving their writing and speaking skills in the English language through specifically designed language learning components for non-native English speakers. Students can use their course paper as a draft of a writing sample for PhD programs. Students are also supported in their regular philosophy courses. This course is linked to one or more 500+ level philosophy seminars that students in this course are enrolled in. Reading materials, writing activities, and projects for the course are designed to complement tasks and projects required in the linked philosophy seminar. **Credits:** 3.00

PHIL 60100 - Special Topics In Ancient Philosophy

Credit Hours: 3.00. A detailed critical analysis of special problems or texts in ancient philosophy. Prerequisite: PHIL 50100. **Credits:** 3.00

PHIL 61000 - Seminar In Recent Continental Philosophy

Credit Hours: 3.00. An intensive, critical examination of some of the current modes of thought in recent continental philosophy, including phenomenology, critical theory, hermeneutics, deconstruction, and postmodernism. Selected writings from representative figures. Topics and texts will vary from semester to semester. Prerequisite: PHIL 51000 or PHIL 52000. **Credits:** 3.00

PHIL 62400 - Seminar In Ethics

Credit Hours: 3.00. An intensive study of some persistent problems of ethics, metaethics, and theory of action such as: intrinsic goods, ends and means, the concepts of utility, justice, and duty; facts and values, justification, ethical relativism, free will and blame-worthiness, belief, and action. Emphasis will be on contemporary discussions. Variable subject matter. Prerequisite: PHIL 52400. **Credits:** 3.00

PHIL 66500 - Philosophy Of Language

Credit Hours: 3.00. An introduction to some of the main concepts and problems in the philosophy of language, such as meaning, reference, and private languages, through readings in the chief contributors to the field. Prerequisite: 6 credit hours in Philosophy. **Credits:** 3.00

PHIL 68000 - Seminar In Philosophy

Credit Hours: 3.00. An intensive course for graduate students majoring or minoring in philosophy. The content of the seminar will be determined in accordance with the needs and interests of the students. Prerequisite: 6 credit hours at the graduate level in Philosophy. **Credits:** 3.00

PHIL 68300 - Studies In Continental Rationalism

Credit Hours: 3.00. An intensive study of Descartes, Spinoza, or Leibniz, or of certain themes and ideas that played an important role in the development of their philosophies. Variable subject matter. Prerequisite: PHIL 30300. **Credits:** 3.00

PHIL 68400 - Studies In British Empiricism

Credit Hours: 3.00. An intensive study of Locke, Berkeley, or Hume, or of certain themes and ideas that played an important role in the development of their philosophies. Variable subject matter. Prerequisite: PHIL 30300. **Credits:** 3.00

PHIL 68500 - The Philosophy Of Kant

Credit Hours: 3.00. This course will be concerned with the critical philosophy as a whole. Primary emphasis, however, will be on the theories of knowledge and metaphysics as developed in the Critique of Pure Reason. Lesser attention will be paid to Kant's ethics and the principles of judgment as time permits. Prerequisite: PHIL 30300. **Credits:** 3.00

PHIL 69800 - Research MA Thesis

Credit Hours: 1.00 to 18.00. Research MA Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

PHIL 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Physical Education Skills

PES 11100 - Lifetime Fitness

Credit Hours: 2.00. Provides students opportunities to assess levels of physical fitness, develop an exercise plan, and experience activities designed to improve cardiovascular condition, strength, and flexibility. Presents current findings and provides laboratory experiences regarding techniques of initiation, maintaining, and evaluating personal fitness. For non-H&K majors only. **Credits:** 2.00

PES 11200 - Aquatic Movement Forms

Credit Hours: 1.00. Instruction and practice in aquatic movement forms. Students select from the activities listed in the current schedule of classes. Following is a partial list of activities: beginning swimming; intermediate swimming; advanced swimming; synchronized swimming. **Credits:** 1.00

PES 11400 - Exercise And Conditioning

Credit Hours: 1.00. Instruction and practice in various types of exercise programs. Students select from the activities listed in the current schedule of classes. Following is a partial list of activities: body conditioning; exercise and fitness; exercise to music; jogging and running; swimnastics; relaxation techniques; weight training; exercise and principles of weight control. **Credits:** 1.00

PES 11500 - Individual And Dual Movement Forms I

Credit Hours: 1.00. Instruction and practice in individual and dual movement forms conducted in an indoor setting. Students select from the activities listed in the current schedule of classes. Following is a partial list of activities: badminton; billiards; bowling; fencing; judo; karate; beginning gymnastics; intermediate gymnastics; squash; racquetball; yoga; kung fu; personal defense. Special fee required. **Credits:** 1.00

PES 11600 - Individualized And Dual Movement Forms II

Credit Hours: 1.00. Instruction and practice in individual and dual movement forms conducted mainly in outdoor settings. Students select from the activities listed in the current schedule of classes. Following is a partial list of activities: beginning golf; intermediate golf; advanced golf; bicycling; beginning tennis; intermediate tennis; advanced tennis; track and field. Special fee required. **Credits:** 1.00

PES 11700 - Team Movement Forms

Credit Hours: 1.00. Instruction and practice in team movement forms. Students select from the activities listed in the current schedule of classes. Following is a partial list of activities: basketball; field hockey; lacrosse; softball; soccer; power volleyball I; power volleyball II. **Credits:** 1.00

PES 11800 - Horseback Riding

Credit Hours: 1.00. Instruction and practice in hunter seat equitation. Class meets off campus, and students are expected to provide their own transportation. Following is a partial list of offerings: beginning; intermediate; advanced; combined training. **Credits:** 1.00

PES 12000 - Officiating

Credit Hours: 1.00. Theory and practice in officiating movement forms. Students select from the activities listed in the current schedule of classes. Following is a partial list of activities: basketball; field hockey; gymnastics; swimming; softball; volleyball; track and field. **Credits:** 1.00

PES 14600 - Advanced Golf Applications

Credit Hours: 1.00. Designed for the student who has either already taken PES 11600, or established themselves as a golfer by having a golf handicap, or by playing on a golf team in the past. Students learn methods to improve course management and strategies on the golf course. Students will receive intense levels of one on one instruction, utilizing video to analyze every student's swing. In addition to instruction, a league will be formed in which the students play 9 holes each week. **Credits:** 1.00

Physics

PHYS 2180N - General Physics

Credit Hours: 4.00. Mechanics, heat, and sound, primarily for technology students.**Credits:** 4.00

PHYS 2720N - Heat, Electricity And Optics

Credit Hours: 5.00. Heat, kinetic theory, elementary thermodynamics, heat transfer. Electrostatics, AC/DC circuits, electromagnetism, magnetic properties of matter; geometrical and physical optics.**Credits:** 5.00

PHYS 10400 - First Year Physics Seminar

Credit Hours: 1.00. A one-credit course for first-year Physics majors designed to develop concepts and skills in team building, time management, and professional development that complement the students' academic and research training. Talks from a broad range of speakers are included. **Credits:** 1.00

PHYS 17200 - Modern Mechanics

Credit Hours: 4.00. Introductory calculus-based physics course using fundamental interactions between atoms to describe Newtonian mechanics, conservation laws, energy quantization, entropy, the kinetic theory of gases, and related topics in mechanics and thermodynamics. Emphasis is on using only a few fundamental principles to describe physical phenomena extending from nuclei to galaxies. 3-D graphical simulations and numerical problem solving by computer are employed by the student from the very beginning. CTL:IPS 1753 Calculus-based Physics I **Credits:** 4.00

PHYS 19000 - Special Assignments

Credit Hours: 1.00 to 4.00. Readings, discussions, written reports, or laboratory work selected for enrichment in special areas of physics. Permission of instructor required. **Credits:** 1.00 to 4.00

PHYS 19400 - Freshman Physics Orientation

Credit Hours: 1.00. Designed to provide incoming physics majors with the academic, survival, and computational skills to make a successful transition from high school to college. Discussion of opportunities within the Department including degree options, co-op program, undergraduate research, careers in physics, use of spreadsheet software, graphing packages, and drawing programs. Attendance and performance on assigned projects are the basis of the Pass/Not Pass requirement. **Credits:** 1.00

PHYS 21400 - The Nature Of Physics

Credit Hours: 3.00. Development of basic concepts and theories in physics; a terminal survey course designed for non-science majors. CTL:IPS 1750 Survey Of Physical Science **Credits:** 3.00

PHYS 21500 - Physics For Elementary Education

Credit Hours: 2.00. The curriculum draws heavily on Project 2061 Benchmarks and NRC Science Education Standards for content and nature of science materials and focuses on middle school learning goals (especially those with strands at elementary level). Each learning goal was expanded to finer-grained target ideas creating more steps to make concepts more understandable and explicit. Activities were designed to enable students to develop deep conceptual understanding of each target area and the structure and sequence were guided by research on student learning. In this class social interactions are used to clarify ideas and to encourage peer teaching. The students' understandings are based on prior knowledge. The class is based on a constructivist framework where new understandings are scaffolded from partial to incomplete understandings, and those are refined over time. **Credits:** 2.00

PHYS 21600 - Introduction To Science-Based Dating

Credit Hours: 3.00. An introduction to age determination techniques used in archaeology and the earth sciences. Various techniques currently in use, and their impact on our understanding of the past, will be described qualitatively. Topics covered include dating by use of Carbon 14, thermoluminescence, tree rings, and fission tracks, and surface exposure dating by use of cosmogenic nuclides. **Credits:** 3.00

PHYS 21700 - Introduction To Current Physics And Forefront Research Honors

Credit Hours: 1.00. This course introduces new physics majors to current physics and the research areas of the department. There are multiple sections with each section having eight or less students meeting with a professor. The course is part seminar, part interactive discussion and questions and answers and part laboratory visits to research areas. Topics cover a wide range including the evolution of the Universe, astrophysics, elementary particle physics, nuclear physics, geophysical dating, nanoscience and imaging. Topics evolve to match current physics and the interests of the students. **Credits:** 1.00

PHYS 21800 - General Physics

Credit Hours: 4.00. Mechanics, heat, and sound, primarily for technology students. **Credits:** 4.00

PHYS 21900 - General Physics II

Credit Hours: 4.00. Electricity, light, and modern physics, primarily for technology students. **Credits:** 4.00

PHYS 22000 - General Physics

Credit Hours: 4.00. Mechanics, heat, and sound, for students not specializing in physics. CTL:IPS 1751 Algebra-based Physics I**Credits:** 4.00

PHYS 22100 - General Physics

Credit Hours: 4.00. Electricity, light, and modern physics, for students not specializing in physics. CTL:IPS 1752 Algebra-based Physics II **Credits:** 4.00

PHYS 23000 - Physical Science For Elementary Education

Credit Hours: 3.00. The course is aimed at facilitating future elementary teachers to learn physical science that will prepare them to teach these concepts to future elementary students grades K-6. The course will be focused on learning physical science by doing science i.e. developing understanding by collaborative activities and discussion in the laboratory and lecture and communicating your ideas to others. The course will have one 50-minute lecture and two 110-minute laboratory meetings each week. The course content is consistent with the CAEP (Council for the Accreditation of Educator Preparation) K-6 Elementary Teacher Preparation Standards (Standard 2: Understanding and Applying Content and Curricular Knowledge for Teaching in *Physical Science* and *Engineering Design*) and the NGSS (Next Generation Science Standards) Disciplinary Core Ideas (DCIs) for the Physical Sciences (*Physical Sciences* PS1, PS2, PS3, and PS4) as well as many of the Science and Engineering Practices (SEPs). The course will be divided into four units: 1) Matter and Interactions, 2) Motion and Stability, 3) Energy, and 4) Waves and their applications. All of these units will be delivered through the paradigm of solving engineering design problems. Engineering design involves many different practices: problem definition, model development and use, investigation, analysis and interpretation of data, application of mathematics and computational thinking, and determination of solutions. **Credits:** 3.00

PHYS 23300 - Physics For Life Sciences I

Credit Hours: 4.00. Physics For Life Sciences I builds upon prerequisite knowledge in college level biology, chemistry, and mathematics to present introductory physics that will be useful for applying physical principles, insights, and problem solving approaches for students with life science majors. Content will feature the Newtonian framework with emphasis on friction, drag and viscosity, random motion and diffusion, fluid flow, the Coulomb force, molecular forces and bonding, momentum, conservation of energy, entropy, and the first and second laws of thermodynamics. **Credits:** 4.00

PHYS 23400 - Physics For Life Sciences II

Credit Hours: 4.00. Physics For Life Sciences II builds upon prerequisite knowledge in college level biology, chemistry, and mathematics, as well as on Physics For Life Sciences I, to develop an understanding of how energy, entropy, enthalpy, and Boltzmann distributions affect the dynamics of living systems, of how electric fields and potentials are applied to fluids and membranes, and how the physics of harmonic oscillators, waves, sound, optics, photons, and quantized states are relevant to biological systems and the tools used for their study. **Credits:** 4.00

PHYS 23500 - Seminar In Careers In Physics

Credit Hours: 1.00. Course is designed to help physics majors evaluate different career options. Permission of instructor required. **Credits:** 1.00

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. **Credits:** 3.00

PHYS 25200 - Electricity And Optics Laboratory

Credit Hours: 1.00. Selected experiments in electric fields, magnetic fields, steady-state and transient DC circuits, thermodynamics, and optics. **Credits:** 1.00

PHYS 27000 - Special Topics In Physics

Credit Hours: 1.00 to 5.00. Specialized topics in physics. Permission of department required. **Credits:** 1.00 to 5.00

PHYS 27200 - Electric And Magnetic Interactions

Credit Hours: 4.00. Calculus-based physics course using concepts of electric and magnetic fields and an atomic description of matter to describe polarization, fields produced by charge distributions, potential, electrical circuits, magnetic forces, induction, and related topics, leading to Maxwell's equations and electromagnetic radiation and an introduction to waves and interference. 3-D graphical simulations and numerical problem solving by computer are employed throughout. **Credits:** 4.00

PHYS 29000 - Special Assignments

Credit Hours: 0.00 to 3.00. Readings, discussions, written reports, or laboratory work selected for enrichment in special areas of physics. Permission of instructor required. **Credits:** 0.00 to 3.00

PHYS 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in physics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

PHYS 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in physics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

PHYS 29500 - Outreach Assistance As Service Learning

Credit Hours: 1.00 to 3.00. Physics 29500 is a service learning class available to students willing and able to deliver physics lessons to K-12 classrooms and to other public events. Students are required to prepare and rehearse labs/activities so they are able to offer professional presentations. Students are also required to maintain a reflection journal, where they record notes about their experiences. Although efforts are made to work around students' schedules, students should have at least on open morning or afternoon each week (preferably 2-3) that allows them to visit an assigned site on a regular, consistent basis. One credit is equivalent to 32 hours of involvement in preparation and/or delivery of activities, and journaling time. Prerequisites: desire, commitment, dependability responsibility. **Credits:** 1.00 to 3.00

PHYS 30600 - Mathematical Methods Of Physics I

Credit Hours: 3.00. Discussion of wide-ranging physics problems from mechanics, E&M, thermal, and modern physics with emphasis on reviews and introductions of mathematical methods and techniques that are essential in such discussion. Relevant mathematical methods include one-and multi-variable calculus, complex numbers and functions of a complex variable, and vector calculus. Intended primarily for sophomore physics majors. **Credits:** 3.00

PHYS 30700 - Mathematical Methods Of Physics II

Credit Hours: 3.00. Discussion of wide-ranging physics problems from mechanics, E&M, thermal, and modern physics with emphasis on reviews and introductions of mathematical methods and techniques that are essential in such discussion. Relevant mathematical methods include vectors, matrices and normal modes as well as ordinary and partial differential equations. Intended primarily for sophomore physics majors. **Credits:** 3.00

PHYS 31000 - Intermediate Mechanics

Credit Hours: 4.00. For students familiar with calculus. Elements of vector algebra; statics of particles and rigid bodies; theory of couples; principle of virtual work; kinematics; dynamics of particles and rigid bodies; work, power, and energy. **Credits:** 4.00

PHYS 31700 - Special Nuclear Materials

Credit Hours: 3.00. This Great Issues course addresses the impact of science and technology of the special nuclear materials (so designated by Congress as they could be used to make nuclear weapons as well as to produce low-cost electric power) on society and the ethical issues that arise. The course is designed to be a dynamic, interactive learning experience, and topics covered range from the technical issues involved in searching, transporting, and safely utilizing these materials to social and economic impact of these activities, and to the ethical and philosophical issues presented by the flow of modernity. **Credits:** 3.00

PHYS 32200 - Intermediate Optics

Credit Hours: 3.00. Wave optics and properties of light, including reflection, refraction interference. Fraunhofer and Fresnel diffraction dispersion, polarization, double refraction, introduction to lasers and holography. **Credits:** 3.00

PHYS 32300 - Research With Big Data I

Credit Hours: 3.00. This course is to conduct physics research in a class-based environment. As such, we will perform authentic research, defined as work with the potential for results that are of interest to the scientific community. We will work with large data sets, such as those collected by survey telescopes, dark matter experiments, or detectors at the Large Hadron Collider. **Credits:** 3.00

PHYS 32400 - Research In Big Data II

Credit Hours: 3.00. This course is to conduct physics research in a class-based environment. As such, we will perform authentic research, defined as work with the potential for results that are of interest to the scientific community. We will work with large data sets, such as those collected by survey telescopes, dark matter experiments, or detectors at the Large Hadron Collider. **Credits:** 3.00

PHYS 33000 - Intermediate Electricity And Magnetism

Credit Hours: 3.00. Electrostatics; electric currents; magnetostatics; electromagnetic induction; Maxwell's equation; electromagnetic waves. **Credits:** 3.00

PHYS 34000 - Modern Physics Laboratory

Credit Hours: 1.00. Laboratory experiments to accompany PHYS 34400. **Credits:** 1.00

PHYS 34202 - Introduction To Quantum Science

Credit Hours: 3.00. This course offers an introduction to quantum mechanics, exploring how it has transformed our understanding of the physical world and revolutionized modern technology. The concepts will be illustrated with a variety of contemporary physics results and applications, including relativistic effects and a brief overview of the emerging field of quantum information science and engineering.**Credits:** 3.00

PHYS 34300 - Modern Physics Laboratory

Credit Hours: 1.00. Laboratory experiments to support PHYS 34200. **Credits:** 1.00

PHYS 34400 - Introduction To Quantum Science

Credit Hours: 4.00. This course offers an introduction to quantum mechanics, exploring how it has transformed our understanding of the physical world and revolutionized modern technology. The concepts will be illustrated with a variety of contemporary physics results and applications, including relativistic effects and a brief overview of the emerging field of quantum information science and engineering.**Credits:** 4.00

PHYS 34500 - Optics Laboratory I

Credit Hours: 1.00. Laboratory experiments in geometrical and physical optics and spectrometry. **Credits:** 1.00

PHYS 36000 - Quantum Mechanics

Credit Hours: 3.00. Historical development of quantum mechanics, wave packets, uncertainty principle, Schrodinger equation, operators, the hydrogen atom, electron spin, angular momentum, perturbation theory, and other selected topics. **Credits:** 3.00

PHYS 38199 - Professional Practice I

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. **Credits:** 0.00

PHYS 38299 - Professional Practice II

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. **Credits:** 0.00

PHYS 38399 - Professional Practice III

Credit Hours: 0.00. To obtain professional practice with qualified employers within industry, government, or small business. **Credits:** 0.00

PHYS 39000 - Special Assignments

Credit Hours: 1.00 to 4.00. Readings, discussions, written reports, or laboratory work selected for enrichment in special areas of physics. Permission of instructor required. **Credits:** 1.00 to 4.00

PHYS 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in physics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

PHYS 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in physics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

PHYS 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in physics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

PHYS 41000 - Physical Mechanics I Honors

Credit Hours: 3.00. Newtonian, Lagrangian, and Hamiltonian mechanics. Emphasis on point mass mechanics. Free, driven, and damped harmonic motion, central force problem. **Credits:** 3.00

PHYS 41100 - Physical Mechanics II Honors

Credit Hours: 2.00. Continuation of mechanics in PHYS 41000. Coupled systems, general theory of small oscillations, the vibrating string, perturbation theory. Rigid body motion. Motion of charged particles in electromagnetic fields. Elements of continuum mechanics. **Credits:** 2.00

PHYS 41600 - Thermal And Statistical Physics Honors

Credit Hours: 4.00. Thermal equilibrium; first, second, and third laws; entropy; probability and statistics; canonical ensembles; chemical potential and Grand Canonical Ensemble; classical and quantum ideal gases; chemical reactions; phase equilibria; critical phenomena. **Credits:** 4.00

PHYS 42200 - Waves And Oscillations

Credit Hours: 3.00. Physics of waves and oscillations including sound, elastic waves, and electromagnetic waves such as light. Topics range from the theory of simple harmonic oscillators, transverse modes of a continuous string, and physical optics including interference, Fresnel and Fraunhofer diffraction, and resolution, to diffraction of X-rays and electrons by crystals. Optionally includes topics such as nonlinear waves and surface waves. **Credits:** 3.00

PHYS 43000 - Electricity And Magnetism I Honors

Credit Hours: 3.00. Electrostatics, solutions of Poisson's equation in spherical and cylindrical coordinates, macroscopic and microscopic theory of dielectrics, electrostatic energy, conduction; magnetostatics, electromagnetic induction, and magnetic properties of matter. **Credits:** 3.00

PHYS 43100 - Electricity And Magnetism II Honors

Credit Hours: 2.00. A continuation of PHYS 43000. Magnetic energy; applications of Maxwell's equations to a.c. circuits, filters, transmission lines, waveguides, and antennae; Lienard-Wiechert potentials. **Credits:** 2.00

PHYS 45000 - Intermediate Laboratory

Credit Hours: 2.00. Laboratory primarily intended for junior year physics majors. Assorted experiments in optics and other fields using lasers, photodiodes, computers, and other modern technology. **Credits:** 2.00

PHYS 46000 - Quantum Mechanics I Honors

Credit Hours: 3.00. Limits of classical physics, wave packets. Bohr model, atomic systems, Schrodinger equation, eigen-functions, one-dimensional potentials, wave mechanics general structure, multiparticle systems, Pauli principle, operator methods. **Credits:** 3.00

PHYS 46100 - Quantum Mechanics II Honors

Credit Hours: 3.00. Angular momenta, radial equation, operators, matrices, spin, time-independent perturbation theory, electron-electromagnetic field interaction, hydrogen atom, structure of atoms, molecules, radiation; selected topics in radiative transitions, collision theory, solids, nuclei, elementary particles and their symmetries. **Credits:** 3.00

PHYS 47000 - Special Topics In Physics

Credit Hours: 1.00 to 5.00. Topics vary. Permission of department required. **Credits:** 1.00 to 5.00

PHYS 49000 - Special Assignments

Credit Hours: 1.00 to 3.00. Reading, laboratory work, or research in special areas of physics. Intended for upperclass students. Permission of instructor required. **Credits:** 1.00 to 3.00

PHYS 51000 - Physical Mechanics

Credit Hours: 3.00. Mechanics of particles, rigid bodies, and vibrating systems. **Credits:** 3.00

PHYS 51500 - Thermal And Statistical Physics

Credit Hours: 3.00. Equilibrium states, the concept of heat, and the laws of thermodynamics; the existence and properties of the entropy; different thermodynamic potentials and their uses; phase diagrams; introduction to statistical mechanics and its relation to thermodynamics; treatment of ideal gases.**Credits:** 3.00

PHYS 52100 - Survey Of Classical Physics

Credit Hours: 3.00. This course is intended for first-year graduate students in the Department of Physics. It provides an intensive problem solving environment encompassing a broad survey of major topics in classical mechanics, electromagnetism, and thermal physics. The primary objective is to prepare beginning graduate students for continuing on to higher level of work in the physics graduate program. **Credits:** 3.00

PHYS 52600 - Physics Of Quantum Computing And Quantum Information

Credit Hours: 3.00. An introduction to the physics of quantum information science. Starting with the concepts of quantum superposition, it defines and describes qubits (quantum bits) and their manipulation by quantum logic gates. The topics of quantum entanglement and the EPR paradox are introduced, and their importance for quantum teleportation, communication, and quantum cryptography are covered. Quantum computing is described in terms of quantum circuits of logic gates, and also in terms of quantum algorithms, such as Deutche's algorithm, the quantum Fourier transform, Shor's prime factoring algorithm, and Grover's search algorithm. The final topic is quantum decoherence and the limits it places on practical implementations of quantum computing. **Credits:** 3.00

PHYS 53000 - Electricity And Magnetism

Credit Hours: 3.00. Electrostatic problems; theory of dielectrics; theory of electric conduction; electromagnetic effects due to steady and changing currents; magnetic properties of matter; Maxwell's equations; electromagnetic radiation. **Credits:** 3.00

PHYS 53600 - Electronic Techniques For Research

Credit Hours: 4.00. A summary of principles of modern electronics currently used in research Coursework will include broad coverage of the field and selected topics in electronics instrumentation. **Credits:** 4.00

PHYS 54500 - Solid-State Physics

Credit Hours: 3.00. Crystal structure; lattice vibrations and electronic band structure of crystals; electrical, optical, and thermal properties of solids; transport and other nonequilibrium phenomena in uniform and nonuniform materials. **Credits:** 3.00

PHYS 55000 - Introduction To Quantum Mechanics

Credit Hours: 3.00. Brief historical survey of the development of quantum mechanics; wave-packets, uncertainty principle, wave functions, operators, Schrodinger equation with application to one-dimensional problems, the hydrogen atom, electron spin, selected topics in perturbation theory, scattering theory, and compounding of angular momenta. Not available for students with credit in PHYS 36000 or PHYS 46000. **Credits:** 3.00

PHYS 55600 - Introductory Nuclear Physics

Credit Hours: 3.00. Theory of relativity, brief survey of systematics of nuclei and elementary particles, structure of stable nuclei, radioactivity, interaction of nuclear radiation with matter, nuclear reactions, particle accelerators, nuclear instruments, fission, nuclear reactors. **Credits:** 3.00

PHYS 56000 - Stellar Evolution

Credit Hours: 3.00. (ASTR 56000) Observational basis of astrophysics; formation of galaxies and stars; evolution of stars; white dwarfs, supernovae and neutron stars, pulsars, quasars, black holes; cosmic rays, their origin and acceleration; radio astronomy, radio galaxies; the H-21 cm line and the 3mK blackbody radiation; gravitational radiation; X-ray and g-ray astronomy; cosmology; space physics, magnetosphere, and solar wind. **Credits:** 3.00

PHYS 56100 - Galaxies And Large Scale Structure

Credit Hours: 3.00. (ASTR 56100) Covers basic observed properties and models of galactic structure, dynamics of stars, physics of interstellar medium, formation of galaxies, properties of clusters of galaxies, and dark matter. **Credits:** 3.00

PHYS 56200 - Introduction To High Energy Astrophysics

Credit Hours: 3.00. (ASTR 56200) An overview of important physical processes in a variety of astronomical settings and of the experimental techniques employed in the field of high energy astrophysics. Covered in more detail are individual systems that include black holes, neutron stars, white dwarfs, supernova remnants, active galactic nuclei, clusters of galaxies, gamma-ray bursts, and cosmic rays, with special emphasis on several research frontiers. **Credits:** 3.00

PHYS 56300 - Astroparticle Physics

Credit Hours: 3.00. (ASTR 56300) An overview of an emerging research frontier in modern physics that lies at the interface of particle physics and astrophysics. Emphasis is on topics that are particularly relevant to both fields, including cosmology, cosmic ray physics, very-high-energy gamma ray astrophysics, neutrino astrophysics, and gravitational wave physics. **Credits:** 3.00

PHYS 56400 - Introduction To Elements Particle Physics

Credit Hours: 3.00. This course brings students up to the current status of research in elementary particle physics. The focus of the course is the construction of the Standard Model with emphasis on the electroweak theory. The seminal experiments that confirmed the predictions of the Standard Model is presented. The solar neutrino problem, the search for nonzero neutrino masses, and the efforts to construct a theory which unifies all interactions, including gravity, is discussed. **Credits:** 3.00

PHYS 56500 - Introduction To Elementary Particle Physics II

Credit Hours: 3.00. This course follows PHYS 56400, and it continues to present current topics in elementary particle physics. It focuses on the Higgs mechanism, and it explores physics beyond the standard model. Special attention is devoted to supersymmetry and searches for new particles. **Credits:** 3.00

PHYS 56600 - Introduction To Quantum Chromodynamics

Credit Hours: 3.00. An introduction to the fundamental theory of strong interactions, Quantum Chromo-Dynamics (QCD), which describes the interactions of quarks and gluons. The main focus is on a reasonably self-contained approach. All the necessary ingredients will be introduced within the course. Knowledge of graduate-level E&M and Quantum Mechanics is helpful but not essential. **Credits:** 3.00

PHYS 56700 - Observational Techniques In Astronomy

Credit Hours: 3.00. (ASTR 56700) Fundamental concepts in observational astronomy, including coordinate and time systems, telescopes and detectors, radiation and optics, and methods of statistical data analysis. **Credits:** 3.00

PHYS 57000 - Selected Topics In Physics

Credit Hours: 3.00. Specialized topics in physics selected from time to time. Permission of instructor required. **Credits:** 3.00

PHYS 58000 - Computational Physics

Credit Hours: 3.00. Introduction to computationally based problem solving in physics, emphasis on understanding and applying various numerical algorithms to different types of physics problems. Topics will include chaos in mechanical systems, stochastic systems including percolation and fractal structures, molecular dynamics and the properties of simple fluids, Monte Carlo methods and phase transitions, and time dependent as well as time dependent problems in quantum mechanics. **Credits:** 3.00

PHYS 59000 - Reading And Research

Credit Hours: 1.00 to 3.00. (Calumet, Fort Wayne) 1.00 to 6.00 (West Lafayette, IUPUI). Reading and research in Physics. Permission of instructor required. **Credits:** 1.00 to 3.00

PHYS 59300 - Independent Research

Credit Hours: 1.00 to 4.00. Research in some area of modern physics (spectroscopy, nuclear physics, solid state physics, elementary particle physics, biophysics, geophysics, etc.) with student receiving individualized supervision and guidance from

staff member. This course may be used to satisfy the independent project or 500-level elective requirement of the undergraduate majors in Honors and Applied Physics Honors Programs. Permission of instructor required. **Credits:** 1.00 to 4.00

PHYS 59500 - Instructional Design In Physical Science

Credit Hours: 1.00 to 3.00. This course builds on collaborative interactions among current Purdue Physics or Education students, K-12 science educators, Physics and Purdue College of Science faculty, and Physics Outreach. The goal for this course is to provide opportunities and mentorship for independent work that could include the design, piloting, and assessment of instructional materials, relevant to learning and teaching topics and concepts related to the physical sciences. With a "service learning" orientation, students enrolled in this course should expect to learn and build upon the fundamental principles related to the design and implementation of instructional materials in classroom or informal learning environments, and assessment of learning. Materials developed could contribute to the repertoire of practicing teachers and/or Physics Outreach. **Credits:** 1.00 to 3.00

PHYS 60000 - Methods Of Theoretical Physics I

Credit Hours: 3.00. This course is designed to provide first-year physics graduate students with the mathematical background for subsequent studies of advanced mechanics, electrodynamics, and quantum theory. Topics treated include functions of complex variable, ordinary and partial differential equations, eigenvalue problems and orthogonal functions. Green's functions, matrix theory, and tensor analysis in three and four dimensions. **Credits:** 3.00

PHYS 60100 - Methods Of Theoretical Physics II

Credit Hours: 3.00. A continuation of PHYS 60000. Prerequisite: PHYS 60000. **Credits:** 3.00

PHYS 60300 - Methods Of Theoretical Physics IIIB

Credit Hours: 3.00. Basic theory of groups and group representations. Finite groups and abelian infinite groups, with applications to atomic physics. Elements of Lie group theory. The three-dimensional rotation group. The group SU(3). Application to particle physics. Prerequisite: PHYS 60100. **Credits:** 3.00

PHYS 60500 - Pedagogical Methods For Physics Graduate Students

Credit Hours: 2.00. This course prepares physics graduate students for classroom and laboratory teaching assignments. Through 100 minutes per week of lectures and hands-on recitations, it provides an intensive survey of basic pedagogical methods, both theoretically and in practice. Students will learn and practice teaching techniques via various forms and microteaching, reading, and class discussion. A broad range of results from physics education research will be studied in detail. Additional topics include grading and assessment, responsible conduct in teaching related to issues such as gender, culture and ethnicity, students with disabilities, and ethics in academia, generally, including ethical conduct of research. **Credits:** 2.00

PHYS 61000 - Advanced Theoretical Mechanics

Credit Hours: 3.00. Lagrangian and Hamiltonian mechanics; variational principles; canonical transformations; Hamilton-Jacobi theory; theory of small oscillations; Lagrangian formulation for continuous systems and fields. Prerequisite: PHYS 51000. **Credits:** 3.00

PHYS 61700 - Statistical Mechanics

Credit Hours: 3.00. Classical and quantum statistical mechanics. Prerequisite: PHYS 66000. **Credits:** 3.00

PHYS 63000 - Advanced Theory Of Electricity And Magnetism

Credit Hours: 3.00. The experimental origins of Maxwell's equations. Electrostatics and magnetostatics; solution of boundary value problems. Quasi-static currents. Electromagnetic energy and momentum and the Maxwell stress tensor. Foundations of optics. Radiation from antennas, multi-pole expansion; waveguides. Prerequisite: PHYS 53000, PHYS 60000. **Credits:** 3.00

PHYS 63100 - Advanced Theory Of Electricity And Magnetism

Credit Hours: 3.00. Covariant formulation of electrodynamics; Lienard-Wiechert potentials; radiation from accelerated particles; Cerenkov radiation; dynamics of relativistic particles; radiation damping; introduction to magneto-hydrodynamics. Prerequisite: PHYS 63000. **Credits:** 3.00

PHYS 64500 - Electron Theory Of Solids I

Credit Hours: 3.00. Electronic energy bands in crystalline solids; crystal symmetry and Brillouin zones, approximate methods of calculation, electrons and holes under applied fields. Lattice dynamics and thermal conductivity. Electron-lattice interactions. Transport phenomena in metals and semi-conductors. Prerequisite: PHYS 54500, PHYS 60100, PHYS 66100. Permission of instructor required. **Credits:** 3.00

PHYS 64600 - Electron Theory Of Solids II

Credit Hours: 3.00. Crystal imperfections, impurities and lattice defects. Magnetic properties: diamagnetic effects, paramagnetism, ferromagnetism, resonance phenomena. Ferroelectricity. Optical properties of metals and semiconductors; interband and intraband transitions, excitons, effects of crystal imperfections. Prerequisite: PHYS 64500. Permission of instructor required. **Credits:** 3.00

PHYS 65800 - Theoretical Techniques Of Elementary Particle Physics I

Credit Hours: 3.00. Theory and phenomenology of the standard model of elementary particle interactions. Electro-weak model of Glashow, Salam, and Weinberg: spontaneous symmetry breaking, mass generation, Cabibbo-Kobayashi-Maskawa mixing in charged weak current, path integral quantization, R3 gauge Feynman fules, renormalization. Parton model. Neutral current phenomenology. Comparison to high energy high precision electron-positron annihilation and deep inelastic scattering experiments: weak mixing angle, heavy top quark constraints. Prerequisite: PHYS 66200, PHYS 66300. Permission of instructor required. **Credits:** 3.00

PHYS 65900 - Theoretical Techniques Of Elementary Particle Physics II

Credit Hours: 3.00. Theory and phenomenology of the standard model of elementary particle interactions. Quantum Chromodynamics (QCD) theory of strong interactions: asymptotic freedom, perturbative QCD applied to high energy electron-positron annihilation and deep inelastic phenomena using operator product expansion, renormalization group, extended parton model, and Altarelli-Parisi equation. SU(3)xSU(3) current algebra and effective Lagrangians, chiral perturbation theory and chiral anomalies. Weak decay of heavy quarks: Cabibbo-Kobayashi-Maskawa mixing matrix, CP violation. Neutrino physics. Electroweak symmetry breaking and Higgs physics. Other topics of current research interests in and beyond the standard model. Prerequisite: PHYS 65800. Permission of instructor required. **Credits:** 3.00

PHYS 66000 - Quantum Mechanics I

Credit Hours: 3.00. Origins of the quantum theory, the uncertainty and complementarity principles. The Schrodinger equation and its solutions for simple physical systems. Mathematical formulation of the quantum theory. Applications: simple harmonic oscillator, theory of angular momentum, the hydrogen atom. Time-independent and time-dependent perturbation theory. The

Pauli exclusion principle. Spin of the electron. Elementary theory of scattering. Prerequisite: PHYS 53000, PHYS 55000, PHYS 60000, PHYS 61000. Corequisite: PHYS 60100. **Credits:** 3.00

PHYS 66100 - Quantum Mechanics II

Credit Hours: 3.00. Symmetry and conservation laws. The Klein-Gordon and Dirac equations. Interaction of radiation with matter. Applications of quantum mechanics to atomic structure. Scattering theory. Prerequisite: PHYS 60100, PHYS 63000, PHYS 66000. **Credits:** 3.00

PHYS 66200 - Quantum Field Theory I

Credit Hours: 3.00. Introduction to relativistic quantum field theory. Representations of the Lorentz and Poincare groups. Noether's theorem: symmetries and conservation laws. Canonical quantization of free Klein-Gordon, Dirac, Maxwell fields. Interacting field theory: Lehmann-Kallen representations. LSZ reduction formula. Schwinger action principle. Quantum Electrodynamics (QED): Gell-Mann Low expansion, Wick's theorem, Feynman rules for Green functions and S-matrix elements. Scattering processes in QED: cross sections in low orders of perturbation theory. Prerequisite: PHYS 66100. Permission of instructor required. **Credits:** 3.00

PHYS 66300 - Quantum Field Theory II

Credit Hours: 3.00. Concepts and techniques of relativistic quantum field theory. Quantum Electrodynamics: radiative corrections, renormalization program, infrared divergences, external field problem. Feynman path integral quantization. Global symmetries and Ward identities. Quantum effective action: effective potential, loop expansion. Non-Abelian gauge theories: quantization via Faddeev-Popov prescription, Feynman rules, BRS invariance. Quantum Chromodynamics. Callen-Symanzik equation and renormalization group. Prerequisite: PHYS 66200. Permission of instructor required. **Credits:** 3.00

PHYS 66400 - Quantum Theory Of Many-Body Systems

Credit Hours: 3.00. Practical introduction to modern quantum field theory techniques as applied to the study of many-body phenomena occurring in solid state systems. Standard perturbative-theoretic results based on zero- and finite-temperature Green's functions, with application to specific physical situations. Introduction to nonperturbative methods. PHYS 64500 and PHYS 64600 are recommended. Prerequisites: PHYS 61700, PHYS 66000, PHYS 66100. Permission of instructor required. **Credits:** 3.00

PHYS 67000 - Selected Topics In Physics

Credit Hours: 1.00 to 3.00. Specialized topics in physics, varied from time to time. Permission of instructor required. **Credits:** 1.00 to 3.00

PHYS 67200 - Advanced Physics Laboratory

Credit Hours: 3.00. Provides modern laboratory experience for graduate students in physics. Emphasis is on student initiative in accomplishing difficult but meaningful results. The course is intended to fill the gap between undergraduate-level laboratory, with detailed description of each experiment, and real-life experimental work. Students will share in the responsibility of determining how to conduct many of these experiments, learn how to use original equipment manuals, redesign experiments, and redefine goals depending on the progress. Prerequisite: graduate level E & M and QM courses, undergraduate level laboratory course. Permission of instructor required. **Credits:** 3.00

PHYS 67500 - General Relativity

Credit Hours: 3.00. Theoretical and experimental general relativity. The equivalence principle and its experimental basis. The Einstein field equations; classical tests of general relativity; gravitational radiation, cosmological considerations; topics to be chosen. Prerequisite: PHYS 60000, PHYS 61000, PHYS 63000. **Credits:** 3.00

PHYS 69600 - Introduction To Physics Research

Credit Hours: 1.00. Seminar designed to acquaint first-year physics graduate students with the research programs of the department. **Credits:** 1.00

PHYS 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required.**Credits:** 1.00 to 18.00

PHYS 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Political Science

POL 1010N - Introduction To American Politics

Credit Hours: 3.00. Introduction to the nature of government and the dynamics of American politics. Origin and nature of the American federal system and its present political party base.**Credits:** 3.00

POL 10100 - American Government And Politics

Credit Hours: 3.00. A study of the nature of democratic government, the U.S. Constitution, federalism, civil rights, political dynamics, the presidency, Congress, and the judiciary. CTL:ISH 1002 American Government **Credits:** 3.00

POL 12000 - Introduction To Public Policy And Public Administration

Credit Hours: 3.00. An introduction to the fields of public policy and public administration. Processes of policy formation and administration are examined. Different approaches to evaluating and improving public policies are discussed. **Credits:** 3.00

POL 13000 - Introduction To International Relations

Credit Hours: 3.00. An analysis of the fundamentals of international law, organization, and politics, particularly as relevant to contemporary international relations. CTL:ISH 1003 Introduction To World Politics **Credits:** 3.00

POL 14100 - Governments Of The World

Credit Hours: 3.00. An introduction to the politics and government in selected foreign countries. The course presents the tools and background needed to understand contemporary events in the world beyond the United States. Readings and discussions pay special attention to democratization and development. **Credits:** 3.00

POL 15000 - Introduction To Political Thought

Credit Hours: 3.00. Introduction to basic concepts in political philosophy, such as conflict and community, justice and the good society, the origins of democracy, and the intersections of class, race, gender, and sexuality. Selected classical and contemporary political thinks covered. **Credits:** 3.00

POL 20000 - Introduction To The Study Of Political Science

Credit Hours: 3.00. Introduction to basic concepts and methods of political science. Basic concepts including, among others, power, justice, authority, ideology, and democracy, and a variety of quantitative and qualitative methods of analysis will be explored. **Credits:** 3.00

POL 20400 - Spies And Lies: Studies In Intelligence And National Security

Credit Hours: 3.00. This course examines the role that the collection, analysis, and dissemination of intelligence plays in US foreign policy and national security. We will unpack the missions and methods of the US Intelligence Community. Who does what? What are the different challenges for those engaged in the different aspects of intelligence? Why is the intelligence community configured like it is? We will also spend time with more contemporary topics in intelligence. What role does intelligence play meeting future national security and foreign policy challenges? What is the role of intelligence in modern warfare, including cyber-warfare? What role does intelligence play in a liberal democracy? What should intelligence oversight look like? **Credits:** 3.00

POL 22200 - Women, Politics, And Public Policy

Credit Hours: 3.00. An introduction to women's participation in politics, with an emphasis on America. Structural and attitudinal conditions limiting women's political roles and contemporary efforts to change women's status in society through politics. **Credits:** 3.00

POL 22300 - Introduction To Environmental Policy

Credit Hours: 3.00. (FNR 22310) Study of decision making as modern societies attempt to cope with environmental and natural resources problems. Focuses on the American political system, with some attention to the international dimension. Current policies and issues will be examined. **Credits:** 3.00

POL 22800 - Data Science And Public Policy

Credit Hours: 3.00. This course is an introduction to the politics and policies of data science and "big data." Students will (1) gain an understanding of how public policy is made, including the role of data in policymaking; (2) learn about whether and what policies govern the use of data in various applications (such as autonomous vehicles, ownership of health care data, etc.); and (3) explore the ethical, legal, and social implications of data science and big data. **Credits:** 3.00

POL 22900 - Emerging Problems In Political Science

Credit Hours: 1.00 to 3.00. This course focuses on problems and issues that are beginning to be recognized as worthy of public discussion or policy action, or that may be new areas of expertise and interest for our faculty members. We use it to introduce new topics and approaches, including experimental pedagogies, courses that involve travel, and the like. The content of the course varies from one offering to the next. Possible topics are Bioethics and Politics, Food Policy, and Bicycle Politics. **Credits:** 1.00 to 3.00

POL 23000 - Introduction To Peace Science

Credit Hours: 3.00. This course provides an introduction to the field of peace science, the systematic study of the causes and consequences of conflict between and within states, including conflict resolution and strategies for creating sustainable peace. **Credits:** 3.00

POL 23100 - Introduction To United States Foreign Policy

Credit Hours: 3.00. Designed to introduce students to the major themes and issues in contemporary U.S. foreign policy. Lectures, discussion, and readings will examine such areas as U.S. relationships with the major powers, the Third World, and international organizations. **Credits:** 3.00

POL 23200 - Contemporary Crises In International Relations

Credit Hours: 3.00. The focus of this course will be on major world crises, such as in the Middle East and Southern Africa, and ways in which these crises may be analyzed. **Credits:** 3.00

POL 23400 - The Politics Of Terrorism

Credit Hours: 3.00. This class examines the phenomenon of terrorism and counterterrorism. Why do terrorists do what they do? What can governments do to stop them? We will begin with issues of definition, and theoretical and empirical approaches to the study of terrorism. We will then delve into the history and evolution of the tactic (taking time to study some of the more notorious organizations). At this point in time it is critical that we look at both domestic-particularly in the United States-and transnational forms of terrorism. The study of terrorism is rife with puzzles that we will explore. Why resort to violence in the first place? How and why do groups evolve over time? How and why do some groups end, and others continue for years? Why are some individuals/groups not classified as terrorists? What are the consequences of terrorism? We will also look closely at counterterrorism policy. What are the most effective ways to respond to terrorism? What doesn't work? How do policies differ between states? To what extent is there global cooperation on counterterrorism? We will conclude the class by taking a critical look at US counterterrorism policy and the massive counterterrorism apparatus that has developed in the aftermath of the attacks of September 11, 2001. Should counterterrorism dominate US national security priorities to the degree it does? **Credits:** 3.00

POL 23500 - International Relations Among Rich And Poor Nations

Credit Hours: 3.00. Introduction to the major themes in the contemporary international relations among rich and poor nations. Examines such areas as North-South relations, interdependence, international organizations, and global development. **Credits:** 3.00

POL 23700 - Modern Weapons And International Relations

Credit Hours: 3.00. This course introduces the student to the roles that modern weapons systems play in contemporary international relations. **Credits:** 3.00

POL 30000 - Introduction To Political Analysis

Credit Hours: 3.00. An introduction to the study of politics, its basic concepts and major areas of concern; also review of important research techniques, including methods of data collection and analysis. **Credits:** 3.00

POL 31400 - The President And Policy Process

Credit Hours: 3.00. A study of presidential leadership as the embodiment of social forces and as reflective of the personality of the incumbent; the president as national leader reflecting national myths and ideologies; the growth of the presidency; issues and forces affecting the continuity of presidential leadership; the degree of institutionalization of the presidency. **Credits:** 3.00

POL 32300 - Comparative Environmental Policy

Credit Hours: 3.00. Comparative study of environmental policy development and processes in industrialized democracies, former and current communist states, and developing nations. **Credits:** 3.00

POL 32600 - Black Political Participation In America

Credit Hours: 3.00. An examination of African American political participation in the United States. Analyzes political culture and socialization, with a focus on the interaction between African Americans and actors, institutions, processes, and policies of the American system of politics and governance. **Credits:** 3.00

POL 32700 - Global Green Politics

Credit Hours: 3.00. Analysis and assessment of the nature of global environmentalism, its connections with other new social movements, and its impact on domestic and international politics worldwide, with particular attention to green political parties and nongovernmental organizations. **Credits:** 3.00

POL 32930 - Topics In Global Politics And International Relations

Credit Hours: 3.00. Variable topic course that examines conflict, competition, and cooperation in global politics and international relations. Students examine the historical background of the topic and apply current political science theories to understand the institutions, participants, and outcomes. Course may be repeated for a maximum of 9 credit hours.**Credits:** 3.00

POL 33500 - China And The Challenges Of Globalization

Credit Hours: 3.00. Globalization is a very popular topic, resulting in a lot of loose and poorly thought-through talk and writing around the subject. The view taken in this course is that to understand current processes of globalization we need to examine it in less broad and amorphous ways by focusing on its specific manifestations. Thus, this course focuses on how China has managed the challenges of globalization. China is a particularly useful case study because it failed the challenges of globalization in the late 19th and early 20th centuries. For an ancient civilization such as China, this failure had tremendous impact on its national pride. The Chinese refer to this historical juncture as the "century of shame." Towards the end of the 20th century and the onset of the 21st, China faced again the challenges of globalization and has arisen to the tasks in a spectacular fashion, transforming a largely rural and agriculture economy into the world's second largest economic power. This amazing transformation is leading some to proclaim that the 21st century will belong to China! **Credits:** 3.00

POL 34500 - West European Democracies In The Post-Industrial Era

Credit Hours: 3.00. An introduction to the political institutions and processes in West European democracies. The course focuses on the ability of Western democracy to survive the transition to the post-industrial era. **Credits:** 3.00

POL 34700 - Introduction To Latin American Politics

Credit Hours: 3.00. Major aspects of Latin American politics and development. Questions such as the impact of the military on political development, the dynamics of Latin American industrialization, and Latin America's changing international role will be explored. **Credits:** 3.00

POL 34800 - East Asian Politics

Credit Hours: 3.00. The course will examine East Asian politics and society, with special emphasis on Japan. **Credits:** 3.00

POL 35000 - Foundations Of Western Political Theory: From The Renaissance To Marx

Credit Hours: 3.00. A survey of modern political thought from Machiavelli through Marx. Major writers studied include Machiavelli, Hobbes, Locke, Rousseau, the Utilitarians, and Marx. **Credits:** 3.00

POL 35100 - Foundations Of Western Political Theory: From Plato To The Reformation

Credit Hours: 3.00. A survey of ancient and medieval political theory in the West. Major writers include Plato, Aristotle, St. Augustine, and St. Thomas Aquinas. **Credits:** 3.00

POL 35200 - Selected Topics In Political Theory

Credit Hours: 3.00. This course is intended to provide a more narrowly focused analysis of selected problems and topics that are briefly presented in POL 35000 and POL 35100, giving special emphasis to their conceptual frameworks and their significance in the history of political philosophy. This course also will allow students to see the practical role of the political theorist by stressing the methods and criteria used in the selection, formulation, and solution of problems in political philosophy. Course topics will be different each semester. **Credits:** 3.00

POL 35300 - Current Political Ideologies

Credit Hours: 3.00. Liberalism, conservatism, socialism, fascism, communism, and other political ideologies. **Credits:** 3.00

POL 36000 - Women And The Law

Credit Hours: 3.00. An introductory survey of women's legal status in America. Topics include constitutional law, marriage and divorce, reproductive rights, employment discrimination, and crimes of violence. **Credits:** 3.00

POL 37200 - Indiana Government And Politics

Credit Hours: 3.00. An examination of the political and governmental organization of the state of Indiana. Includes the political and historical development of Indiana state government and comparison of policies and institutions with those of other states. **Credits:** 3.00

POL 37300 - Campaigns And Elections

Credit Hours: 3.00. This course analyzes the role of political parties, issues, candidates, media, funding, and electoral and campaign strategies in presidential, congressional, and state campaigns. Contemporary election examples will be utilized. **Credits:** 3.00

POL 40200 - Topics In Political Research Methods

Credit Hours: 3.00. This variable topics course in political methodology acquaints students with the scientific process of political research by applying different research designs and methodological approaches to analyzing political data. Students must complete POL 30000 before taking this course. This variable topic course may be repeated for up to 9 credit hours.**Credits:** 3.00

POL 40300 - Field Experience In Political Science

Credit Hours: 1.00 to 9.00. Students are able to earn credit for internships in federal, state, and local government offices as well as with political parties, campaign organizations, nonprofit organizations, legislative bodies, and interest groups. Credit and course requirements to be arranged with the instructor. Permission of instructor required. **Credits:** 1.00 to 9.00

POL 40301 - Local Partner Internship In Political Science

Credit Hours: 3.00. This course in Political Science offers experiential learning opportunities to qualified junior and senior political science majors. These competitive internships allow students to explore a political science-related field, apply classroom knowledge and skills, and gain valuable work experience for academic credit. Employers recognize that the most qualified graduates come into the workforce with a combination of strong academic preparation and practical on-the-job experience. Political science internship partners include city and county governments, non-profit agencies, political parties, and other community organizations. Public policies affect every aspect of community life, and our internship partners enable students to experience first-hand the impact of government actions on local organizations' work and the constituencies they serve. POL 403 internships provide the opportunity to develop and refine skills that are important to academic success, career readiness, and personal growth. All internships for credit must be approved by the Department of Political Science through the application process. Students can only take either POL 40301, 40302, or 40303 once for a letter grade and 3 credit hours. Students have the option to take up to 6 additional credit hours as Pass/Not Pass by enrolling in POL 40300. Internships can be paid or unpaid. Some internships require a background check. Permission of department required. **Credits:** 3.00

POL 40302 - Self-Initiated Internship In Political Science

Credit Hours: 3.00. This course in Political Science offers the opportunity to complete a self-initiated internship for academic credit. Employers recognize that the most qualified college graduates come into the workforce with a combination of strong academic preparation and practical on-the-job experience. Internships strengthen resumes and law and graduate school applications. All internships for credit must be approved by the Department of Political Science through the application process. Students can only take either POL 40301, 40302, or 40303 once for a letter grade and 3 credit hours. Students have the option to take up to 6 additional credit hours as Pass/Not Pass by enrolling in POL 40300. Internships can be on-site or virtual, or a hybrid. Internships can be paid or unpaid. Some internships require a background check. Permission of department required. **Credits:** 3.00

POL 41000 - Political Parties And Politics

Credit Hours: 3.00. An analysis of the nature and functioning of U.S. political parties in terms of social and economic forces that shape our political system. Interactions among political parties, pressure groups, and formal government structures are emphasized throughout. Special attention is devoted to political leadership, nominating processes, campaign management, voting behavior, and other important aspects of American politics. **Credits:** 3.00

POL 41100 - Congress: Structure And Functioning

Credit Hours: 3.00. A study of how Congress actually operates. Formal and informal power structures within both chambers and roles of the individual members of Congress are analyzed. Attention is directed to latent, as well as manifest, functions of legislative, investigative, and other major activities of Congress. The problem of bringing expertise to bear on the legislative process is considered throughout. **Credits:** 3.00

POL 41300 - Analysis Of Political Attitudes And Behavior

Credit Hours: 3.00. A broad-based survey of human political attitudes and behavior and the forces that underlie them, utilizing contemporary research tools to examine and evaluate theoretical claims. Examines how people respond to information about politics, communicate about politics, form attitudes and preferences about politics, and their political interactions with other individuals, groups, and nations. Introduces survey research methodology, its uses, and its challenges in measuring political attitudes and behavior. **Credits:** 3.00

POL 41500 - US Politics And The Media

Credit Hours: 3.00. This course examines the roles and influences of the mass media on American politics generally and with particular emphasis on election campaigns and the evolving political culture of the United States. **Credits:** 3.00

POL 42300 - International Environmental Policy

Credit Hours: 3.00. Environmental policy development in the international arena, with attention to international law, international organizations, and transboundary environmental problems. **Credits:** 3.00

POL 42500 - Environmental Law And Politics

Credit Hours: 3.00. This course provides an introduction to statutory and case law relating to environmental policy. Regulatory schemes in environmental policy and the legal framework for environmental regulation are presented. Market alternatives to various regulatory mechanisms will also be treated. **Credits:** 3.00

POL 42800 - The Politics Of Regulation

Credit Hours: 3.00. Politics and policies of federal and state regulatory agencies. Explanations of regulatory agency behavior, arguments for and against government regulation, and alternatives to government regulation. **Credits:** 3.00

POL 42900 - Contemporary Political Problems

Credit Hours: 3.00. Contemporary political problems in the United States affecting the interpretation of democracy, human rights and welfare, social pressures, and intergovernmental relations. **Credits:** 3.00

POL 43000 - Selected Problems In International Relations

Credit Hours: 3.00. An in-depth analysis of selected problems in international relations. **Credits:** 3.00

POL 43200 - Selected Problems In World Order

Credit Hours: 3.00. An in-depth analysis of how selected problems in international relations are treated within international organizations. **Credits:** 3.00

POL 43300 - International Organization

Credit Hours: 3.00. A study of the structure and functions of the United Nations and associated agencies, with an emphasis on the role of this system in contemporary international relations. **Credits:** 3.00

POL 43500 - International Law

Credit Hours: 3.00. A study of international legal theories, principles, and practices, with an emphasis on the role and utility of law in contemporary international relations. **Credits:** 3.00

POL 43801 - International Human Rights

Credit Hours: 3.00. This course exposes students to the politics of international human rights through reading, lectures, film, discussion, and student research. Topics include the concept of human rights, international law related to the protection of human

rights, empirical research on political and economic causes of human rights violations in individual countries, and research on prevention efforts and remedies for past violations. This political science course is also part of Purdue's Human Rights Minor program. **Credits:** 3.00

POL 43900 - United States Foreign Policy Making

Credit Hours: 3.00. An analysis of the decision-making process in United States foreign policy. **Credits:** 3.00

POL 45000 - Game Theory And Strategy In Political Science

Credit Hours: 3.00. This course introduces students to the basics of game theory and its applications in political science. The course will cover foundational concepts in game theory, including strategic rationality, best responses, normal and strategic form games, backward induction, and games of incomplete information. Students will complete problem sets to demonstrate mastery of these subjects. We will also apply these basic game theoretic tools to important problems in political science to better understand the dynamics of bargaining, coercion, reassurance, cooperation, and other key concepts. **Credits:** 3.00

POL 46000 - Judicial Politics

Credit Hours: 3.00. A survey of judicial processes as they operate in America. Both trial courts and appellate courts will be examined in light of the procedures with which they operate. The external social, economic, and political pressures surrounding courts and the impact courts have on society will be considered. **Credits:** 3.00

POL 46100 - Constitutional Law I

Credit Hours: 3.00. A survey of selected areas of constitutional law, considering the political and social influences as well as the doctrinal forces that have produced these policies and interpretations. **Credits:** 3.00

POL 46200 - Constitutional Law II

Credit Hours: 3.00. An examination of the development of individual rights and civil liberties through constitutional law and interpretation of the Bill of Rights and Civil War Amendments. Both doctrinal and political pressures will be discussed to illustrate the evolution of these rights. **Credits:** 3.00

POL 46400 - Legal Writing, Ethics, And Professionalism

Credit Hours: 3.00. This class is designed to provide students with the practical skills and knowledge they will need to embark on an internship or career in the legal environment. The class will focus on legal ethics, writing and research skills.**Credits:** 3.00

POL 49100 - Political Science Senior Seminar

Credit Hours: 3.00. This is a variable-title seminar focusing on contemporary issues in political science at the senior level. It is part of the "capstone" experience for political science majors. **Credits:** 3.00

POL 49300 - Interdisciplinary Undergraduate Seminar

Credit Hours: 1.00 to 3.00. An undergraduate seminar devoted to an interdisciplinary examination of social, economic, political, and intellectual movements, using the faculty resources of the participating departments. Subject matter will vary. Each offering of the seminar will be approved by a committee of department heads from the sponsoring departments. Permission of instructor required. **Credits:** 1.00 to 3.00

POL 49500 - Undergraduate Research Experience

Credit Hours: 1.00 to 3.00. Students are able to earn credit by working on a research project with a faculty member. Students will become familiar with all phases of the research process. Credit and course requirements are arranged with the instructor. Permission of instructor required. **Credits:** 1.00 to 3.00

POL 49505 - Undergraduate Research Experience Capstone

Credit Hours: 3.00. Students are able to earn credit by working on a research project with a faculty member to count as capstone credit on plan of study. Students will become familiar with all phases of the research process. Credit and course requirements are arranged with the instructor. Permission of department required. **Credits:** 3.00

POL 50100 - Political Science: Methodology

Credit Hours: 3.00. Introduction to the basic techniques of statistical analysis applicable to political science data. Elementary descriptive statistics and statistical inference. Introduction to multivariate analysis. Permission of instructor required. **Credits:** 3.00

POL 50601 - Data, Machine Learning, And Artificial Intelligence For The Public Sector

Credit Hours: 3.00. This course examines how machine learning algorithms and tools related to artificial intelligence can be used to advance our understanding in public sector domains. Students will develop a comprehensive understanding of how to apply AI and various machine learning algorithms, focusing on practical applications and hands-on experience. It provides an overview public sector data sources and addresses ethical and privacy issues associated with this type of data.**Credits:** 3.00

POL 51700 - Applied Political Economy

Credit Hours: 3.00. An examination of the core concepts of political economy, the interaction of political institutions, markets, and economic choices, including the nature of capital and labor in the political process. Understand how political institutions and policies influence the organization of economic activity, and the role of the state and policy in shaping the domestic and global political economy since World War II. **Credits:** 3.00

POL 52000 - Special Topics In Public Policy

Credit Hours: 3.00. This is a course focused on a specific current public policy topic, chosen for its contemporary political relevance, which varies from semester to semester. In general, each topic will be examined in terms of its historical roots, past policy initiatives, present policy proposals, and its enduring political and social challenges. **Credits:** 3.00

POL 52101 - Applied Public Policy: Institutions, Processes, Practices

Credit Hours: 3.00. Applied introduction to the institutions, processes, and practices in the field of public policy. Students will examine the role of government institutions, standards organizations, corporate actors, and non-governmental organizations, policymakers, regulators, and the public in the policy process. The course will draw examples from one or more applied policy areas such as economic development, emerging technology policy, sustainability policy, energy, foreign policy, or social policy.**Credits:** 3.00

POL 52300 - Environmental Politics And Public Policy

Credit Hours: 3.00. The political problems of natural resource use and environmental quality. Theoretical foundations for environmental policy and its evaluation, the political context of environmental policy, principles of administering environmental policies, and the significance of international law and institutions for environmental policies. **Credits:** 3.00

POL 52400 - Public Policy And The Family

Credit Hours: 3.00. An intensive examination of the interrelationships between public policy making and the structure and quality of life of families. The primary focus is the United States, but consideration is given to family policies in other capitalist nations. **Credits:** 3.00

POL 52601 - Technology, AI, And Ethics In Public Policy And Public Administration

Credit Hours: 3.00. Examines how emerging technologies like artificial intelligence (AI), automated decision systems, and digital platforms are being adopted in the public sector. It explores the benefits as well as ethical risks and challenges associated with implementing these technologies in areas like healthcare, education, child welfare, and criminal justice. Students will analyze governance strategies, policies, and administrative procedures to promote responsible technology use in government.**Credits:** 3.00

POL 52701 - Local To Global Governance Of Data, AI, And Emerging Technology

Credit Hours: 3.00. This course introduces students to the institutions and governing systems at the subnational, national, supranational, and international levels that regulate emerging technology, AI, and data. Focusing on laws, standards, and best practices, students will examine comparative case studies of regulation of big tech in differing governing environments. Students will explore how social, economic, and political factors shape differences in technology regulation across the globe.**Credits:** 3.00

POL 52901 - Applied Policy And Program Evaluation

Credit Hours: 3.00. This course introduces students to the logic of designing and implementing program evaluations to assess implemented policies and programs. The course examines research designs for different evaluation goals, the application of evaluation strategies, and strategies for reporting results to specialist and non-specialist audiences.**Credits:** 3.00

POL 53100 - Terrorism And WMD Threat Assessment

Credit Hours: 3.00. "Terrorism and WMD Threat Assessment" is designed to teach students how to analyze and assess the threats terrorist organizations present in the area of nuclear and radiological security and weapons of mass destruction more generally. The goal of this class is to enable students to identify, prioritize, and assess terrorist threats and propose appropriate, proportional, and cost-effective counter-measures. **Credits:** 3.00

POL 53200 - Nuclear Strategy And Proliferation

Credit Hours: 3.00. "Nuclear Strategy and Proliferation" is designed to teach students about 1) the conceptual elements and operational requirements of nuclear deterrence and 2) the historical dynamics of nuclear proliferation and nonproliferation. The goal of the class is to enable students to 1) evaluate the deterrent effects of different nuclear weapons and various configurations of nuclear arsenals and 2) analyze the technological, political and legal incentives and obstacles for acquiring nuclear weapons. **Credits:** 3.00

POL 54101 - Applied Foundations Of Global Development

Credit Hours: 3.00. Describes the foundational concepts of economic development and the historical emergence of global inequality, provides explanations of global inequality, and explores Western efforts to mitigate it through foreign aid. Applies concepts to analyze current trends in development and emerging practices in foreign aid.**Credits:** 3.00

POL 59000 - Directed Reading In Political Science

Credit Hours: 1.00 to 3.00. A reading course directed by the instructor in whose field of specialization the content of the reading falls. Approval of each reading project must be secured from the department. Permission of instructor required. **Credits:** 1.00 to 3.00

POL 60000 - Political Science: Discipline And Profession

Credit Hours: 3.00. An exploration of the scope of political science and of its development as a profession, with a focus on what American political scientists do as disciplinary professionals. Analysis of major approaches to the study of politics and of current developments. Prerequisite: 6 credit hours in Political Science. **Credits:** 3.00

POL 60500 - Research Design And Methods

Credit Hours: 3.00. Selection of research problems involving political phenomena; formulation of concepts and hypotheses; research design; data collection techniques; data processing, analysis, and interpretation, with attention to uses of high-speTed facilities. Students will design a research project and, as appropriate, carry out the project in the laboratory or in the field. Prerequisite: POL 50100. **Credits:** 3.00

POL 60600 - Advanced Quantitative Techniques In Political Science

Credit Hours: 3.00. This course deals with advanced quantitative techniques useful in political science research. These include multiple correlation and regression, causal modeling, dynamic (time series) analysis, dimensional analysis (Coombsean scaling, Shepard-Kruskal scaling, and factor analysis), and cross-level inference techniques. Prerequisite: POL 50100, POL 60500. **Credits:** 3.00

POL 60800 - Qualitative Methods In Political Science

Credit Hours: 3.00. This course is an introduction to the use of qualitative methods in political science. In addition to a detailed consideration of several leading qualitative approaches to political research, the course will also consider the distinctive issues of research design for qualitative research as well as the relationship of qualitative and quantitative methods. Prerequisite: POL 50100 Political Science Methodology or equivalent or consent of instructor. **Credits:** 3.00

POL 60900 - Advanced Applied Research Design

Credit Hours: 3.00. The main goal of this seminar is to guide graduate students when preparing their Ph.D. dissertation proposals. The seminar aims to do two things. The first is to provide an overview of the crucial research design tools and research planning considerations that can help students plan and carry out better dissertation projects. The second is to offer a structured forum where students can present and receive feedback on their dissertation proposals. With permission from the Director of Graduate Studies, this course may be repeated and used to support the development of a grant proposal or research publication. Pre-requisite: POL 60000 with a grade B or better.**Credits:** 3.00

POL 61000 - Proseminar In American Political Systems, Processes, And Behavior

Credit Hours: 3.00. An introduction to American political systems, processes, and behavior as a field of graduate study with an emphasis on literature. **Credits:** 3.00

POL 61100 - Research Seminar In American Government And Politics

Credit Hours: 3.00. Topics vary. Permission of department required. **Credits:** 3.00

POL 61500 - Proseminar In Electoral Behavior And Political Socialization

Credit Hours: 3.00. A reading and lecture course acquainting the student with the general literature in the field. Traces the descriptive aspects, causes, and consequences of electoral behavior and political socialization in the American polity and selected European countries. Emphasis on the processes of citizen integration into the larger political system. Both historical and comparative approaches to the material will be used. **Credits:** 3.00

POL 61600 - Research Seminar In Political Behavior

Credit Hours: 3.00. Extends the work of POL 51600 (Group Politics) to the empirical study of primary groups, cliques, social groups, voluntary associations, experimental and occupational groups (insofar as they have political impacts) and of political clubs and associations, paraparties, and inchoate political movements and parties. Training will be given in the use of phenomenological observation, interaction analysis, content analysis, personality inventories, and other instruments that reveal the social structure and dynamics of groups. Students will conduct field studies of politically-relevant groups, or will conduct or participate in conducting laboratory experiments. **Credits:** 3.00

POL 62000 - Proseminar In Public Policy And Processes

Credit Hours: 3.00. An introduction to public policy and processes as a field of graduate study with an emphasis on the literature. **Credits:** 3.00

POL 62200 - Research Seminar In Public Policy And Public Administration

Credit Hours: 3.00. Investigation in depth of a substantive aspect of public policy such as energy policy or social policy, or of a theoretical topic, for example, policy formulation, enactment, implementation, impact, or evaluation. Permission of instructor required. **Credits:** 3.00

POL 62300 - Research Seminar In Environmental Policy

Credit Hours: 3.00. Investigation in depth of a substantive aspect of environmental policy or a theoretical approach to environmental policy, with emphasis on student research. Permission of instructor required. **Credits:** 3.00

POL 63000 - Proseminar In International Relations

Credit Hours: 3.00. An introduction to international relations as a field of graduate study with an emphasis on literature. **Credits:** 3.00

POL 63100 - Research Seminar In International Relations

Credit Hours: 3.00. Topics vary. Permission of department required. **Credits:** 3.00

POL 63200 - Research Seminar In Peace And World Order Studies

Credit Hours: 3.00. A study of some of the forces which endanger the planet, the related political problems, and prospective strategies to overcome these problems. Particular attention will be directed to problems such as war, population pressure,

resource shortages, and environmental deterioration. Students will examine a variety of ideas that might contribute to the elimination or control of these problems, and their overarching objective will be to conceptualize a "world order model" in conformity with basic canons of scientific inquiry. Permission of department required. **Credits:** 3.00

POL 64000 - Proseminar In Comparative Political Systems

Credit Hours: 3.00. An introduction to comparative political systems, processes, and behavior as a field of graduate study with an emphasis on literature. **Credits:** 3.00

POL 64100 - Research Seminar On Comparative Politics

Credit Hours: 3.00. Topics vary. Prerequisite: POL 64000. **Credits:** 3.00

POL 65000 - Proseminar In Political Theory

Credit Hours: 3.00. An introduction to political theory as a field of graduate study with special emphasis on the literature of great political thinkers. Prerequisite: Master's student standing. **Credits:** 3.00

POL 65100 - Research Seminar In Political Theory

Credit Hours: 3.00. Investigation in depth into a selected area of political thought. Intensive study and close analysis of the selected topic, school, or theoretic system. Development of historic and philosophic methods applicable to the study of political thought. Prerequisite: POL 35000, POL 35100. **Credits:** 3.00

POL 66200 - Proseminar In Political Economy

Credit Hours: 3.00. An introduction to political economy as a field of graduate study with an emphasis on literature. **Credits:** 3.00

POL 68500 - Professional Development Practicum

Credit Hours: 0.00 or 1.00. This course examines the ethics, norms, and expectations of the profession of political science and public policy for those engaged in doctoral level study. the course explores topics of professional development to support progress in the degree and building a successful career. Permission of department required.**Credits:** 0.00 or 1.00

POL 68600 - Career And Placement Practicum

Credit Hours: 2.00. Provide practical guidance and workshops to help students plan job searches, prepare application materials, and develop skills in public presentations such as video interviews, in-person interviews, job talks, teaching talks, and other public talks. Permission of department required.**Credits:** 2.00

POL 69300 - Interdisciplinary Seminar

Credit Hours: 3.00. Topics vary - Interdisciplinary Seminar. Permission of instructor required. **Credits:** 3.00

POL 69500 - Directed Reading And Research Topics

Credit Hours: 1.00 to 3.00. Individual topics involving research by the student other than on a thesis topic. Admission and hours require the consent of instructor who will supervise the research. Approval of each topic must be secured from the department. Permission of instructor required. **Credits:** 1.00 to 3.00

POL 69800 - Research MA Thesis

Credit Hours: 1.00 to 18.00. Research MA Thesis. **Credits:** 1.00 to 18.00

POL 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Polytechnic

PTEC 10601 - ePortfolio I

Credit Hours: 1.50. Part one of creation and curating of an electronic portfolio demonstrating foundational levels of competence across broad competencies. Students will meet individually and in small groups with faculty mentors to review and critique progress. Permission of department required. **Credits:** 1.50

PTEC 10602 - ePortfolio II

Credit Hours: 1.50. Part two of creation and curating of an electronic portfolio demonstrating foundational levels of competence across broad competencies. Students will meet individually and in small groups with faculty mentors to review and critique progress. Permission of department required. **Credits:** 1.50

PTEC 10800 - Guided Exploration

Credit Hours: 4.00 to 8.00. The first in a series of transdisciplinary, real-world, project-based work and conversations exploring the intersections of humanities and technology, social and natural sciences. Projects emphasize design thinking; collaboration; communication; hands-on prototyping; testing; assessing. Learners will engage in individual and team project work and conversations that will change in scale and scope based on the learners experience, goals, and learning needs. Permission of department required. **Credits:** 4.00 to 8.00

PTEC 10801 - Guided Exploration I

Credit Hours: 3.00. Part one of the first in a series of transdisciplinary, real-world, project-based work and conversations exploring the intersections of humanities and technology, social and natural sciences. Projects emphasize design thinking; collaboration; communication; hands-on prototyping; testing; assessing. Learners will engage in individual and team project work and conversations that will change in scale and scope based on the learner's experience, goals, and learning needs. Permission of department required. **Credits:** 3.00

PTEC 10802 - Guided Exploration II

Credit Hours: 3.00. Part two of the first in a series of transdisciplinary, real-world, project-based work and conversations exploring the intersections of humanities and technology, social and natural sciences. Projects emphasize design thinking; collaboration; communication; hands-on prototyping; testing; assessing. Learners will engage in individual and team project work and conversations that will change in scale and scope based on the learner's experience, goals, and learning needs. **Credits:** 3.00

PTEC 20601 - ePortfolio III

Credit Hours: 1.50. Part one of creation and curating of an electronic portfolio demonstrating foundational to developing levels of competence across broad competencies. Students will meet individually and in small groups with faculty mentors to review and critique progress. **Credits:** 1.50

PTEC 20602 - ePortfolio IV

Credit Hours: 1.50. Part two of creation and curating of an electronic portfolio demonstrating foundational to developing levels of competence across broad competencies. Students will meet individually and in small groups with faculty mentors to review and critique progress. **Credits:** 1.50

PTEC 20700 - ePortfolio I

Credit Hours: 0.50. Creation and curating of an electronic portfolio demonstrating developing and emerging levels of competence across broad competencies. Students will meet individually and in small groups with faculty mentors to review and critique progress. Permission of department required. **Credits:** 0.50

PTEC 20800 - Formation And Immersion

Credit Hours: 4.00 to 8.00. The second in a series of transdisciplinary, real-world, project-based work and conversations exploring the intersections of humanities and technology, social and natural sciences. Projects emphasize design thinking; collaboration; communication; hands-on prototyping; testing; assessing. Learners will engage in individual and team project work and conversations that will change in scale and scope based on the learner's experience, goals, and learning needs. Permission of department required. **Credits:** 4.00 to 8.00

PTEC 20801 - Formation And Immersion I

Credit Hours: 3.00. Part one of the second in a series of transdisciplinary, real-world, project-based work and conversations exploring the intersections of humanities and technology, social and natural sciences. Projects emphasize design thinking; collaboration; communication; hands-on prototyping; testing; assessing. Learners will engage in individual and team project work and conversations that will change in scale and scope based on the learner's experience, goals, and learning needs. **Credits:** 3.00

PTEC 20802 - Formation And Immersion II

Credit Hours: 3.00. Part two of the second in a series of transdisciplinary, real-world, project-based work and conversations exploring the intersections of humanities and technology, social and natural sciences. Projects emphasize design thinking; collaboration; communication; hands-on prototyping; testing; assessing. Learners will engage in individual and team project work and conversations that will change in scale and scope based on the learner's experience, goals, and learning needs. **Credits:** 3.00

PTEC 30601 - ePortfolio V

Credit Hours: 1.50. Part one of students curating an electronic portfolio demonstrating emerging to proficient levels of competence across broad competencies. Students will meet individually and in small groups with faculty mentors to review and critique progress. **Credits:** 1.50

PTEC 30602 - ePortfolio VI

Credit Hours: 1.50. Part two of students curating an electronic portfolio demonstrating emerging to proficient levels of competence across broad competencies. Students will meet individually and in small groups with faculty mentors to review and critique progress. **Credits:** 1.50

PTEC 30800 - Deep Immersion

Credit Hours: 4.00 to 8.00. The third in a series of transdisciplinary, real-world, project-based work and conversations exploring the intersections of humanities and technology, social and natural sciences. Projects emphasize design thinking; collaboration; communication; hands-on prototyping; testing; assessing. Learners will engage in individual and team project work and conversations that will change in scale and scope based on the learner's experience, goals, and learning needs. Permission of department required. **Credits:** 4.00 to 8.00

PTEC 30801 - Deep Immersion I

Credit Hours: 3.00. Part one of the third in a series of transdisciplinary, real-world, project-based work and conversations exploring the intersections of humanities and technology, social and natural sciences. Projects emphasize design thinking; collaboration; communication; hands-on prototyping; testing; assessing. Learners will engage in individual and team project work and conversations that will change in scale and scope based on the learner's experience, goals, and learning needs. **Credits:** 3.00

PTEC 30802 - Deep Immersion II

Credit Hours: 3.00. Part two of the third in a series of transdisciplinary, real-world, project-based work and conversations exploring the intersections of humanities and technology, social and natural sciences. Projects emphasize design thinking; collaboration; communication; hands-on prototyping; testing; assessing. Learners will engage in individual and team project work and conversations that will change in scale and scope based on the learner's experience, goals, and learning needs. **Credits:** 3.00

PTEC 40601 - ePortfolio VII

Credit Hours: 1.50. Part one of students curating an electronic portfolio demonstrating proficient levels of competence across broad competencies. Students will meet individually and in small groups with faculty mentors to review and critique progress. **Credits:** 1.50

PTEC 40602 - ePortfolio VIII

Credit Hours: 1.50. Part two of students curating an electronic portfolio demonstrating proficient levels of competence across broad competencies. Students will meet individually and in small groups with faculty mentors to review and critique progress. **Credits:** 1.50

PTEC 40700 - ePortfolio II

Credit Hours: 0.50. Students curate an electronic portfolio demonstrating emerging to proficient levels of competence across broad competencies. Students will meet individually and in small groups with faculty mentors to review and critique progress. Permission of department required. **Credits:** 0.50

PTEC 40800 - Capstone And Planning

Credit Hours: 4.00 to 8.00. The final in a series of transdisciplinary, real-world, project-based work and conversations exploring the intersections of humanities and technology, social and natural sciences. Capstone projects emphasize design thinking;

collaboration; communication; hands-on prototyping; testing; assessing. Learners will engage in individual and team project work and conversations that will demonstrate proficiency based on the learner's experience, goals, and learning needs. Permission of department required. **Credits:** 4.00 to 8.00

PTEC 40801 - Capstone And Planning I

Credit Hours: 3.00. Part one of the final in a series of transdisciplinary, real-world, project-based work and conversations exploring the intersections of humanities and technology, social and natural sciences. Capstone projects emphasize design thinking; collaboration; communication; hands-on prototyping; testing; assessing. Learners will engage in individual and team project work and conversations that will competency proficiency based on the learner's experience, goals, and learning needs. **Credits:** 3.00

PTEC 40802 - Capstone And Planning II

Credit Hours: 3.00. Part two of the final in a series of transdisciplinary, real-world, project-based work and conversations exploring the intersections of humanities and technology, social and natural sciences. Capstone projects emphasize design thinking; collaboration; communication; hands-on prototyping; testing; assessing. Learners will engage in individual and team project work and conversations that will competency proficiency based on the learner's experience, goals, and learning needs. **Credits:** 3.00

Portuguese

PTGS 10100 - Portuguese Level I

Credit Hours: 3.00. A beginning course in Portuguese. **Credits:** 3.00

PTGS 10200 - Portuguese Level II

Credit Hours: 3.00. Continuation of PTGS 10100. **Credits:** 3.00

PTGS 10500 - Accelerated Portuguese

Credit Hours: 3.00. Accelerated acquisition of basic Portuguese for speakers of Spanish or another romance language. Capitalizes on students' backgrounds in related languages to build skills in listening comprehension, reading comprehension, basic writing, and conversation. Knowledge of a romance language. **Credits:** 3.00

PTGS 20100 - Portuguese Level III

Credit Hours: 3.00. An intermediate Portuguese course with emphasis on communicative skills (listening and speaking), literacy skills (reading and writing) and culture. **Credits:** 3.00

PTGS 20200 - Portuguese Level IV

Credit Hours: 3.00. Continuation of PTGS 20100. **Credits:** 3.00

PTGS 23500 - Luso-Brazilian Literature In Translation

Credit Hours: 3.00. Reading and discussion of selected masterpieces of Brazilian and Portuguese literature, with an emphasis on transatlantic cultural traditions and creative responses to contemporary social challenges. Knowledge of Portuguese not required. **Credits:** 3.00

PTGS 30100 - Portuguese Level V

Credit Hours: 3.00. Continued development of Portuguese speaking, listening, reading and writing abilities, using materials dealing primarily with everyday life and civilization in the Portuguese-speaking countries from a variety of sources (e.g., newspapers, magazines, TV, recent literature, etc.). Conducted primarily in Portuguese. **Credits:** 3.00

PTGS 30200 - Portuguese Level VI

Credit Hours: 3.00. Further work to develop speaking, listening, reading, and writing abilities in Portuguese on the basis of materials dealing primarily with the ideas and events that have shaped present-day Portuguese-speaking countries. Conducted primarily in Portuguese. **Credits:** 3.00

PTGS 33000 - Brazilian, Portuguese, And African Cinema

Credit Hours: 3.00. Screening and analysis of selected films from Portuguese-speaking countries: Brazil, Portugal, Angola, Mozambique, Cape Verde, Guinea-Bissau, S. Tome and Principe, with discussion of their cultural contexts (colonial/post-colonial societies; cross-Atlantic relationships; racial diversity; minority/majority issues). Knowledge of Portuguese not required. **Credits:** 3.00

PTGS 39800 - Topics In Portuguese

Credit Hours: 3.00. Advanced studies of particular aspects of Portuguese (e.g., culture, civilization, literature, linguistics, film, art, politics, etc.) by examining a varied selection of works. Readings, discussion, and papers in Portuguese. **Credits:** 3.00

PTGS 39900 - Special Study Abroad Credit In Portuguese

Credit Hours: 1.00 to 4.00. This course number is for assignment after the fact of credits in Portuguese earned while enrolled at a foreign university on a Study Abroad program which cannot be appropriately accommodated under an established Purdue course number. It is not for use for courses offered at or conducted by Purdue. **Credits:** 1.00 to 4.00

PTGS 49800 - Advanced Topics In Portuguese

Credit Hours: 3.00. Advanced studies of particular aspects of Portuguese (e.g., culture, civilization, literature, linguistics, film, art, politics, etc.) by examining a varied selection of works. Readings, discussion, and papers in Portuguese. **Credits:** 3.00

PTGS 55100 - Brazilian Poetry

Credit Hours: 3.00. A survey of the major currents and most important writers of Brazilian poetry. Readings include Gregorio de Matos, Goncalves Dias, Castro Alves, Mario de Andrade, Manuel Bandeira, and Cecilia Meireles. Permission of instructor required. **Credits:** 3.00

PTGS 55500 - Brazilian Drama

Credit Hours: 3.00. A survey of the primary movements and most important works of Brazilian theatre. Readings include plays by Nelson Rodrigues, Dias Gomes, Ariano Suassuna, and Jorge Andrade. Permission of instructor required. **Credits:** 3.00

PTGS 55700 - Brazilian Fiction

Credit Hours: 3.00. A survey of the development and major texts of Brazilian fiction. Readings include novels or short stories by Jose de Alencar, Machado de Assis, Graciliano Ramos, and Clarice Lispector, among others. Permission of instructor required. **Credits:** 3.00

PTGS 59000 - Directed Reading In Portuguese

Credit Hours: 1.00 to 4.00. Directed readings in Portuguese. Permission of instructor required. **Credits:** 1.00 to 4.00

PTGS 59400 - Special Topics In Luso-Brazilian Literature

Credit Hours: 1.00 to 4.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 4.00

Psychological Sciences

PSY 1200N - Introduction To Psychology

Credit Hours: 3.00. This foundational course introduces students to psychology as a systematic and scientific way to think about the biological and social aspects of behavior and mental processes. Topics include Research Methods, Behavioral Neuroscience, Sensation/Perception, Learning, Memory, Cognition and Language, Motivation/Emotion, Personality, Social, Stress and Health, Psychological Disorders and Treatment, and Life-Span Development.**Credits:** 3.00

PSY 10000 - Introduction To The Science And Fields Of Psychology

Credit Hours: 1.00. An introduction to psychology as a science and as a profession. **Credits:** 1.00

PSY 12000 - Elementary Psychology

Credit Hours: 3.00. Introduction to the fundamental principles of psychology, covering particularly the topics of personality, intelligence, emotion, abnormal behavior, attention, perception, learning, memory, and thinking. As part of their learning experience, students participate in psychological experiments. CTL:ISH 1020 Introduction To Psychology **Credits:** 3.00

PSY 12300 - Beyond Mental Health: The Science Of Well-Being

Credit Hours: 3.00. This course seeks to provide a scientific and psychological account of well-being - its definition, determinants, and outcomes. We address questions such as: How do we go about measuring happiness? Can happiness enhance longevity and health? What interventions can promote happiness? What types of societies are happier? This course will engage and challenge students not only intellectually, but also experientially as we work on enhancing happiness in our lives and in the lives of others around us. **Credits:** 3.00

PSY 20000 - Introduction To Cognitive Psychology

Credit Hours: 3.00. A survey of psychology as the science of mental life, covering theories and research in perception, reading, attention, consciousness, imagery, memory and its improvement, problem solving, creativity, decision-making, and artificial intelligence. **Credits:** 3.00

PSY 20100 - Introduction To Statistics In Psychology

Credit Hours: 3.00. An introduction to the development and application of statistical, quantitative, and measurement techniques pertinent to the psychological sciences. Fundamental concepts of numerical assignment, sampling theory, distribution functions, experimental design, inferential procedures, and statistical control. Should be taken at Purdue University, West Lafayette.**Credits:** 3.00

PSY 20300 - Introduction To Research Methods In Psychology

Credit Hours: 3.00. The use of scientific method in psychology. Lecture covers principles of collecting and interpreting data, using examples of research from many areas of psychology. In the laboratory portion, the student uses many different techniques from various areas of psychology. Should be taken at Purdue University, West Lafayette.**Credits:** 3.00

PSY 22200 - Introduction To Behavioral Neuroscience

Credit Hours: 3.00. An introduction to how the nervous system controls behavior. Topics include evolution and comparative psychobiology, the neuroscience of sensation and perception, the neuroscience of motivation, neuropsychology, and cognitive neuroscience. **Credits:** 3.00

PSY 23099 - Cooperative Education Seminar I

Credit Hours: 1.00 or 2.00. (ENGR 23099) This seminar course is optional for Co-Op students when they are on-campus. In this course, students share their work experiences, receive feedback from the instructor and seminar participants, and continue their professional development. Prerequisite: Student must have completed at least one Co-Op work term. May be repeated once after the second work term. Can be taken for two credits subsequent to completing two back-to-back work terms. Instructor permission required. **Credits:** 1.00 or 2.00

PSY 23500 - Child Psychology

Credit Hours: 3.00. Not open to students with credit in PSY 36000. General principles of children's behavior and development, from conception to adolescence, including sensory and motor development, and basic psychological processes such as learning, motivation, and socialization. **Credits:** 3.00

PSY 23900 - The Psychology Of Women

Credit Hours: 3.00. The purpose of the course is to provide an overview of the psychology of women. Topics include stereotyping, women and achievement, aggression and power, the psychological concept of androgyny, and attitudes toward feminism. **Credits:** 3.00

PSY 24000 - Introduction To Social Psychology

Credit Hours: 3.00. Not open to students with credit in SOC 34000. A broad survey in current knowledge about human social behavior. Topics covered include aggression, attraction and love, social influence, attitudes and attitude change, nonverbal communication, leadership, prejudice and discrimination, and application of social psychology to law, medicine, and other fields. CTL:ISH 1024 Social Psychology **Credits:** 3.00

PSY 24400 - Introduction To Human Sexuality

Credit Hours: 3.00. This course will provide a broad survey of research on human sexuality from a psychosocial perspective. Topics covered include research methods, gender identity, sexual orientation, reproductive anatomy, typical and atypical sexual behavior, and sexual difficulties and their treatments. CTL:ISH 1022 Human Sexuality **Credits:** 3.00

PSY 27200 - Introduction To Industrial-Organizational Psychology

Credit Hours: 3.00. Survey of psychological principles and research methods relevant to organizations and industry. Topics covered include research methodology, individual differences, personnel selection, performance measurement, training, motivation, job satisfaction, emotions, work stress, and leadership. **Credits:** 3.00

PSY 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in psychological sciences. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

PSY 29200 - Topics In Psychology

Credit Hours: 1.00 to 3.00. Various introductory-level topics in Psychology that may be offered on a semester-by-semester basis by Purdue Psychological Sciences faculty or by non-Purdue faculty/instructors as part of a student's study abroad program. **Credits:** 1.00 to 3.00

PSY 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in psychological sciences. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

PSY 30500 - Understanding And Analyzing Psychological Data

Credit Hours: 3.00. This course is an upper level undergraduate statistics course for students in psychology and related fields who are interested in conducting or understanding quantitative research. Students should have successfully completed an introductory statistics course (e.g., PSY 20100). The course will begin with an accelerated review of fundamentals concepts (e.g., data visualization, central limit theorem, probability) and then will focus primarily on regression. **Credits:** 3.00

PSY 30600 - Understanding And Analyzing Experiments

Credit Hours: 3.00. This course helps to prepare students for independent research. Students (1) develop an understanding of group-based statistical analyses, such as t-tests and ANOVA; (2) formulate and present a research idea based on statistical tools covered in class; and (3) get experience using statistical software to analyze data.**Credits:** 3.00

PSY 31000 - Sensory And Perceptual Processes

Credit Hours: 3.00. A survey of the study of psychological experiences caused by stimulation to the senses. Topics include theory and research in seeing, hearing, touching, smelling, and tasting as experienced by humans and other animals. **Credits:** 3.00

PSY 31100 - Human Memory

Credit Hours: 3.00. A survey of theories and research about how humans remember information and why they often forget. Topics include research on amnesia, forgetting, and sensory memory systems as well as on practical issues such as how to improve memory. **Credits:** 3.00

PSY 31400 - Introduction To Learning

Credit Hours: 3.00. This course attempts to make clear the theoretical and practical implications of learning principles and findings. Various theories of learning are examined and the implications of these theories, and the learning approach generally, for a variety of practical problems are emphasized. **Credits:** 3.00

PSY 32400 - Introduction Cognitive Neuroscience

Credit Hours: 3.00. (SLHS 30100) Introduction to the neural bases of complex human mental abilities. Emphasis on integrating research from cognitive science, brain-scanning techniques, and the lesion technique. Topics include perception, attention, memory, language, motor control, planning/decision-making and consciousness. **Credits:** 3.00

PSY 32700 - Psychology Of Helping

Credit Hours: 3.00. This course is designed to provide a broad but rigorous, undergraduate-level comprehensive overview of contemporary scientific research on prosocial processes from the perspective of personality and social psychology. **Credits:** 3.00

PSY 33099 - Cooperative Education Seminar II

Credit Hours: 1.00 or 2.00. This seminar course is optional for Co-Op students when they are on-campus. In this course, students share their work experiences, receive feedback from the instructor and seminar participants, and continue their professional development. Permission of instructor required. **Credits:** 1.00 or 2.00

PSY 33200 - Forensic Psychology

Credit Hours: 3.00. The study of the production and application of psychological knowledge and research findings within the civil and criminal justice systems, including the use of psychological science to resolve legal issues.**Credits:** 3.00

PSY 33500 - Stereotyping And Prejudice

Credit Hours: 3.00. This course examines the topics of stereotyping, prejudice, and discrimination from a social psychological perspective. Relying on empirical findings and relevant theoretical approaches, the course moves beyond lay opinions to explore the social psychological foundations and forms of stereotyping and prejudice, and to examine various strategies for reducing intergroup biases. **Credits:** 3.00

PSY 33600 - Issues In Developmental Psychology

Credit Hours: 3.00. Survey of current issues in developmental psychology and methods for studying these problems. The topics selected for intensive examination reflect contemporary developmental research issues and may involve different-aged children or adults. **Credits:** 3.00

PSY 33700 - Social Cognition

Credit Hours: 3.00. A survey of theory and research on the role of thought processes in social behavior (a combination of social and cognitive psychologies). Topics include causal attribution, person perception, stereotyping, impression formation, event memory, and social judgment. **Credits:** 3.00

PSY 34200 - Introduction To Psychology Of Personality

Credit Hours: 3.00. This course integrates empirical studies (observational, correlational, experimental) with classical and current personality theories. Topics include the biological foundations of personality, self-esteem, extraversion, sex role orientation, authoritarianism, and personality disorders. Minimum competence is assumed in basic experimental design and correlations. **Credits:** 3.00

PSY 35000 - Abnormal Psychology

Credit Hours: 3.00. Various forms of mental disorders from the standpoint of their origin, treatment, prevention, social significance, and relation to problems of normal human adjustment. CTL:ISH 1023 Abnormal Psychology **Credits:** 3.00

PSY 35200 - Introduction To Neuropsychology

Credit Hours: 3.00. This course is an examination of the effects of various types of brain damage on human behavior, the methods used to assess brain damage, and evaluation of research studies on human brain damage and behavior. **Credits:** 3.00

PSY 35400 - Close Relationships

Credit Hours: 3.00. This course introduces undergraduate college students to major topics in psychological research on intimate relationships. There are many types of close relationships. This primarily focuses on relationships that currently are, will be soon, or at one point were, romantic involvements. A goal is to educate students on current research findings concerning intimate relationships. **Credits:** 3.00

PSY 36700 - Adult Development And Aging

Credit Hours: 3.00. Theory and research on adult development from young adulthood through the elderly years. Course covers biological, cognitive, personality, and social issues. Topics include vocational choice, marriage, parenthood, the empty nest, menopause, memory and aging, retirement, widowhood, longevity, and death and dying. **Credits:** 3.00

PSY 37600 - Attention And Cognitive Control

Credit Hours: 3.00. This upper-level undergraduate course provides an overview of research and theory related to attention and cognitive control. The first half of the course focuses on selective attention to locations, objects, and features, as well as the role of attention in memory and skilled performance. The second half focuses on divided attention and cognitive control in multitasking situations, as well as aspects of adaptive, hierarchical, and inhibitory control. The goal of the course is to provide you with an understanding of major theoretical views, key experimental findings, and common research procedures related to attention and cognitive control. **Credits:** 3.00

PSY 38000 - Behavior Change Methods

Credit Hours: 3.00. Application of behavioral learning principles to problems in living. Self-paced learning format covers design and evaluation of behavior modification programs, with practical and ethical issues. Relevant to work with children, adults, clinical patients, athletes, etc., in schools, institutions, and everyday situations. **Credits:** 3.00

PSY 39000 - Research Experience In Psychology

Credit Hours: 1.00 to 3.00. Involvement in an ongoing research project in the Department of Psychological Sciences. Up to 6 credits may be taken for a letter grade. Additional credits after 6 must be taken as Pass/No Pass. Permission of instructor required. **Credits:** 1.00 to 3.00

PSY 39100 - Readings In Psychology

Credit Hours: 1.00 to 3.00. In-depth reading on a specific topic in psychology under the guidance of a faculty member, often in preparation for PSY 49800. Permission of instructor required.**Credits:** 1.00 to 3.00

PSY 39200 - Special Topics In Psychology

Credit Hours: 1.00 to 3.00. Various topics that may change from semester to semester are presented by Psychological Sciences department faculty. **Credits:** 1.00 to 3.00

PSY 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in psychological sciences. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

PSY 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in psychological sciences. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

PSY 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in psychological sciences. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

PSY 39800 - Independent Research In Psychology

Credit Hours: 3.00. Students will conduct an independent research project related to research that is ongoing in the lab. Students will discuss theories and ideas related to the project, and plan and execute a thesis. Duties may include data coding and entry; participating in the planning of the research and the development of research materials; executing the research with responsibility for all aspects of data collection. Students are expected to be involved in the research project for an average of nine hours per week. Permission of instructor required.**Credits:** 3.00

PSY 40100 - Language And The Brain

Credit Hours: 3.00. (SLHS 40100) This course is an overview of the neutral systems that underlie the core components of language, including speech perception and production, reading and writing, morphology, syntax, semantics, and discourse. During the past few decades, there has been an unprecedented increase in studies on these topics, due in large part to the widespread use of highly sensitive brain mapping techniques that enable researchers to identify relationships between particular brain areas and particular language functions. The findings that have been emerged from this recent explosion of research are exciting and important for several reasons. They provide fresh insights into the nature of the uniquely human capacity for language, and they have significant implications for understanding and treating language disorders that result from brain injury. **Credits:** 3.00

PSY 40300 - Psycholinguistics

Credit Hours: 3.00. (PSY 40300) This course aims to introduce students to the current, research-based understanding of how different aspects of language (such as word perception, language acquisition, or speech production) are represented in the mind. In addition, it will introduce some of the research methods employed by language scientists for gaining insight into such a

representation. This course also aims to help students learn how to critically evaluate research data used to support various theories about psychological and neural foundations of language knowledge. **Credits:** 3.00

PSY 40400 - Honors Research Seminar I

Credit Hours: 3.00. Part one of a research series aimed at providing a structured learning experience to help students develop the basic research skills needed in order to conduct psychological research. Students will be expected to develop a research plan to be completed in concert with PSY 40500. Permission of department required. **Credits:** 3.00

PSY 40500 - Honors Research Seminar II

Credit Hours: 3.00. Part two of a research series aimed at providing a structured learning experience to help students develop the basic research skills needed in order to conduct psychological research. Students will be expected to develop a research plan to be completed in concert with PSY 40400. Permission of department required. **Credits:** 3.00

PSY 41800 - Understanding Autism

Credit Hours: 3.00. (HDFS 41800, SLHS 41800) This course will explore the etiology, neuroscience, diagnosis, and treatment of autism spectrum disorder (ASD). Approached from a multi-disciplinary perspective this course brings together gene, brain, and behavioral sciences with the aim of developing a better understanding of autism. The course will begin with an overview of ASD as a complex behavioral phenotype. This will include discussion of the history of ASD and the expansion of the diagnostic criteria associated with the disorder. This introduction will be followed by several classes in which we will examine some of the key domains of impairment in ASD: reciprocal social interaction, language and communication, and restricted and repetitive behaviors. We will also consider the deficits associated with, but not defining of ASD, and examine co-morbid conditions frequently present in individuals with ASD. We will then address the topics of brain architecture, neurochemistry, and genetics and gene expression, all of which we will attempt to relate back to the behavioral features of autism. We will end the course with a review of treatment practices and their efficacy and an examination of impact of ASD on the family and society. **Credits:** 3.00

PSY 42100 - Alcohol Use And Disorders

Credit Hours: 3.00. The goal of this course is to provide students with a broad understanding of the biological bases of alcohol abuse and alcoholism. The course will cover neuroanatomical, neurochemical and biological systems that regulate the biological and behavioral response to alcohol. Coverage will also include discussions of the role of environment, age, gender, among other factors that influence the response to alcohol and propensity toward abuse and addiction. The course will also cover the neuroscience of treatment and relapse. **Credits:** 3.00

PSY 42200 - Genes and Behavior

Credit Hours: 3.00. An examination of genetic influences on behavior, including the mechanisms of genetic influence, methods of gene manipulation, and the role of genes in development and evolution. Genetic influences on mental illness, learning, memory, and intelligence are considered. **Credits:** 3.00

PSY 42600 - Language Development

Credit Hours: 3.00. (SLHS 30900) Specific nature, sequence, and pattern of oral language development from birth through adolescence. Nature of language acquisition and approaches to the study of children's language are presented. Linguistic and psychological explanations of the sequence of development are discussed. **Credits:** 3.00

PSY 42800 - Drugs And Behavior

Credit Hours: 3.00. Discussion of the variety of drugs that affect the nervous system and behavior. Emphasis will be upon a discussion of the physiological and pharmacological bases for the use and misuse of drugs in our society. **Credits:** 3.00

PSY 42900 - Hormones And Behavior

Credit Hours: 3.00. Discussion of the mechanisms and effects of endocrine hormones and brain peptides on sexual differentiation, sexual behavior, learning, response to stress, maternal behavior, and weight regulation. **Credits:** 3.00

PSY 43099 - Cooperative Education Seminar III

Credit Hours: 1.00 or 2.00. This seminar course is optional for Co-Op students when they are on-campus. In this course, students share their work experiences, receive feedback from the instructor and seminar participants, and continue their professional development. Permission of instructor required. **Credits:** 1.00 or 2.00

PSY 43200 - Social Psychology In Film

Credit Hours: 3.00. This course examines theory and research in experimental social psychology and uses popular films to assist in provoking thought and analysis of the theory and research. **Credits:** 3.00

PSY 43400 - Neurobiology Of Disease

Credit Hours: 3.00. This course explores the neurobiological basis of disorders of the nervous system and psychiatric disease. Students will learn various neurological disorders that affect behavior, the associated cellular and molecular mechanisms, and current treatment strategies. **Credits:** 3.00

PSY 43600 - Foods And Behavior

Credit Hours: 3.00. This course examines aspects of the scientific study of eating and drinking; its effects on individual health and well-being; broader implications of psychology, culture and society on eating and drinking; the effects of food policy on food and beverage intake and well-being. Topics to be covered include physiological signals affecting hunger and satiety, social norms and influences regarding food intake, identifying sources of food and its constituents, disordered food intake, malnutrition, poverty and food, and the influence of food and agriculture industries on food choices and consumption. **Credits:** 3.00

PSY 43700 - Behavioral And Neural Systems Of Learning And Memory

Credit Hours: 3.00. The purpose of this course is to integrate insights on learning and memory from behavioral and neuroscience perspectives based on animal and human research. How brain regions underlie different categories of learning will be covered. Discussions on how these types of learning contribute to clinical disorders, such as anxiety and addiction disorders. **Credits:** 3.00

PSY 43800 - Introduction To Clinical Psychology

Credit Hours: 3.00. This course introduces students to the field of clinical psychology and will provide a broad overview of the roles and responsibilities that fall under the rubric of clinical psychology, with a particular emphasis on psychological assessment and intervention. Focus is on the professional responsibilities of a clinical psychologist (i.e., how clinical psychology is applied in practice), rather than the study of psychopathology per se. **Credits:** 3.00

PSY 44300 - Aggression And Violence

Credit Hours: 3.00. An intensive examination of the nature of human aggression. Among the topics covered will be (1) theoretical perspectives concerning such behavior; (2) social conditions that encourage its performance; and (3) means for its prevention and control. **Credits:** 3.00

PSY 46400 - Research Ethics In Psychological Sciences

Credit Hours: 3.00. Research Ethics broadly refers to the application of everyday values, such as fairness, honesty, and objectivity to scientific research. This course is designed to provide broad coverage of the ethical standards that research scientists must follow and allow exploration of various real-world ethical issues in the psychological sciences. **Credits:** 3.00

PSY 47300 - Selection And Performance Appraisal In Organizations

Credit Hours: 3.00. Classic and current issues in employee selection and the appraisal of employee performance will be discussed. Topics addressed will include: Equal Employment Opportunity and unfair discrimination, developing effective selection and placement strategies, evaluating employee performance, and understanding the performance appraisal process.**Credits:** 3.00

PSY 47500 - Work Motivation And Job Satisfaction

Credit Hours: 3.00. Psychological processes and current theories of work motivation and job satisfaction and their practical implications. **Credits:** 3.00

PSY 48400 - The Psychology Of Consciousness

Credit Hours: 3.00. A survey of psychological experiments and theory in consciousness. An emphasis is placed on altered states of consciousness such as dreaming, hypnosis, drug-induced changes in consciousness, and meditation; and comparison with ordinary consciousness is made. **Credits:** 3.00

PSY 49200 - Internship In Psychology

Credit Hours: 3.00. Experiential, supervised training in various areas of psychology-related fields including human factors, human resources, mental health-related organizations, research labs, and supervised living institutions. Usually taken in junior or senior year. Permission of instructor required.**Credits:** 3.00

PSY 49800 - Senior Research

Credit Hours: 3.00. Student conducts and writes a report on an individual research project under the guidance of a faculty member. Permission of instructor required. **Credits:** 3.00

PSY 50600 - Professional Issues And Trends In Social Psychology

Credit Hours: 3.00. This course is designed to help students acculturate to and acquire a broad knowledge of social psychological research. Topics to be covered include but are not limited to: how to apply for academic jobs, how to present your program of research, how to network at conferences, how to develop a website presence, how to approach potential collaborators, and how to structure your research questions in an appropriate manner for grant applications. Permission of department required. **Credits:** 3.00

PSY 50700 - Current Readings In Social Psychology

Credit Hours: 3.00. This course is designed to expose students to a variety of readings, discussions, and presentations. The seminar examines a diverse assortment of social psychological topics. Students benefit from exposure to current research and methods in the field. Students also benefit from becoming increasingly conversant regarding the latest empirical advances in the field. Permission of department required. **Credits:** 3.00

PSY 51100 - Psychophysics

Credit Hours: 3.00. (ECE 51100) An examination of the relationship between physical stimuli and perception (visual, auditory, haptics, etc.). Includes a review of various methods for studying this relationship and of the mathematical and computational tools used in modeling perceptual mechanisms. Permission of instructor required. **Credits:** 3.00

PSY 51200 - Neural Systems

Credit Hours: 3.00. (SLHS 50700, BIOL 56200) Background in cell biology, psychobiology, physiology, or anatomy is recommended. Overview of the structure and function of neural systems including those involved with motor, somatosensory, visual, auditory, learning, memory, and higher cortical processes. Molecular and cellular aspects of neural function are integrated with discussion of relevant neuroanatomy. Permission of instructor required. **Credits:** 3.00

PSY 51300 - Introduction To Computational Cognitive Neuroscience

Credit Hours: 3.00. Computational cognitive neuroscience is a new field of study that lies at the intersection of computational neuroscience and the similar fields of machine learning, neural network theory, connectionism, and artificial intelligence. Like computational neuroscience, computational cognitive neuroscience strives for neurobiological accuracy and like connectionism, a major goal is to account for behavior. Covered topics include feature extraction / optimization, connectionism, computational neuroscience, and computational cognitive neuroscience applications. Permission of department required. **Credits:** 3.00

PSY 51400 - Introduction To Mathematical Psychology

Credit Hours: 3.00. This course introduces the student to the field of mathematical modeling of psychological processes. Mathematical techniques employed in modeling are learned, and a number of mathematical models and theories that have been developed and employed in various important areas of experimental psychology are explained. An introduction to problems in theory and model testability also is given. **Credits:** 3.00

PSY 51500 - Neuroscience Of Consciousness

Credit Hours: 3.00. How does your brain generate your uniquely subjective experience of the world? Is it possible to identify distinct neurophysiological markers of your awareness of a particular sight, sound, taste, or touch? What is the cortical basis of your sense of being a self with a first-person point of view that is spatiotemporally grounded in a body? How does consciousness relate to attention and working memory? Does consciousness have an adaptive function? Might a person in a coma or a vegetative state still have some form of awareness? Could a computer or a robot ever have what we would consider to be genuine experiences? During the past few decades, these and other questions about the nature of consciousness have been the focus of increasing empirical and theoretical research in neuroscience and other disciplines. The main purpose of the course is to introduce students to this exciting field of inquiry by exposing them to a variety of representative books and articles in the literature. The "backbone" of the course will be Stanislas Dehaene's Consciousness and the brain: Deciphering how the brain codes our thoughts (2014). As we go through the course, we will use each successive chapter in this book as the starting point for a deeper and wider exploration of the given topic(s), bringing into our discussion relevant experimental findings and philosophical perspectives from other investigators. Requirements: Students will take turns guiding discussions and will also write 1-2 page "response papers" to the weekly readings. Permission of department required. **Credits:** 3.00

PSY 52200 - An Introduction To Pediatric Psychology

Credit Hours: 1.00. This course is designed for the clinical psychologist who desires to become acquainted with the field of pediatrics as it is seen by the practicing pediatrician. The student will be introduced to common medical terminology, literature, and interrelated pediatric and psychological problems. Permission of instructor required. **Credits:** 1.00

PSY 55600 - Job Design

Credit Hours: 3.00. (IE 55600) Task analysis, personnel selection and training, job and organizational design, and criteria development and use. Human factors related to job design in order to increase job satisfaction and productivity. **Credits:** 3.00

PSY 57700 - Human Factors In Engineering

Credit Hours: 3.00. (IE 577) Survey of human factors in engineering, with particular reference to human functions in human-machine systems, and consideration of human abilities and limitations in relation to design of equipment and work environments. Primarily for engineers and other non-psychology majors. **Credits:** 3.00

PSY 58100 - Neuroethics

Credit Hours: 3.00. Neuroscience research has led to a better understanding of the neuronal basis of behavior. The knowledge, together with new technological approaches that can predict and even control some aspects of human behavior, can have a major impact on social and legal policies. The course explores ethical, social, and legal implications of the use of new technological and pharmacological advances in brain research. Permission of department required. **Credits:** 3.00

PSY 59100 - Topics In Psychology

Credit Hours: 1.00 to 3.00. Various topics that may change from semester to semester are presented by faculty in the Department of Psychological Sciences. **Credits:** 1.00 to 3.00

PSY 60000 - Statistical Inference

Credit Hours: 3.00. Emphasis is given to principles underlying both parametric and nonparametric inference. **Credits:** 3.00

PSY 60100 - Correlation And Experimental Design

Credit Hours: 3.00. Continuation of PSY 60000 with emphasis upon the design and analysis of experiments. Prerequisite: PSY 60000. **Credits:** 3.00

PSY 60300 - Psychopharmacology

Credit Hours: 3.00. This course will cover core pharmacology concepts and principles, such as neurotransmitters, receptors, drug classes, and mechanisms of drug action, while highlighting recent findings related to pharmacogenetics and sex/gender differences in psychopharmacology. There will also be a primary focus on drug therapy for major psychiatric disorders including addiction, depression, anxiety and schizophrenia. Prerequisites: (BIOL 56200 and PSY 51200) or PSY 61500 or MCMP 57000. **Credits:** 3.00

PSY 60500 - Applied Multivariate Analysis

Credit Hours: 3.00. A survey of the most frequently employed multivariate research techniques, such as multivariate generalizations of univariate tests and analysis of variance, principal components, canonical analysis, and discriminant analysis. A central theme of the course is the general linear model, both univariate and multivariate. A multipurpose program for this

model provides the student with practical experience in conducting multivariate research. Some prior exposure to elementary matrix algebra is recommended. Prerequisite: PSY 60000. **Credits:** 3.00

PSY 60600 - Special Topics In Quantitative Psychology

Credit Hours: 3.00. A seminar covering such topics as linear models, statistical decision-making, and multidimensional scaling. Permission of instructor required. **Credits:** 3.00

PSY 60601 - ANOVA For The Behavioral Sciences

Credit Hours: 3.00. This course is a first-semester graduate statistics course for students in psychology and related fields who conduct quantitative research. The course involves an accelerated review of fundamental concepts (e.g., data visualization, central limit theorem probability), after which the course will focus on statistical techniques for between- and within-person designs that include categorical independent variables (e.g., t-tests, ANOVA). Permission of department required. **Credits:** 3.00

PSY 60700 - Scaling And Measurement

Credit Hours: 3.00. An introduction to the theory of measurement and a survey of modern scaling methods (unidimensional and multidimensional, metric and nonmetric) within the framework of the modern theory of measurement. Some prior exposure to elementary matrix and set algebra is recommended. **Credits:** 3.00

PSY 60800 - Measurement Theory And The Interpretation Of Data

Credit Hours: 3.00. The theory of measurement and the development of reliability and the Spearman-Brown equations, true scores and variables, and correction for attenuation. Variance or covariance of combinations of variables. Item analysis and test construction strategies. Reliability and validity of measurements and the influence of measurement error and measurement threats to research design. Prerequisite: PSY 60000. **Credits:** 3.00

PSY 60901 - Multilevel Modeling

Credit Hours: 3.00. This course familiarizes students with (1) generalized linear mixed (multilevel) models that are often used in the social sciences, and (2) best practices in the models' applications and interpretations. These models are extensions of classic linear regression models, and they go by many names: multilevel modes, hierarchical models, mixed models, etc. Throughout the course, models and methods will be introduced conceptually and will be illustrated using real and simulated data. Prerequisites: graduate coursework in regression and ANOVA, or by permission. Permission of department required. **Credits:** 3.00

PSY 61000 - Multivariate Analysis In The Behavioral Sciences

Credit Hours: 3.00. This is an advanced doctoral-level statistics course that examines the application of multivariate methods to the analyses of organizational data. Topics include: matrix algebra, the general linear model, multivariate analysis of variance, canonical correlation, discriminant function analysis, and factor/component analysis. Prerequisite: Grade of B or higher in (PSY 60000 and PSY 60100) or (STAT 51200 and STAT 51400) or (HDFS 68500 and PSY 63100). **Credits:** 3.00

PSY 61501 - Systems And Behavioral Neuroscience

Credit Hours: 4.00. This course will provide you with a broad introduction to the field of neuroscience and how it can inform our understanding of behavior. First, we will cover neuroanatomy, synaptic communication, and plasticity. Next, we will cover neuroscience research on a range of major topics relevant to behavior: emotion, motivation, attention, learning, decision-making, and social cognition. This course will also provide a brief introduction to a variety of neuroscience research methods that are

commonly used in animal and human research (e.g., electroencephalography, magnetic resonance imaging), including tutorials and live demonstrations. Permission of department required. **Credits:** 4.00

PSY 61601 - Neurobiology Of Brain Disorders

Credit Hours: 4.00. This course covers cellular and molecular mechanisms associated with alterations in brain function and human behavior linked to the most common neurological and psychiatric disorders. Students will learn about genetic, pharmacological, and physiological mechanisms related to the etiology, expression, and treatment of brain disorders. Permission of department required. **Credits:** 4.00

PSY 62101 - Genes, Brain And Behavior

Credit Hours: 3.00. This course examines how genes regulate development and function of the brain to ultimately influence behavior. Genetics has come to be an important aspect of research in almost every field of Neuroscience and Psychology ranging from neural development to cognitive function and dysfunction. However, many students have not had the opportunity to explore this in their studies to date. Therefore, the goal of this course is to provide students with the background needed to understand and think critically about the genetic components of Neuroscience and behavioral research. Numerous questions will be explored mainly through discussion of research papers. Lectures by the professor will fill in background knowledge needed to understand the readings. The questions explored will include: What are chromosomes and genes? What do they do? How do they do it? How do genes control development of the brain? How are single genes manipulated in animals to study their effects on behavior? How can genes associated with normal or abnormal behavior be identified? What has been learned from gene-behavior studies in animals? in humans? What do these studies tell us about the nature-nurture controversy? In addition to exploring these more traditional aspects of behavioral genetics we will address the three most exciting recent developments. These include the use of transgenic primate models, selective remote control of specific neural circuits using optogenetics and chemogenetics, and epigenetics, which helps explain how environmental factors and behavior itself can change gene activity and how these changes may be transmitted from one generation to the next. Many behaviors could be used to explore the principles these questions address. The readings will be selected from papers that focus on learning & memory and mental illness. However, if students are interested in other behaviors, papers that involve those behaviors and serve our purposes can be substituted. Grading will be based mainly on informal presentations of papers and participation in discussions of these papers. Permission of department required. **Credits:** 3.00

PSY 62400 - Human Learning And Memory

Credit Hours: 3.00. Selected survey of important problems in the encoding, storage, and retrieval of laboratory and naturalistic events. **Credits:** 3.00

PSY 62500 - Complex Cognitive Processes

Credit Hours: 3.00. Surveys research and theory concerned with the nature of the "higher-order" mental processes, including decision making, categorization, problem solving, and language. Fundamental questions regarding the nature of the representations that underlie conceptual and linguistic behavior will be addressed. Permission of instructor required. **Credits:** 3.00

PSY 62601 - Bayesian Statistics For Psychological Sciences

Credit Hours: 3.00. The course will explain why you might want to use Bayesian methods instead of frequentist methods (such as t-tests, ANOVA, or regression). We discuss the basic properties and methods of Bayesian analysis and have many activities to show how Bayesian analyses are used. Prerequisites: PSY 60000 and PSY 60100. Permission of department required. **Credits:** 3.00

PSY 62800 - Perceptual Processes

Credit Hours: 3.00. This course is an advanced introduction to the psychology of perception. The course emphasizes visual and auditory perception, reviewing basic concepts, methodologies, research findings, and theoretical approaches. Theories of direct perception, constructivist perception, and computational vision are discussed in detail. **Credits:** 3.00

PSY 62901 - fMRI Design And Analysis

Credit Hours: 3.00. Introduces students to the design of fMRI experiments and fMRI data analysis. Covered topics include an introduction to MR physics, block designs, rapid-event related designs, data preprocessing, and standard analyses using the general linear model. Advanced analysis techniques such as functional connectivity and multivariate pattern analysis and common pitfalls in design and analysis will also be covered. Prerequisites: Required: Basic knowledge of inferential statistics. Recommended: Familiarity with the general linear mode (GLM) and signal processing. Permission of department required. **Credits:** 3.00

PSY 63000 - Stereotyping And Prejudice

Credit Hours: 3.00. Provides an in-depth examination of issues related to stereotyping, prejudice, and discrimination. After a general introduction and historical overview, students will be exposed to a detailed study of the social psychological foundations of stereotyping and prejudice to include their impact and reduction strategies. Permission of instructor required. **Credits:** 3.00

PSY 63100 - Multiple Regression Analysis For The Behavioral Sciences

Credit Hours: 3.00. This "data analytic" course provides an examination of the conceptual underpinnings and advanced application of multiple regression analyses to psychological data. Permission of instructor required. **Credits:** 3.00

PSY 63300 - Seminar In Experimental Psychology

Credit Hours: 2.00 to 3.00. Critical analysis of current problems in experimental psychology. Emphasis upon reviewing literature, preparing and presenting papers. Permission of instructor required. **Credits:** 2.00 to 3.00

PSY 63600 - Self And Identity

Credit Hours: 3.00. This seminar explores many issues related to the self from a social psychological perspective. The goal is to develop a better understanding of theory and research dealing with various aspects of the self. To accomplish this goal, students will learn to critically analyze research papers addressing self-related material. Department permission required. **Credits:** 3.00

PSY 63700 - Human Information Processing

Credit Hours: 3.00. This course develops the methodological tools required for an information processing approach to human behavior. These techniques are applied to such topics as reaction time, signal detection, attention, and skilled behavior, with emphasis upon unifying empirical findings. Prerequisite: PSY 60000, PSY 60100. **Credits:** 3.00

PSY 64000 - Survey Of Social Psychology I

Credit Hours: 3.00. An extensive survey of methods, research, and theory in social psychology. **Credits:** 3.00

PSY 64200 - Social Influence

Credit Hours: 3.00. Students are immersed into the exciting sub-field of social psychology: social influence through lively discussions and readings on the subject. Students will evaluate what is meant by social influence, what it includes, what it doesn't include, as well as current trends in social influence. Permission of instructor required. **Credits:** 3.00

PSY 64300 - Attitudes And Attitude Change

Credit Hours: 3.00. Considers relation of attitudes to beliefs and to behaviors. Surveys major theories of attitude formation and change as well as empirical research related to these theories. **Credits:** 3.00

PSY 64400 - Close Relationships

Credit Hours: 3.00. Acquaints participants with the major social psychological approaches to the study of close, interpersonal relationships, including evolutionary, attachment, and interdependence perspectives. Methodological and data analytic issues relevant to relationships research also are examined. **Credits:** 3.00

PSY 64600 - Seminar In Social-Personality Psychology

Credit Hours: 3.00. A seminar covering a special topic in personality or social psychology. Specific topic varies from seminar to seminar. Permission of instructor required. **Credits:** 3.00

PSY 64700 - Group Processes And Performance

Credit Hours: 3.00. Provides a survey of research concerning small group interaction and performance. Covers topics such as group problem-solving, group decision-making, group polarization, and group structure. Will also discuss group interaction and communication patterns. **Credits:** 3.00

PSY 66700 - Clinical Assessment I

Credit Hours: 4.00. Presentation of general assessment principles and methods. Supervised practice in general diagnostic and treatment procedures as applied to both children and adults. Emphasis is placed on laboratory practice in the administration and interpretation of intelligence tests; behavioral observation techniques and operant remediation procedures. Permission of instructor required.**Credits:** 4.00

PSY 66800 - Clinical Assessment II

Credit Hours: 4.00. Presentation of methods of clinical assessment including structured and unstructured personality tests, physiological recording, behavioral observation, and interview techniques. Emphasis is placed on laboratory practice in the administration and interpretation of personality tests and training in the basic clinical interview techniques. Permission of instructor required. **Credits:** 4.00

PSY 66900 - Prosocial Behavior

Credit Hours: 3.00. This course is designed to provide a broad and rigorous, graduate-level overview of contemporary scientific research on prosocial processes from the perspective of personality and social psychology. Permission of department required. **Credits:** 3.00

PSY 67000 - Principles And Techniques Of Psychotherapy

Credit Hours: 3.00. Discussion and elaboration of the main theories and techniques of psychotherapy, the application of these techniques to the change of behavior, and the analysis of clinical cases for therapy planning. **Credits:** 3.00

PSY 67300 - Psychology Of Behavior Disorders

Credit Hours: 3.00. Advanced abnormal psychology. Consideration will be given to research and theory of psychopathology. **Credits:** 3.00

PSY 67400 - Structural Equation Modeling

Credit Hours: 3.00. This is an advanced course in structural equation modeling (SEM), intended to provide doctoral students with an introductory treatment of the theory and methods of SEM. SEM is a statistical methodology that encompasses a wide variety of models, including path models, exploratory and confirmatory factor models, structural regression models, and latent growth models, among others. Prerequisites: PSY 61000 is highly recommended but not required. Permission of department required. **Credits:** 3.00

PSY 67510 - Research Methods In Clinical Psychological Sciences

Credit Hours 3.00. This course provides an in-depth introduction to the fundamentals of research methods and design, including the scientific approach and its applicability to the science of psychology to the philosophy of science, the role of theory, and hypothesis testing. Philosophical and theoretical fundamentals are discussed, followed by methodological issues. The course includes content on the replication crisis in psychology, the practices that contributed to it, and the means to overcome it, as well as issues in sampling, measurement, and design. The course will examine nonexperimental research as well as experimental and quasi-experimental approaches. Permission of department required.**Credits:** 3.00

PSY 67800 - Seminar In Clinical Psychology

Credit Hours: 2.00. Discussion of special topics in clinical psychology. Permission of instructor required. **Credits:** 2.00

PSY 67900 - Practicum In Clinical Psychology

Credit Hours: 1.00 to 6.00. This is a practicum in clinical psychology, whereby students see individuals for therapy. These cases are supervised by faculty in clinical psychology. This is a requirement for the graduate program, and students must do both adult and child practicum. Students enrolled in this program must register for this course a minimum of four times. Prerequisite: Master's student standing and Psychology majors only. Permission of instructor required. **Credits:** 1.00 to 6.00

PSY 68000 - Survey Of Industrial/Organizational Psychology

Credit Hours: 3.00. This two-semester sequence extensively surveys the various areas of industrial/organizational psychology. The first semester surveys those topics generally classified as dealing with industrial psychology (e.g., selection, placement, training, performance appraisal), and the second semester surveys organizational psychology topics (e.g., job satisfaction, motivation, leadership, decision making, role making). Course provides a critical and up-to-date review of recent and classical research in these areas. Prerequisite: Any undergraduate Statistics course and any undergraduate Social Science Research Methods course. **Credits:** 3.00

PSY 68010 - Survey Of Industrial Psychology

Credit Hours: 3.00. This seminar is designed to familiarize doctoral students with the basic areas of Industrial Psychology and Human Resource Management. The course will include a discussion and analysis of book chapters and journal articles related to key topics. The goal of this seminar is to help students develop frameworks for organizing the myriad conceptual, professional,

and technical issues associated with Industrial Psychology / Human Resource Management. Development of these frameworks is requisite for effective acquisition and integration of information provided in future seminars and development of research ideas. Permission of department required. Prerequisites: Any undergraduate Statistics course and any undergraduate Social Science Research Methods course. **Credits:** 3.00

PSY 68020 - Survey Of Organizational Psychology

Credit Hours: 3.00. The main objective of this course is to introduce doctoral students in the Industrial and Organizational Psychology program (and related disciplines) to the major areas of research in the field of organizational psychology. Additionally, the course aims to provide students an opportunity to: (1) hone their analytic and information presentation skills, and (2) gain practice in developing research ideas. We will discuss classical and contemporary issues in light of both their theoretical and practical implications for the field. The course will include presentations and (synchronous and asynchronous) discussions of assigned readings. Permission of department required. Prerequisites: Any undergraduate Statistics course and any undergraduate Social Science Research Methods course. **Credits:** 3.00

PSY 68100 - Seminar In Research Methodologies Of Industrial/Organizational Psychology

Credit Hours: 3.00. Intensive analysis of application of various research and statistical methods to the study of human behavior in organizational settings. **Credits:** 3.00

PSY 68110 - Research Methods In Industrial-Organizational Psychology I

Credit Hours: 3.00. Intensive analysis of application of various research and statistical methods to the study of human behavior in organizational settings. This course is the first part of a two-semester sequence which covers issues in research design and data analysis techniques common to I-O psychology and other applied fields. We will review the overall research process and various types of research. We will review the various threats to the validity of conclusions that can be drawn from quantitative research and how design features can help address these threats. We will spend time in class critiquing research articles. Permission of department required. **Credits:** 3.00

PSY 68120 - Research Methods In Industrial-Organizational Psychology II

Credit Hours: 3.00. This course is the second part of a two-semester sequence that covers core research methods in the social sciences focusing on Industrial/Organizational psychology, Organizational Behavior, and allied fields of Social and Personality psychology. This course sequence is designed for doctoral students who intend to conduct quantitative empirical research publishable in scholarly journals. This course begins with the philosophy of science, developing and evaluating theory, reviewing and summarizing relevant research. Topics include the examination of research methods applicable to survey data, multilevel data, and longitudinal data. The course concludes with a discussion of 'methods' (strategies) for publishing in scholarly journals. Permission from department required. Prerequisites: PSY 68110, Research Methods in Industrial-Organizational Psychology I (or equivalent) and Basic Statistics. **Credits:** 3.00

PSY 68200 - Advanced Seminar In Industrial Organizational Psychology

Credit Hours: 3.00. Special topics in industrial and organizational psychology are offered on a two-year rotating basis. The special topics are: work motivation, leadership, advanced selection and placement, and performance appraisal. One topic will be treated each semester. **Credits:** 3.00

PSY 68300 - Seminar In Industrial/Organizational Psychology

Credit Hours: 3.00. Topics vary. Permission of instructor required. **Credits:** 3.00

PSY 68800 - Research Methods In Social Psychology

Credit Hours: 3.00. This course provides a broad and rigorous, graduate-level overview of contemporary research methodology in social psychology and personality. The course follows a discussion seminar format. Permission of department required. **Credits:** 3.00

PSY 69000 - Individual Research In Psychology

Credit Hours: 1.00 to 3.00. Involvement in research design, execution, and analysis under the guidance of a faculty member. Permission of instructor required. **Credits:** 1.00 to 3.00

PSY 69100 - Readings In Psychology

Credit Hours: 1.00 to 3.00. In-depth reading into specific topic area in psychology, under the guidance of a faculty member. Permission of instructor required. **Credits:** 1.00 to 3.00

PSY 69200 - Special Topics In Psychology

Credit Hours: 1.00 to 3.00. Various topics which may change from semester to semester are presented by faculty in the Department of Psychological Sciences. **Credits:** 1.00 to 3.00

PSY 69600 - Seminar In Neuroscience

Credit Hours: 2.00. The course is designed to expose graduate students to diverse areas of most up-to-date research and hone their skills in understanding conceptual issues and tools used to study neuroscience. The students help host speakers and introduce speakers before their colloquium talk. The students will also formally present their own research to the area faculty and students once each year, at a level appropriate to their years in the program. Lastly, each student will write a "journal club" style paper on a recently published empirical study. Permission of instructor required. **Credits:** 2.00

PSY 69700 - Clinical Psychology Internship

Credit Hours: 0.00. Clinical psychology internship. Open only to Clinical Psychology students in approved internship facilities. Permission of instructor required. **Credits:** 0.00

PSY 69710 - Clinical Psychology Internship

Credit Hours: 3.00. Clinical psychology internship. Open only to Clinical Psychology students in approved internship facilities. Permission of instructor required.**Credits:** 3.00

PSY 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

PSY 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Public Health

PUBH 120AN - Culture, Health And Happiness

Credit Hours: 3.00. In the US we don't have one culture. We have regional cultures which influence our environmental and health. Students of all majors can learn about mortality patterns in different cultural regions of the country, and learn to use concept maps to understand cultural influences on those patterns in death.**Credits:** 3.00

PUBH 10000 - Introduction To Public Health

Credit Hours: 1.00. This course serves as an introduction to the field of public health. Topics include identification of the principal determinants of health and how they affect individuals and populations, the role of government and public health professionals in health and healthcare, and critical and emerging issues in public health in the US and around the world. **Credits:** 1.00

PUBH 10001 - Introduction To Public Health

Credit Hours: 3.00. This course serves as an introduction to the field of public health. Topics include identification of the principal determinants of health and how they affect individuals and populations, the role of government and public health professionals in health and healthcare, and critical and emerging issues in public health in the US and around the world.**Credits:** 3.00

PUBH 20200 - Health In The Time Of Pandemics: An Introduction

Credit Hours: 3.00. This course will introduce students to basic concepts about health and disease through examination of the sweeping effects of pandemics. In addition to reviewing the effects directly related to human health and healthcare systems, the course will provide an interdisciplinary overview of the social, political, and economic consequences of infectious disease outbreaks and the range of local, national, and global responses to address them. The course will be taught by faculty members representing the broad diversity of disciplines within the College of Health and Human Sciences (HHS), with additional specific contributions from faculty representing other disciplines outside HHS. **Credits:** 3.00

PUBH 20500 - Basic Public Health Studies

Credit Hours: 3.00. Examination of basic scientific concepts as applied to the problems and issues in selected areas of human health behavior with particular attention to their influence on population and individual health. Restricted to students enrolled in major degree programs for which this course is a requirement. **Credits:** 3.00

PUBH 22000 - Sexuality And Health

Credit Hours: 3.00. Deals with various aspects of human sexuality and sexual behavior and their impact upon individual health. Health concerns related to sexual behavior. **Credits:** 3.00

PUBH 22500 - Contemporary Women's Health

Credit Hours: 3.00. Examines behavioral, psychological, and sociocultural aspects of women's experience in healthcare systems. Includes the influence of factors such as age, social class, and ethnicity on women's roles as recipients and providers of health care. **Credits:** 3.00

PUBH 23000 - Community, Culture And Social Justice From A Public Health Perspective

Credit Hours: 3.00. The course provides an introduction to the concepts of community, culture, and social justice. The interaction between community, cultural, ethical, social, economic, environmental, political and social justice dynamics that shape health will be explored.**Credits:** 3.00

PUBH 23500 - Stress And Human Health

Credit Hours: 3.00. Course is designed to provide an understanding of stress and stress management, including the physiology of the stress response, the relationship between stress and disease, potential sources of stress, and methods of intervening to prevent and/or relieve stress. **Credits:** 3.00

PUBH 24000 - Global Health

Credit Hours: 2.00. This course introduces students to current challenges, debates, and efforts at solutions in global public health with a focus on low-and middle-income countries. It provides an interdisciplinary overview of topics that include measures of health and disease, health disparities, communicable and non-communicable diseases, women's health, maternal and child health, food systems and nutrition, health systems, and global cooperation. It also highlights the central role of data in achieving the global health agenda. Permission of department required.**Credits:** 2.00

PUBH 25000 - Intercultural Development In Public Health And Human Sciences

Credit Hours: 3.00. There is a high demand for students to be prepared to work efficiently and effectively across different cultures. Whether working on sustainable and thriving communities and organizations, promoting healthy lifestyles, disease prevention, or developmental health and wellness, the need to develop cultural bridging skills is important for effectively helping individuals and their communities. The course teaches students how to develop a deeper appreciation and empathy for cultural values and traditions that are different from their own, learn how to cultivate a cultural worldview, become more aware of their own cultures, foster intercultural openness and curiosity, and how to communicate across cultures.**Credits:** 3.00

PUBH 29500 - Internship & Career Preparation

Credit Hours: 1.00. This course provides students with professional competencies in identification and development of professional resources that aid in a greater understanding and preparation for careers in public health. Upon completion of the course, students will be prepared to seek an internship and apply concepts learned to their professional development experiences. **Credits:** 1.00

PUBH 30500 - Health Education In Elementary Schools

Credit Hours: 3.00. The problems of physical health, mental health, and safety of the school-aged child are considered, with emphasis on ways in which the elementary teacher meets his or her responsibilities and opportunities for promoting pupil health.**Credits:** 3.00

PUBH 32000 - Health Behavior And Health Promotion

Credit Hours: 3.00. Introduces health behavior theory and practice in the context of health promotion and education. Examines individual, interpersonal, and community approaches to explaining and predicting health behavior and emphasizes their application to interventions in health promotion and education. **Credits:** 3.00

PUBH 32500 - Methods Of Health Promotion And Education

Credit Hours: 3.00. Methods and materials of health promotion and education; preparation and use of content and materials related to health concerns of target populations. A variety of strategies and media are covered with theoretical and practical applications. **Credits:** 3.00

PUBH 36500 - Public Health Research Methods

Credit Hours: 3.00. The course is designed to help you (1) develop an understanding of the nature of research and the scientific method in public health, (2) acquire an appreciation for the different types of research conducted within public health, and (3) provide an overview of the ethical, conceptual, and logistical considerations involved in designing, conducting, and critically evaluating public health research in basic and applied settings.**Credits:** 3.00

PUBH 38000 - Public Health Policy

Credit Hours: 3.00. This course will provide the opportunity to examine and analyze the financing, organization and delivery of health care in the U.S. and how these core elements are shaped and influenced by health care policy and decision-making.**Credits:** 3.00

PUBH 40000 - Human Diseases And Disorders

Credit Hours: 3.00. The major communicable and noncommunicable diseases and disorders that afflict modern man, with particular emphasis upon the etiology, epidemiology, and ecology of these diseases and disorders.**Credits:** 3.00

PUBH 40500 - Principles Of Epidemiology

Credit Hours: 3.00. The study of the distribution of diseases in human populations and factors that influence these distributions. **Credits:** 3.00

PUBH 48000 - Internship For Public Health

Credit Hours: 9.00. The internship experience is a valuable opportunity for students to apply the procedures, theories, skills, and techniques they have mastered in the classroom to a professional work experience in the field. Each student in the Public Health Major at Purdue University is required to perform a 400 hour internship experience that meets the expectations of the student, the internship/practicum site, and the University. The internship is to be a culminating experience representative of the degree program and clinical work that provides students the opportunity to acquire invaluable work experience in the field outside of the academic setting. Must have completed all other major requirements. Permission of instructor required.**Credits:** 9.00

PUBH 49000 - Special Topics In Public Health

Credit Hours: 0.00 to 6.00. Various public health topics that may change from semester to semester. Department persmission required. **Credits:** 0.00 to 6.00

PUBH 49200 - Mentored Research In Public Health

Credit Hours: 3.00. Designed to provide a research learning activity for undergraduate students majoring in Public Health. Students will gain research and presentation experience under the guidance of a supervising public health faculty member. Permission of instructor required. **Credits:** 3.00

PUBH 50000 - Introduction To Public Health

Credit Hours: 1.00 to 3.00. This Public Health course covers a variety of issues related to the profession of public health. The Introduction to Public Health provides the graduate student with an overview of the history, science, mission, practice and future of public health. The core public health principles and services, and the expected competencies of the professional public health practitioner, are discussed. Current issues in public health are also presented for discussion and analysis. **Credits:** 1.00 to 3.00

PUBH 50100 - Introduction To Health Equity

Credit Hours: 3.00. This course introduces the participants to graduate level research in health disparities and the various theoretical and analytical skills needed to be a good health disparities researcher. It will take the course participants through the axiological, ontological and epistemological questions that we are confronted within social scientific research. This course will walk the participants through the various research paradigms and the critical debates associated with it so that they can reflect and possibly make an informed choice about their own research priorities. Permission of department required. **Credits:** 3.00

PUBH 51100 - Foundations Of Global Health

Credit Hours: 3.00. Global disparities in the health and well-being of diverse populations, across and within borders, has never been greater. Profound and rapid changes in demographics, from population growth to urbanization, along with unprecedented shifts in patterns of disease and risks, are coupled with game-changing advances in knowledge, technology, and innovation. This course will introduce students to current challenges and efforts at solutions in global health, with a focus on low- and middle-income countries. It will provide an interdisciplinary overview of topics that include measures of health and disease, communicable diseases such as HIV/AIDS and malaria, non-communicable diseases such as diabetes and cardiovascular disease, women's health, maternal and child health, food systems and nutrition, health systems, and health care delivery. In addition to lectures, the course will include interactive discussions of case studies and specific country examples, aimed at immersing students in the debates and challenges facing global health leaders and decision makers. **Credits:** 3.00

PUBH 51250 - International Health Systems: A Comparative Approach

Credit Hours: 3.00. This course is an introduction to public health priorities from an international perspective, illustrating the interdependent nature of health promotion and disease prevention issues across diverse regions and populations. Coursework examines population health determinants, contrasting industrialized and developing countries and how these influence health goals established by public health institutions, such as the World Health Organization, philanthropic foundations and governmental agencies. International health care needs continue to emerge as interchanges among peoples and nations increase. To effectively address these needs, public health leaders must understand the social, economic, environmental, and political determinants of health and be prepared to respond to challenges related to health and health care at the local, national, and global level. This course examines the historical evolution of international health challenges as well as the future trends that will continue to impact health and health systems worldwide. The course is intended for graduate students in public health; however, it may be of interest to students in social work, nursing, education, criminal justice, psychology, and other related fields. Permission of instructor required.**Credits:** 3.00

PUBH 51350 - Global Health Security And Disaster Management

Credit Hours: 3.00. This course is a contemporary examination of the growing threat and potential public health consequences of disasters and the role of climate change. Additionally, we review the variety of public health and environmental health disasters, their consequences and the role of public health agencies health care systems and practitioners in preparedness, response and recovery from a local, national and global perspective. The course is designed to develop proficiency in analyzing and evaluating the public health response to disasters, the linkage to emergency management frameworks and identifying solutions and methods for improvement. The course is intended for graduate students in public health; however, it may be of interest to students in social work, nursing, education, criminal justice, psychology, and other related fields. Permission of instructor required. **Credits:** 3.00

PUBH 52000 - Human Sexuality And Sexual Health

Credit Hours: 3.00. This course is designed to provide students with an in-depth and applied understanding of the major theories and principles guiding human sexuality and sexual health research. Content covered will enrich an understanding of sexuality and sexual health research methods, past and present research findings, and the intersection of this field and public health practice.**Credits:** 3.00

PUBH 52500 - Statistical Methods For Public Health Evaluation

Credit Hours: 3.00. This course provides an overview of the statistical methods required to evaluate the effectiveness of public health intervention or prevention programs and policies. The course introduces a range of quantitative, qualitative, and mixed methods research designs and the application and tailoring of these designs to evaluations. In addition, we will focus on categorical data analysis methods, which are often necessary for evaluation projects. You will collaborate with those students to conduct an evaluation, develop a report with your findings, and present your findings. The course is intended for graduate students in public health; however, it may be of interest to students in social work, nursing, education, criminal justice, psychology, and other related fields. Permission of department required. **Credits:** 3.00

PUBH 52600 - Randomized Control Trials In Public Health

Credit Hours: 3.00. Randomized control trials provide solid evidence on whether interventions and programs "work" to improve health outcomes. In this course, students will learn how to design a randomized study, handle practical issues that arise in data collection, analyze data using appropriate methods and good statistical practice, identify limitations to statistical evidence, and interpret and communicate findings in an audience-appropriate way. This is a hands-on course in which students will work with data and build skills using SAS statistical software in preparation for careers as biostatisticians, data scientists, and researchers. Pre-requisite: A graduate level introductory statistics course that includes simple linear regression.**Credits:** 3.00

PUBH 53500 - Fundamentals Of Epidemiology

Credit Hours: 3.00. This course is an introduction to epidemiology, which is the study of the patterns, causes, and impact of disease in populations. Epidemiology is increasingly important for public health and clinical medicine research and policy. This course will discuss the basic principles and methods of epidemiology, including measurements of disease occurrence and association, study designs, and determination of causality. Contemporary examples will be used to illustrate the application of these concepts, with an emphasis on environmental causes of disease.**Credits:** 3.00

PUBH 54250 - Public Health And Nutrition

Credit Hours: 3.00. This course will emphasize development, implementation, and evaluation of nutrition intervention programs from a public health perspective. Students have an opportunity to practice setting realistic goals that produce outcomes aimed to improve health and support community and public nutrition. Students will explore changing nutritional behavior and the barriers to such change. This course is intended for graduate students interested in developing, implementing, and evaluating community-based nutrition programs The course is intended for graduate students in public health; however, it may be of interest to students in social work, nursing, education, criminal justice, psychology, and other related fields. Permission of instructor required.**Credits:** 3.00

PUBH 54300 - Physical Activity And Public Health

Credit Hours: 3.00. In this course students will be exposed to epidemiological, behavioral, and public health issues relevant to effective promotion of physical activity. The course is appropriate for students training to be practitioners or researchers from a range of disciplines including exercise science, nutrition, psychology, and public health. Major topic areas will include physical activity epidemiology, determinants of physical activity in youth and adults, and current evidence for physical activity interventions ranging from individual, behavioral strategies, to environmental or policy approaches. **Credits:** 3.00

PUBH 54500 - Healthcare Policy And Administration

Credit Hours: 3.00. This course will provide the opportunity to examine and analyze the financing, organization and delivery of health care in the U.S. and how these core elements are shaped and influenced by health care policy and decision-making. Additionally, we will examine the landmark healthcare reform the Patient Protection and Affordable Care Act (PPACA) of 2010 and legislation since its passing to study the transformation of healthcare to present time. **Credits:** 3.00

PUBH 54600 - Child And Family Health Policy

Credit Hours: 3.00. The main goals of the course are to provide students with foundational knowledge related to research and policies that affect the health and wellbeing of children and families. Students will read and discuss policy-relevant research on current topics associated with child and family health. Students will read and discuss examples of researchers who have made an impact on child and family policies. Students will also write three papers that integrate research and policy perspectives.**Credits:** 3.00

PUBH 54700 - Public Health Program And Policy Evaluation

Credit Hours: 3.00. This course provides an overview of the methods required to evaluate the effectiveness of public health intervention or prevention programs and policies. The course introduces a range of quantitative, qualitative, and mixed methods research designs, and the process for applying and tailoring these designs to program and policy evaluations. In addition, we will focus on the process of engaging communities and stakeholders in program evaluation efforts. The course is intended for graduate students in public health; however, it may be of interest to students in social work, nursing, education, criminal justice, psychology, and other related fields. Permission of instructor required. **Credits:** 3.00

PUBH 54750 - Public Health Program And Policy Evaluation

Credit Hours: 3.00. This course provides an overview of the methods required to evaluate the effectiveness of public health intervention or prevention programs and policies. The course introduces a range of quantitative, qualitative, and mixed methods research designs, and the process for applying and tailoring these designs to program and policy evaluations. In addition, we will focus on the process of engaging communities and stakeholders in program evaluation efforts. The course is intended for graduate students in public health; however, it may be of interest to students in social work, nursing, education, criminal justice, psychology, and other related fields. Permission of instructor required.**Credits:** 3.00

PUBH 54850 - Public Health Law

Credit Hours: 3.00. This course examines the role of law in promoting or impeding positive health outcomes. Students will study the authority and limitations of governments engaging in public health activities as well as the types of legal interventions available to promote public health. Students will apply legal principles to public health case studies on topics such as infectious disease, chronic disease, and violence prevention, among others. Students will also apply public health legal research methodologies to current public health issues and discuss the role of law in public health advocacy. The course is intended for graduate students in public health; however, it may be of interest to students in social work, nursing, education, criminal justice, law, psychology, and other related fields. Permission of instructor required.**Credits:** 3.00

PUBH 57000 - Healthcare In The United States

Credit Hours: 3.00. By the end of this course, you will have a strong foundational understanding of the American healthcare system, along with the basic financial and management skills to make better, well-informed decisions that improve the cost and quality of the healthcare you or your enterprise provides. Understanding the evolution of today's system form the foundation for subsequent learning and leadership. Landmark legislation will also be reviewed including: Hill-Burton Act, Social Security Act, HMO Act, Balanced Budget Act of 1997, PPACA, ARRA. We will focus on a range of healthcare services, including acute care, post-acute care and senior health and housing, ambulatory surgery centers, behavioral health, and medical insurance companies. Permission of instructor required. **Credits:** 3.00

PUBH 57100 - The Business Of Healthcare

Credit Hours: 3.00. This course is designed to help you keep pace with the rapidly changing world health and healthcare. We will (1) explore the drivers of value creation, valuation approaches, and the differences in capital structures between nonprofit and for-profit healthcare providers; (2) examine horizontal consolidation and integrations among nonprofit and for-profit providers mergers and acquisitions, join ventures, and vertical consolidation and integration between providers and payers; and (3) discuss the ethos of healthcare, disruptive innovation, and emotional intelligence. **Credits:** 3.00

PUBH 57200 - International And Comparative Healthcare Systems

Credit Hours: 3.00. This course examines international and comparative healthcare systems by analyzing the roles of private, public, non-profit and civil society sectors on national policy, planning and development. **Credits:** 3.00

PUBH 57300 - Cultural Proficiency For Healthcare Leaders

Credit Hours: 3.00. This course meets all four criteria for being a graduate level course. Readings for this course consist of journal articles and advanced readings. Assessments are designed to require students to integrate and synthesize course concepts. Our reading list and discussion prompts consists of current articles, texts, and examples. Finally, students as part of weekly discussions are required to read and critique academic articles and case studies. **Credits:** 3.00

PUBH 57400 - Healthcare Economics, Policy And Law

Credit Hours: 3.00. This course presents an overview of legal regulations and issues related to healthcare delivery and administration in multiple settings. Topics include healthcare legislation and regulation; professional and institutional liability; medical staff credentialing; patient consent requirements; termination of care; confidentiality of medical care; and the roles of federal, state and private stakeholders. **Credits:** 3.00

PUBH 57500 - Healthcare Accounting & Reimbursement

Credit Hours: 3.00. This course teaches core financial skills of accounting and financial management as they apply to healthcare management systems. Topics include analysis of financial reporting, cost management; reimburse mechanisms, CFO Responsibilities, managed care contracting and fundraising and capital investment. This course is a core class for the Healthcare Operations certificate program. **Credits:** 3.00

PUBH 57600 - Workforce Management And Organizational Behavior In Healthcare

Credit Hours: 3.00. The course focuses on the relationships between healthcare administration and human resource management across various health care organizations, including hospitals, long-term care facilities, and community health organizations. Topics include personnel recruitment and training; compensation and benefits; performance evaluations; staffing plans; employee discipline; and credentialing health care professionals. This course is a core class for the Healthcare Operations certificate program. **Credits:** 3.00

PUBH 57700 - Strategic Planning And Marketing For Healthcare

Credit Hours: 3.00. This course provides an introduction to the conceptualization, development and implementation of strategic planning and marketing for healthcare organizations across several practice settings. Topics covered in the course include theories of decision-making, strategic planning and resource allocation, consumer behavior and provider comparisons. This course is a core class for the "Healthcare Quality Improvement" certificate program. **Credits:** 3.00

PUBH 57800 - Healthcare Quality And Risk Management

Credit Hours: 3.00. The course explores how to identify quality and complexity issues affecting healthcare organization; how to develop, implement and assess quality improvement programs and strategies in various healthcare settings. Topics include continuous quality improvement; lean management; Six Sigma; IHI Quality Improvement Program; Baldrige criteria; patient safety; and quality tools. This course is a core class for the Healthcare Quality Improvement certificate programs. **Credits:** 3.00

PUBH 57900 - Information Powered Patient Care In The 21st Century

Credit Hours: 3.00. This course focuses on the use of computer technology and information science to identify, gather, process, and manage information to help healthcare organizations succeed. Emphasis is placed on technology-based health applications, which support clinical, administrative, research, and educational decision-making that enhance the efficacy of health care administration. **Credits:** 3.00

PUBH 58000 - Health Economics

Credit Hours: 3.00. This course will provide an introduction to the application of health economic principles as it relates to various health care systems, healthcare stakeholders and health policy issues in the United States. Topics include access to care; healthcare parity; relationships between economic characteristics and health status; impact of economy on health services industry; demand and resources for health services; utilization, prices, costs, and health insurance. This course is a core class for the Healthcare Operations certificate program. **Credits:** 3.00

PUBH 58100 - Managing Complex Healthcare Operations

Credit Hours: 3.00. This course focuses on the familiarization of production processes and service systems, and quantitative analysis of problems arising in the management of operations. We consider key performance measures of operations (productivity, flexibility, quality, and response time) as well as important concepts in the planning, design, control, and improvement of processes in healthcare contexts along these dimensions. For this course, students will also acquire the ability to learn ways to conduct operations management through data analysis. This course is a core class for the Healthcare Operations certificate program. **Credits:** 3.00

PUBH 58200 - Advanced Executive Healthcare Leadership Development

Credit Hours: 3.00. This course provides advanced leadership training for healthcare executive. Topics include: emotional intelligence, managing difficult conversations, successful interviewing, employee engagement, building learning environments, adaptive leadership, and creating innovative cultures. This course is a core class for the Healthcare Leadership certificate program. **Credits:** 3.00

PUBH 58500 - Introduction To Environmental Health

Credit Hours: 3.00. An introduction to chemical, physical and biological factors in the environment that affect the health of the community. This course examines health issues, scientific understanding of causes and approaches to the control of major environmental health problems in industrialized and developed countries. This is a core course for the Masters in Public Health (MPH) degree at Purdue. **Credits:** 3.00

PUBH 59000 - Special Topics In Public Health

Credit Hours: 0.00 to 9.00. Various public health topics that may change from semester to semester. **Credits:** 0.00 to 9.00

PUBH 60000 - Professional Development In Public Health Seminar

Credit Hours: 0.00. A professional development course designed to the meet the needs of MPH students in the Department of Public Health. **Credits:** 0.00

PUBH 60100 - Introduction To The Quantitative Methods Of Public Health

Credit Hours: 3.00. Acquaints students with the basic concepts and methods of statistics, the applications, and their interpretation as used in public health. Students learn basic terminology and its meaning, how to calculate various statistical measures and indices, how to quantify health relationships, and how to compute and interpret inferential statistical techniques. Students will acquire the ability to utilize statistical software as a tool to facilitate the processing, editing, storing, displaying, analysis, and interpretation of health research-related data. **Credits:** 3.00

PUBH 60200 - Theoretical Foundations Of Health Behavior

Credit Hours: 3.00. Examines the theoretical foundations of health behavior. Emphasizes the development of a conceptual framework for understanding and facilitating behavior enhancement, elimination, and/or maintenance in health promotion and education. Focuses on current theories regarding health-related behaviors. Permission of instructor required. **Credits:** 3.00

PUBH 60400 - Public Health Administration

Credit Hours: 3.00. An introduction to the principals of management as applied to public health organizations, particularly local health departments. Topics include the organization of the U.S. public health system, legal and ethical obligations of public health administrators, the public health workforce and human resource issues, public health budgeting and finance, and leadership in the public health agency. The course is designed to introduce master's level students in public health to the management skills necessary to successfully implement a public health program. **Credits:** 3.00

PUBH 60600 - Design And Analysis Of Public Health Interventions

Credit Hours: 3.00. (CSR 62300) Professional competencies in design, implementation, evaluation and diffusion of health interventions in community settings. Program planning paradigms, determinants of health behavior, and behavior change strategies serve as a basis for analyzing health interventions. Prerequisite: HS 56500. **Credits:** 3.00

PUBH 60700 - Public Health Practicum

Credit Hours: 3.00. This course integrates public health theory and practice in a professional setting. Students have the opportunity to apply concepts from core and concentration courses, conduct projects, and interact with a range of professionals in the designated setting. Permission of instructor required. **Credits:** 3.00

PUBH 60800 - Culminating Experience

Credit Hous: 3.00. The MPH degree plans of study require a culminating project to be completed in the final semester of study. The student provides evidence of competency mastery by partnering with a public health related agency, identifying a community problem, proposing an evidence-based solution, and developing an evaluation plan. The final product is in the form of a grant proposal. Guidance for proposal development is achieved through completion of a grant-writing workshop and feedback from a faculty advisor. Permission of department required.**Credits:** 3.00

PUBH 69400 - Graduate Seminar In Public Health

Credit Hours: 0.00. Seminar course covering a broad range of current research topics in public health and related fields of study. Seminar presentations by representatives from academia, industry, government, other external institutions and organizations, and

members of the Purdue University community. Intensive analysis of application of various research and statistical methodologies to the study of public health.**Credits:** 0.00

PUBH 69500 - Public Health Independent Research Or Study

Credit Hours: 1.00 to 9.00. Investigation of various public health topics as determined by the interest of the individual public health graduate student and faculty mentor. Permission of department required. **Credits:** 1.00 to 9.00

PUBH 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis.**Credits:** 1.00 to 18.00

PUBH 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis.**Credits:** 1.00 to 18.00

Purdue Systems Collaboratory

SYS 30000 - It's A Complex World - Addressing Global Challenges

Credit Hours: 3.00. The main goal of this course is to address grand challenges that are of global concern - such as environmental sustainability and energy use, natural and human disasters, and political and economic development - using the ideas and tools of complex adaptive systems. The course exploits the broad expertise of the four faculty members by treating these challenges from diverse disciplinary perspectives, from the biological and physical sciences, to the social sciences, to engineering. By way of a set of case studies, students will analyze the features of these challenges which make them complex, and seek to explain and find solutions to the problems that arise in each case. Their treatment of the cases will be informed by published research and computer simulation. Students will actively participate in discussions regarding these global challenges, and contribute to the progress of the class using oral and written presentations. The course will culminate with a final project completed by teams composed of students from different disciplines. **Credits:** 3.00

SYS 35000 - Systems Methods

Credit Hours: 3.00. Introduction to modeling tools and methods for understanding and designing systems. Topics include: defining the problem; defining and validating stakeholders' needs; system modeling and types of models; defining and modeling system behavior; defining and modeling functional, physical and allocated system architectures; and evaluating and modeling the tradeoffs between alternative system designs.**Credits:** 3.00

SYS 40000 - Systems Praxis

Credit Hours: 3.00. Engineers, social scientists, and managers frequently bring people and technology together to address complex problematic situations in an equitable way that benefits people and the environment. Multiple systems concepts and methods have been developed to address these situations, and typical courses in systems focus on a relatively small portion of the rich assortment of available approaches to addressing systems problems. This course introduces students to multiple systems concepts and methods via readings and class lecture. The students then apply these concepts and methods on team-based projects. The course will emphasize critical thinking about how the concepts and methods are applicable to the problematic situations of the projects and how well the project teams were able to perform the required activities.**Credits:** 3.00

SYS 49000 - Topics In Systems

Credit Hours: 1.00 to 6.00. This is an UG Level variable title course for topics related to Systems (Systems Thinking, Systems Engineering, Systems Dynamics, etc.). UG students can enroll in this course to do independent study or individual project with the instructor. Permission of instructor required. **Credits:** 1.00 to 6.00

SYS 50000 - Perspectives On Systems

Credit Hours: 3.00. This course provides an introduction to, and references for, each of four distinct approaches to SE concepts and tools. Individual assignments and team projects will be based on readings from these multiple approaches and selected case studies. Participants will be encouraged to bring their own prior expertise and examples to the discussions and projects. While the course will discuss quantitative topics (including cybernetics, feedback control systems, and statistical process control), the course itself will emphasize a more interdisciplinary conceptual integration rather than stand-alone analysis of these topics. **Credits:** 3.00

SYS 51000 - Tools And Methodologies For Designing Systems

Credit Hours: 3.00. Introduction to modeling tools and methods for designing engineered systems. Topics include: defining the design problem; defining and validating stakeholders' and system requirements; discrete mathematics for system modeling; defining and modeling system operational scenarios; the system development life cycle; defining and modeling functional, physical, and allocated architectures; evaluating and modeling the tradeoffs between alternative architectures; and defining the system qualification process. **Credits:** 3.00

SYS 52000 - Systems Engineering Processes And Professional Competencies

Credit Hours: 3.00. This course covers life cycle processes performed by system engineers and soft skills essential to being a successful system engineer. Topics include systems engineering technical processes, technical management processes, organizational strategies and operations supporting system development, tailoring of processes to industry sectors and domains, cross-cutting systems engineering methods, specialty engineering, systems engineering competencies, and relevant soft skills. Permission of instructor required.**Credits:** 3.00

SYS 53000 - Practical Systems Thinking

Credit Hours: 3.00. Practical systems thinking is designed to give students a sense of how problem solving happens in the real world. This is accomplished through case examples and group projects. **Credits:** 3.00

SYS 59000 - Projects In Systems

Credit Hours: 1.00 to 6.00. This is a Graduate Level variable title course for topics related to Systems (Systems Thinking, Systems Engineering, Systems Dynamics, etc). Graduate students and seniors can enroll in this course to do independent study or individual project with the instructor. Permission of instructor required.
Credits: 1.00 to 6.00

Religious Studies

REL 20000 - Introduction To The Study Of Religion

Credit Hours: 3.00. This course will introduce students to the academic study of religion through an exploration of various methodologies available for a critical, reflective investigation of the study of religion. **Credits:** 3.00

REL 20100 - Interpretation Of The New Testament

Credit Hours: 3.00. An investigation of the religious content of the Christian Scriptures in light of the historical, social, and intellectual contexts out of which they emerged. Other canons and extra-canonical interpretations of the New Testament will also be investigated. **Credits:** 3.00

REL 20200 - Interpretation Of The Old Testament

Credit Hours: 3.00. An investigation of the religious content of documents Christians call the "Old Testament" in light of the historical, social, and intellectual contexts out of which they arose. The student will be introduced to problems and methods in their interpretation. **Credits:** 3.00

REL 20300 - Theology Of Paul

Credit Hours: 3.00. A critical examination of the Pauline and Deutero-Pauline epistles, the book of Acts, and other first century texts associated with Paul of Tarsus. Students will be introduced to problems and methods in the interpretation of ancient texts. **Credits:** 3.00

REL 20400 - Introduction To Christian Theology

Credit Hours: 3.00. This course is an introductory survey of the goals and aims of theology in the Christian tradition. Focus is on the content of Christian theology, its methodological presuppositions and principles of development. **Credits:** 3.00

REL 23000 - Religions Of The East

Credit Hours: 3.00. (PHIL 33000) A study of the history, teaching, and present institutions of the religions of India, Southeast Asia, China, and Japan. This will include Hinduism, Jainism, Sikhism, Buddhism, Confucianism, Taoism, Shintoism, and Zoroastrianism. **Credits:** 3.00

REL 23100 - Religions Of The West

Credit Hours: 3.00. (PHIL 33100) A comparative study of the origins, institutions, and theologies of the three major Western religions, Judaism, Christianity, and Islam. **Credits:** 3.00

REL 24000 - Engaging Religious Diversity

Credit Hours: 3.00. The course offers students case-based explorations of local and global religious diversity in various cultural contexts. Religious diversity in secular spaces and the significance of religion for shaping community identities will be examined from multiple disciplinary perspectives. Students will analyze religious representations and influences in the public sphere by studying examples from different genres and media. Additionally, this course offers students opportunities to improve their religious literacy and gain real-world experience through experiential learning projects. **Credits:** 3.00

REL 25000 - A History Of The Christian Afterlife

Credit Hours: 3.00. An exploration of the ways Christians have envisioned the afterlife, including New Testament descriptions. Apocryphal notions, Patristic conceptions, mystical and 19th century descriptions of heaven as sexual union, and 20th century understandings of the afterlife as a "process of education". **Credits:** 3.00

REL 26400 - The Bible As Literature

Credit Hours: 3.00. A literary study of selections from the Old and New Testaments as examples of Hebrew and early Christian literature.**Credits:** 3.00

REL 31700 - Ancient Judaism And Early Christianity

Credit Hours: 3.00. This course is a study of the emergence of Judaism and the rise of Christianity out of roots in the history of ancient Israel. This will include noticing the effects of Greek culture, evidence of anti-Semitism and admiration of the Jews, conversion in a setting of religious pluralism, and the development of Jewish and Christian self-definition in this climate. **Credits:** 3.00

REL 31800 - The Bible And Its Early Interpreters

Credit Hours: 3.00. This course will start with observation of the development of early themes in later parts of the Hebrew Bible and proceed to the on-going influence of these themes in Jewish literature outside the Hebrew canon (apocrypha, pseudepigrapha, targums, midrash, Josephus, Philo, and other Hellenistic Jewish authors), as well as in pagan literature of this era and in early Christian literature, particularly the New Testament. **Credits:** 3.00

REL 35100 - Christian Mysticism

Credit Hours: 3.00. A critical, historical examination of the development of Christian mystical thought, beginning with its earliest intimations in the Hebrew Scriptures, the thought of Plato and Aristotle and continuing through Patristic, Medieval, Renaissance, Reformation, Counter-Reformation and Modern periods to the present. **Credits:** 3.00

REL 45000 - Christian Ethics

Credit Hours: 3.00. The course explores the historical development of Christian moral theology, from pre-Christian times to the present. It includes a study of Biblical moral conceptions, patristic, medieval, Enlightenment, modern, and contemporary understandings of Christian ethics. **Credits:** 3.00

REL 45100 - Christology

Credit Hours: 3.00. The course examines the historical development of Christological doctrine in the Christian faith from the age of the New Testament to the late 20th/early 21st century, paying special attention to the New Testament and conciliar formulations. **Credits:** 3.00

REL 45200 - Systematic Theology

Credit Hours: 3.00. An introduction to the nature, tasks, and methods of what Christians have called "systematic theology", historically conceived through an exploration of the writings of figures such as Augustine, Aquinas, Melancthon, John Calvin, Barth, and Paul Tillich. **Credits:** 3.00

REL 49100 - Special Topics In Religious Studies

Credit Hours: 3.00. Investigation of a special topic in Religious Studies. The topic will vary from semester to semester.**Credits:** 3.00

Russian

RUSS 10100 - Russian Level I

Credit Hours: 4.00. A beginning course in Russian which builds basic skills in speaking, oral comprehension, reading, and writing in Russian through class participation, structured conversation, and short writing assignments. **Credits:** 4.00

RUSS 10200 - Russian Level II

Credit Hours: 4.00. Continuation of RUSS 10100. Further work on developing skills in speaking, oral comprehension, reading, and writing in Russian through class participation, structured conversation, and short writing assignments. **Credits:** 4.00

RUSS 11100 - Conversation Supplement To Russian Level I

Credit Hours: 1.00. Basic development of intonation patterns, formulas for question and response in a variety of situations. Activization of basic Russian vocabulary and grammar. May be taken concurrently with RUSS 10100. **Credits:** 1.00

RUSS 11200 - Conversation Supplement To Russian Level II

Credit Hours: 1.00. Guided practice in conversation based on vocabulary and grammar learned in RUSS 10200. May be taken concurrently with RUSS 10200. **Credits:** 1.00

RUSS 20100 - Russian Level III

Credit Hours: 4.00. An intermediate-level course designed to develop higher skills in speaking, listening, reading, and writing Russian, as well as in intercultural competence and communication through further work on conversational and writing ability. Students work individually and in small groups using authentic reading and audio materials. **Credits:** 4.00

RUSS 20200 - Russian Level IV

Credit Hours: 4.00. Continuation of RUSS 20100. Development of Russian language skills at the higher intermediate level in speaking, listening, reading, writing, and in cultural competence. Conversational and writing ability receive prominence, as well as a review of Russian grammar. Students continue working with authentic reading and audio materials individually and in small groups. **Credits:** 4.00

RUSS 21100 - Conversation Supplement To Russian Level III

Credit Hours: 1.00. Guided practice in conversation based on vocabulary, grammar, and readings covered in RUSS 20100. May be taken concurrently with RUSS 20100. **Credits:** 1.00

RUSS 21200 - Conversation Supplement To Russian Level IV

Credit Hours: 1.00. Guided practice in conversation, based on vocabulary, grammar, and readings covered in RUSS 20200. May be taken concurrently with RUSS 20200. **Credits:** 1.00

RUSS 29800 - Special Topics In Russian

Credit Hours: 3.00. Studies of particular aspects of Russian (e.g. culture, civilization, linguistics, literature, film, etc.) by examining varied selection of works. Readings, discussion, and papers in English. **Credits:** 3.00

RUSS 30100 - Russian Level V

Credit Hours: 3.00. Continued development of Russian speaking, listening, reading, and writing abilities, using material dealing primarily with everyday life and civilization in the Soviet Union from a variety of sources (e.g., newspapers, magazines, TV, recent literature, etc.). Conducted primarily in Russian. **Credits:** 3.00

RUSS 30200 - Russian Level VI

Credit Hours: 3.00. Further work to develop speaking, listening, reading, and writing abilities in Russian, on the basis of materials dealing with the ideas and events that have shaped present-day Russia and the Soviet Union. Conducted primarily in Russian. **Credits:** 3.00

RUSS 31100 - Russian Conversation I

Credit Hours: 1.00. Guided practice in conversation on a variety of assigned and spontaneous topics to enhance communicative competence and develop oral and aural abilities. Small group discussions in Russian on various topics. May be taken alone or concurrently with RUSS 30100 or above. May be repeated for credit. **Credits:** 1.00

RUSS 33000 - Russian And East European Cinema

Credit Hours: 3.00. Viewing and analysis of significant Russian and East European films. Evolution of the Russian and East European cinema, its place in world cinema, and its relation to cultural, political, and social trends. Cinematic adaptation of literary and theatrical works. Knowledge of Russian or East European languages not required. **Credits:** 3.00

RUSS 33100 - Post-Soviet Russian Cinema

Credit Hours: 3.00. Viewing and analysis of significant post-Soviet Russian films, providing an understanding of the nuanced sociopolitical situation in contemporary Russia. Evolution of Russian cinema in the post-Soviet era, its place in world cinema, and its relation to cultural, political, and social trends. The course builds an understanding of the Russian political, historical, and cultural context through an exploration of cinematic artistry. It presents and analyzes films that depict aspects of contemporary Russia, covering subjects from the collapse of the Soviet Union to the rise and hold on power of Vladimir Putin, through cinematic adaptation of literary and theatrical works. Conducted in English. Knowledge of Russian is not required. **Credits:** 3.00

RUSS 34100 - Russian Literature In The Nineteenth Century

Credit Hours: 3.00. Selected Russian poetry, prose, and drama from the Kievan period to 1900 in historical and cultural context. Students will write critical essays on literary topics. Conducted largely in Russian. **Credits:** 3.00

RUSS 34200 - Revolution, Repression, Renewal: Soviet Literature And Beyond

Credit Hours: 3.00. Selected Russian poetry, prose, and drama of the 20th century in historical and cultural context. Students will read and discuss major authors and texts and will write critical essays on literary topics. Conducted largely in Russian. **Credits:** 3.00

RUSS 38000 - Russian Culture And Civilization I

Credit Hours: 3.00. This course traces the intellectual and cultural development of Russia, starting with the founding of the Kievan state and continuing to the last days of the Russian Empire. No knowledge of Russian is required. **Credits:** 3.00

RUSS 38100 - Russian Culture And Civilization II

Credit Hours: 3.00. This course traces the intellectual and cultural development of Russia from the revolutionary period to the present. No knowledge of Russian is required. **Credits:** 3.00

RUSS 39900 - Special Study Abroad Credit In Russian

Credit Hours: 1.00 to 4.00. This course number is for assignment after the fact of credits in Russian earned while enrolled at a foreign university on a Study Abroad program which cannot be appropriately accommodated under an established Purdue course number. It is not for use for courses offered at or conducted by Purdue. **Credits:** 1.00 to 4.00

RUSS 40100 - Russian Level VII

Credit Hours: 3.00. Advanced work on development of Russian speaking, listening, reading, and writing abilities, focusing on materials dealing primarily with culture and the arts in Russia and the Soviet Union. Conducted primarily in Russian. **Credits:** 3.00

RUSS 40200 - Russian Level VIII

Credit Hours: 3.00. Further advanced work on speaking, listening, reading, and writing abilities in Russian. Course materials will cover a variety of topics illustrated by film and other media, both print and nonprint. Conducted primarily in Russian. **Credits:** 3.00

RUSS 41100 - Advanced Russian Conversation I

Credit Hours: 1.00. Guided practice in conversation on a variety of advanced assigned and spontaneous topics to enhance communicative competence and develop oral and aural abilities. Small group discussions in Russian on various topics. May be taken alone or concurrently with RUSS 40100 or above. May be repeated for credit. **Credits:** 1.00

RUSS 42400 - Business Russian

Credit Hours: 3.00. A study of the terminology and techniques used in commercial transactions, including the interpretation and writing of business materials. Development of the four language skills, with emphasis on writing and speaking. **Credits:** 3.00

RUSS 49700 - Topics In Russian Literature

Credit Hours: 3.00 to 6.00. This course provides in-depth study of a particular author or facet of the Russian literary tradition. Possible topics include Dostoevsky and His Age; The Art and Thought of Leo Tolstoy; Russian Romanticism: Pushki, Gogol, Lermontov; The Russian Stage: Theater in Russia and the Soviet Union. **Credits:** 3.00 to 6.00

RUSS 49800 - Topics In Russian Culture

Credit Hours: 3.00 to 6.00. This course provides a sustained examination of some aspect of Russian culture or a topic relevant to Russian cultural studies. Topics may include Russia Confronts the East; The Caucasus: An Introduction; Popular Culture in Russia. **Credits:** 3.00 to 6.00

RUSS 56100 - The Structure Of Russian I: Phonology And Syntax

Credit Hours: 3.00. This course treats the sound system and sentence structure of Russian, dealing with the structural pattern on various levels (phonetic, phonemic, syntactic) from various points of view. One weekly class is devoted to theoretical issues affecting Russian phonology and syntax.**Credits:** 3.00

RUSS 56200 - The Structure Of Russian II: Morphology

Credit Hours: 3.00. This course will present a systematic study of Russian morphology in the light of current linguistic research, dealing both with the various categories of inflected words (nouns, pronouns, adjectives, verbs) and with word formation.**Credits:** 3.00

RUSS 59000 - Directed Reading In Russian

Credit Hours: 1.00 to 4.00. Directed readings in Russian. Permission of instructor required. **Credits:** 1.00 to 4.00

RUSS 59600 - Special Topics In Russian Linguistics

Credit Hours: 1.00 to 4.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 4.00

Sociology

SOC 10000 - Introductory Sociology

Credit Hours: 3.00. A survey course designed to introduce the student to the scene of human society. Fundamental concepts, description, and analysis of society, culture, the socialization process, social institutions, and social change. Students of junior or senior standing should take SOC 31200, unless they are sociology or law and society majors. CTL:ISH 1060 Introduction To Sociology **Credits:** 3.00

SOC 22000 - Social Problems

Credit Hours: 3.00. Contemporary problems at the community, society, and international levels, focusing on patterns of social organization and social change in American society, with concentration on such topics as technological militarism and war, poverty, racism, political protest, and cybernation. CTL:ISH 1061 Social Problems **Credits:** 3.00

SOC 26700 - Religion In The Modern World

Credit Hours: 3.00. A sociological overview of religious change in the modern world covering topics such as secularization, religious freedom, religious and ethnic conflicts, the mutual impacts between religion and various social institutions, such as the family, economy, politics, education, and international relations. The thematic and regional foci may vary when the course is offered in different semesters, but the course will emphasize the sociological approach to understanding religion from a global-comparative perspective. **Credits:** 3.00

SOC 27500 - Sociology Of Aging And The Life Course

Credit Hours: 3.00. An examination of research on the social context of human aging, including demographic and developmental changes. A life course perspective is emphasized for studying health, life events, and quality of life. Considers exceptional longevity in comparative perspective. **Credits:** 3.00

SOC 28500 - Criminal Law And Procedure

Credit Hours: 3.00. This course will introduce students to the fundamental role of law in the American criminal justice arena with an overview on general legal principles, the contemporary form and function of criminal laws in today's American society. The course provides a survey on Substantive Criminal Laws emphasizing definitions of a criminal act, elements of criminal culpability, constitutional limitations on declaring certain conduct criminal, and the purposes of punishment. An overview on

criminal procedure defined through federal and state case law will guide understanding on guidelines governing lawful law enforcement procedures and practices, courtroom decorum and admissibility. Emphasis is given on the role of technology in law enforcement to include Fourth Amendment search and seizure, Fifth Amendment right of privacy and electronic surveillance, self-incrimination, and other topics concerning balance of powers pertaining to rights of citizens and rights of state. **Credits:** 3.00

SOC 31000 - Race And Ethnicity

Credit Hours: 3.00. This course is a sociological examination and analysis of the presence and significance of race and ethnicity in our society. The purpose of this course is to provide a foundation and critical framework for assessing the origins and manifestations of race and ethnicity. Race and ethnicity have historically been one basis for differentiation and stratification in the United States and other societies, and this persists today. In this course, we will examine the emergence of race and ethnicity as concepts, and how they shape our everyday lives. We will be guided by the following questions: Why do we study race and ethnicity? How and why are they relevant in our society? How do we experience race and ethnicity, and how has this changed over time? Topics include multiculturalism and diversity; media representations; racism and discrimination; colorism; racial hierarchies; immigration; and different domains of racial inequality.**Credits:** 3.00

SOC 32400 - Criminology

Credit Hours: 3.00. (CRJU 32400) Nature and cause of crime; methods of dealing with adult and juvenile offenders, consideration of present programs for the social treatment of crime in the light of needed changes. **Credits:** 3.00

SOC 32600 - Social Conflict And Criminal Justice

Credit Hours: 3.00. This course examines the dynamics of social conflict, with a special focus on legal institutions and criminological processes. Students will learn to think more analytically about the causes of social conflict, its dynamics, and strategies for resolution. **Credits:** 3.00

SOC 32700 - Crime, Deviance And Mass Media

Credit Hours: 3.00. Various forms of mass media are used to explore the sociology of crime and deviance. Topics may include white collar crime, juvenile delinquency, street crime, sexuality and sexual orientation, hate crimes, deviance and community. Assignments include quizzes and short papers. **Credits:** 3.00

SOC 32800 - Criminal Justice

Credit Hours: 3.00. Introduction to institutionalized responses of society to the problem of crime. Analysis of the administration of justice in each of the major components of the criminal justice system and laws regulating their operations. Some consideration given to comparative criminal justice. CTL:ISH 1030 Introduction To Criminal Justice **Credits:** 3.00

SOC 33400 - Urban Sociology

Credit Hours: 3.00. Development of the city and its functions; types of social behavior in cities; influences of city life on personality; city planning. **Credits:** 3.00

SOC 33500 - Political Sociology

Credit Hours: 3.00. Analysis of the social and social psychological sources of routine political participation such as voting and interest group activity, and nonroutine political action such as protest movements and revolution; the organization of power at the community, national, and international level; and political ideology. **Credits:** 3.00

SOC 33800 - Global Social Movements

Credit Hours: 3.00. Explores dynamics of social movements in the world; emphasizes movements in non-western world. Examines emergences of movements, mobilization, tactical actions and consequences, and formal and informal organizations within movements to understand how international, national and local structures affect people. **Credits:** 3.00

SOC 33900 - Sociology Of Global Development

Credit Hours: 3.00. Analysis of the causes and consequences of global development. Topics include: globalization; colonialism and decolonization; food insecurity and dependency; industrialization, poverty and inequality; migration; debt and trade; women's empowerment; global health; rights and social change; and sustainable development. This course will introduce you to the study of global development and globalization. The primary questions we will address are: What is development? What is globalization and what is its relationship with development? How have the processes of global development produced inequalities among nations, regions, races, genders, and classes? Is there a "developing" world and a "developed" world? If so, what are their differences and how do they relate with each other? How have some developing countries become more developed than others? What roles do corporations, the state, and civil society organizations play in the processes of global development? How is global development interrelated with the physical environment, inequalities of consumption, and the environmental crisis? How do people resist the inequalities and perceived injustices of global development through global social movements? How are we interconnected economically, politically, culturally, socially, and ecologically with people all over the world? What are the possible futures of development? To address these issues, our focus will be on the developing world, our scope will be global and long-term, our methodology will be historical-comparative, and our perspective will be social-scientific and critical. **Credits:** 3.00

SOC 34000 - General Social Psychology

Credit Hours: 3.00. Social influences on the individual and processes of social interaction. Individual attitudes and behavior as related to socialization, social norms, social roles, communication and propaganda, and other social influences. Among the interaction processes considered are interpersonal attraction, influence, leadership, cooperation, and conflict. Not open to students with credit in PSY 24000. **Credits:** 3.00

SOC 34400 - Environmental Sociology

Credit Hours: 3.00. This course introduces students to the interplay between human societies and environmental problems. The most challenging environmental problems we face are rooted in human activities. Why do some environmental problems come to be viewed as problems and others do not? How did environmental problems come to be viewed differently by different social groups? How do we motivate the necessary social support to address these problems? Answers to these kinds of questions and others are what we will consider in this class. **Credits:** 3.00

SOC 34500 - Analyzing Culture On TV

Credit Hours: 3.00. This course uses television shows to explore sociological perspectives on culture. The premise of this class is that we can learn a great deal about how culture is constructed, shared, consumed, and contested from watching (and critically analyzing) television shows. We will read theoretical and empirical work about how culture is defined in the social sciences and some of the leading approaches to studying culture in sociology, and then use those concepts to analyze popular television shows. The study of culture centrally concerns the place of meaning in human life, and we will explore how television shapes and is shaped by culture. We will consider how signs, symbols, language, conceptual structures, forms of knowledge, and forms of power interact to create meaning in our life. Cultural change both produces and is produced by changes in meaning, and we will investigate how cultural change occurs, with a focus on topics like changes to American cultures of love, work, religion, and politics. **Credits:** 3.00

SOC 35000 - Sociology Of Family

Credit Hours: 3.00. Designed to provide an understanding of contemporary courtship, marriage, and family interaction as cultural, social, and social-psychological phenomena. Consideration of the major sources of marital strain and conflict within a heterogeneous, rapidly changing society. **Credits:** 3.00

SOC 35200 - Drugs, Culture, And Society

Credit Hours: 3.00. The course provides an overview of the social and cultural underpinnings of drug use across societies. Students engage with various topics, including addiction, global markets, drug epidemics, public policy, and cross-cultural differences in drug use. **Credits:** 3.00

SOC 35600 - Hate And Violence

Credit Hours: 3.00. Examines the causes of and solutions to hatred and violence. Concepts such as anti-Semitism, discrimination, hate crimes, prejudice, racism, bullying, homosexual prejudice, terrorism and other topics will be addressed. This course uses experiential activities, videos, guest speakers and classroom discussion. **Credits:** 3.00

SOC 36700 - Religion In America

Credit Hours: 3.00. Examines the social dimensions of religion in American life; religion in American culture; social profiles of America's religious groups, trends in individual religious commitment; and religion's impact on American life. **Credits:** 3.00

SOC 36800 - The Social Significance Of Religion

Credit Hours: 3.00. Examines religion's relationship with family, work, politics, gender, war and peace, race and ethnicity, health, crime and deviance, education, law, and poverty. Content differs each time course is taught. **Credits:** 3.00

SOC 36900 - Religion And Chinese Society

Credit Hours: 3.00. This course provides an overview of various religions in contemporary China, examines religiosity at the micro, meso and macro levels, and discusses the mutual impacts between religion and social, cultural and political life in Chinese societies. **Credits:** 3.00

SOC 37400 - Medical Sociology

Credit Hours: 3.00. Medical sociology provides an overview of the social determinants of health and health disparities, the experience of illness and being a patient, the organization of the medical profession, and the health care system in the United States as well as other areas of the world. **Credits:** 3.00

SOC 37700 - Sociology Of Mental Health

Credit Hours: 3.00. Examines social influences and consequences of mental health and illness. Considers definitions of psychological disorders, stress, stigma, labeling, and treatments. **Credits:** 3.00

SOC 38100 - Data And Society

Credit Hours: 3.00. We are currently witnessing amazing technological innovations brought about by the production, accumulation, and analysis of unimaginable amounts of data. These technologies are disrupting industries, creating new classes of wealthy and poor, and providing novel opportunities for social control and resistance. This course will look at how the

increasing centrality of data is changing our world. Among the questions we will answer: What's so big about Big Data? How intelligent is artificial intelligence? Why does everyone want my data? Will there still be jobs when I graduate? **Credits:** 3.00

SOC 38200 - Introduction To Statistics In Sociology

Credit Hours: 3.00. Introduction to the basic techniques of statistical analysis applicable to sociological data. Elementary descriptive statistics and statistical inference. Introduction to multivariate analysis. **Credits:** 3.00

SOC 38300 - Introduction To Research Methods In Sociology

Credit Hours: 3.00. Introduction to the methods of data collection and analysis and to the use of the scientific method of social research. Formulation of hypotheses and research designs for their testing. Elementary principles for the conduct of experiments, observation and interviewing, documentation, content analysis, and surveys. Relationship between social research and social theory. **Credits:** 3.00

SOC 39000 - Individual Research In Sociology

Credit Hours: 1.00 to 3.00. Individual research or reading in an area of sociology under the guidance of a Sociology faculty member. Permission of instructor required. **Credits:** 1.00 to 3.00

SOC 39100 - Selected Topics In Sociology

Credit Hours: 1.00 to 3.00. Various topics in sociology that may change from semester to semester are presented by Sociology faculty members. **Credits:** 1.00 to 3.00

SOC 39103 - Applied Internship In Sociology

Credit Hours: 0.00 to 3.00. Internships offer experiential learning opportunities where students can apply classroom knowledge and develop practical skills while earning academic credit. Permission of department required.**Credits:** 0.00 to 3.00

SOC 40200 - Sociological Theory

Credit Hours: 3.00. An advanced critical treatment of the theories, concepts, and methods of sociology. A basic course required of undergraduate majors in sociology. **Credits:** 3.00

SOC 40900 - Social Networks

Credit Hours: 3.00. Social networks are patterns of social relationships among people, organizations, and other entities (words, events, etc.) that allow communication and influence and provide a context for social life. This course considers social networks both on and off the internet that are important in people's lives for finding dates, getting jobs, maintaining friends and family, finding and maintaining identities, belonging to groups, and communication and influence more generally. **Credits:** 3.00

SOC 41100 - Social Inequality

Credit Hours: 3.00. Examination of systems of class and caste, with special attention to the United States; status, occupation, income, and other elements in stratification. **Credits:** 3.00

SOC 41900 - Sociology Of Law

Credit Hours: 3.00. Provides an overview of American legal thought and legal processes. Major topics include definitions of law; anthropological studies of law; origin and development of law; jurisprudence; police behavior; lawyers and courts; deterrent and labeling effects of legal sanctions. **Credits:** 3.00

SOC 42100 - Juvenile Delinquency

Credit Hours: 3.00. A study of social and psychological factors influencing individual delinquent behavior patterns. Emphasis on preventive and rehabilitative programs and the role of community agencies such as social service agencies, juvenile courts, and youth authorities. Visits to selected organizations and institutions. **Credits:** 3.00

SOC 42300 - Field Practicum In Sociology And Law And Society

Credit Hours: 4.00. Field experience in criminal justice system or social services. Students serve as "interns" in a criminal justice or social service agency one day (or its equivalent) per week, under the supervision of agency personnel. Application of theory and empirical research findings to field problems. Permission of instructor required. **Credits:** 4.00

SOC 42600 - Social Deviance And Control

Credit Hours: 3.00. Sociological and social psychological study of social control and social deviance. Emphasis on theoretical frameworks and empirical research. Consideration also given to specific areas such as substance abuse, suicide, violence, and deviant collective behavior. **Credits:** 3.00

SOC 42900 - Sociology Of Protest

Credit Hours: 3.00. This course focuses on the sociological study of protest. Topics include protest emergence, individual reasons for participation in protest, and outcomes. Course readings cover protest in the United States as well as other cultural contexts. **Credits:** 3.00

SOC 43000 - Sociology of Aging

Credit Hours: 3.00. Examination of the theories of aging, problems confronting older persons, and programs designed to assist the elderly. Consideration of social aspects of aging in the U.S. in the areas of retirement, employment, housing, income, health care, and the family relationships with cross-cultural and a historical comparisons. Typically offered Fall Spring Summer.**Credits:** 3.00

SOC 43200 - Work In Contemporary America

Credit Hours: 3.00. Examines meaning and organization of work in technological society, including job satisfaction, alienation, mobility, conflict, stratification, and unemployment and the impact of race-sex composition of occupations on mobility and politics. Also considers relations with colleagues, organization, clients, and public. **Credits:** 3.00

SOC 45000 - Gender Roles In Modern Society

Credit Hours: 3.00. A critical examination of the complementary roles of men and women, with particular attention to problems of role adjustment in the contemporary United States. The neofeminist movement and countermovements. Role conflicts and adjustments in such areas as family, education, employment, and the political arena. **Credits:** 3.00

SOC 46100 - Health And Social Behavior

Credit Hours: 3.00. This course provides a sociological examination of health and illness, with a particular focus on social position (e.g., race, socioeconomic status, gender), stress and social support, and health care. Goals for this course include developing critical thinking skills, understanding the broader implications of issues related to health, and thinking creatively about potential societal solutions to these issues. **Credits:** 3.00

SOC 48900 - Research Internship In Sociology And Law And Society

Credit Hours: 3.00 to 6.00. Course organized around internship experience in organizations that collect or analyze data from surveys, social media, focus groups, interviews, or experiments. Completion of 60 credits with a minimum GPA of 3.0, including 15 credits of Sociology with a minimum grade of B in SOC 10000, SOC 38200, and SOC 38300. Permission of instructor required. **Credits:** 3.00 to 6.00

SOC 49300 - Interdisciplinary Undergraduate Seminar

Credit Hours: 1.00 to 3.00. An undergraduate seminar devoted to an interdisciplinary examination of social, economic, political, and intellectual movements, using the faculty resources of the participating departments. Subject matter will vary. Each offering of the seminar will be approved by a committee of department heads from the sponsoring departments. Permission of instructor required. **Credits:** 1.00 to 3.00

SOC 49700 - Senior Honors Seminar

Credit Hours: 3.00. A critical examination of some major works in sociology and anthropology, both classical and modern, and of some current theoretical and substantive issues in these disciplines. Open only to students in the departmental honors program. **Credits:** 3.00

SOC 49800 - Senior Honors Paper

Credit Hours: 3.00. The production of a major paper on a topic selected by the student in consultation with the instructor. The students will meet early in the semester for orientation and discussion of topics; in the middle of the semester for progress reports; and late in the semester for presentation and critique of their papers. Open only to students in the departmental honors program. **Credits:** 3.00

SOC 51400 - Racial And Cultural Minorities

Credit Hours: 3.00. America's minority groups; immigration; interracial and intercultural conflicts; assimilation. **Credits:** 3.00

SOC 52500 - Social Movements

Credit Hours: 3.00. A history of social movements and social movement theories from the 19th through the 20th centuries, focused on Western Europe and the USA, although students are encouraged to explore new theories and new movements for their course projects. **Credits:** 3.00

SOC 53100 - Community Organization

Credit Hours: 3.00. A history of communities and community studies from pre-contact North America to the present (including virtual communities, which students may choose to study for their course projects). **Credits:** 3.00

SOC 57000 - Sociology Of Education

Credit Hours: 3.00. Analysis of the American public school as a social organization. Includes: interrelations among community power structure, social stratification, and the school; the roles of superintendent, principal, and teacher in community and school; the classroom as a social system; student culture; and teaching as a profession. **Credits:** 3.00

SOC 57200 - Comparative Healthcare Systems

Credit Hours: 3.00. Using cost, quality, and access to care as core concepts, this course explores healthcare in comparative context. Special topics are health and gender, the environment, epidemics, long-term care, technology, and rationing, among others. **Credits:** 3.00

SOC 57300 - The Human Side Of Medicine

Credit Hours: 3.00. Focuses on sociological theory and research related to social conflicts over the delivery of healthcare in the U.S. Considers social issues pertaining to abortion, AIDS, human experimentation, reproductive technologies, euthanasia, and others. **Credits:** 3.00

SOC 57400 - The Social Organization Of Healthcare

Credit Hours: 3.00. Analysis of the determinants and consequences of the social organization of medical care. Considers morbidity and mortality, costs and utilization of medical services, healthcare occupations and institutions, and change in programs and policies. **Credits:** 3.00

SOC 57600 - Health And Aging In Social Context

Credit Hours: 3.00. Analysis of the social and cultural influences on health in adulthood and later life. Considers distribution of illness among older adults, health behavior, and health services use, including long-term care. **Credits:** 3.00

SOC 58000 - Methods Of Social Research I

Credit Hours: 3.00. An intermediate-level examination of research designs, measurement, and sampling with emphasis on issues of problem formulation and the logic and application of methodological procedures. **Credits:** 3.00

SOC 58100 - Meth Soc Research II

Credit Hours: 3.00. Emphasis on statistical inference applied to sociological problems; topics include the binomial distribution and the logic of inference, one and two sample tests, confidence intervals, and chi-square. Introduction to bivariate correlation and regression, analysis of variance. **Credits:** 3.00

SOC 58300 - Application Of Social Research Methods

Credit Hours: 3.00. Specific methods of survey research, including questionnaire construction, and sampling techniques, as well as case studies and field experiments are covered. Emphasis is on the use of such methods and their implications for the nature of social data. Permission of instructor required. **Credits:** 3.00

SOC 59000 - Individual Research Problems

Credit Hours: 1.00 to 3.00. Individual research or reading in an area of sociology under a Sociology department staff member. Does not include thesis work. Permission of instructor required. **Credits:** 1.00 to 3.00

SOC 59100 - Selected Topics In Sociology

Credit Hours: 1.00 to 3.00. Topics vary. **Credits:** 1.00 to 3.00

SOC 60000 - Development Of Sociological Theory

Credit Hours: 3.00. The development of sociological thought in Western Europe and subsequently in the United States from the publication of Marx's early manuscripts through the sociological writings of the 1940s. **Credits:** 3.00

SOC 60200 - Contemporary Sociological Theories

Credit Hours: 3.00. A companion course to SOC 60000. Examination of the works of recent and contemporary sociological theorists such as Durkheim, Weber, Pareto, Parsons, and Merton, and of major theorists in related disciplines such as Marx, Freud, and Malinowski. Includes an examination of major "schools" or frames of reference such as ecology, structural-functionalism, etc. **Credits:** 3.00

SOC 60900 - Seminar In Sociology

Credit Hours: 3.00. Topics vary. **Credits:** 3.00

SOC 61000 - Seminar On Teaching Sociology

Credit Hours: 3.00. Acquaints students with the literature on teaching sociology and its issues and provides practice instruction through videotaped microteaching, syllabus and examination construction, etc. A theoretical or research paper is required. Prerequisite: Master's student standing. **Credits:** 3.00

SOC 61100 - Social Inequality: Class, Race, And Gender

Credit Hours: 3.00. Survey of major approaches (functional, status attainment, labor market, class, culture) to the sociological study of inequality, including qualitative and quantitative, historical and comparative studies. Students will be asked to complete a project analyzing inequality, which might provide the basis for a publishable paper. Prerequisite: Master's student standing and Sociology majors only. **Credits:** 3.00

SOC 63000 - Seminar In Political Sociology

Credit Hours: 3.00. Intensive consideration of a selected topic or set of topics in political sociology such as political socialization, political movements, comparative political analysis, political ideology in the industrialized West. **Credits:** 3.00

SOC 65900 - Seminar In Marriage And The Family

Credit Hours: 3.00. Seminar in Marriage and the Family. Offered in alternate years. **Credits:** 3.00

SOC 66700 - Seminar In The Sociology Of Religion

Credit Hours: 3.00. Examines topics of traditional or emerging interest in the sociology of religion. Topics covered depend on the theoretical research interests of participating faculty and students.**Credits:** 3.00

SOC 67400 - Seminar In Medical Sociology

Credit Hours: 2.00 or 3.00. Seminar in Medical Sociology. Prerequisite: SOC 57400. **Credits:** 2.00 or 3.00

SOC 67700 - Research Seminar On Aging And The Life Course

Credit Hours: 1.00. An interdisciplinary seminar examining recent research on aging and the responsible conduct of research. Emphasis is given to professional development in gerontology and related fields. **Credits:** 1.00

SOC 68000 - Advanced Social Research Methods

Credit Hours: 3.00. Survey analysis using regression models. Emphasizes ordinary least squares model applied to sociological problems. Also considered are path analysis and logit and logistic regression. A series of projects are required using the PUCC mainframe computer applying course concepts. Prerequisite: SOC 58100 or SOC 60000. **Credits:** 3.00

SOC 68100 - Selected Problems Of Social Research

Credit Hours: 3.00. Working with already available data, each student will conduct one or more research projects, including conceptualization, operational procedures, analysis of the data, and report writing. The data to be used may be from surveys, small group studies, organizational studies, or written documents. Prerequisite: SOC 60000 or SOC 68000. Permission of instructor required. **Credits:** 3.00

SOC 68600 - Qualitative Methods

Credit Hours: 3.00. Surveys qualitative research methods. Considers methods of data collection and data analysis, including computer-assisted techniques. Critical examination of perspectives, assumptions, and issues, including protection of human subjects. Students conduct research projects and write papers using techniques encountered in class. Prerequisite: SOC 58000. **Credits:** 3.00

SOC 69300 - Interdisciplinary Seminar

Credit Hours: 3.00. A seminar on a topic of interdisciplinary interest, taught in cooperation with a member of another department. **Credits:** 3.00

SOC 69500 - Analytic Project In Sociology

Credit Hours: 3.00 or 6.00. Designed to provide experience in defining a research problem, in assessing knowledge and research about the problem, and in analysis. Prerequisite: SOC 58000, SOC 58100. Permission of instructor required. **Credits:** 3.00 or 6.00

SOC 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Space Force Training

SFT 11000 - Foundations Of The Space Force I

Credit Hours: 1.00. A survey of officership, professionalism, communications skills, the Space Force organization and its mission. Emphasis is placed on helping students understand what they will experience as a Space Force officer.**Credits:** 1.00

SFT 12000 - Foundations Of The Space Force II

Credit Hours: 1.00. A survey of Space Force installation design and location, Space Force professions, principles of spaceflight and the space environment, geopolitics, defense policy and strategy, and the Space Force's partner services in the Department of Defense. Emphasis is placed on helping students understand what they will experience as a Space Force officer.**Credits:** 1.00

SFT 23000 - Evolution Of Space Power

Credit Hours: 1.00. An exploration of Space Force heritage and leaders and an examination of distinctive space power capabilities and functions. Its purpose is to instill an appreciation of space power development and employment, while continuing to develop cadet communication skills.**Credits:** 1.00

SFT 24000 - Team And Leadership Fundamentals

Credit Hours: 1.00. This course provides a fundamental understanding of both leadership and team building. Topics include leadership principles, conflict and stress management, and ethical decision making in the context of space Force officership.**Credits:** 1.00

SFT 35100 - Space Security, Law, Policy, And Doctrine I

Credit Hours: 3.00. An examination of space law and policy at the national and international levels with particular focus on the Outer Space Treaty of 1967 and the United Nations' Remote Sensing Principles. Students examine how these laws and policies are viewed in real-world situations.**Credits:** 3.00

SFT 36100 - Space Security, Law, Policy, And Doctrine II

Credit Hours: 3.00. This course address the use of space power as an instrument of national power, emphasizing Space Force doctrine, joint doctrine, and space as an operational domain of war. Students examine both the United States' and other nations' space security programs and how international partners and adversaries view and apply space power.**Credits:** 3.00

SFT 47100 - National Security, Leadership Responsibilities, And Commissioning Preparation I

Credit Hours: 3.00. This course examines security challenges around the world and identifies how the Space Force and the other services are organized and employed in response to those challenges. Topics include fundamental aspects of command, the military justice system, and effective communication.**Credits:** 3.00

SFT 48100 - National Security, Leadership Responsibilities, And Commissioning Preparation II

Credit Hours: 3.00. This course addresses how the Space Force and the other services are organized and employed to respond to national security challenges. It also examines the military justice system and the responsibilities, authorities and functions of military command. Emphasizes the importance of effective communication.**Credits:** 3.00

Spanish

SPAN 1010N - First-Year Spanish I

Credit Hours: 3.00 to 5.00. Introductory Spanish language course. Emphasis on developing basic speaking, writing, listening and reading skills as well as awareness of Hispanic cultures.**Credits:** 3.00 to 5.00

SPAN 10100 - Spanish Level I

Credit Hours: 3.00. A beginning Spanish course with emphasis on communicative skills (listening and speaking), literacy skills (reading and writing) and culture. Typically offered Fall Spring Summer. CTL:IWL 1910 Spanish Level I**Credits:** 3.00

SPAN 10200 - Spanish Level II

Credit Hours: 3.00. Continuation of SPAN 10100. CTL:IWL 1911 Spanish Level II**Credits:** 3.00

SPAN 10500 - Accelerated Basic Spanish

Credit Hours: 4.00. Accelerated Basic Spanish course that substitutes for SPAN 10100 and 10200.**Credits:** 4.00

SPAN 11200 - Elementary Spanish Conversation

Credit Hours: 1.00. Development of oral skills for self-expression. Guided practice in conversation to enhance communicative competence. Small group; discussions in Spanish on various topics. Not open to students enrolled in or having credit for SPAN 20100 or above. **Credits:** 1.00

SPAN 20100 - Spanish Level III

Credit Hours: 3.00. An intermediate Spanish course with emphasis on communicative skills (listening and speaking), literacy skills (reading and writing) and culture. CTL:IWL 1912 Spanish Level III **Credits:** 3.00

SPAN 20200 - Spanish Level IV

Credit Hours: 3.00. Continuation of SPAN 20100. CTL:IWL 1913 Spanish Level IV**Credits:** 3.00

SPAN 20500 - Accelerated Intermediate Spanish

Credit Hours: 4.00. An accelerated intermediate Spanish course that substitutes for SPAN 20100 and 20200.**Credits:** 4.00

SPAN 21200 - Intermediate Spanish Conversation

Credit Hours: 1.00. Development of oral skills for self-expression. Guided practice in Spanish conversation to enhance communicative competence. Small group discussions in Spanish on various topics. **Credits:** 1.00

SPAN 22400 - Spanish Level IV: Business Spanish

Credit Hours: 3.00. Practical reading, writing, speaking, and listening comprehension skills directed towards use of Spanish for business purposes. Course materials cover a variety of business aspects in several professions. **Credits:** 3.00

SPAN 23100 - Cervantes' Don Quixote

Credit Hours: 3.00. Reading and discussion of Cervantes' masterpiece. All readings, discussion, papers, and examinations will be in English. **Credits:** 3.00

SPAN 23500 - Spanish American Literature In Translation

Credit Hours: 3.00. Reading and discussion of selected masterpieces of Spanish American literature. The course context will change from semester to semester. Knowledge of Spanish not required. **Credits:** 3.00

SPAN 24100 - Introduction To The Study Of Hispanic Literature

Credit Hours: 3.00. Reading and discussion of selected poetry, prose, and theatre from Spain and Spanish-speaking America; introduction to critical discourse and basic concepts of literary theory. Texts, discussion, and written assignments in Spanish.**Credits:** 3.00

SPAN 28000 - Second-Year Spanish: Special Topics

Credit Hours: 3.00. Selected topics on the civilization, culture, and literature of Spain and Spanish America. Lectures and readings primarily in English, but knowledge of Spanish at the first-year level necessary. **Credits:** 3.00

SPAN 30100 - Spanish Level V

Credit Hours: 3.00. Continued development of Spanish speaking, listening, reading, and writing abilities, using materials dealing primarily with everyday life and civilization in the Spanish-speaking countries from a variety of sources (e.g., newspapers, magazines, TV, recent literature, etc.). Conducted primarily in Spanish. **Credits:** 3.00

SPAN 30200 - Spanish Level VI

Credit Hours: 3.00. Further work to develop speaking, listening, reading, and writing abilities in Spanish on the basis of materials dealing with the ideas and events that have shaped the present-day Spanish-speaking countries. Conducted primarily in Spanish. **Credits:** 3.00

SPAN 30500 - Spanish For Heritage Speakers

Credit Hours: 3.00. This course is intended for the student whose home language is Spanish, but whose education has been exclusively in English. The students will first learn to read and write their native dialects and then the standard language using the orthographic norms of the standard language. **Credits:** 3.00

SPAN 30801 - Advanced Spanish For Heritage Speakers

Credit Hours: 3.00. This course is a continuation of SPAN 30500. It is an advanced grammar course designed for Spanish-English bilinguals exposed to Spanish as a minority/native language during early childhood or adolescence but who have not received formal instruction or education in the language. It aims to develop advanced grammar and writing skills. **Credits:** 3.00

SPAN 31200 - Advanced Spanish Conversation

Credit Hours: 1.00. One credit hour advanced Spanish conversation course focused on guided practice in conversation to enhance communicative competence. Discussions in Spanish on various topics. Course may be taken concurrently with SPAN 30100, 30200, 40100 or 40200. **Credits:** 1.00

SPAN 32100 - Introduction To Spanish For The Professions

Credit Hours: 3.00. Continued work at the advanced-intermediate level with a focus on vocabulary and grammar for contexts in a wide variety of professional settings. Conducted primarily in Spanish.**Credits:** 3.00

SPAN 32200 - Spanish For The Health Professions

Credit Hours: 3.00. Intermediate level course directed towards the use of Spanish in the health care professions. It covers specialized vocabulary from the medical fields, as well as grammar and syntax with the goal of developing speaking, listening, reading and writing abilities. Students will have the opportunity to apply their skills in practical contexts and discuss cultural considerations. **Credits:** 3.00

SPAN 32300 - Global Sustainable Engineering

Credit Hours: 1.00 to 3.00. The main goal of this course is to encourage students to think like global engineers by focusing curricular activities on engineering case studies from a humanistic-engineering perspective. The case studies examined in the course may include past, present, and hypothetical engineering successes and failures; analyses will require engineering skills combined with understanding of cultural perspectives of local communities and cultural context (i.e., sociological, anthropological, and historical information and analyses that contribute to cultural understanding). This humanities-infused approach will encourage students to develop a new mindset--a way of seeing current and hypothetical engineering plans, projects, and impacts through local communities' pasts and presents, unique values, perspectives, and daily ways of life. Taught in Spanish.**Credits:** 1.00 to 3.00

SPAN 32400 - Cultural Engineering Research In Spanish

Credit Hours: 1.00 to 3.00. The course will apply principles examined and mindsets developed during the Humanities-Informed Engineering Projects course to engineering projects in situ during an internship in the Spanish-speaking world. The local context of the students in this class (i.e., internship abroad) allows students to gain knowledge and practice with a humanistic-engineering framework situated in a particular community and professional setting. There are two, multistep main projects in this course: 1) Case study project and 2) Spanish language use and development project. To connect language learning and intercultural competence more strongly to the humanistic-engineering framework set up in the prior course, this course is conducted in Spanish.**Credits:** 1.00 to 3.00

SPAN 32500 - Spanish For Engineering And Technology

Credit Hours: 3.00. This is an intermediate-level course directed towards the use of Spanish in Engineering and Technology professions. It covers specialized vocabulary from the different technical areas, as well as grammar and syntax, with the goal of developing speaking, listening, reading, and writing abilities. Students will have the opportunity to apply their skills in practical contexts, including job interviews, internships, formal presentations and communication in the workplace.**Credits:** 3.00

SPAN 33000 - Spanish And Latin American Cinema

Credit Hours: 3.00. Screening and analysis of selected Spanish and Latin American films with readings and discussions relative to their historical, social, political, aesthetic, literary, and linguistic contexts. No knowledge of Spanish required. **Credits:** 3.00

SPAN 33500 - The Literature Of The Spanish-Speaking Peoples In The United States

Credit Hours: 3.00. Study of selected poetry, fiction, theatre, and essays written in the United States by Spanish-speaking writers; includes readings in the literature written in Spanish and English as well as bilingual poetry and prose. Conducted in Spanish and English. **Credits:** 3.00

SPAN 34100 - Hispanic Literature I: Poetry And Drama

Credit Hours: 3.00. Reading of selected poetic and dramatic texts from Spain and Spanish-speaking America in their historical and cultural contexts. Readings, discussion, and papers in Spanish. **Credits:** 3.00

SPAN 34200 - Hispanic Literature II: Prose

Credit Hours: 3.00. Reading of selected novels and short fiction from Spain and Spanish-speaking America in their historical and cultural contexts. Readings, discussion, and papers in Spanish. **Credits:** 3.00

SPAN 36100 - The Structure Of Spanish I: Phonetics And Phonology

Credit Hours: 3.00. Linguistic analysis of Spanish phonology, phonetics, and dialectology. Selected topics within the areas of Spanish sociolinguistics and language acquisition. Each of these topics will be approached from a contrastive Spanish/English perspective. One session per week devoted to pronunciation improvement. **Credits:** 3.00

SPAN 36200 - The Structure Of Spanish II: Morphology, Lexicology, And Syntax

Credit Hours: 3.00. Linguistic analysis of Spanish, focusing on morphology, lexicology, and syntax. This course will present the grammatical structure of Spanish dealing with word-level phenomena (derivational and inflectional morphology, the lexicon) and phrase- and sentence-level phenomena (constituents, word order, sentence structure, etc.). **Credits:** 3.00

SPAN 38000 - Spanish Language And Culture Abroad

Credit Hours: 3.00 to 6.00. This course must be taken concurrently with participation in an experiential learning opportunity abroad (e.g., study abroad, internship) that requires a period abroad in a Spanish-speaking location. The course will guide students to improve their Spanish language abilities and gain cultural knowledge about their experiential learning location. This course, coupled with the immersion experience, will enhance student learning through Spanish language activities and also cultural research projects. Permission of instructor is required. **Credits:** 3.00 to 6.00

SPAN 39800 - Special Topics In Spanish

Credit Hours: 1.00 to 3.00. Studies of particular aspects of Spanish (e.g., culture, civilization, literature, linguistics, film, art, politics, etc.) by examining a varied selection of works. Readings, discussions, and papers in Spanish.**Credits:** 1.00 to 3.00

SPAN 39900 - Special Study Abroad Credit In Spanish

Credit Hours: 1.00 to 4.00. This course number is for assignment after the fact of credits in Spanish earned while enrolled at a foreign university on a Study Abroad program which cannot be appropriately accommodated under an established Purdue course number. It is not for use for courses offered at or conducted by Purdue. **Credits:** 1.00 to 4.00

SPAN 40100 - Spanish Level VII

Credit Hours: 3.00. Advanced work on development of Spanish speaking, listening, reading, and writing abilities, focusing on materials dealing primarily with culture and the arts in the Spanish-speaking countries. Conducted primarily in Spanish. **Credits:** 3.00

SPAN 40200 - Spanish Level VIII

Credit Hours: 3.00. Spanish 40200 is a content-based course that includes an overview of Spanish grammar. Students will therefore be required to learn a considerable amount of information about the different aspects of the Hispanic, Peninsular and Latin American culture that will include history, politics, art, gastronomy, music, traditions, and literature, among others. **Credits:** 3.00

SPAN 41201 - Advanced Spanish Conversation II

Credit Hours: 1.00. This course is designed to help students use and improve their Spanish speaking and comprehensive skills. Students will be expected to actively participate in classroom discussions, prepare for class, and utilize the target language only. No textbook is needed.**Credits:** 1.00

SPAN 41500 - Spanish Translation And Interpreting

Credit Hours: 3.00. Introduction to the Translation and Interpretation Studies field for Spanish speakers. High level of competence in Spanish required. Overview of translation theory, methodology, and practice both in class and in real settings. Includes a service learning component. Conducted in English and Spanish. **Credits:** 3.00

SPAN 41900 - Directed Tutoring In Spanish

Credit Hours: 1.00 to 4.00. Guided practicum in tutoring Spanish, operation of a tutorial laboratory, and the rationale for audio tutorial second language learning. Students learn tutorial techniques, grade homework, and maintain records under the supervision of the SPAN 10100-SPAN 10200 course chairperson and experienced teaching assistants. Permission of instructor required. **Credits:** 1.00 to 4.00

SPAN 42400 - Business Spanish

Credit Hours: 3.00. A study of the terminology and techniques used in commercial transactions, including the interpretation and writing of business materials. Development of the four language skills, with emphasis on writing and speaking. **Credits:** 3.00

SPAN 44400 - Advanced Communication In Spanish

Credit Hours: 3.00. Advanced-level communication course that delves into oral and written communication within the Spanish-speaking world, emphasizing cultural context and practical application. This course explores complex grammar structures, pronunciation, lexical variations, and intercultural differences in authentic scenarios. Students will enhance their Spanish language proficiency, focusing particularly on oral expression. Taught in Spanish.**Credits:** 3.00

SPAN 48000 - Spanish Civilization

Credit Hours: 3.00. The study of modern Spanish life, with special emphasis on social institutions and customs. Lectures in Spanish. **Credits:** 3.00

SPAN 48100 - Spanish Culture

Credit Hours: 3.00. The development of the cultural life of the Spanish people as reflected in the geography, history, music, art, and architecture of Spain. Lectures in Spanish. **Credits:** 3.00

SPAN 48200 - Latin American Civilization

Credit Hours: 3.00. Outline of Latin American history; the cultural heritage from Spain and from the pre-Spanish civilizations; the intellectual, social, and cultural progress of the Latin American countries. Lectures in Spanish. **Credits:** 3.00

SPAN 48300 - Latin American Culture

Credit Hours: 3.00. Study of Latin American cultures and U.S. Latino culture, from pre-Columbian times to the present. The course will focus on selected aspects of the cultures of Latin American groups. Conducted in Spanish. **Credits:** 3.00

SPAN 48500 - Food And Culture In The Hispanic World

Credit Hours: 3.00. Advanced-level language and culture course about food culture in the Spanish-speaking world. It covers gastronomy, celebrations, history, art, mythology, and other aspects of daily life related to the culinary traditions of the Hispanic countries. Students will further develop their speaking, listening, reading and writing abilities in Spanish. They will have the opportunity to apply their skills in practical contexts and discuss cultural considerations, as well as participate in some hands-on cooking experience. **Credits:** 3.00

SPAN 49800 - Advanced Topics In Spanish

Credit Hours: 1.00 to 3.00. Advanced studies of particular aspects of Spanish (e.g. culture, civilization, literature, linguistics, film, etc) by examining a varied selection of works. Readings, discussion, and papers in Spanish. **Credits:** 1.00 to 3.00

SPAN 51900 - Teaching College Spanish

Credit Hours: 3.00. A course designed to provide a forum for ideas connecting theory and research to teaching practice. Explores issues related to how learning and teaching can be enhanced and presents practical ideas that can be implemented in the classroom. Permission of instructor required. **Credits:** 3.00

SPAN 54000 - Spanish Literature Of The Middle Ages

Credit Hours: 3.00. A survey of Spanish Literature from 11th to the 15th century through the reading and discussion of representative prose, dramatic and poetic works. Lectures and supplemental readings on literary criticism and on various aspects of the period useful to an understanding of the literature it produced. Permission of instructor required. **Credits:** 3.00

SPAN 54100 - Spanish Literature Of The Golden Age

Credit Hours: 3.00. A survey of Spanish literature from 1500 to 1681. Reading and discussion of representative prose, dramatic and poetic works. Lectures and supplemental readings on literary criticism and on various aspects of the period useful to an understanding of the literature it produced. **Credits:** 3.00

SPAN 54200 - Cervantes Don Quijote

Credit Hours: 3.00. Reading and discussion of Don Quixote in the context of Spanish Renaissance literature and subsequent developments in the genre of the novel. **Credits:** 3.00

SPAN 54300 - Spanish Literature Of The 18th And 19th Centuries

Credit Hours: 3.00. The development of Spanish peninsular literature from Neoclassicism to Realism. Reading, analysis, and discussion of a representative selection of works of the periods. **Credits:** 3.00

SPAN 54500 - Spanish Literature Of The 20th Century

Credit Hours: 3.00. The study of major trends in Spanish peninsular literature from the generation of 1898 to the present. Reading, analysis, and discussion of a representative selection of works of the period. **Credits:** 3.00

SPAN 54900 - Hispanic Women Writers

Credit Hours: 3.00. A survey of the literature of Hispanic women writers from Latin America, the Caribbean, and Spain in light of their traditions and of feminist literary theory and criticism. Permission of instructor required. **Credits:** 3.00

SPAN 55000 - Spanish American Literature Of The Colonial Period

Credit Hours: 3.00. A survey of Spanish American literature of the colonial period. Reading and discussion of a number of representative works as well as excerpts from several others. **Credits:** 3.00

SPAN 55100 - Spanish American Literature Of The 19th Century

Credit Hours: 3.00. A survey of Spanish American literature of the 19th century. Reading and discussion of a number of representative works as well as excerpts from several others. **Credits:** 3.00

SPAN 55200 - Spanish American Literature From 1900 To 1970

Credit Hours: 3.00. A survey of Spanish American literature from 1900 to 1970. Readings and discussion of a number of representative works, as well as excerpts from several others. **Credits:** 3.00

SPAN 55300 - Spanish American Literature From 1970 - Present

Credit Hours: 3.00. A survey of Spanish American literature from 1970 to the present. Readings and discussion of a number of representative works, as well as excerpts from several others. **Credits:** 3.00

SPAN 55400 - Hispanic Caribbean Literature

Credit Hours: 3.00. This course focuses on various topics pertaining to Hispanic Caribbean literature. The particular works included will change each time the course is offered. All coursework and discussion is in Spanish. **Credits:** 3.00

SPAN 55500 - Latino/a Literature

Credit Hours: 3.00. This class offers an overview of U.S. Latino/a literature, written in Spanish and English and produced in the United States. It will introduce students to the many and diverse experiences of different Latino/a groups through their literary production. Permission of instructor required. **Credits:** 3.00

SPAN 55600 - Mexican Literature

Credit Hours: 3.00. A survey of Mexican literature. Reading and discussion of a number of representative works as well as excerpts from several others. Permission of instructor required. **Credits:** 3.00

SPAN 55700 - Argentine Literature

Credit Hours: 3.00. A survey of Argentine literature. Reading and discussion of a number of representative works as well as excerpts from several others and from standard anthologies. **Credits:** 3.00

SPAN 56100 - The Structure Of Spanish I: Phonetics, Phonology, And Dialectology

Credit Hours: 3.00. Linguistic analysis of Spanish phonology, phonetics, and dialectology. Selected topics within the areas of Spanish sociolinguistics and language acquisition. Each of these topics will be approached from a theoretical and contrastive Spanish/English perspective. **Credits:** 3.00

SPAN 56200 - The Structure Of Spanish II: Morphology, Lexicology, And Syntax

Credit Hours: 3.00. Linguistic analysis of Spanish focusing on morphology, lexicology, and syntax. This course will present the grammatical structure of Spanish dealing with word-level phenomena (derivational and inflectional morphology, the lexicon) and phrase- and sentence-level phenomena (constituents, word order, sentence structure, etc.). **Credits:** 3.00

SPAN 56300 - History Of The Spanish Language

Credit Hours: 3.00. Development of Spanish since the Ancient Latin period, taking into account influences of other cultures and languages; Spanish in relation to Latin and other Romance languages; basic principles of language change; language change underlying differences between American and Peninsular Spanish.**Credits:** 3.00

SPAN 56401 - Spanish Sociolinguistics

Credit Hours: 3.00. This course addresses the linguistic variation found at all linguistic levels of Spanish (e.g., phonetics, morphology, syntax) that is explained through social variation (e.g., socio-economic status, race, gender). Regional varieties of Spanish in Latin America, the U.S., and Peninsular societies will be studied. Related topics are style and identity, language attitudes, discourse analysis, and pragmatics. All classes will be conducted in Spanish.**Credits:** 3.00

SPAN 59000 - Directed Reading In Spanish

Credit Hours: 1.00 to 4.00. Directed readings in Spanish. Permission of instructor required. **Credits:** 1.00 to 4.00

SPAN 59400 - Special Topics In Hispanic Literature

Credit Hours: 1.00 to 4.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 4.00

SPAN 59600 - Special Topics In Spanish Linguistics

Credit Hours: 1.00 to 4.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 4.00

SPAN 60300 - Second Course To Establish Reading Knowledge

Credit Hours: 3.00. Readings in the physical and biological sciences, mathematics, and engineering. Prerequisite: SPAN 60100. **Credits:** 3.00

SPAN 63000 - Bibliography And Literary Criticism

Credit Hours: 3.00. The use of general and specific reference materials and bibliographical aids in literary research; the basic concepts and terminology of literary criticism. Required of all MA candidates in Spanish. **Credits:** 3.00

SPAN 64200 - Seminar In Spanish Theater

Credit Hours: 3.00. Advanced study of Spanish theater. Content will vary depending on the choice of periods, authors, works, and themes. Permission of instructor required. **Credits:** 3.00

SPAN 65900 - Seminar In Hispanic Literature

Credit Hours: 3.00. Advanced study of special subject. Topics to be announced in advance. Content varies. Permission of instructor required. **Credits:** 3.00

SPAN 67900 - Seminar In Spanish Linguistics

Credit Hours: 3.00. Advanced study and research on a significant topic in Spanish linguistics. Topic to be announced in advance. Permission of instructor required. **Credits:** 3.00

SPAN 68200 - Topics In Latin American Culture

Credit Hours: 3.00. Selected facets of Latin American culture through the eyes of the continent's artists, creative writers, essayists, and social scientists - and in view of current theories of the arts, literatures, multiculturalism, and postcolonialism. **Credits:** 3.00

SPAN 69800 - Research MA Thesis

Credit Hours: 1.00 to 18.00. Research MA Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

SPAN 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Speech, Language and Hearing Science

SLHS 11000 - Exploring The Science And Practice Of Speech, Language, And Hearing Sciences

Credit Hours: 1.00. The Speech, Language, and Hearing Sciences (SLHS) Learning Community will provide SLHS majors with an opportunity to connect with each other, with SLHS graduate students, and with SLHS faculty. Students will be exposed to a variety of different learning and career opportunities within the SLHS field. Participants will also enroll in SLHS 11500 (Introduction to Communication Sciences and Disorders). **Credits:** 1.00

SLHS 11500 - Introduction To Communicative Disorders

Credit Hours: 3.00. Nature, systems, and causes of communicative disorders and the principal methods used for remediation. **Credits:** 3.00

SLHS 13000 - Perception, Action, And Cognition In The Speech, Language, And Hearing Sciences

Credit Hours: 3.00. This course provides a broad introduction to basic science topics that underlie research in the speech, language, and hearing sciences. Topics center around biological and psychological aspects of perception (especially hearing), action (especially speech production), and cognition (especially language). Topics are addressed in terms of developing an understanding of material drawn from popular media aimed at interested non-specialists, including long-form journalism, essays and editorials, documentaries, TEDtalks, popular films and TV shows, etc.**Credits:** 3.00

SLHS 21500 - Exploring Audiology And Hearing Science

Credit Hours: 3.00. This course will introduce students to the discipline of hearing science and to the clinical profession of audiology, with a focus on the unique and exciting aspects of the auditory system. Students will be introduced to the acoustic properties of environmental and speech sounds in relation to hearing loss, the fundamental anatomical and physiological bases of hearing, normal development of hearing and auditory behaviors, history and scope of practice in Audiology, hearing disorders across the life span and assessment and intervention techniques used to manage hearing disorders in children and adults. Guest speakers will include hearing researchers from Purdue University who will talk about their specific research, audiologists from Purdue University and the community who will talk about clinical practice and individuals with hearing disorders who will speak about their personal stories. **Credits:** 3.00

SLHS 22700 - Elements Of Linguistics

Credit Hours: 3.00. (ENGL 22700) Credit will not also be awarded for both SLHS 22700 and LC 26100. A summary of what is known about human language, its structure, its universality, and its diversity; language in its social setting; language in relation to other aspects of human inquiry and knowledge. **Credits:** 3.00

SLHS 30100 - Introduction To Cognitive Neuroscience

Credit Hours: 3.00. (PSY 32400) Introduction to the neural bases of complex human mental abilities. Emphasis on integrating research from cognitive science, brain-scanning techniques, and the lesion technique. Topics include perception, attention, memory, language, motor control, planning/decision-making, and consciousness. **Credits:** 3.00

SLHS 30200 - Hearing Science

Credit Hours: 3.00. An introduction to the scientific foundations of auditory sensation and perception. The course covers those aspects of acoustics most pertinent to understanding auditory processing of simple and complex sounds (e.g. speech and music), the anatomy and physiology of the peripheral and central auditory systems, and a range of auditory perceptual phenomena and their physiological correlates. **Credits:** 3.00

SLHS 30300 - Anatomy And Physiology Of The Speech Mechanism

Credit Hours: 3.00. This course provides an introduction to the anatomical and physiological bases of the speech mechanism with an emphasis on the neural, respiratory, laryngeal, and supralaryngeal subsystems. **Credits:** 3.00

SLHS 30600 - Introduction To Phonetics

Credit Hours: 3.00. Credit will not be given for both SLHS 30600 and LING 31500. An introduction to articulatory phonetics, speech sounds in languages of the world, and principles and symbols of the International Phonetic Alphabet. Extensive practice in phonetic transcription. **Credits:** 3.00

SLHS 30900 - Language Development

Credit Hours: 3.00. (PSY 42600) Specific nature, sequence, and pattern of oral language development from birth through adolescence. Numerous examples illustrating the nature of language acquisition and approaches to the study of children's language are presented. Linguistic and psychological explanations of the sequence of development are discussed. **Credits:** 3.00

SLHS 31000 - Introduction To Audiology: Foundations, Assessment And Management

Credit Hours: 3.00. This course will cover the breadth of audiology practice beginning with foundational content on the acoustic properties of environmental and speech sounds in relation to hearing loss, the fundamental anatomical and physiological bases of hearing, typical development of hearing and auditory behaviors, and the history and scope of practice in Audiology. Clinical topics will include hearing disorders across the lifespan, as well as assessment and intervention techniques used to manage hearing disorders in children and adults. Threaded throughout the course will also be activities designed to develop personal intercultural competence to enhance students' ability to work with diverse patients in a clinical setting. **Credits:** 3.00

SLHS 34500 - Research Methods In Infancy And Childhood

Credit Hours: 3.00. This is a laboratory-based course that focuses on methods to test childhood cognitive and language development. As part of the course, students will be working in the Purdue University Infant Labs. Permission of instructor required. **Credits:** 3.00

SLHS 40100 - Language And The Brain

Credit Hours: 3.00. (PSY 40100) This course is an overview of the neutral systems that underlie the core components of language, including speech perception and production, reading and writing, morphology, syntax, semantics, and discourse. During the past few decades, there has been an unprecedented increase in studies on these topics, due in large part to the widespread use of highly sensitive brain mapping techniques that enable researchers to identify relationships between particular brain areas and particular language functions. The findings that have been emerged from this recent explosion of research are exciting and important for several reasons. They provide fresh insights into the nature of the uniquely human capacity for language, and they have significant implications for understanding and treating language disorders that result from brain injury. **Credits:** 3.00

SLHS 40200 - Introduction To Hearing Loss Treatment And Management

Credit Hours: 3.00. This course provides a broad introduction to audiological treatment and management of hearing loss and its associated challenges. Course topics include an overview of current technology options, including hearing aids, cochlear implants, assistive listening devices, and tinnitus treatment devices. This course emphasizes appropriate counseling techniques, communication strategies, and patient-centered treatment considerations.**Credits:** 3.00

SLHS 40300 - Psycholinguistics

Credit Hours: 3.00. (SLHS 40300) This course aims to introduce students to the current, research-based understanding of how different aspects of language (such as word perception, language acquisition, or speech production) are represented in the mind. In addition, it will introduce some of the research methods employed by language scientists for gaining insight into such a representation. This course also aims to help students learn how to critically evaluate research data used to support various theories about psychological and neural foundations of language knowledge. **Credits:** 3.00

SLHS 40400 - End Of Life Care And Management

Credit Hours: 3.00. We will discuss end of life care and management, primarily from the perspective of speech-language pathologists and audiologists. We will read books, chapters, and articles to gain broad perspectives on end of life, death and dying, and advanced care planning. We will discuss alternative breathing and nutritional interventions, along with their advantages and disadvantages. We will consider methods of counseling patients and families at end of life. We will cover

advanced care planning, health care proxies, advanced directives, palliative care (including hospice). Guest speakers with expertise in related areas will be engaged to provide students with a strong background in these topics.**Credits:** 3.00

SLHS 40500 - Science Of Reading

Credit Hours: 2.00. This course offers an extensive review of the scientific evidence regarding how children learn to read and best practices in teaching reading to typically achieving and struggling readers. Emphasis is placed on informed assessment, the five elements of reading and how to provide an interdisciplinary approach to reading instruction that is explicit, systematic, and cumulative.**Credits:** 2.00

SLHS 40600 - Introduction To Neurodegenerative Disorders

Credit Hours: 3.00. This course is an upper-level elective course for undergraduates in the SLHS major and others who are interested in learning more about neurodegenerative disorders and the effect these disorders have on the cranial sensorimotor system. This course assumes a basic knowledge of the anatomical and physiological bases of the speech mechanism (SLHS 30300) with an emphasis on the neural, respiratory, laryngeal, supralaryngeal, and aerodigestive subsystems. Information presented in this course will build on that basic knowledge and will focus on the effect of neurodegeneration on each of these systems through lectures, article reviews, case-based discussions, and disease-specific group presentations.**Credits:** 3.00

SLHS 40700 - Culturally And Linguistically Diverse Children With Communication Disorders

Credit Hours: 3.00. This course provides students with an overall understanding of typical speech and language development, and communication disorders, across cultural-linguistic groups and issues related to the assessment of and intervention with children from culturally and linguistically diverse populations.**Credits:** 3.00

SLHS 40800 - Introduction To Voice, Upper Airway, And Swallowing Disorders

Credit Hours: 3.00. This course is focused disorders of the larynx and the affect they have on speaking, breathing, and swallowing. This course assumes a basic knowledge of the anatomical and physiological bases of the speech mechanism (SLHS 30300) with an emphasis on the respiratory, laryngeal, and aerodigestive subsystems. Information presented in this course will build on that knowledge and will focus on the etiologies and characteristics of voice, upper airway, and swallowing impairments and the role of speech-language pathologist in assessing and treating these conditions. **Credits:** 3.00

SLHS 40900 - Introduction To The Neural Bases Of Speech And Hearing

Credit Hours: 3.00. An introduction to the neuroanatomy and neurophysiology of the sensory and motor systems involved in speech and hearing. Topics covered include general neuroscience principles, methods for studying the nervous system, and neural mechanisms underlying speech and hearing. The course also introduces disordered systems and contemporary speech and auditory neuroscience research topics.**Credits:** 3.00

SLHS 41000 - Evolution Of Language

Credit Hours: 3.00. This course provides an overview of what is known and what is hypothesized about the evolution of human language. Issues include how we can study evolution of language and speech, how human language compares to animal communication, what neural resources are needed for language use and what is known about how such resources developed in the human brain (perception, production, auditory and visual).**Credits:** 3.00

SLHS 41100 - Speech Vs Sign: Perception, Production, Structure

Credit Hours: 3.00. This course offers a 'compare and contrast' of signed languages and spoken languages, and in the process provides a review of what students have learned about language and speech in their other classes. Issues covered include the definition of 'language', understanding the interaction of cognition and language, neural resources necessary for use of language in speech and in signing, the relationship between gesture and sign languages, and perception and production in both modalities.**Credits:** 3.00

SLHS 41200 - Pediatric Audiology

Credit Hours: 3.00. This course will cover the breadth of pediatric audiology practice including the historical developments in pediatric audiology, as well as assessment, hearing disorders, and management of hard-of-hearing infants, toddlers, young children, and adolescents. Threaded throughout the course will also be activities designed to develop personal intercultural competence to enhance students' ability to work with diverse patients in a clinical setting.**Credits:** 3.00

SLHS 41800 - Understanding Autism

Credit Hours: 3.00. (HDFS 41800, PSY 41800) This course will explore the etiology, neuroscience, diagnosis, and treatment of autism spectrum disorder (ASD). Approached from a multi-disciplinary perspective this course brings together gene, brain, and behavioral sciences with the aim of developing a better understanding of autism. The course will begin with an overview of ASD as a complex behavioral phenotype. This will include discussion of the history ASD and the expansion of the diagnostic criteria associated with the disorder. This introduction will be followed by several classes in which we will examine some of the key domains of impairment in ASD: reciprocal social interaction, language and communication, and restricted and repetitive behaviors. We will also consider the deficits associate with, but not defining of ASD, and examine co-morbid conditions frequently present in individuals with ASD. We will then address the topics of brain architecture, neurochemistry, and genetics and gene expression, all of which we will attempt to relate back to the behavioral features of autism. We will end the course with a review of treatment practices and their efficacy and an examination of impact of ASD on the family and society. **Credits:** 3.00

SLHS 41900 - Topics In Audiology And Speech Pathology

Credit Hours: 1.00 to 3.00. Study of selected topics, varying from semester to semester. Course content will be drawn from areas for which there are no permanent courses. **Credits:** 1.00 to 3.00

SLHS 42000 - Introduction To Developmental Speech And Language Disorders

Credit Hours: 3.00. Students cannot receive credit for both AUS 42000 and AUS 42200. Introduction to disorders of speech and language in children. Characteristics of these disorders, methods of evaluation, and intervention procedures are discussed. **Credits:** 3.00

SLHS 43000 - Speech-Language Disorders In Health Care Settings

Credit Hours: 3.00. Presents speech-language disorders across the lifespan, encountered in a variety of health care settings. Discusses the etiology, evaluation, and management of these disorders; addresses administrative structures, team approaches, and reimbursement issues in health care settings. **Credits:** 3.00

SLHS 44400 - Introduction To Research In Communication Sciences And Disorders

Credit Hours: 3.00. An introduction to fundamental concepts of research in the basic and clinical disorder aspects of speech, language, and hearing processes. Among topics to be covered are research design/strategies, model and theory development, research ethics and data collection and interpretation. Permission of instructor required. **Credits:** 3.00

SLHS 44900 - Introduction To Clinical Practice In Communication Disorders

Credit Hours: 3.00. A course designed to provide instruction in basic diagnostic procedures and therapeutic approaches to speech, language, and hearing disorders. **Credits:** 3.00

SLHS 46000 - Assessment Audiology And Aural Rehabilitation Across The Lifespan

Credit Hours: 4.00. This course will provide an introduction to disorders of the auditory system, the basic assessments that are used to diagnose disorders, and habilitation/rehabilitation. The laboratory provides practical instruction in the procedures discussed in class. **Credits:** 4.00

SLHS 49000 - Directed Study Special Problems

Credit Hours: 1.00 to 6.00. Designed for student to work with individual instructors on special topics of interest. Permission of instructor required. **Credits:** 1.00 to 6.00

SLHS 49800 - Undergraduate Research Experience

Credit Hours: 1.00 to 4.00. The course allows students an opportunity to obtain first-hand experience with research in speech, language, and hearing sciences. Permission of instructor required. **Credits:** 1.00 to 4.00

SLHS 50100 - Neural Bases Of Speech And Hearing

Credit Hours: 3.00. Study of normal human neuroanatomy and neurophysiology related to speech, language, and hearing functions. Includes material concerning normal and abnormal neurological development over the lifespan. **Credits:** 3.00

SLHS 50200 - Fundamentals Of Speech Production And Perception

Credit Hours: 3.00. The physical, biological, and behavioral correlates of normal speech production and perception. Includes an exposure to the measures and methods of speech science. **Credits:** 3.00

SLHS 50300 - Auditory Perception

Credit Hours: 3.00. Behavioral measurement of the capabilities of the normal and impaired auditory system. The laboratory experience includes an exposure to the measures and methods of hearing science. **Credits:** 3.00

SLHS 50401 - The Auditory Periphery

Credit Hours: 3.00. Acoustics and Fourier analysis; outer-ear resonance and interaural differences; middle-ear impedance and structure; inner-ear mechanical responses; hair-cell transduction, electrophysiology, motility; cochlear potentials; cochlear amplifier; suppression; otoacoustic emissions; efferent feedback to the cochlea; damage to the ear; treatments for damaged ears. Permission of department required. **Credits:** 3.00

SLHS 50601 - Neural Bases Of Hearing

Credit Hours: 3.00. **Section I.** Neuroanatomy. Anatomy terminology, overview of cochlear neuroanatomy; afferent and efferent cochlear innervation; auditory nerve formation and termination points in the cochlear nucleus; Neuroanatomy of Cochlear Nucleus, Superior Olivary complex, Nuclei of Lateral lemniscus, Inferior colliculus, Medial geniculate body and the auditory cortex, corticofugal efferent pathways complex. **Section II.** Physiology Neuronal Physiology; response properties of the auditory nerve, cochlear nucleus, superior olivary complex, inferior colliculus, medial geniculate body and auditory cortex, rate-place and temporal-place neural encoding schemes in the auditory nerve, intensity encoding, frequency tuning in normal and cochlear loss,

binaural processing in the superior olivary complex and inferior colliculus, feature maps in the inferior colliculus and medial geniculate body and serial, parallel, hierarchical processing in the auditory cortex and role of cortico thalamic and corticocollicular pathways in shaping subcortical neural representation. **Credits:** 3.00

SLHS 51800 - Counseling In Speech-Language Pathology And Audiology

Credit Hours: 2.00. Application of counseling models, theories, and methods to persons with communicative disorders and their families. Permission of instructor required. **Credits:** 2.00

SLHS 51900 - Special Topics In Audiology And Speech Pathology

Credit Hours: 1.00 to 3.00. Study of special topics, drawn from areas not covered in permanent courses. Topics may vary from semester to semester. **Credits:** 1.00 to 3.00

SLHS 52101 - Speech Disorders In Children

Credit Hours: 3.00. Knowledge base necessary for the competent assessment, diagnosis, and treatment of speech sound disorders in children, including developmental phonological disorders, motor speech disorders, and residual speech errors.**Credits:** 3.00

SLHS 52200 - Language Disorders Of Exceptional Children

Credit Hours: 3.00. Description and diagnosis of children with language disorders and procedures for management. Students in a certification program for EMR, ED, LD or TMR should register for this course rather than AUS 52300. **Credits:** 3.00

SLHS 52300 - Language Disorders In Children: Basic Principles

Credit Hours: 3.00. Principles of description assessment and intervention for children with language disorders. Specific language evaluation and treatment procedures for children in the preschool years. **Credits:** 3.00

SLHS 52900 - Stuttering: Nature, Diagnosis, And Treatment

Credit Hours: 2.00. Reviews applications of research findings and theoretical developments to our understanding of the onset, development, perpetuation, and amelioration of stuttering. Demonstrates and discusses methods and procedures for diagnosing and treating stuttering across the lifespan. **Credits:** 2.00

SLHS 53100 - Language Disorders In Adults

Credit Hours: 3.00. Study of the causes, assessment, and treatment of acquired language disorders in adults, including aphasia, right hemisphere syndromes, and dementia. **Credits:** 3.00

SLHS 53200 - Voice Disorders

Credit Hours: 2.00. Principles of differential diagnosis and clinical management for children and adults presenting voice disorders, based on a working knowledge of normal laryngeal structure and function. **Credits:** 2.00

SLHS 53300 - Medical Speech-Language Pathology

Credit Hours: 2.00. Introduces the graduate speech-language pathology student to issues encountered in the medical environment in preparation for a healthcare externship and a career in the healthcare setting. Topics will include collaborative models in the medical setting, clinical documentation, ethical issues, equipment and instrumentation, medications, among others. **Credits:** 2.00

SLHS 53600 - Traumatic Brain Injury

Credit Hours: 2.00. The mechanisms, effects, assessment, and rehabilitation of traumatic brain injury in children and adults, with emphasis on a team approach to remediation. **Credits:** 2.00

SLHS 53800 - Motor Disorders Of Speech

Credit Hours: 2.00. A study of the neuropathologies that affect the speech production system. Emphasizes the differential diagnosis and management of acquired motor speech disorders. **Credits:** 2.00

SLHS 53900 - Dysphagia

Credit Hours: 3.00. A study of the normal and disordered anatomy and physiology of the swallowing process. Principles of evaluation and treatment of dysphagia are discussed. **Credits:** 3.00

SLHS 54001 - Augmentative And Alternative Communication (AAC)

Credit Hours: 2.00. This course will orient students to the use of augmentative and alternative communication (AAC) across the lifespan. Assessment and evidence-based intervention for people who cannot meet their daily communication needs via natural speech and/or writing and who need AAC will be covered. AAC is neither disorder- nor age-specific. As such, AAC strategies, techniques, and options may be used across the lifespan and with people who have severe communication disorders that interfere with expressive and/or receptive speech and/or language. In that way, AAC can have broad applicability across settings and populations.**Credits:** 2.00

SLHS 54300 - Assessment And Treatment Of Literacy Disorders

Credit Hours: 2.00. An introduction to the characteristics, definitions, etiologies, and assessment of literacy development in school-aged children (4-18 years of age). Emphasis is placed on the scope of practice for speech-language pathologists in the assessment and intervention process for children diagnosed with language-based literacy disorders. **Credits:** 2.00

SLHS 54400 - Clinical School Methods For Communication Disorders

Credit Hours: 2.00. Organization, materials, and methods for conducting speech, language, and hearing services in elementary and secondary schools. Permission of instructor required. **Credits:** 2.00

SLHS 54401 - School-Clinical Methods In Communication Disorders

Credit Hours: 1.00. The focus of this course is on the implementation of speech, language, and hearing services with preschool to secondary (P-12) school-aged children. Students develop a working knowledge of special education law, disability law, and other resources for school-aged children. **Credits:** 1.00

SLHS 54600 - Clinical Seminar In Speech-Language Pathology

Credit Hours: 1.00. This is a clinical seminar course designed to support students' ability to meet knowledge and skills standards related to the scope of practice of speech-language pathologists. This course provides supplemental learning opportunities and

support for students as they complete their hands-on clinical practice each semester by taking a more in-depth look at conditions within the nine areas of practice as well as cultural and linguistically diverse families, ethical standards in clinical practice, professional issues and trends within communication sciences and disorders, and interprofessional education and practice. The course is offered each semester and objectives vary to advance the knowledge and skills required to meet the program and ASHA/CAA guidelines for completion of the program as well as certification standards as indicated by the CFCC.**Credits:** 1.00

SLHS 54900 - Clinical Practice In Speech-Language Pathology I

Credit Hours: 1.00 to 8.00. The second in a series of practicum courses designed to provide instruction and practical experience in fundamental diagnostic and therapeutic approaches to speech and language disorders. AUS 43000 is recommended. Permission of instructor required.**Credits:** 1.00 to 8.00

SLHS 55300 - Implantable Devices

Credit Hours: 3.00. Provides fundamental principles to assist audiologists and speech-language pathologists in the understanding of candidacy, principles of signal processing, and audiologic rehabilitation for children and adults who use cochlear implants. **Credits:** 3.00

SLHS 56000 - Audiologic Diagnostics

Credit Hours: 3.00. Audiometers, audiometric standards, and the use of pure tone and speech signals in the measurement of auditory abilities. Laboratory provides practical instruction in the procedures discussed in class. **Credits:** 3.00

SLHS 56100 - Medical Audiology

Credit Hours: 3.00. Study of the etiology, pathogenesis, symptomology, epidemiology, diagnosis and treatment of diseases, and injuries to the auditory system. **Credits:** 3.00

SLHS 56300 - Pediatric Audiology

Credit Hours: 3.00. Examination of protocols for the identification and evaluation of infants and children with hearing loss, using behavioral, physiologic, and electro-physiologic assessment methods. Course content places an emphasis on clinical decision-making and problem-solving skills. **Credits:** 3.00

SLHS 56400 - Hearing Aids I

Credit Hours: 3.00. An examination of amplification systems as applied in audiological rehabilitation; acoustic, electroacoustic, electronic, and clinical considerations. Laboratory exercises in measurement, modifications, maintenance, selection, and dispensing of hearing aid systems. **Credits:** 3.00

SLHS 56501 - Vestibular Assessment And Rehabilitation

Credit Hours: 3.00. This course will review anatomy and physiology of the vestibular system. Diagnostic assessment, interpretation and proper recommendation techniques will be discussed. Current research addressing dizziness and balance issues will be reviewed as well as case history discussions to help prepare students to see these patients in a clinic setting. The clinical practice of audiology encompasses the assessment and habilitation/rehabilitation vestibular and balance disorders arising from a wide variety of medical and environmental etiologies. It is essential that audiologists have a firm understanding of the most common causes and medical treatments of vestibular disorders for all age groups. Additionally, vestibular assessment and treatment options are expanding rapidly in the past 5-10 years. Student clinicians need exposure to this area of care so that they may grow as research and technology change. Audiologists practice in a medical setting and thus must be comfortable with the

medical approaches and terminology used by otolaryngologists, otologists, neuro-otologists, pediatricians, physical therapists and other allied health professions.**Credits:** 3.00

SLHS 56700 - Auditory Evoked Responses I

Credit Hours: 3.00. Evaluation of peripheral and brainstem auditory system function using evoked potentials. **Credits:** 3.00

SLHS 56800 - Tinnitus Assessment And Rehabilitation

Credit Hours: 2.00. Ringing in the ears (tinnitus) is a common problem among millions of individuals with sensorineural hearing loss. This course will review the physiology, measurement, and treatment for tinnitus. **Credits:** 2.00

SLHS 57000 - Hearing Conservation

Credit Hours: 2.00. A study of noise as a health hazard and as a nuisance; an examination of the ways in which hearing problems related to noise may be reduced. Permission of instructor required. **Credits:** 2.00

SLHS 57401 - Hearing Aids II

Credit Hours: 2.00. The focus of this course is on the evolving technology in hearing aids with an emphasis on the information students will need to make efficacious clinical decisions not only for the hearing aids of today but also for the hearing aids of tomorrow. For each of the hearing aid features that are discussed, we review (1) the need or potential benefit to the patient, (2) the engineering behind the feature, (3) research supporting its efficacy and effectiveness, (4) its limitations, and (5) how to conduct routine clinical measurements to document its functioning. **Credits:** 2.00

SLHS 57700 - Auditory Evoked Responses II

Credit Hours: 3.00. Administration and interpretation of auditory evoked responses generated in the auditory thalamus and cortex. Emphasis is on application of auditory evoked potentials in clinical diagnosis and intraoperative monitoring. Topics include middle (AMLR), late (AEP), and steady-state (SSEP) evoked responses. **Credits:** 3.00

SLHS 57900 - Clinical Practice In Audiology

Credit Hours: 1.00 to 12.00. Supervised clinical practicum in evaluation of hearing and communication status and in remediation of communication problems. Clinical practices include, but are not limited to, auditory site of lesion, sensory aid selection, fitting and evaluation and communication training for children and adults. Clinical practicum is available in the M. D. Steer Audiology Center and off-campus facilities. Permission of instructor required. **Credits:** 1.00 to 12.00

SLHS 58500 - Engineering Projects In Community Service: AuD I

Credit Hours: 2.00. Audiology clinical doctoral students, engineering, and speech, language, and hearing sciences undergraduate students work in a team-oriented research and development service-learning process. Students with faculty advisors collaborate with community partners to develop technology meeting adaptive and educational needs. **Credits:** 2.00

SLHS 58800 - Evaluating Research In Evidence-Based Practice

Credit Hours: 2.00. The focus of this course is on developing the skills necessary to critically consume literature and apply it to clinical practice as speech-language pathologists and audiologists. Students complete a comprehensive evidence-based practice project, which includes developing a clinical question, conducting a literature review, and critiquing acquired research articles.

They gain guidance from a skilled mentor in their research area and receive course instruction on best practices in appraising research necessary for evidence-based practice. **Credits:** 2.00

SLHS 59000 - Directed Study Of Special Problems

Credit Hours: 1.00 to 6.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 6.00

SLHS 60900 - Seminar In Language Acquisition

Credit Hours: 2.00. Critical review of current research in selected areas of typical and atypical language acquisition. Permission of instructor required. **Credits:** 2.00

SLHS 61900 - Advanced Topics In Audiology And Speech Pathology

Credit Hours: 0.00 to 3.00. Study of advanced topics, varying from semester to semester. Course content will be drawn from areas for which there are no permanent courses. **Credits:** 0.00 to 3.00

SLHS 64800 - Speech-Language Pathology Education Externship

Credit Hours: 1.00 to 8.00. Full-time school-clinical experience to provide speech, language, and hearing services in elementary and secondary schools, under the supervision of a school clinician and university staff holding the ASHA Certificate of Clinical Competency. **Credits:** 1.00 to 8.00

SLHS 64900 - Speech-Language Pathology Healthcare Externship

Credit Hours: 1.00 to 8.00. An advanced-level clinical practicum in speech and language disorders. Prerequisite: SLHS 54900. Permission of instructor required. **Credits:** 1.00 to 8.00

SLHS 65800 - Advanced Topics In Audiology

Credit Hours: 2.00 or 3.00. Detailed study of selected topics in audiology. Permission of instructor required. **Credits:** 2.00 or 3.00

SLHS 65900 - Audiology Practice Management

Credit Hours: 2.00. An examination of business and professional issues related to audiology. Practice management topics include conducting a feasibility analysis, writing a business plan, employee management, marketing, reimbursement, and practice growth. Professional issues include licensing, certification, liability issues, and career planning. Prerequisite: SLHS 57900 and Doctor of Audiology majors only. **Credits:** 2.00

SLHS 66100 - Advanced Medical Audiology

Credit Hours: 3.00. The clinical practice of audiology encompasses the audiological assessment and habilitation/rehabilitation of hearing loss arising from a wide variety of medical and environmental etiologies. It is essential that audiologists have a firm understanding of the most common causes and medical treatments of hearing impairment for all age groups. Additionally, the future clinician will be better served by recognizing the how rapidly information changes in this arena and becoming comfortable with reliable educational resources that are available for life-long learning in this area. Audiologists also practice in a medical setting and thus must be comfortable with the medical approaches and terminology used by otolaryngologists, otologists, neuro-

otologists, pediatricians, radiologists, anesthesiologists and other physicians. Additionally, audiologists may be the first contact with a hearing-impaired patient and their role in the referral process will be emphasized. **Credits:** 3.00

SLHS 67000 - Integrative Audiology Grand Rounds

Credit Hours: 1.00. This course provides advanced audiology students an opportunity to share and think deeply about the complex cases they are experiencing on off-campus placements. Students share cases online with their peer students who will provide thoughtful responses and reflections based on their own experiences. This course also provides a summative assessment of the students' knowledge in the final two years of their education. Due to the highly complex nature of the cases, students must use past clinical experiences and knowledge learned in multiple courses in order to successfully present cases and to respond in thoughtful ways that contribute to the online learning environment. Permission of department required; must also be currently enrolled in SLHS 57900 or SLHS 67900 completing an audiology externship.**Credits:** 1.00

SLHS 67800 - Audiology Educational Externship

Credit Hours: 1.00 to 8.00. School clinical experience to provide audiology services in elementary and secondary schools under the supervision of a school clinician and University staff holding the Certificate of Clinical Competence in Audiology from the American Speech-Language and Hearing Association. Permission of department required. **Credits:** 1.00 to 8.00

SLHS 67900 - Advanced Clinical Practice In Audiology

Credit Hours: 4.00. An advanced-level clinical practicum in audiology. Permission of instructor required. **Credits:** 4.00

SLHS 68800 - Research Integration And Dissemination For Evidence Based Practice

Credit Hours: 2.00. The focus of this course is on developing skills integrating current research and communicating about research in clinical practice. Students complete a comprehensive project involving a literature review, clinical decision and poster. They gain guidance from a skilled mentor in their research area and receive course instruction on best practices in scientific communication in a variety of modes, including developing an oral pitch, preparing a literature review and evaluation, and creating and delivering a poster and writing a research abstract. Pre-Requisite: Students must complete Evaluating Research - currently offered as SLHS 51900. **Credits:** 2.00

SLHS 69000 - Directed Study Of Special Problems

Credit Hours: 1.00 to 4.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 4.00

SLHS 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

SLHS 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Studies College of Liberal Arts

SCLA 10100 - Transformative Texts, Critical Thinking And Communication I: Antiquity To Modernity

Credit Hours: 3.00. The primary goal of the course is to provide students with a foundational knowledge of transformative literature from around the world as well as fundamental reading, writing, speaking and analytical skills. This first course in the sequence introduces students to great texts from antiquity to the birth of the modern era. Its goal is to create life-long learners, open to the world, and sensitive to other points of view. It exposes students from across the university to the ideas, skill-set and inspiration that animates from the liberal arts, and it also introduces them to liberal arts faculty. **Credits:** 3.00

SCLA 10200 - Transformative Texts, Critical Thinking And Communication II: Modern World

Credit Hours: 3.00. The primary goal of the course is to provide students with a foundational knowledge of transformative literature from around the world as well as fundamental reading, writing, speaking and analytical skills. This second course in the sequence introduces students to great texts from the modern era. Its goal is to create life-long learners, open to the world, and sensitive to other points of view. It exposes students from across the university to the ideas, skill-set and inspiration that animates from the liberal arts, and it also introduces them to liberal arts faculty. **Credits:** 3.00

SCLA 11000 - Language And Cultural Exchange I: Self In Context

Credit Hours: 3.00. The course takes a social science-based approach to investigating the American university by examining contemporary college life, the history of the American academy, social and environmental issues on campus, and opportunities for engagement with the wider community. Students will improve their speaking, listening, reading, writing skills in English so that they can actively participate in social and academic communication.**Credits:** 3.00

SCLA 11100 - Language And Cultural Exchange II: Texts And Contexts

Credit Hours: 3.00. Students will continue to develop the foundational language skills and knowledge that they need to succeed in their other classes at Purdue and to prepare for further academic and professional opportunities. Students will also deepen their understanding of American culture and improve their ability to think about cultural differences in positive ways. In a sense, this class will be a bridge to help you transition to other language-intensive courses at Purdue where you need to read, write, and speak frequently and/or work in groups (such as business, engineering, literature, public speaking, and social sciences).**Credits:** 3.00

SCLA 11500 - Introduction To Career Decisions

Credit Hours: 1.00. This course is designed to guide the student through self-exploration and an investigation of the world of work. The class format will be short lectures followed by class discussions and activities. Not open to students who have completed GS 11900. **Credits:** 1.00

SCLA 19100 - Special Topics In Liberal Arts

Credit Hours: 1.00 to 3.00. Special topics, varying from semester to semester. Course content will be drawn from areas not dealt within the regular curriculum. Permission from instructor required. **Credits:** 1.00 to 3.00

SCLA 20000 - Cornerstones In Constitutional Law

Credit Hours: 3.00. In this interdisciplinary course, students read case law to understand legal reasoning and constitutional doctrines and identify major constitutional conflicts. It explores how the forces of technology, economics, politics, environmental change, scientific development, and medicine transform constitutional law. **Credits:** 3.00

SCLA 29100 - Special Topics In Liberal Arts

Credit Hours: 1.00 to 3.00. Special topics, varying from semester to semester. Course content will be drawn from areas not dealt within the regular curriculum. Permission from instructor required. **Credits:** 1.00 to 3.00

SCLA 30000 - Liberal Arts Influentials

Credit Hours: 1.00. As a lecture/discussion course, Liberal Arts Influentials features speakers from a diverse range of Liberal Arts majors and introduces students to the myriad career opportunities available to Liberal Arts graduates. Speakers represent careers in the arts, media, industry, politics and more. Students are encouraged to initiate dialogue with working professionals. Only students enrolled in the College of Liberal Arts may register for GS 30000: LA Influentials. **Credits:** 1.00

SCLA 31500 - Internship Development Strategies

Credit Hours: 1.00. This course offers sophomore and junior students the opportunity to gain key skills to prepare for a professional internship. Topics range from "Why intern" to conducting searches, to resumé writing and interview techniques to establishing a professional identity. **Credits:** 1.00

SCLA 39000 - Special Credit For Study Abroad In Liberal Arts

Credit Hours: 1.00 to 4.00. This course number is for assignment of credits in studies in Liberal Arts earned while enrolled at a foreign university on a Study Abroad program which cannot be appropriately accommodated under an established Purdue course number. It is not for use for courses offered at or conducted by Purdue. **Credits:** 1.00 to 4.00

SCLA 39100 - Special Topics In Liberal Arts

Credit Hours: 1.00 to 3.00. Special topics, varying from semester to semester. Course content will be drawn from areas not dealt within the regular curriculum. Permission from instructor required. **Credits:** 1.00 to 3.00

SCLA 41500 - Senior Job Search Seminar

Credit Hours: 2.00. This course is designed to get LA seniors actively started on their job search. Highly intensive assignments, in-class activities, presentations and projects are designed to better prepare students for all aspects of the job search process. **Credits:** 2.00

SCLA 49000 - Directed Reading

Credit Hours: 1.00 to 3.00. Designed for a student to work with an instructor on a topic of special interest. **Credits:** 1.00 to 3.00

SCLA 49100 - Special Topics In Liberal Arts

Credit Hours: 0.00 to 3.00. Special topics, varying from semester to semester. Course content will be drawn from areas not dealt within the regular curriculum. **Credits:** 0.00 to 3.00

SCLA 49105 - Liberal Arts Undergraduate Research Experience

Credit Hours: 0.00. This course is for students in the Dammon Dean's Scholars program or the Margo Katherine Wilke Undergraduate Research program. This course is required each semester a student participates in either program. Permission of instructor required.**Credits:** 0.00

SCLA 49500 - Special Credit For Study Abroad In Liberal Arts

Credit Hours: 1.00 to 4.00. This course number is for assignment of credits in studies in Liberal Arts earned while enrolled at a foreign university on a Study Abroad program which cannot be appropriately accommodated under an established Purdue course number. It is not for use for courses offered at or conducted by Purdue. **Credits:** 1.00 to 4.00

SCLA 50500 - Technology, War, And Strategy

Credit Hours: 3.00. This course introduces students to the interaction between strategy and technology internationally and across historical eras. The course is rooted in historical political, military, economic, technological, and cultural strategy, and it engages core ideas that cut across disparate schools of thought and historical contexts. The course prepares students to appreciate and understand the foundational principles of designing and executing broad strategic initiatives with world-changing consequences that engage profound national economic and technological commitments.**Credits:** 3.00

SCLA 50600 - Space Strategy

Credit Hours: 3.00. Space is the most recent domain in which nations and great powers dispute strategic political, military, economic, and legal interests. The course analyzes the origins, tensions, and promises embedded in the space-focused strategies of major international players. The course will discuss these issues from the US national and strategic interests perspective, focusing on how strategic competition and conflict in space could and should be handled. The course combines technological with grand strategy concerns. **Credits:** 3.00

SCLA 50700 - Grand Challenges In Defense Engineering

Credit Hours: 3.00. This course examines past, present, and future engineering challenges to develop new conceptual insight, research priorities, system integration, and timely methods to meet emerging national defense engineering needs. The course matter involves challenges in Energy, Logistics and Information, and Rapid Offense and Defensive Systems and subsets of each designed to develop understanding depth and transfer analytic and planning skills needed to meet future defense needs. The selected three topics begin with a past engineering challenge to gain perspective on how prior needs were met in their time, a present challenge under current focus, and a possible future challenge and solutions that will require combining prior best practices with the accelerated development needed in the changing world. **Credits:** 3.00

SCLA 51000 - Data And Science Storytelling

Credit Hours: 3.00. The primary assumption of our course is that the goal of communicating with data is ultimately to identify causal mechanisms and change the status quo due to the obtained insights. All audiences have previous understandings of the world, and meaningful data stories should challenge their assumptions about that world. The communication of this data-based new knowledge violates prior assumptions, shares memorable new information and moves the audience to act based on the new knowledge. This is best accomplished through a story. In other words, this communication assumes the form of a story, which is defined as the narrative of how an unexpected cause creates an effect. **Credits:** 3.00

SCLA 52000 - Social And Digital Media Analytics For Business Communication Professionals

Credit Hours: 3.00. This course provides an overview of how to transform social media and digital media information into business intelligence and actionable insight. Although students are not expected to know a programming language prior to taking the course, students are expected to understand basic statistics and to have a desire to learn the processes, procedures and vocabulary used by data analysts in modern organizations. The goal is not to train them as practicing data scientists, but as knowledgeable data analytics consumers and as informed teammates and leaders of cross-functional teams tasked to make decisions using data.**Credits:** 3.00

SCLA 52100 - Societal Impacts Of Artificial Intelligence

Credit Hours: 3.00. Students in this course will draw upon knowledge from multiple fields to understand how AI is transforming social, political, and economic practices in institutions and in society. They will utilize interdisciplinary theories and methodological tools to measure and evaluate the societal impacts of AI. The utilizes a mix of case and source data and recent research in the field of AI to create opportunities for shared communication and learning among those in technical and non-technical fields that utilize artificial intelligence. Students will engage in systematic analysis of societal impact. **Credits:** 3.00

SCLA 52200 - Artificial Intelligence Policy, Governance, And Ethics

Credit Hours: 3.00. This course provides students with a strong grounding in the policy, ethical, and legal regulatory dimensions and environment that shape the governance of AI. Students will analyze current and emerging laws, regulations, and governance strategies shaping the AI landscape across multiple jurisdictions and sectors. The course will help students gain an interdisciplinary understanding of the core ethical principles and values that guide AI.**Credits:** 3.00

SCLA 53000 - Strategic Foresight And Leadership

Credit Hours: 3.00. This course provides emerging leaders with strategic foresight tools and skills to understand and make decisions regarding long-term future operational defense-related environments. Strategic foresight is the ability to create and sustain a variety of high-quality long-term views and apply emerging insights in organizationally adaptive ways. Strategic foresight produces scenarios that are the basis for strategies and plans to help defense or industry organizations remain competitive into the foreseeable future. **Credits:** 3.00

SCLA 59000 - Special Topics

Credit Hours: 3.00. This course, whose specific topics might change, focuses on strategy and military studies a global scale. The course will be rooted in all the elements of strategy (political, military, economic and cultural), plus strategic theory and technology's impact on it. The course exposes students to a set of historical and contemporary strategic dilemmas that involved difficult trade-offs, costly investments, wild risks, incredible victories, and crushing defeats. This is a multidisciplinary course that focuses on several core ideas and principles that cut across schools of thought and examples from past, present and future. **Credits:** 3.00

Sustainable Food and Farm Systems

SFS 21000 - Small Farm Experience I

Credit Hours: 3.00. This is the first course of two designed to help students gain an understanding of what is needed to establish a productive small farm enterprise. There will be short field trips to local small farming enterprises. Classes will also be taught by guest lecturers and local farmers who have been successful at establishing small farming enterprises. Students in the class will be responsible for working on the Purdue Student Farm to gain practical experience on the topics and concepts being taught in the class. **Credits:** 3.00

SFS 21100 - Small Farm Experience II

Credit Hours: 3.00. This course is a continuation of SFS 21000 and is designed to help students gain an understanding of what is needed to establish a productive small farm enterprise. There will be short field trips to local small farming enterprises. Classes will also be taught by guest lecturers and local farmers who have been successful at establishing small farming enterprises. Students in the class will be responsible for working on the Purdue Student Farm to gain practical experience on the topics and concepts being taught in the class. **Credits:** 3.00

SFS 30100 - Agroecology

Credit Hours: 3.00. This course introduces students to the application of ecological concepts to food production systems and farm management. We will consider species interactions, nutrient and water cycles, regenerative practices, alternative approaches to agriculture, and ecosystem services provided to and by agro-ecosystems. **Credits:** 3.00

SFS 30200 - Principles Of Sustainability

Credit Hours: 3.00. Principles of sustainability is an experiential (discussion/debate) course that delivers an expansive overview of the principles of sustainability as they relate to energy and resources, communities, and agriculture. Students will learn to understand and analyze different food and farming systems and how they relate to environmental, economic and social sustainability. **Credits:** 3.00

SFS 31100 - Aquaponics

Credit Hours: 1.00. (FNR 31300) (HORT 31100) There has been significant renewed interest in the investigation of integrated fish-food plant systems. Such systems have a long and rich history, particularly in Asia, and our impending food crisis has kindled an interest in developing aquaponic systems in western countries. Many growers are turning to controlled environment and hydroponic production methods to produce high-value crops in tight quarters. High input costs can, however, be a limitation. The waste disposal problem of the fish can become the nutrient supply to the plants. **Credits:** 1.00

SFS 31200 - Urban Agriculture

Credit Hours: 1.00. Urban agriculture has the potential to address a range of social, economic and environmental issues including food insecurity, energy conservation, and human health and well-being. During this 5-week course, students will learn about the forces driving urban agriculture as well as the political and biophysical factors constraining it by reading articles, reviewing case studies, and visiting urban farms, vertical farm factories, food pantries, and local food advocacy groups. At the end of this course, students will apply the knowledge they've gained by developing a plan to increase urban agriculture in the greater Lafayette metropolitan area. **Credits:** 1.00

SFS 31300 - Farm To Fork

Credit Hours: 1.00. This course will investigate the culinary opportunities of local and seasonal foods and the horticultural demands of producing and marketing them. Dr. Hallett will represent the "farm", giving students a brief overview of the production of local and seasonal foods in Indiana. The "farm" will harvest produce at the student farm and deliver it to the "fork" -- Chef Ambarish Lulay - who will work his culinary magic in the teaching kitchens in the HTM department. The focus, from both "sides" of the course will be the importance of niche marketing for farmers and chefs. This course is going to be tasty and fun! **Credits:** 1.00

SFS 31400 - Comparative Livestock Production Systems

Credit Hours: 1.00. This course will compare and contrast the various livestock and poultry systems in the United States. The course will begin with in depth analysis of the history and structure of prevalent or conventional livestock and poultry production systems followed by a similar analysis of the various alternative production systems currently in use in the US, including organic, grass-fed, and pasture-raised among others. A heavy focus will be placed on critically evaluating the pros and cons of each system, regulations of both conventional and process-verified systems and potential differences in products resulting from different management and processing systems. **Credits:** 1.00

SFS 31500 - Principles Of Permaculture

Credit Hours: 1.00. The goal of this class is to encourage students to think of farming systems, including their energy and resource flows, economics and social characteristics, in the ways that ecologists think of ecological systems. How does energy flow through farming systems, and how do resources recycle (or not)? What are the weaknesses of farming systems that could be

mitigated by mimicking natural systems? Issues of efficiency, sustainability and resilience will be investigated in the context of permaculture, a theory of food production and landscape design that has an emphasis on perennial crops, low input production, and ecological diversity. The centerpiece of the course will be to further develop the Purdue Student Farm using permaculture principles. **Credits:** 1.00

SFS 35100 - SFS Capstone Project

Credit Hours: 1.00. The SFS Capstone Project is a directed-learning course that will require students to prepare and present a sustainability analysis of a farm enterprise, most likely the enterprise at which they conduct their required summer internship, and this may be an internship approved at an operation other than a farm. Students will be required to analyze and enterprise taking into account its economic, environmental and social sustainability, and its broader role in sustaining the local and regional economy, environment and community. The analysis will be prepared as a paper and a presentation that will be given to the undergraduates of the SFS program at an SFS program meeting. The paper and the presentation will be prepared in consultation with a faculty mentor from the SFS program committee and will be graded by the faculty mentor. Completion of an approved work or internship experience. **Credits:** 1.00

SFS 39100 - Special Problems In Sustainable Food And Farming Systems

Credit Hours: 1.00 to 3.00. Contemporary topics in sustainable food and farming systems are explored. Topic selection is based on student interest. Permission of instructor required. **Credits:** 1.00 to 3.00

SFS 41100 - Structural Racism In US Agriculture

Credit Hours: 1.00. A discussion-based exploration of the history and legacies of structural racism in American agriculture. We will analyze the barriers to success faced by non-white farmers in the US, the structures that have oppressed minority groups in agriculture, and ways in which these forces might be reversed or resisted.**Credits:** 1.00

SFS 41200 - Colonialism, Globalization, And Food Justice

Credit Hours: 1.00. This course will uncover the foundations of inequities in access to healthy, nutritious food from the first era of colonization to the modern era of globalization. The course will make students aware of the racial and ethnic inequities in farming and food systems and consider mechanisms of decolonization: resistance against the status quo and the development of new food systems. **Credits:** 1.00

SFS 41300 - The Cultures And Agricultures Of The United States

Credit Hours: 1.00. The United States is a vast country encompassing many climates, geographies, and human histories. This course will investigate the diversity of the United States by examining a dozen locations with respect to people-and-place. How have people shaped these places, and how have these places shaped the people who have lived in them?**Credits:** 1.00

SFS 48500 - Environmental Communication

Credit Hours: 3.00. This is an interactive learning course in science and environmental communication with a strong emphasis on development of practical writing and communication skills for students who will become professionals in environment or natural resources. The public primarily obtains environmental information through the media, as such, scientists need to develop the understanding and skills necessary to engage with a range of audiences through the design of effective communication products. This course provides a unique balance of communication theory and skills training in which students develop the confidence to meaningfully communicate environmental issues. Permission of instructor required if not Junior or Senior standing. **Credits:** 3.00

Statistics

STAT 3010N - Elementary Statistical Methods

Credit Hours: 3.00. Introduction to statistical methods with applications to diverse fields. Emphasis on understanding and interpreting standard techniques. Data analysis for one and several variables, design of samples and experiments, basic probability, sampling distributions, confidence intervals and significance tests for means and proportions, correlation and regression. Software is used throughout. For statistics majors and minors, credit should be allowed in no more than one of STAT 30100, 30301, 35000, 35500, 50100, and in no more than one of STAT 50300 and STAT 51100. Prerequisite: college algebra.**Credits:** 3.00

STAT 3500N - Introduction To Statistics

Credit Hours: 3.00. A data-oriented introduction to the fundamental concepts and methods of applied statistics. Exploratory analysis of data. Sample design and experimental design. Probability distributions and simulation. Sampling distributions. The reasoning of statistical inference. Confidence intervals and tests for one and two samples. Inference for contingency tables, regression, and correlation. Introduction to regression with several explanatory variables. Essential use is made of statistical software throughout. Intended primarily for students majoring in the mathematical sciences. For statistics majors and minors, credit should be allowed in no more than one of STAT 30100, 30301, 35000, 35500, 50100, and in no more than one of STAT 50300 and STAT 51100. Prerequisite: two semesters of college calculus.**Credits:** 3.00

STAT 5110N - Statistical Methods

Credit Hours: 3.00. Descriptive statistics; elementary probability; sampling distributions; inference, testing hypotheses, and estimation; normal, binomial, Poisson, hypergeometric distributions; one-way analysis of variance; contingency tables; regression. For statistics majors and minors, credit should be allowed in no more than one of STAT 30100, STAT 30301, STAT 35000, STAT 35500, STAT 50100, and in no more than one of STAT 50300 and STAT 51100. Prerequisite: Two semesters of college calculus.**Credits:** 3.00

STAT 5120N - Applied Regression Analysis

Credit Hours: 3.00. Inference in simple and multiple linear regression, residual analysis, transformations, polynomial regression, model building with real data, nonlinear regression. One-way and two-way analysis of variance, multiple comparisons, fixed and random factors, analysis of covariance. Use of existing statistical computer programs. Prerequisite: Coursework in Statistical Methods with a calculus prerequisite.**Credits:** 3.00

STAT 5190N - Introduction To Probability

Credit Hours: 3.00. (MA 51900) Algebra of sets, sample spaces, combinatorial problems, independence, random variables, distribution functions, moment generating functions, special continuous and discrete distributions, distribution of a function of a random variable, limit theorems.**Credits:** 3.00

STAT 5200N - Time Series And Applications

Credit Hours: 3.00. An introductory course in stationary time series with applications. Topics include stationarity, autocovariance function, ARIMA (Autoregressive Integrated Moving Average) models, and basic spectral analysis (periodograms and their estimation, tapering, linear filtering). Extensive use of R is incorporated for building time series models and estimating the time series spectrum.**Credits:** 3.00

STAT 10100 - Freshman Orientation Seminar

Credit Hours: 1.00. A one-credit course for first-year Statistics/Mathematics majors designed to develop concepts and skills in team building, time management, and professional development that complement the students' academic and research training. Talks from a broad range of speakers are included. **Credits:** 1.00

STAT 11300 - Statistics And Society

Credit Hours: 3.00. This course is an introduction to statistical literacy and the cultivation of critical thinking skills. Statistical concepts are learned through practical application in the context of contemporary societal issues and debates. Some of the concepts explored include the statistical problem-solving process, data collection methodologies such as surveys and experiments, the ethical considerations entailed in data acquisition, the relationship between variables, the assessment of validity and reliability in the measurement of variables, analysis and graphical representation of single and multiple variables, as well as statistical inference. Furthermore, the curriculum actively encourages the development of critical thinking abilities with a specific focus on data-related inquiries. **Credits:** 3.00

STAT 17000 - Introduction To Actuarial Science

Credit Hours: 2.00. (MA 17000) An introduction to actuarial science from the point of view of practicing actuaries from life insurance, casualty insurance and consulting; introduction to insurance and the mathematical theory of interest; application of spreadsheets to problems related to actuarial science. **Credits:** 2.00

STAT 19000 - Topics In Statistics For Undergraduates

Credit Hours: 1.00 to 5.00. Supervised reading course or special topics course at the freshman level for undergraduates are given under this number. Permission of instructor required. **Credits:** 1.00 to 5.00

STAT 22500 - Introduction To Probability Models

Credit Hours: 3.00. An introduction to basic probability. Emphasis is placed on formulation of models and applications. Probability calculus, standard distributions, random variables, and moments. Credit cannot be given for more than one of STAT 22500, 31100, or 41600. **Credits:** 3.00

STAT 24200 - Introduction To Data Science

Credit Hours: 3.00. (CS 24200) This course provides a broad introduction to the field of data science. The course focuses on using computational methods and statistical techniques to analyze massive amounts of data and to extract knowledge. It provides an overview of foundational computational and statistical tools for data acquisition and cleaning, data management and big data systems. The course surveys the complete data science process from data to knowledge and gives students hands-on experience with tools and methods. Basic knowledge of Python required. Computer Science majors cannot count this course as a degree requirement but can take it for credit as a free elective if taken before CS 37300, 34800, 47100, 47300, 44800.**Credits:** 3.00

STAT 25000 - Problems Solving In Probability

Credit Hours: 2.00. (MA 25000) This course is designed to teach techniques for solving problems in probability theory which are relevant to the actuarial sciences. It is intended to help actuarial students prepare for the Society of Actuaries and Casualty Actuarial Society Exam P/1. Credit by Examination is not available for this course. MA/STAT 41600 is strongly recommended. **Credits:** 2.00

STAT 29000 - Topics In Statistics For Undergraduates

Credit Hours: 1.00 to 5.00. Supervised reading course or special topics course at the sophomore level for undergraduates are given under this number. Permission of instructor required. **Credits:** 1.00 to 5.00

STAT 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in statistics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

STAT 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in statistics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

STAT 30100 - Elementary Statistical Methods

Credit Hours: 3.00. Introduction to statistical methods with applications to diverse fields. Emphasis on understanding and interpreting standard techniques. Data analysis for one and several variables, design of samples and experiments, basic probability, sampling distributions, confidence intervals and significance tests for means and proportions, correlation and regression. Software is used throughout. For statistics majors and minors, credit should be allowed in no more than one of STAT 30100, 35000, 50100, and in no more than one of STAT 50300 and STAT 51100. Prerequisite: college algebra. **Credits:** 3.00

STAT 30301 - Probability And Statistics For Business

Credit Hours: 3.00. This course provides fundamentals for describing data, probability theory, and statistical inference. Topics include exploratory data analysis, discrete and continuous probability distributions, sampling techniques, sampling distributions, confidence intervals and hypothesis tests for means and proportions, and 1 -sample variance, and hypothesis tests about the distributions of categorical variables. Students will utilize Microsoft Excel 2019 or 365. **Credits:** 3.00

STAT 31100 - Introductory Probability

Credit Hours: 3.00. An introduction to basic probability with some theoretical background as well as applications to the physical sciences and engineering. Formulation of probability problems, general probability rules, conditional probability and Bayes Theorem, and discrete and continuous random variables and their properties. Prerequisite: two semesters of college calculus. **Credits:** 3.00

STAT 35000 - Introduction To Statistics

Credit Hours: 3.00. This course provides a data-oriented introduction to applied statistics, covering exploratory data analysis, experimental design, probability distributions, simulation, sampling distributions, and the Central Limit Theorem. Students will learn the fundamentals of statistical inference, including confidence intervals and hypothesis tests for population means, paired and independent comparisons of means, analysis of variance, and regression. The course emphasizes hands-on experience with statistical software and is primarily intended for students majoring in the mathematical sciences. Prerequisite: two semesters of college calculus. **Credits:** 3.00

STAT 35500 - Statistics For Data Science

Credit Hours: 3.00. An introduction to methodologies for data analysis and simulation. Populations and sampling. Distributions and summaries of distributions. Algorithms for sampling and resampling. Foundational statistical concepts including confidence

intervals, hypothesis testing, correlation. Introduction to classification and regression. Essential use is made of statistical software throughout. For statistics majors and minors, credit should be allowed in no more than one of STAT 30100, 30301, 35000, 35500, 50100, and in no more than one of STAT 50300 and STAT 51100. **Credits:** 3.00

STAT 38199 - Professional Practice Co-Op I

Credit Hours: 0.00. Professional experience in Statistics. Program coordinated by Office of Professional Practice with cooperation of participating employers. Students submit a summary report and company evaluation. Permission of instructor required. **Credits:** 0.00

STAT 38299 - Professional Practice Co-Op II

Credit Hours: 0.00. Professional experience in Statistics. Program coordinated by Office of Professional Practice with cooperation of participating employers. Students submit a summary report and company evaluation. Permission of instructor required. **Credits:** 0.00

STAT 38399 - Professional Practice Co-Op III

Credit Hours: 0.00. Professional experience in Statistics. Program coordinated by Office of Professional Practice with cooperation of participating employers. Students submit a summary report and company evaluation. Permission of instructor required. **Credits:** 0.00

STAT 39000 - Topics In Statistics For Undergraduates

Credit Hours: 1.00 to 5.00. Supervised reading course or special topics course at the junior level for undergraduates are given under this number. Permission of instructor required. **Credits:** 1.00 to 5.00

STAT 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in statistics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

STAT 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in statistics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

STAT 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in statistics. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

STAT 41600 - Probability

Credit Hours: 3.00. (MA 41600) An introduction to mathematical probability suitable as preparation for actuarial science, statistical theory, and mathematical modeling. General probability rules, conditional probability and Bayes theorem, discrete and

continuous random variables, moments and moment generating functions, joint and conditional distributions, standard discrete and continuous distributions and their properties, law of large numbers and central limit theorem. Credit cannot be given for more than one of STAT 22500, 31100, or 41600. Prerequisite: multivariate calculus. **Credits:** 3.00

STAT 41700 - Statistical Theory

Credit Hours: 3.00. An introduction to the mathematical theory of statistical inference, emphasizing inference for standard parametric families of distributions. Properties of estimators. Maximum likelihood estimation. Sufficient statistics. Hypothesis tests and confidence intervals. Distribution theory for common statistics based on normal distributions, including linear regression. Bayesian Statistics include posterior inference, posterior mean, maximum a-posteriori estimator, credible intervals, and Bayesian hypothesis testing. **Credits:** 3.00

STAT 42000 - Introduction To Time Series

Credit Hours: 3.00. An introduction to time series analysis suitable for students of actuarial science, engineering, and the sciences. Model building and forecasting with ARMA and ARIMA models. Basic financial volatility models (ARCH and GARCH). Resampling methods for confidence intervals. Basics of spectral analysis, including spectral density estimation and periodograms. **Credits:** 3.00

STAT 46800 - Applied Multivariate Analysis

Credit Hours: 3.00. A detailed exposition of some of the more commonly used multivariate statistical techniques, including the geometric intuition underlying their use. Familiarity with the notation and the basic operations of matrix algebra, and with the standard univariate statistical procedures is assumed. Topics include dimension reduction techniques (principal components, factor analysis, and canonical correlation), clustering, classification, neural network, and structural equation models.**Credits:** 3.00

STAT 47201 - Fundamental Long Term Actuarial Mathematics

Credit Hours: 4.00. Mathematical foundation of actuarial science, emphasizing probability models for life contingencies as the basis for analyzing life insurance and life annuities and determining premiums and reserves. This course provides the background for Course MLC of the Society of Actuaries and Course 3L of the Casualty Actuarial Society.**Credits:** 4.00

STAT 47301 - Introduction To Arbitrage-Free Pricing Of Financial Derivatives

Credit Hours: 3.00. This course exposes students to a number of financial economics concepts related to arbitrage-free option pricing in the binomial market model and the Black-Scholes model. Specific models include (1) Options and parity relationship between options; (2) Option Pricing under the Binomial model; (3) Option Pricing under the Black-Scholes model; (4) Option hedging and the market maker's overnight profit; (5) Black Scholes theory with Brownian motion and Ito calculus; (6) Risk-neutral option pricing and Monte Carlo valuation; (7) Stochastic interest rates and Stochastic Volatility. This course provides the background for Couse MFE of the Society of Actuaries and Course 3F of the Casualty Actuarial Society. **Credits:** 3.00

STAT 47401 - Statistics For Risk Modeling I

Credit Hours: 3.00. This course introduces various statistics learning methods for analyzing insurance data. The main objective is to prepare actuarial science students for the Exam SRM: Statistics for Risk Modeling of the Society of Actuaries.**Credits:** 3.00

STAT 47501 - Advanced Long Term Actuarial Mathematics

Credit Hours: 3.00. This course covers advanced life contingencies topics such as multiple decrement models, joint life models, pension models, and profit emergence and testing for insurance products. It builds on the basic life contingent models learned in STAT 47200. **Credits:** 3.00

STAT 47902 - Fundamental Short Term Actuarial Mathematics

Credit Hours: 3.00. This course aligns with one of the Society of Actuaries examinations. The course will cover the learning objectives for a portion of the Society of Actuaries Examination STAM. Permission of department required. Permission of instructor required.**Credits:** 3.00

STAT 49000 - Topics In Statistics For Undergraduates

Credit Hours: 1.00 to 5.00. Supervised reading course or special topics course at the senior level for undergraduates are given under this number. Permission of instructor required. **Credits:** 1.00 to 5.00

STAT 50100 - Experimental Statistics I

Credit Hours: 3.00. Concepts and methods of applied statistics. Exploratory analysis of data. Sample design and experimental design. Normal distributions. Sampling distributions. Confidence intervals and tests of hypotheses for one and two samples. Inference for contingency tables, regression and correlation, and one-way analysis of variance. Use of the SAS statistical software. Intended primarily for students who have not had calculus. Not open to students in mathematical sciences or engineering. For statistics majors and minors, credit should be allowed in no more than one of STAT 30100, STAT 30301, STAT 35000, STAT 35500, STAT 50100, and in no more than one of STAT 50300 and STAT 51100. Prerequisite: College Algebra. **Credits:** 3.00

STAT 50200 - Experimental Statistics II

Credit Hours: 3.00. Multiple regression including the general linear test, model selection, and regression diagnostics. Analysis of variance for factorial designs, including multiple comparisons. Analysis of covariance. Repeated measures designs. Extensive use of the SAS statistical software. Intended primarily for students who have not had calculus.**Credits:** 3.00

STAT 50300 - Statistical Methods For Biology

Credit Hours: 3.00. Introductory statistical methods, with emphasis on applications in biology. Topics include descriptive statistics, binomial and normal distributions, confidence interval estimation, hypothesis testing, analysis of variance, introduction to nonparametric testing, linear regression and correlation, goodness-of-fit tests, and contingency tables. Open only to majors related to the life sciences. For statistics majors and minors, credit should be allowed in no more than one of STAT 30100, STAT 30301, STAT 35000, STAT 35500, STAT 50100, and in no more than one of STAT 50300 and STAT 51100. **Credits:** 3.00

STAT 50600 - Statistical Programming And Data Management

Credit Hours: 3.00. Use of the SAS software system for managing statistical data. How to write programs to access, explore, prepare, and analyze data. Using the DATA step and procedures to access, transform, and summarize data. Introduction to the SAS macro language. Prepares students for the base SAS certification exam. **Credits:** 3.00

STAT 51100 - Statistical Methods

Credit Hours: 3.00. Descriptive statistics; elementary probability; sampling distributions; inference, testing hypotheses, and estimation; normal, binomial, Poisson, hypergeometric distributions; one-way analysis of variance; contingency tables; regression. For statistics majors and minors, credit should be allowed in no more than one of STAT 30100, STAT 30301, STAT

35000, STAT 35500, STAT 50100, and in no more than one of STAT 50300 and STAT 51100. Prerequisite: Two semesters of college calculus. **Credits:** 3.00

STAT 51200 - Applied Regression Analysis

Credit Hours: 3.00. Inference in simple and multiple linear regression, residual analysis, transformations, polynomial regression, model building with real data, nonlinear regression. One-way and two-way analysis of variance, multiple comparisons, fixed and random factors, analysis of covariance. Use of existing statistical computer programs. Prerequisite: Coursework in Statistical Methods with a calculus prerequisite. **Credits:** 3.00

STAT 51300 - Statistical Quality Control

Credit Hours: 3.00. A strong background in control charts including adaptations, acceptance sampling for attributes and variables data, standard acceptance plans, sequential analysis, statistics of combinations, moments and probability distributions, applications.**Credits:** 3.00

STAT 51400 - Design Of Experiments

Credit Hours: 3.00. Fundamentals, completely randomized design; randomized complete blocks; latin square; multi-classification; factorial; nested factorial; incomplete block and fractional replications for 2n, 3n, 2m x 3n; confounding; lattice designs; general mixed factorials; split plot; analysis of variance in regression models; optimum design. Use of existing statistical programs. **Credits:** 3.00

STAT 51500 - Statistical Consulting Problem

Credit Hours: 1.00. Taken by students in the Applied Statistics Master's program who have participated in the Statistical Consulting Service (STAT 597). Focus is on addressing statistical consultation problems that involve either design of experiments or statistical analysis. Problems involve written reports and oral presentations. Permission of instructor required. **Credits:** 1.00

STAT 51600 - Basic Probability And Applications

Credit Hours: 3.00. A first course in probability, intended to serve as a background for statistics and other applications. Sample spaces and axioms of probability, discrete and continuous random variables, conditional probability and Bayes' theorem, joint and conditional probability distributions, expectations, moments and moment generating functions, law of large numbers, and central limit theorem. (The probability material in course one of the Society of Actuaries and the Casualty Actuarial Society is covered by this course.)**Credits:** 3.00

STAT 51700 - Statistical Inference

Credit Hours: 3.00. A basic course in statistical theory covering standard statistical methods and their application. Estimation including unbiased, maximum likelihood and moment estimation; testing hypotheses for standard distributions and contingency tables; confidence intervals and regions; introduction to nonparametric tests and linear regression. **Credits:** 3.00

STAT 51900 - Introduction To Probability

Credit Hours: 3.00. (MA 51900) Algebra of sets, sample spaces, combinatorial problems, independence, random variables, distribution functions, moment generating functions, special continuous and discrete distributions, distribution of a function of a random variable, limit theorems. **Credits:** 3.00

STAT 52000 - Time Series And Applications

Credit Hours: 3.00. An introductory course in stationary time series with applications. Topics include stationarity, autocovariance function, ARIMA (Autoregressive Integrated Moving Average) models, and basic spectral analysis (periodograms and their estimation, tapering, linear filtering). Extensive use of R is incorporated for building time series models and estimating the time series spectrum. **Credits:** 3.00

STAT 52200 - Sampling And Survey Techniques

Credit Hours: 3.00. This course covers basic sampling design and analysis techniques. Sampling designs include: simple random, stratified, clustered, multi-staged, and systematic samples. Methods of estimation appropriate to design features and efficiency and costs related to sample design are covered. **Credits:** 3.00

STAT 52400 - Applied Multivariate Analysis

Credit Hours: 3.00. Extension of univariate tests in normal populations to the multivariate case, equality of covariance matrices, multivariate analysis of variance, discriminant analysis and misclassification errors, canonical correlation, principal components, factor analysis. Strong emphasis will be placed on use of existing computer programs.**Credits:** 3.00

STAT 52500 - Intermediate Statistical Methodology

Credit Hours: 3.00. Statistical methods for analyzing data based on general/generalized linear models, including linear regression, analysis of variance (ANOVA), analysis of covariance (ANCOVA), random and mixed effects models, and logistic/loglinear regression models. Application of these methods to real-world problems using SAS statistical software. **Credits:** 3.00

STAT 52600 - Advanced Statistical Methodology

Credit Hours: 3.00. As a sequel to STAT 52500, this course introduces statistical modeling tools for situations where standard least-squares techniques may not apply. This includes an extensive coverage of generalized linear models (GLM) for non-Gaussian responses, mixed effects models to describe correlated data, nonparametric regression, and lastly, parametric and nonparametric survival models for the analysis of (possibly censored) time-to-event data. Among issues to be discussed are the estimation of the models, the testing of hypotheses, and the checking of model adequacy. Data examples will be used throughout the course to illustrate the methodologies and the related software tools in R. **Credits:** 3.00

STAT 52700 - Introduction To Computing For Statistics

Credit Hours: 3.00. This course provides a thorough introduction to the R programming language, and its use for statistical computing and data science. The course will first look at the fundamentals of R, including different data-structures, control-flow, and the basic vocabulary. An emphasis will be placed on learning idiomatic and efficient R, covering ideas such as recycling, vectorization and functional programming. The course will then look at principles and tools for tasks like organizing data ('tidy data'), manipulating data ('data carpentry'), querying data (through topics like regular expressions) as well as visualizing data (including interactive visualizations). The material and the homework will encourage development of modular reusable code and reproducible research through ideas such as object-oriented programming and dynamic documents in R Markdown. The last part of the course will study statistical procedures such as least-squares regression, LASSO, Monte Carlo sampling and Markov chain Monte Carlo. Besides exams and homeworks, the course will involve a final project that students can collaborate together on. **Credits:** 3.00

STAT 52800 - Introduction To Mathematical Statistics

Credit Hours: 3.00. The course introduces the fundamental frameworks of statistical theory, from which statistical methods can be derived. This includes the framework of data and statistical models, decision theory (risk functions, Bayes and minimax criteria), sufficient statistics, exponential distribution families, estimation methods, unbiased estimators and information inequality (Cramer-Rao), the Neyman-Pearson framework of hypothesis testing, monotone likelihood ratio families and likelihood ratio tests, and an introduction of asymptotic approximations. Students will need background in advanced calculus, linear algebra, probability, and some mathematical analysis. **Credits:** 3.00

STAT 52900 - Applied Decision Theory And Bayesian Statistics

Credit Hours: 3.00. Bayesian and decision-theoretic formulation of problems; construction of utility functions and quantifications of prior information; methods of Bayesian decision and inference, with applications; empirical Bayes; combination of evidence; Bayesian design and sequential analysis; comparisons of statistical paradigms. **Credits:** 3.00

STAT 53200 - Elements Of Stochastic Processes

Credit Hours: 3.00. (MA 53200) A basic course in stochastic models, including discrete and continuous time Markov chains and Brownian motion, as well as an introduction to topics such as Gaussian processes, queues, epidemic models, branching processes, renewal processes, replacement, and reliability problems. **Credits:** 3.00

STAT 53800 - Probability Theory I

Credit Hours: 3.00. (MA 53800) Mathematically rigorous, measure-theoretic introduction to probability spaces, random variables, expectation, independence, weak and strong laws of large numbers, conditional expectations, and martingales. **Credits:** 3.00

STAT 53900 - Probability Theory II

Credit Hours: 3.00. (MA 53900) Convergence of probability laws; characteristic functions; convergence to the normal law; infinitely divisible and stable laws; Brownian motion and the invariance principle. **Credits:** 3.00

STAT 54000 - Computational Finance I

Credit Hours: 3.00. An introduction to the mathematical tools and techniques of modern finance theory, in the context of Black-Scholes option pricing. Brownian motion and its stochastic calculus, Ito's formula, and Feynman-Kac formula. Pricing and hedging of claims on Black-Scholes assets. Incomplete markets. Path-dependent options. Stochastic portfolio optimization.**Credits:** 3.00

STAT 54100 - Computational Finance II

Credit Hours: 3.00. Stochastic interest rate models. American options from the probabilistic and PDE points of view. Numerical methods for European and American options, including binomial, trinomial, and Monte-Carlo methods. **Credits:** 3.00

STAT 54500 - Introduction To Computational Statistics

Credit Hours: 3.00. This introductory course covers the fundamentals of computing for statistics and data analysis. It starts with a brief overview of programming using a general purpose compiled language (C) and a statistics-oriented interpreted language (R). The course proceeds to cover data structures and algorithms that are directly relevant to statistics and data analysis and concludes with a computing-oriented introduction to selected statistical methods. A significant part of the course involves programming and hands-on experimentation demonstrating the covered techniques, ration, and Markov chain Monte Carlo methods. **Credits:** 3.00

STAT 54600 - Computational Statistics

Credit Hours: 3.00. The course focuses on two fundamental aspects in computational statistics: (1) what to compute and (2) how to compute. The first is covered with a brief review of advanced topics in statistical inference, including Fisher's fiducial inference, Bayesian and frequenstist methods, and the Dempster-Shafer (DS) Theory. The second is discussed in detail by examining exact, approximation, and interactive simulation methods for statistical inference with a variety of commonly used statistical models. The emphasis is on the EM-type and quasi-Newton algorithms, numerical differentiation and integration, and Markov chain Monte Carlo methods.**Credits:** 3.00

STAT 54900 - An Introduction To QTL Mapping In Experimental Populations

Credit Hours: 3.00. This is an introductory/interdisciplinary (master's level) quantitative trait locus (QTL) mapping course. QTL mapping is associated with the statistical analysis of genetic/genomic data and is considered part of the general science known as bioinformatics. **Credits:** 3.00

STAT 55300 - Theory Of Linear Models And Analysis Of Experimental Designs

Credit Hours: 3.00. Least squares analysis of linear models. Gauss Markov Theorem. Estimability and testability of parameters. Confidence regions and prediction regions. Introduction to design of experiments. Analysis of variance. Factorial and block designs. Analysis of random, fixed, and mixed models. Components of variance. Distribution of linear and quadratic forms in normal vectors. A firm background in matrix algebra and some previous exposure to linear models or analysis of variance is desirable. **Credits:** 3.00

STAT 57900 - Foundations Of Statistical Machine Learning

Credit Hours: 3.00. This course provides a comprehensive treatment of modern statistical machine learning topics. These include linear regression, kernel method, trees, boosting, and deep neural networks. We understand these subjects from a statistical perspective with some mathematical rigorousness.**Credits:** 3.00

STAT 58000 - Application Of Statistical Theory

Credit Hours: 3.00. The use of numerical methods to obtain answers in problems arising in probability and statistics. Topics will include the use of the likelihood function, Bayesian and classical methods of estimation and testing, evaluation of probabilities, linear and nonlinear regression. STAT 53200, 55400, and some knowledge of computing and complex analysis are desirable. **Credits:** 3.00

STAT 58100 - Bioinformatics Seminar

Credit Hours: 1.00. This is a weekly forum for presenting both applied and theoretical work in the broad area of bioinformatics. Bioinformatics is the science of generating, organizing, and analyzing biological data. This seminar series occurs both in the fall and spring semesters and attracts speakers from Purdue University, as well as throughout the world. Students are encouraged to register for this course, and everyone else is encouraged to attend this open seminar. **Credits:** 1.00

STAT 58200 - Statistical Consulting And Collaboration

Credit Hours: 3.00. This course is designed to emphasize and develop the skills needed by a statistical consultant/collaborator. Topics include: problem solving, consulting session management, written and oral communication, research ethics, design of experiments, collection of data, and application of statistical methods to real problems. Class activities include actively participating in consulting sessions held by the Statistical Consulting Service, small group projects, short papers, and oral presentations. Permission of instructor required. **Credits:** 3.00

STAT 59000 - Internship Seminar

Credit Hours: 1.00 to 3.00. Students complete an internship where they will use statistical methods. A detailed report describing the internship work is required. Permission of department required. Permission of instructor required. **Credits:** 1.00 to 3.00

STAT 59700 - Statistical Consulting Seminar

Credit Hours: 1.00. Active participation in weekly consulting meetings, directed reading in the statistical literature, application of statistical methods to real problems, report writing. Permission of Instructor required. **Credits:** 1.00

STAT 59800 - Topics In Statistical Methods

Credit Hours: 0.00 to 6.00 (West Lafayette, IUPUI) 1.00 to 3.00 (North Central). Directed study and reports for students who wish to undertake individual reading and study on approved topics. Permission of instructor required. **Credits:** 0.00 to 6.00

STAT 63800 - Stochastic Processes I

Credit Hours: 3.00. (MA 63800) Advanced topics in probability theory which may include stationary processes, independent increment processes, Gaussian processes; martingales, Markov processes, ergodic theory. Prerequisite: STAT 53900. **Credits:** 3.00

STAT 63900 - Stochastic Processes II

Credit Hours: 3.00. (MA 63900) Continuation of STAT 63800. **Credits:** 3.00

STAT 65600 - Bayesian Data Analysis

Credit Hours: 3.00. Bayesian data analysis refers to practical inferential methods that use probability models for both observable and unobservable quantities. The flexibility and generality of these methods allow them to address complex real-life problems that are not amenable to other techniques. This course will provide a pragmatic introduction to Bayesian data analysis and its powerful applications. Topics include: the fundamentals of Bayesian inference for single and multiparameter models, regression, hierarchical models, model checking, approximation of a posterior distribution by iterative and non-iterative sampling methods, and Bayesian nonparametrics. Specific topics and the course outline are subject to change as the semester progresses. All topics will be motivated by problems from the physical, life, social, and management sciences. Conceptual understanding and inference via computer simulation will be emphasized throughout the course. Permission of department required.**Credits:** 3.00

STAT 66700 - Measure-Theoretic Statistics: Decision Theoretic And Classical

Credit Hours: 3.00. Decision theoretic approach to statistical problems, complete class theorems, Bayes and minimax procedures, sequential decision problems, sufficiency, comparison of experiments, invariance; most stringent, similar, unbiased, likelihood ratio tests; efficiency, Cramer-Rao inequality, estimation analogues of good tests; confidence sets. Prerequisite: MA 57100, STAT 52800, STAT 53900, STAT 57600. **Credits:** 3.00

STAT 69000 - Seminar

Credit Hours: 1.00 to 3.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 3.00

STAT 69100 - Seminar In Probability Theory

Credit Hours: 1.00 to 3.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 3.00

STAT 69200 - Research Colloquium

Credit Hours: 1.00. A colloquium or seminar course with discussion. Colloquium speakers present current technical results from statistics. A discussion follows in which the speaker and instructor take questions and explain issues in detail. Students give reports on lectures. Permission of department required. **Credits:** 1.00

STAT 69500 - Seminar In Mathematical Statistics

Credit Hours: 1.00 to 3.00. Topics vary. Permission of instructor required. **Credits:** 1.00 to 3.00

STAT 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

STAT 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Technical Communications

TCM 18000 - Exploring Intercultural technical Communication

Credit Hours: 3.00. This course will explore issues in diverse technical communication workplace settings using Intergroup Dialogue. Students will explore intercultural communication, conflict resolution, social identity, community, and social justice with diverse groups. A component of this class will be engaging with clients, co- facilitators, and/or guest speakers. Topics in this course will include a variety of social identities including (but not limited to) race/ethnicity, nationality of origin/citizenship, gender, sex, sexual orientation/attraction, SES/social class, age, religion/spirituality, ability/disability status, body size/type, level of education.**Credits:** 3.00

TCM 21800 - Introduction To Engineering Technical Reports

Credit Hours: 1.00. This integrated technical communication course introduces foundational skills for technical reports in engineering. Students will practice a recursive writing process and use techniques for analyzing content for different audiences and purposes.**Credits:** 1.00

TCM 22000 - Technical Report Writing

Credit Hours: 3.00. Extensive application of the principles of clear writing in industrial reporting, with emphasis on adaptation to the audience; organization of ideas; and a concise, objective writing style.**Credits:** 3.00

TCM 22200 - Introduction To Technical Documentation

Credit Hours: 1.00. This integrated technical communication course introduces foundational skills for creating effective technical documentation.**Credits:** 1.00

TCM 25000 - Career Planning In Engineering And Technology

Credit Hours: 1.00. Course will guide you through a systematic, hands-on approach to making career-related decisions. The course assumes that career planning is an ongoing process and requires understanding of self and one's environment; therefore, you will leave the course with the necessary tools to find and acquire an internship, co-op, or job now and in the future.**Credits:** 1.00

TCM 31000 - Technical And Scientific Editing

Credit Hours: 3.00. The course focuses on techniques for editing functional technical and scientific products in academic and professional settings.**Credits:** 3.00

TCM 32000 - Written Communication In Science And Industry

Credit Hours: 3.00. Analysis of current writing practices in technology and science, especially in organizational settings. Practice in designing and preparing reports for a variety of purposes and audiences.**Credits:** 3.00

TCM 34000 - Correspondence In Business And Industry

Credit Hours: 3.00. The development and application of strategies and skills for writing letters for business and industry in technology and engineering. Applications may include resumes and letters of application, informational and persuasive letters, and in-house memoranda.**Credits:** 3.00

TCM 35800 - Technical Reporting Analysis And Development

Credit Hours: 1.00. This integrated technical communication course builds advanced technical reporting skills including analysis, synthesis, and development of technical content, structure, and style for technical audiences.**Credits:** 1.00

TCM 35900 - Technical Data Reporting And Presentation

Credit Hours: 1.00. This integrated technical communication course builds advanced data reporting and presentation skills for technical and non-technical workplace audiences.**Credits:** 1.00

TCM 36000 - Communication In Engineering Practice

Credit Hours: 2.00. The application of rhetorical principles to written and oral communication in the engineering professions. Planning, drafting, and revising professional engineering reports; planning and delivering oral presentations; organizing information; developing persuasive arguments.**Credits:** 2.00

TCM 41500 - Technical Communication For Design Projects

Credit Hours: 1.00. This integrated course applies advanced principles and theories of technical communication in a senior design project. Students will create and manage effective oral and written communication for workplace contexts.**Credits:** 1.00

TCM 42000 - Field Experience In Technical Communication

Credit Hours: 1.00 to 3.00. Full- or part-time work in technical communications, supervised by a qualified professional in the cooperating organization and a faculty advisor. Requires periodic written and oral reports and final written and oral reports on work experience and assigned readings. Credit varies with scope of projects. Meets RISE criteria. May be repeated for a total of 4 credit hours. Permission of instructor required.**Credits:** 1.00 to 3.00

TCM 42500 - Managing Document Quality

Credit Hours: 3.00. (ENG W532) This course examines and applies principles of creating technical publication in order to pursue quality management of the process. Students will produce effective publications by identifying and intervening in crucial points in documentation cycle - planning, researching, designing, drafting, reviewing, testing, and revising.**Credits:** 3.00

TCM 43500 - Portfolio Preparation

Credit Hours: 1.00. Preparation of professional portfolio for review by faculty or subject matter experts. Includes readings and development of a professional career plan. **Credits:** 1.00

TCM 49900 - Issues in Technical Communcation

Credit Hours: 1.00 to 3.00. Topics of current and specialized interest for technical communicators. Hours and subject matter arranged by staff.**Credits:** 1.00 to 3.00

TCM 51000 - Effective Workplace Technical Communication

Credit Hours: 3.00. Students from a variety of majors will blend theory and practice as they analyze variables in workplace communication contexts, apply iterative processes of creating effective technical communication, and produce publications within typical workplace technical communication genres.**Credits:** 3.00

TCM 54000 - Advanced Managing Document Quality

Credit Hours: 3.00 to 4.00. In this course, students will examine and apply principles of creating a technical or professional publication from start to finish Students will explore and practice publication quality management issues such as planning, researching audience and content, designing the publication, drafting, obtaining reviews, conducting usability testing, and negotiating within organizational cultures.**Credits:** 3.00 to 4.00

Technology

TECH 10000 - Technology Freshman Seminar

Credit Hours: 1.00. Technology Freshman Seminar. **Credits:** 1.00

TECH 10100 - Women In Technology: Exploring The Possibilities

Credit Hours: 1.00. An in-depth view of the emerging role of women in technology. Presentations by career professionals and faculty in a variety of technology disciplines will increase familiarity with the diversity of programs within the school. Academic and interpersonal skills and strategies needed to succeed in technology careers, and issues such as balancing work and family, will be addressed. **Credits:** 1.00

TECH 10500 - Introduction To Engineering Technology

Credit Hours: 3.00. Introduction to the different disciplines incorporated in engineering technology as well as the skill set needed to be a successful student in engineering technology. Focus will be on individual and professional development, problem identification, developing analytical skills, time and resource management, project planning, design, implementation and evaluation, and oral and written communication in the engineering technology profession. **Credits:** 3.00

TECH 11000 - Freshman Honors Seminar

Credit Hours: 1.00. A first-year honors seminar designed to inform and challenge technology students. Discussion will include a broad range of technology and intellectual issues. By invitation or permission of the instructor. Permission of instructor required. **Credits:** 1.00

TECH 12000 - Design Thinking In Technology

Credit Hours: 3.00. Student will engage in critical analysis of real-world problems and global challenges. They will demonstrate the ability to recognize opportunity and to take initiative in developing solutions applying the principles of human centered design. Students will be able to communicate effectively and to work well on teams. Problems and solutions will be examined from societal, cultural, and ethical perspectives. **Credits:** 3.00

TECH 19900 - Special Topics In Technology

Credit Hours: 1.00 to 3.00. Special topics in Technology; subject matter to be arranged. **Credits:** 1.00 to 3.00

TECH 22000 - Designing Technology For People

Credit Hours: 3.00. Innovating in our complex world requires understanding people and the issues and challenges they face. This unique course brings together perspectives from technology and anthropology to address this by exploring ethnographic studies of people and technology interactions. Through this process, students will practice the problem scoping skills necessary to identify and define problems and begin to generate appropriate design solutions. In addition, students will learn how to observe and talk with people about technology and discuss a range of ways people use technology. Accordingly, the course will focus on human-centered design and how to empathize will people during the design process. This will allow students to learn how to identify opportunities for innovation that emerge when designers carefully observe and listen to humans using technology and/or experiencing problems with current technology. Note: This class engages the material in both the classroom and innovation labs.**Credits:** 3.00

TECH 23199 - Professional Practice Extensive Seminar II

Credit Hours: 1.00. Optional co-op seminar course where students advance their professional development through sharing their work experiences and receiving feedback from the instructor and other co-op students. Seminar enrollment is intended to occur in the first on-campus semester following a co-op work session. **Credits:** 1.00

TECH 27199 - Professional Practice Extensive Seminar I

Credit Hours: 1.00. Optional co-op seminar course where students advance their professional development through sharing their work experiences and receiving feedback from the instructor and other co-op students. Seminar enrollment is intended to occur in the first on-campus semester following a co-op work session. **Credits:** 1.00

TECH 28155 - Technology Study Abroad

Credit Hours: 1.00 to 6.00. Faculty-led, short-term, study abroad experience with a technology-related focus. Topics and learning outcomes will vary by course offering. Instructor permission required.**Credits:** 1.00 to 6.00

TECH 29199 - Cooperative Experience I

Credit Hours: 0.00. Professional experience in technology. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

TECH 29299 - Cooperative Experience II

Credit Hours: 0.00. Professional experience in technology. Program coordinated by school with cooperation of participating exmployers. Students submit summary report and company evaluation. Professional Practice students only. Permission of department required. **Credits:** 0.00

TECH 29900 - Special Topics In Technology II

Credit Hours: 1.00 to 3.00. Hours, subject matter, and credit to be arranged by faculty. Group instruction in new or specialty areas of technology provided by technology faculty. **Credits:** 1.00 to 3.00

TECH 30000 - Technology Cooperative Education Practice III

Credit Hours: 1.00 to 3.00. Semester of external career related experiences designed to enhance the student's preparedness for entering an initial or second career. A minimum of 10 weeks and 200 hours are required for credit. Instructor permission required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 3.00

TECH 30010 - Technology Career Enrichment Internship III

Credit Hours: 1.00 to 3.00. Semester of external career related experience designed to enhance the student's preparedness for entering an initial or secondary career. A minimum of 10 weeks and 200 hours are required. Instructor permission required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 3.00

TECH 30100 - Renewable Energy Systems

Credit Hours: 3.00. Course provides the students with an introduction to renewable energy sources. Topics include photovoltaic, solar thermal systems, fuel-cells, hydrogen, wind power, waste heat, bio-fuels, wave/tidal power, geothermal power and hydroelectric. Analysis of technical, economic, environment, politics, and social policy are integral components of the course. Typically offered Fall Spring Summer.**Credits:** 3.00

TECH 30300 - Energy Efficiency And Auditing

Credit Hours: 3.00. Course discusses fundamentals of energy efficiency and energy auditing. Students will analyze audit data, research energy improvement measures, and prepare recommendations. Topics include energy audit process, energy audit reports, energy bill analysis, economic analysis, audit instrumentation, and will include a subset of the following: building envelope, electrical system, HVAC system, waste heat recovery, lighting, cogeneration, and other prevalent commercial/industrial systems. Typically offered Fall Spring Summer.**Credits:** 3.00

TECH 32000 - Technology And The Organization

Credit Hours: 3.00. A course intended to provide students with experiences mirroring what they will encounter in the world of work. Students will participate in interdisciplinary teams to explore technology solutions. Course topics include public policy, regulatory and ethical issues, teaming and leadership, and project management. Permission of department required. **Credits:** 3.00

TECH 33000 - Technology And The Global Society

Credit Hours: 3.00. The intersection of technology, globalization, and society is at the core of this course. Students examine socio-cultural issues related to the development and use of technology across intercultural contexts, explore perspectives and principles behind global technology influences, and examine the complexities and ethical nuances of technology and innovation.**Credits:** 3.00

TECH 33099 - Professional Practice Extensive Seminar III

Credit Hours: 1.00. Optional co-op seminar course where students advance their professional development through sharing their work experiences and receiving feedback from the instructor and other co-op students. Seminar enrollment is intended to occur in the first on-campus semester following a co-op work session. **Credits:** 1.00

TECH 33199 - Professional Practice Extensive Seminar IV

Credit Hours: 1.00. Optional co-op seminar course where students advance their professional development through sharing their work experiences and receiving feedback from the instructor and other co-op students. Seminar enrollment is intended to occur in the first on-campus semester following a co-op work session. **Credits:** 1.00

TECH 34000 - Prototyping Technology For People

Credit Hours: 3.00. Innovating in our complex world requires us to think strategically and make the best decisions possible for both designing and business development. Accordingly, this unique course brings together perspectives from technology and business management to iteratively prototype innovative solutions to student-selected problems. This process will include creating prototypes in a variety of media, using the appropriate methods/tools, as well as exploring the processes and biases related to how people process information and make decisions. This type of work will help to guide the innovation process by gaining insights from testing prototypes and interacting with people to deepen one's understanding of customer needs, market segments, costs of goods, competitor operations, and market strategies. At the conclusion of the course, students will pitch a viable design solution and business model for a validated problem to a variety of potential investors and/or stakeholders. Note: This class engages the material in both the classroom and innovation labs. Students of all levels of experience, will explore tools/programs related to computer aided design, 3D printing, app development, and digital prototyping.**Credits:** 3.00

TECH 34099 - Professional Practice Seminar I

Credit Hours: 1.00. Optional co-op seminar course where students advance their professional development through sharing their work experiences and receiving feedback from the instructor and other co-op students. Seminar enrollment is intended to occur in the first on-campus semester following a co-op work session. **Credits:** 1.00

TECH 35000 - Technology Cooperative Education Practice IV

Credit Hours: 1.00 to 3.00. Semester of external career related experience designed to enhance the student's preparedness for entering an initial or secondary career. A minimum of 10 weeks and 200 hours are required for credit. Instructor permission required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 3.00

TECH 35010 - Technology Career Enrichment Internship IV

Credit Hours: 1.00 to 3.00. Semester of external career related experience designed to enhance the student's preparedness for entering an initial or second career. A minimum of 10 weeks and 200 hours are required for credit. Instructor permission required. Typically offered Fall Spring Summer.**Credits:** 1.00 to 3.00

TECH 35099 - Professional Practice Seminar II

Credit Hours: 1.00. Optional co-op seminar course where students advance their professional development through sharing their work experiences and receiving feedback from the instructor and other co-op students. Seminar enrollment is intended to occur in the first on-campus semester following a co-op work session. **Credits:** 1.00

TECH 36099 - Professional Practice Seminar III

Credit Hours: 1.00. Optional co-op seminar course where students advance their professional development through sharing their work experiences and receiving feedback from the instructor and other co-op students. Seminar enrollment is intended to occur in the first on-campus semester following a co-op work session. **Credits:** 1.00

TECH 38199 - Professional Practice Co-Op I

Credit Hours: 0.00. Professional practice with qualified employers within industry, government, or small business. Permission of instructor required. **Credits:** 0.00

TECH 38299 - Professional Practice Co-Op II

Credit Hours: 0.00. Professional practice with qualified employers within industry, government, or small business. Permission of instructor required. **Credits:** 0.00

TECH 38399 - Professional Practice Co-Op III

Credit Hours: 0.00. Professional practice with qualified employers within industry, government, or small business. Permission of instructor required. **Credits:** 0.00

TECH 39399 - Cooperative Experience III

Credit Hours: 0.00. Professional experience in technology. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of instructor required. **Credits:** 0.00

TECH 39499 - Extensive Cooperative Experience IV

Credit Hours: 0.00. Professional experience in technology. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of instructor required. **Credits:** 0.00

TECH 39599 - Extensive Cooperative Experience V

Credit Hours: 0.00. Professional experience in technology. Program coordinated by school with cooperation of participating employers. Students submit summary report and company evaluation. Professional Practice students only. Permission of instructor required. **Credits:** 0.00

TECH 39699 - Professional Practice Internship

Credit Hours: 0.00 to 3.00. Professional practice with qualified employers within industry, government, or small business. Permission of instructor required. **Credits:** 0.00 to 3.00

TECH 39900 - Special Topics In Technology III

Credit Hours: 1.00 to 3.00. Hours, subject matter, and credit to be arranged by faculty. Group instruction in new or specialty areas of technology provided by technology faculty. **Credits:** 1.00 to 3.00

TECH 40000 - Technology Study Abroad

Credit Hours: 1.00 to 8.00. This course is utilized to record credits earned through participation in Purdue study abroad programs. Permission of instructor required. **Credits:** 1.00 to 8.00

TECH 43099 - Professional Practice Extensive Seminar V

Credit Hours: 2.00. Optional co-op seminar course where students advance their professional development through sharing their work experiences and receiving feedback from the instructor and other co-op students. Seminar enrollment is intended to occur in the first on-campus semester following a co-op work session. **Credits:** 2.00

TECH 48155 - Technology Study Abroad

Credit Hours: 1.00 to 6.00. Faculty-led, short-term, study abroad experience with a technology-related focus. Topics and learning outcomes will vary by course offering. Instructor permission required.**Credits:** 1.00 to 6.00

TECH 49600 - Senior Design Project Proposal

Credit Hours: 1.00. Capstone problem identification and solution design course demonstrating synthesis of technical, professional, and general knowledge for senior engineering technology students. Proposal presentation is required. **Credits:** 1.00

TECH 49700 - Senior Design Project

Credit Hours: 2.00. Teams will develop innovative solutions based on proposal outcomes in TECH 49600 for current issues in the engineering technology profession, workplace, or community. Project deliverable, presentation, and written report are required. **Credits:** 2.00

TECH 49900 - Special Topics In Technology IV

Credit Hours: 1.00 to 3.00. Hours, subject matter, and credit to be arranged by faculty. Group instruction in new or specialty areas of technology provided by technology faculty. **Credits:** 1.00 to 3.00

TECH 52200 - Sustainability Foundations

Credit Hours: 3.00. Emphasis is placed on definitions of sustainability for corporate, governmental and non-governmental organizations, as well as the frameworks used for developing and implementing sustainability programs. Areas of emphasis in environmental, economic, social, and energy sustainability are explored along with policy and regulations that apply to decision-making. Permission of instructor required. **Credits:** 3.00

TECH 52300 - Sustainable Critical Infrastructures

Credit Hours: 3.00. This is an applied sustainability course that explores critical infrastructures needed for sustainability efforts, and explores several industrial segments in-depth including supply chain and energy. Frameworks for evaluating benefits versus risks will be introduced as well as metrics for evaluating. Permission of instructor required. **Credits:** 3.00

TECH 52400 - Sustainability Analysis Assessment

Credit Hours: 3.00. Applied research project where students conduct a sustainability project under instructor guidance. Emphasis is on new developments relating to technical and operational aspects of sustainability as it applied in industry using triple bottom line evaluations. This course emphasizes a holistic approach to sustainability that includes environmental, economic, and social aspects as well as the impact of policy, standards and regulations on decision-making for sustainability. Permission of instructor required. **Credits:** 3.00

TECH 53300 - Design Theory And Technology

Credit Hours: 3.00. This course provides an overview of theories and approaches to the transdisciplinary concept of design, spanning multiple disciplines and types of design outputs with a focus on technology. Students will read the work of leading design scholars, and situate their personal approach to design practice and research based on historical and current trends in the literature. Student work will be focused on theoretical and practical outcomes, with two main learning goals: 1) building upon and critiquing theories, methods, and processes of design in their original research; and 2) generating an awareness and representation of their personal design philosophy. **Credits:** 3.00

TECH 58100 - Workshop In Technology

Credit Hours: 0.00 to 8.00. Advanced study of technical and professional topics. Emphasis is on new developments relating to technical, operational, and training aspects of industry and technology education. **Credits:** 0.00 to 8.00

TECH 58300 - Smart Manufacturing Applied Technologies

Credit Hours: 3.00. This course addresses new content focusing on the 9 core capabilities and technologies that are at the forefront of digital transformation in the manufacturing industry. It also discusses the three core principles driving this transformation, particularly with the use of the Internet of Things (IoT) to create digital, smart, and connected systems using data to optimize key business drivers and objectives in manufacturing. The goal is to enable faster, flexible, and more efficient processes to produce higher-quality goods, reduce manufacturing costs, increase productivity, and foster industrial growth. These new concepts have not been previously taught at Purdue.**Credits:** 3.00

TECH 58400 - Financial Analysis For Smart Manufacturing

Credit Hours: 3.00. The course will provide manufacturing professionals with foundational tools needed to conduct financial analysis for planning, implementing, and assessing Industry 4.0 projects focused on the application of technology for the integration of the smart manufacturing enterprise. The course begins with basic financial topics including financial statements, financial ratio analysis, and the strategic profit model, and then moves into concepts needed to address typical investment projects for Industry 4.0. Particular attention will be paid to asset lifecycle management models and the priorities that are important in the application of Industry 4.0 technologies to achieve performance improvements. Focus areas will include digital cost reduction efforts such as cost, level of effort, and impact needed to drive capital efficiencies and lower organizational costs. Project budgeting, savings and return on investment models, and project scalability and repeatability will all be discussed. A final corporate financial investment project is required.**Credits:** 3.00

TECH 60100 - Research Seminar In Technology

Credit Hours: 1.00. This course provides an introduction to the field and scholarship of Technology and the skills necessary for success. Prerequisite: Doctoral student standing. **Credits:** 1.00

TECH 60200 - Seminar In Technology And Society

Credit Hours: 1.00. This course focuses on relevant issues and challenges facing professionals in technology-related careers. Topics may include, but are not limited to: ethics, legal issues, public policy, defining technology, and technology and society. Prerequisite: Doctoral student standing. **Credits:** 1.00

TECH 60300 - Graduate Seminar - Planning

Credit Hours: 1.00. This course is designed to guide students in creating individual development plans tailored to their academic and professional aspirations. Students will learn to assess their skills, interests, and values, aligning them with potential research and academic paths. The course will cover setting realistic goals, identifying resources, and developing strategies for personal and academic growth. Students will engage in workshops and activities that foster self-reflection and practical planning skills. By the end of the course, students will have a personalized roadmap that outlines the steps necessary to achieve their graduate school objectives. **Credits:** 1.00

TECH 62100 - Seminar In Technology

Credit Hours: 1.00 to 3.00. Current problems in Technology. **Credits:** 1.00 to 3.00

TECH 62510 - Risk Analysis And Management

Credit Hours: 3.00. Study of the conceptual frameworks of risk management and internal control that form the basis of the internal auditing profession; review the professional standards and practices that guide the internal auditor; define the roles and responsibilities of the internal auditor in assessing enterprise risk and in establishing or enhancing controls to mitigate such risk; describe the assurance tests and techniques that support the internal auditor in assessing governance, risk management, and process controls. Assurance engagements are mainly addressed. Special attention will be given to audit sampling plans and the role of the internal auditor in assessing internal controls over fraud. A study of risk assessment and management techniques, methods, and models used in industry to minimize, control and communicate risks, including conducting various risk management protocols. In addition, the class will examine the latest ISO Standards. ISO 14001 and ISO 31000 standards. Permission of department required. Prerequisite: STAT course 300 level or higher with a C or better.**Credits:** 3.00

TECH 62700 - Digital Leadership

Credit Hours: 3.00. This course will provide an overview of the strategic use and management of social media by technology leaders. In the digital age, technology and data transform every step of the business process, generating a need for new digital tools across all industries and capabilities. Technology innovation leaders and enterprise leaders must be conversant in current and emerging technologies, particularly the growing influence of social media, to identify opportunities and create competitive advantage. Permission of department required. **Credits:** 3.00

TECH 62800 - Technology Research And Use Of Data Analytics

Credit Hours: 3.00. Examines concepts, models and methods useful for applying data analytics in business environments. Focusing on Hypothesis generation, the capturing, storage and expression of data, analysis for research and visualization. Permission of department required. **Credits:** 3.00

TECH 62900 - Global Supply Chain Analysis & Optimization

Credit Hours: 3.00. This course will provide an overview to supply chain management including history of supply chain, elements of supply chain, interactions of supply chain elements, and factors that impact supply chain success. **Credits:** 3.00

TECH 63000 - Leadership Of Cybersecurity & Cyberforensics

Credit Hours: 3.00. This course will provide an overview of cybersecurity for technology leaders. The digital age is ever changing and provides new challenges, threats and opportunities to the technologies that we use. As leaders, we need to learn the considerations of the impact of our decisions on the stakeholders in our environment and the risks they expose. In this course, we

will analyze current trends and threats in the information security space. In addition, the course will also force the analysis of current computing environments and the unique challenges they can bring. Permission of department required.**Credits:** 3.00

TECH 63100 - Global Perspectives On Emerging Technologies

Credit Hours: 3.00. This course centers on an in-depth treatment of the discipline of technology and its intersections with culture, innovation and economics. Systematic analysis of technology and its international dimensions will be required as is horizon scanning, both nationally and internationally. Proficient written and oral communication is necessary for success. Permission of department required.**Credits:** 3.00

TECH 63200 - Demographic Leadership

Credit Hours: 3.00. This course addresses the major underlying changes redefining the United States. It directly yet sensitively examines how we as individuals can more readily deal with demographic shifts, and in the end, how changes in racial and ethnic diversity and age distribution present us all an opportunity to be our better selves. Permission of department required.**Credits:** 3.00

TECH 63300 - Strategic Management Of Technology Innovation

Credit Hours: 3.00. This course looks at how organizations manage the technology innovation process and the function of new product development teams. We discuss idea generation, new product research and development, management of the innovation process, strategies for successful deployment and marketing of technology innovation, applicable laws, and regulations, and return on investment. We will take a broad look at industry though three lenses: 1 - large public companies, 2 - mid-sized family and privately controlled enterprises, and 3 - entrepreneurially led startups.**Credits:** 3.00

TECH 63400 - Global, Legal, Ethical Issues For Technology Leaders

Credit Hours: 3.00. In this course, the nature of contemporary ethical, legal, and technological issues facing organizational leaders are examined. Effective organizational leadership strategies will be explored through a series of readings, discussions, case studies and reflective practice, and organizational effectiveness will be discussed in terms of topics such as ethical decision-making, corporate social responsibility, codes of ethics, public policies/government regulations, the global environment, technological innovation, risk management, and specific areas of law covering health and safety, contracts, warranties and liabilities, intellectual property, technology, and international laws and regulations. Strategies for effective leadership within the framework of managerial decision-making in an ethical context will be examined. Graduate student standing or senior status with consent of instructor.**Credits:** 3.00

TECH 63500 - Global Perspectives In Emerging Technology

Credit Hours: 3.00. This course involves an in-depth treatment of technology and its intersections with culture, innovation and economics. Systematic analysis of technology and its international dimensions will be required. Horizon scanning both in North America and internationally is needed to succeed in this course as is proficient written and oral communication.**Credits:** 3.00

TECH 63700 - Research Focus: The Social Internet

Credit Hours: 3.00. This course simulates an interdisciplinary think tank environment where students identify research questions and examine the impact of social media and social networking technologies on various aspects of society, business, culture, communication, web experience, and interface design. The course integrates immersion in social media with consideration of several theoretical perspectives from diverse fields. Students complete an original research project customized to fit individual or team interests. The course encourages theoretical and methodological diversity. Permission of instructor required. **Credits:** 3.00

TECH 63800 - Leading & Managing Tech Organizations

Credit Hours: 3.00. This course will provide an overview of many Issues in leadership to include topics such as but not limited to Leadership framework, strategies, and an overview of critical business processes. Leading organizations and the teams within are elements of this course that will be addressed and demonstrated throughout the books and exercises in this course. We will focus on what is needed to be a great leader in various situations, and paths to improving leadership trust and leader thinking skills.**Credits:** 3.00

TECH 64000 - Research DTech Thesis

Credit Hours: 1.00 to 18.00. This course will be the research course for Online Doctor of Technology (DTech) students. This research dissertation course is to reflect the student's work to prepare and pass the preliminary examination, prepare and pass the dissertation proposal and successfully defend and pass the DTech dissertation.**Credits:** 1.00 to 18.00

TECH 64100 - Advanced Analytics For Research And Industry

Credit Hours: 3.00. Offers students training and experience in advanced parametric statistical techniques in both research and industrial applications. While statistical theory necessary to properly conduct analyses will be discussed, this course focuses on practical applications of analysis strategies, including issues in handling data from organizations and industry settings. Material includes overview and implementation of relevant statistical software applications. Practical skills in presenting advanced analyses to both professional and scientific audiences is a key component of the course. Prerequisites: IET 50700 or STAT 50100. Permission of instructor required. **Credits:** 3.00

TECH 64600 - Analysis Of Research In Industry And Technology

Credit Hours: 3.00. Analysis of research and evaluation of research reports. Emphasis on understanding the application of fundamental statistical methods in design and interpretation of research findings in industrial, technical, and human resource development environments. Prerequisite: Master's student standing. **Credits:** 3.00

TECH 67600 - Analysis Of Research Methods

Credit Hours: 3.00. Analysis of research and evaluation of research reports and funding - emphasis on understanding the application of fundamental statistical methods in design and interpretation of research findings in industrial, technical, business, and government environments.**Credits:** 3.00

TECH 69000 - Independent Study In Technology

Credit Hours: 1.00 to 6.00. Intensive individual study of selected current developments and issues in technology. A faculty sponsor is required for this course. Prerequisite: Doctoral student standing. Permission of instructor required. **Credits:** 1.00 to 6.00

TECH 69500 - Graduate Professional Practice

Credit Hours: 0.00. Advanced professional experience in Technology. The experience is coordinated by the major professor with cooperation of a participating employer. Students submit a summary report. Permission of instructor required. **Credits:** 0.00

TECH 69700 - Qualitative Research Methods In Technology Studies

Credit Hours: 3.00. In-depth examination of qualitative methods and frameworks used in technology research. Students learn by application a variety of methods from the qualitative research toolbox such as interviewing, focus groups, observation, and

experience analysis. TECH 69700 prepares students to plan, pilot, and assess an original qualitative research study and to integrate qualitative research findings in the technology design and evaluation process. Permission of instructor required. **Credits:** 3.00

TECH 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Technology Leadership and Innovation

TLI 10000 - Organizational Leadership Career Orientation

Credit Hours: 1.00. In this course students are introduced to potential organizational leadership-related career paths. Topics include introduction to organizational leadership careers, self-assessment and career alignment, and networking and professional development. **Credits:** 1.00

TLI 11200 - Foundations Of Organizational Leadership

Credit Hours: 3.00. A survey of individual and organizational behavioral concepts and principles that provide a foundation for leadership in technology organizations. The focus will be toward the understanding of behaviors necessary for effective organizational leadership, including concepts of work in a technology-rich environment. **Credits:** 3.00

TLI 15200 - Business Principles For Organizational Leadership

Credit Hours: 3.00. This course will introduce the topic of applied organization leadership in the context of working organizations. Topics include basic functions, structures, and operations of organizations, and an introduction to reading and understanding balance sheets, cash flow statements, and profit-loss statements. **Credits:** 3.00

TLI 16100 - Prototyping In Engineering/Technology Education

Credit Hours: 3.00. Design, make, and innovate! This course provides basic instruction on the proper and safe use of tools and equipment used to prototype innovative ideas. This includes 3D printers, laser cutters/engravers, fabrication tools/equipment, CNC mills/routers, and microcontrollers/microcomputers.
Credits: 3.00

TLI 20000 - Organization Leadership Career Exploration

Credit Hours: 1.00. In this course students continue their exploration of organizational leadership-related career opportunities. Topics include resume building and internship search strategies, interview skills and professional etiquette, and identifying and securing internships. **Credits:** 1.00

TLI 21300 - Project Management

Credit Hours: 3.00. Project management is an ad hoc technique for accomplishing specialized missions or work. Examples of projects include research and development studies, consulting projects, reorganizations efforts, implementation of total quality management, installation of new equipment, advertising campaigns, construction or other one-time efforts. This course will provide a leadership approach to project management, including team development and team selection. **Credits:** 3.00

TLI 25500 - Foundations Of Human Resource Development

Credit Hours: 3.00. Much has been discussed about the importance of people in organizations, difficulties within organizations, and challenges faced by today's organizations. This course covers the field of human resource development (HRD) as an important area of practice within organizations. The course provides an introduction to HRD theories, principles, concepts, and practices. It provides foundations through the study of history, current paradigms, and perspectives on the future of the field of HRD while specifically focusing on training and development, organization development, and career development as organizational functions within HRD. **Credits:** 3.00

TLI 26200 - Foundations Of Integrated STEM Education

Credit Hours: 3.00. This course provides students with a conceptual understanding of an integrated approach to teaching Science, Technology, Engineering, and Mathematics (STEM). Integrated STEM pedagogies include project/problem-based (PBL), design-based, and inquiry-based approaches to teaching. Students engage in a co-teaching model to deliver STEM instruction and observe local K-12 classrooms.**Credits:** 3.00

TLI 26500 - Teaching The TE Of STEM

Credit Hours: 3.00. A course for teacher education majors that provides rationale and techniques for integrating engineering and technological literacy into the K-12 mathematics and science curriculum. Experiences focus on the engineering design process, mechanisms, robotics, strength of materials, electrical circuits, and electronics. **Credits:** 3.00

TLI 29000 - Independent Study In Technology Leadership And Innovation

Credit Hours: 1.00 to 3.00. Supervised individual study in technology leadership and innovation topics. Permission of instructor required. **Credits:** 1.00 to 3.00

TLI 29900 - Special Topics In Technology Leadership & Innovation

Credit Hours: 1.00 to 3.00. Hours, subject matter, and credit to be arranged by faulty. Group instruction in new or specialty areas of Technology Leadership and Innovation is provided by Technology faculty, subject to TLI Curriculum Committee approval. **Credits:** 1.00 to 3.00

TLI 30000 - Organizational Leadership Career Transition

Credit Hours: 1.00. In this course students prepare to make the transition from organizational leadership students to organizational leadership professionals. Topics include career planning and advancement, professional networking and relationship building, and transitioning successfully from college to career. **Credits:** 1.00

TLI 31400 - Leading Innovation In Organizations

Credit Hours: 3.00. This course provides the foundation for understanding the manner in which companies capture innovation and use it to set themselves apart from competitors. Topics covered include the attributes of organizations that are successful in fostering a culture of innovation; the characteristics and roles of leaders and members in innovative organizations; managerial processes and organizational systems that facilitate the successful development, commercialization, and adoption of innovative technologies, products, and services; and methods used to measure innovation-related outcomes. **Credits:** 3.00

TLI 31500 - New Product Development

Credit Hours: 3.00. This course introduces the process of technological innovation and new product development from concept to commercialization. Topics covered include ideation, R&D, prototyping (design and modeling), testing for quality, the patent process, intellectual property rights, marketing and cost evaluation. **Credits:** 3.00

TLI 35510 - Training And Talent Development

Credit Hours: 3.00. This course is designed to develop theoretical and applied perspectives on needs assessment, design, development, delivery, and evaluation of training and development in organizational contexts. Emphasis is placed on assessing learning and performance outcomes throughout the training and development process. Implication of training to talent development are also highlighted in a highly automated workplace. **Credits:** 3.00

TLI 35520 - Organization Development And Change

Credit Hours: 3.00. This course provides an introduction to major theories, concepts, skills and techniques for the practice of organization development processes and interventions using a consultancy approach. Implications for organizational change are integrated as part of an OD effort. **Credits:** 3.00

TLI 35530 - Strategic Planning In Human Resources

Credit Hours: 3.00. The course provides students with a theoretical foundation for strategic planning within the context of systems thinking. It also develops the practical skills needed to create and execute effective strategic plans for human resource activities. **Credits:** 3.00

TLI 35540 - Staffing Organizations

Credit Hours: 3.00. This course provides an overview of the processes by which organizations staff positions with both internal and external applicants. The course covers theory, research, and legal foundations that inform organizational staffing actions. Topics include staffing strategy and context, measurement of staffing effectiveness, job/competency analysis, human resource planning, recruitment and job choice, retention, and internal and external selections practices. **Credits:** 3.00

TLI 35550 - Compensation And Rewards

Credit Hours: 3.00. This course examines the compensation and reward structures of organizations. It covers the planning and implementation of a total compensation system, including job evaluation, salary survey and analysis, benefits, and development of a structured pay system. Included are behavior implications and legal compliance issues related to compensation and rewards. **Credits:** 3.00

TLI 35560 - Employment And Labor Law For The Human Resource Professionals

Credit Hours: 3.00. This course provides a foundation for understanding the impact of labor laws and legal issues in organizations. Topics include corporate social responsibility, employment law, environmental issues, conflict resolution, and global challenges. **Credits:** 3.00

TLI 35570 - Job Analysis And Job Design

Credit Hours: 3.00. This course demonstrates procedures for analyzing tasks related to specific jobs. Topics include collecting occupational data and information, the relevance of job analysis on individual and organizational performance, impact on training and development, and associated legal issues. **Credits:** 3.00

TLI 35580 - The Individual And Organizational Performance

Credit Hours: 3.00. This course develops an understanding of the principles and theoretical foundations of individual and organizational performance management. Emphasis is placed on the perspectives, methodology, and theoretical frameworks as well as applications for performance management from the perspective of human resources professionals.**Credits:** 3.00

TLI 35600 - Global Technology Leadership

Credit Hours: 3.00. This course examines leadership of high-tech organizations across cultures and national boundaries. Topics covered may include forging strategic alliances, negotiating contracts, meeting ISO requirements, managing a multinational workforce, identifying emerging markets, and driving innovation. **Credits:** 3.00

TLI 36100 - Engineering And Technology Education Instructional Planning And Evaluation

Credit Hours: 3.00. This course addresses selecting content, writing instructional objectives, planning lessons, preparing a unit of study, and evaluating student progress. Emphasis is placed on evaluating instruction and student achievement to include developing valid, reliable testing instruments as they relate to measuring student achievement in the cognitive, affective, and psychomotor domains. **Credits:** 3.00

TLI 36700 - Teaching Design And Innovation I

Credit Hours: 3.00. This course focuses on the development of appropriate engineering design knowledge and skill required to effectively teach middle and high school engineering/technology education courses by infusing engineering design into the curriculum. Students will use 3-D solid modeling software, rapid prototyping, and other design technologies as they engage in the engineering design process through an open-ended engineering design challenge.**Credits:** 3.00

TLI 45560 - Professional Internship In Human Resources

Credit Hours: 3.00. The undergraduate internship course is designed as a culminating learning experience for students nearing graduation. Students have an opportunity to seek out practical work experience related to human resources to use knowledge acquired in the classroom. The course will serve as a professional development opportunity helping students reflect and build upon their experiences gained through the required 500-hours human resources related work. **Credits:** 3.00

TLI 45570 - Global Human Resources

Credit Hours: 3.00. This course prepares students to lead human resource activities within a global, technology-driven economy and business environment. Topics include recruitment, training and development processes, cultural issues, policies and regulations within a global and international context. **Credits:** 3.00

TLI 45580 - Human Resource Information Systems And People Analytics

Credit Hours: 3.00. This class surveys Human Resource Information Systems (HRIS) to understand how they facilitate communication processes, policy implementations and change management. Big data is transforming how firms recruit and develop talent and this course introduces concepts and methods for making better through people analytics.**Credits:** 3.00

TLI 45590 - Foundations Of Human Resources Capstone

Credit Hours: 3.00. This course synthesizes all of the required and secondary content areas described in the SHRM HR Curriculum Guidelines. Students will prepare for the SHRM Certified Professional (SHRM-CP) exam while demonstrating their accumulated knowledge and in the area of human resources. **Credits:** 3.00

TLI 45700 - Technology Policy And Law

Credit Hours: 3.00. This course provides a foundation of understanding the broad impact of technology policies and laws on organizational performance, innovation, corporate accountability, and sustainability. Topics include corporate social responsibility, employment and contract law, intellectual property, e-commerce, and environmental and global challenges. **Credits:** 3.00

TLI 45800 - Leadership For Competitive Advantage

Credit Hours: 3.00. Organizations who consistently outperform competitors realize bottom-line impact through efficient leveraging of organizational strategy, leadership, internal and external talent acquisition, organizational culture, and marketing strategies. This course will explore the relationships between these areas and introduce organizational tools and concepts to enable the student to recognize and build capacity for sustainable competitive advantage in technology organizations. **Credits:** 3.00

TLI 45810 - Internship Program

Credit Hours: 1.00. An internship designed to combine university study with work experience directly related to the student's plan of study. Permission of department required. **Credits:** 1.00

TLI 45820 - Internship Program Seminar

Credit Hours: 2.00. An internship designed to combine university study with work experience directly related to the student's plan of study. Includes reflection on interning experience as well as a written final paper and oral presentation covering the student's internship experience. Permission of department required. **Credits:** 2.00

TLI 45830 - Service Learning

Credit Hours: 3.00. Service learning is a reflective experience in which students actively engage in the community and integrate that experience into the classroom. Permission of department required. **Credits:** 3.00

TLI 45900 - Technology Focus Seminar

Credit Hours: 3.00. This course will provide the synthesis between each student's technology focus area and technology leadership. Students will apply advanced leadership knowledge and skills to technology-based problems while working in diverse teams. Topics include team leadership, integration of technologies to develop innovative solutions, and project management. **Credits:** 3.00

TLI 46000 - Teaching Design And Innovation II

Credit Hours: 3.00. This course expands the engineering design process, incorporating rapid prototyping and other fabrication technologies to create a specified solution. The course emphasizes process flow chart planning and logistics of engineering/technology education laboratory management. Prototypes will be tested in real situations and data gathered on performance. Designs will be revised to reflect a deeper understanding of manufacturing and use, being sensitive to structure, function, and behavior from a systems-level perspective. Intellectual property, marketing, and infrastructure will be discussed.**Credits:** 3.00

TLI 46100 - Engineering/Technology Teacher Lab Planning

Credit Hours: 3.00. This course provides future engineering/technology education teachers with information on designing, organizing, and managing engineering/technology education facilities. An in-depth study of specific laboratory requirements

related to safety is covered. Management skills related to students, equipment, and supplies are addressed. Students design an engineering/technology education laboratory.**Credits:** 3.00

TLI 46200 - Methods Of Teaching Engineering/Technology Education

Credit Hours: 3.00. Students identify a variety of instructional techniques appropriate for teaching engineering/technology education. Students will present lessons and develop evaluation instruments to determine student achievement. Methodological insights and understanding for teaching technical subject matter is stressed. **Credits:** 3.00

TLI 48590 - Organizational Leadership Capstone I

Credit Hours: 3.00. This course provides the synthesis between technology and organizational leadership. Students will apply advanced leadership knowledge and skills to issues, problems, and challenges in technology-rich organizations while working in diverse teams. Topics include team leadership, integration of technologies to develop innovative solutions, problem-solving and decision-making, globalization, cross-cultural management, and project management. Permission of Department required. **Credits:** 3.00

TLI 48595 - Organizational Leadership Capstone II

Credit Hours: 3.00. This course builds upon the prerequisite capstone course in which students engage in theory-based applied learning as well as team project-based learning and learning in context. Students will work with organizations to address various organizational challenges in which they will integrate their organizational skills and demonstrate their leadership competencies. **Credits:** 3.00

TLI 48800 - Technology Leadership And Innovation Capstone

Credit Hours: 3.00. This is an integrative course that focuses on using cross-functional teams to identify, scope, design, and propose solutions for problems that span the areas of industrial engineering technology, organizational leadership, and supply chain management. Field trips may be required. **Credits:** 3.00

TLI 49000 - Independent Study In Technology Leadership And Innovation

Credit Hours: 1.00 to 3.00. Supervised individual study in technology leadership and innovation topics. Permission of instructor required. **Credits:** 1.00 to 3.00

TLI 49800 - Undergraduate Research In Technology Leadership And Innovation

Credit Hours: 1.00 to 3.00. Students will conduct research in the area of technology leadership and innovation with a primary investigator. The primary focus of the course is to contribute to ongoing research, while learning current research techniques. Analyzing data, determining courses of action, developing critical thinking, and presenting results are emphasized. Requires prior approval of, and arrangement with, a faculty research advisor. Permission of instructor required. **Credits:** 1.00 to 3.00

TLI 49900 - Special Topics In Technology Leadership & Innovation

Credit Hours: 1.00 to 3.00. Hours, subject matter, and credit to be arranged by faulty. Group instruction in new or specialty areas of Technology Leadership and Innovation is provided by Technology faculty, subject to TLI Curriculum Committee approval. **Credits:** 1.00 to 3.00

TLI 52000 - Foundations Of Innovation Studies

Credit Hours: 3.00. Foundations Of Innovation Studies has been designed to provide a broad spectrum introduction to the field of innovation studies. Students will gain practical and theoretical knowledge of innovation at a variety of levels, including the individual, team, organizational, and ecosystem contexts. Students will examine innovation strategies and tensions within the innovation "Triple Helix" of industry, academia, and government through the use of case studies and individually selected research reports. Throughout the class, students will examine recent innovation efforts and present short innovation cases that align with the learning objectives of the class. **Credits:** 3.00

TLI 52100 - Drug Development

Credit Hours: 3.00. (ABE 51100) A review of drug discovery and drug development, with emphasis on the regulatory aspects of these activities. Animal preclinical research and human clinical research are discussed in detail. In addition, the process for the assembly of an IND and NDA is discussed along with the Phases (I,II,III) of human clinical trials. The CMC (chemistry manufacturing and control) aspects of drug development are presented along with ICH documents and manufacturing process analytical technologies. The course concludes with a brief review of international regulatory issues and patents. **Credits:** 3.00

TLI 52200 - Good Regulatory Practice

Credit Hours: 3.00. Includes a review of the FDA and ICH regulations on good manufacturing, good laboratory, and good clinical practices. The meaning of these regulations, the globalization of practices, and the roles and responsibilities of various professionals implementing these regulations are addressed. Special emphasis will be detailed coverage of the process for the assembly and submission of an IND or NDA, and the function of the regulatory affairs department in a pharmaceutical company. **Credits:** 3.00

TLI 52300 - Quality Management, Audits And Inspections

Credit Hours: 3.00. This course provides advanced topics in quality management and business improvement methods that apply to the pharmaceutical industry. Emphasis will be placed on specific issues of industry, audits, and inspections, as well as the successful selection and presentation of business and quality improvement projects to produce compliance and competitive advantage. **Credits:** 3.00

TLI 52400 - The Documents And Dialogues Of Drug Delivery And Registration

Credit Hours: 3.00. This capstone advanced course will integrate previous learning relating to laws and regulations, quality principles and practices, and the preparation and submission of documents for preclinical research, clinical trials and new drug approvals. Special topic lectures will be given. Considerable time will be devoted to preparing regulatory documents and conducting "mock" dialogues and negotiations with "pretend" agency officials. **Credits:** 3.00

TLI 52500 - Molecular Basis Of Manufacturing Pharmaceuticals

Credit Hours: 3.00. This advanced course addresses important Chemistry Manufacturing and Control (CMC) issues related to process analytical technology. The course provides important information on strategies for monitoring processes on-line, the best approaches to analyzing data, how the data can be used to find process critical control points, and strategies for reporting the data to the FDA. The course may include laboratory exercises, laboratory tours, and/or workshops outlining how to interpret the data. **Credits:** 3.00

TLI 52600 - Digital Innovation And Transformation

Credit Hours: 3.00. Rapidly evolving digital technologies are fueling a stream of innovation opportunities. To remain relevant, incumbent firms need to innovate and transform their business models. Digital strategies and innovation, however, oftentimes conflict with traditional managerial thinking. For example, rapidly falling coordination costs and the rising relevance of data make diversification patterns profitable that contradict today's dominant view that focused product-market positioning is best.

This course explores the different effects the digital revolution has on the foundations of competitive advantage and thereby prepares its students to design, apply, and implement strategies and systems for digital innovation. Permission of instructor required. **Credits:** 3.00

TLI 52700 - Behavioral Analytics

Credit Hours: 3.00. Behavioral Analytics has been designed to provide a foundation of skills and tools that enable students to determine their own project topic, collect the data that they need, manipulate that data, and perform analysis consistent with their data. This is an experiential learning process that offers a great deal of flexibility with respect to the methods and tools used, and students are encouraged to create a final project in a manner consistent with publications within their discipline. Permission of instructor required. **Credits:** 3.00

TLI 54000 - Smart Manufacturing Enterprise: Organizational Behavior And Leadership In The Digital Enterprise

Credit Hours: 3.00. Smart manufacturing is about increasing efficiency and eliminating pain points in your system. It's characterized by a highly connected, knowledge-enabled industrial enterprise where all organizations and operating systems are linked, leading to enhanced productivity, sustainability, and economic performance. Implementing smart manufacturing techniques requires an effective understanding of organizational behavior and leadership skills required for the new digital enterprise. This knowledge of individuals' perceptions, attitudes, and behavior enables leaders to choose appropriate leadership styles and managerial practices to increase organizational effectiveness and positive human outcomes. This course will provide an overview of organizational behavior and leadership concepts important for implementing change within a smart manufacturing enterprise. **Credits:** 3.00

TLI 62500 - Research In Open Innovation I

Credit Hours: 3.00. This is a research-oriented course designed for graduate students who aim to develop and implement a scientific research project in the field of open innovation. They will critically discuss and evaluate scientific writings relevant to the new research area of open innovation from the fields and disciplines of innovation studies, information systems, and other social sciences. Through synthesis of theories and frameworks used in academic articles, the students will develop a theoretically and practically motivated research question. They will also implement a pilot study to examine their hypotheses. The Research Center for Open Digital Innovation (RCODI) in the Discovery Park at Purdue will offer opportunities to plan and implement individual questions, if students have not identified their own data source. In addition, the students will participate in an action-oriented research project in open innovation performed by the class as a group project to gain experience in experimental innovation research and practice. Prerequisites: Basic statistics (at least STAT 30100 or equivalent, STAT 50100 or higher is recommended); foundational knowledge in scientific research (TECH 64600 or SOC 58000 or equivalent). Permission of instructor required. **Credits:** 3.00

TLI 62579 - Global, Legal And Ethical Issues In Technology Leadership

Credit Hours: 3.00. This course examines the global, legal and ethical issues that influence global technology leadership and management. Topics include ethical decision making; management; global issues; intellectual property and innovation; business law; relevant international laws; public policies and regulations; risk management; strategic alliances and joint ventures; and issues of organizational sustainability. This course relies on the case-study approach and covers a broad range of current and emerging technologies and businesses. **Credits:** 3.00

TLI 62600 - Technology Entrepreneurship And Research Translation

Credit Hours: 3.00. (ABE 62600) The course is designed to introduce graduate students and faculty mentors to the intellectual, financial, and management processes associated with translating research into tangible products through university initiated, early-stage commercialization (start-up) activities. Lectures will present case studies of technologies and pathways to

commercialization. Guest speakers will illustrate the start-up process through real-world experience, and will also address approaches for managing entrepreneurial activities, intellectual property and conflicts of interest in a university environment. No course prerequisites, however students should be involved in research with commercial implications. Permission of instructor required.**Credits:** 3.00

TLI 66200 - Philosophy Of Technology

Credit Hours: 3.00. The term technology has multiple meanings and applications so vast that one clear and all-encompassing definition of the term has become unattainable. However, to build an epistemology of technology, we must explore ways to define technology so to provide a foundation for a philosophy of technology. This course will explore multiple views and definitions of technology embedded within the scholarly work focused on technology in order to build and defend a philosophy of technology. **Credits:** 3.00

The Data Mine

TDM 10100 - The Data Mine Seminar I

Credit Hours: 1.00. The Data Mine is a supportive environment for students in any major from any background who want to learn some data science skills. Students will gain hands-on experience with computational tools for representing, extracting, manipulating, interpreting, transforming, and visualizing data, especially big data sets, and in effectively communicating insights about data. Topics include: the R environment, Python, visualizing data, UNIX, bash, regular expressions, SQL, XML and scraping data from the internet, as well as selected advanced topics, as time permits.**Credits:** 1.00

TDM 10200 - The Data Mine Seminar II

Credit Hours: 1.00. The Data Mine is a supportive environment for students in any major from any background who want to learn some data science skills. Students will gain hands-on experience with computational tools for representing, extracting, manipulating, interpreting, transforming, and visualizing data, especially big data sets, and in effectively communicating insights about data. Topics include: the R environment, Python, visualizing data, UNIX, bash, regular expressions, SQL, XML and scraping data from the internet, as well as selected advanced topics, as time permits.**Credits:** 1.00

TDM 11100 - Corporate Partners I

Credit Hours: 3.00. Students in The Data Mine Corporate Partners Learning Community will work in groups with Corporate Partner mentors on a variety of projects. They will analyze real data related to questions that the Corporate Partner proposes. Most projects will last for a full academic year (late August through late April), with multiple reports and presentations given more frequently. The mentor is expected to meet with the students weekly by Microsoft Teams, or (more rarely) in person. Students are expected to actively participate in these meetings and in all individual and group work. The goal of the course is to help students build impactful industry related skills in data science, visualization, and data engineering. The Data Mine staff also has data scientists who can assist students with technical questions focused on the skills being built and the research conducted. Students can work on real-world industry facing issues that have a high value add for the corporate partner.**Credits:** 3.00

TDM 11200 - Corporate Partners II

Credit Hours: 3.00. Students in The Data Mine Corporate Partners Learning Community will work in groups with Corporate Partner mentors on a variety of projects. They will analyze real data related to questions that the Corporate Partner proposes. Most projects will last for a full academic year (late August through late April), with multiple reports and presentations given more frequently. The mentor is expected to meet with the students weekly by Microsoft Teams, or (more rarely) in person. Students are expected to actively participate in these meetings and in all individual and group work. The goal of the course is to help students build impactful industry related skills in data science, visualization, and data engineering. The Data Mine staff also

has data scientists who can assist students with technical questions focused on the skills being built and the research conducted. Students can work on real-world industry facing issues that have a high value add for the corporate partner.**Credits:** 3.00

TDM 19000 - The Data Mine Special Topics

Credit Hours: 1.00 to 5.00. Supervised reading course or special topics course at the freshman level for undergraduates are given under this number.**Credits:** 1.00 to 5.00

TDM 20100 - The Data Mine Seminar III

Credit Hours: 1.00. The Data Mine is a supportive environment for students in any major from any background who want to learn some data science skills. Students will gain hands-on experience with computational tools for representing, extracting, manipulating, interpreting, transforming, and visualizing data, especially big data sets, and in effectively communicating insights about data. Topics include: the R environment, Python, visualizing data, UNIX, bash, regular expressions, SQL, XML and scraping data from the internet, as well as selected advanced topics, as time permits.**Credits:** 1.00

TDM 20200 - The Data Mine Seminar IV

Credit Hours: 1.00. The Data Mine is a supportive environment for students in any major from any background who want to learn some data science skills. Students will gain hands-on experience with computational tools for representing, extracting, manipulating, interpreting, transforming, and visualizing data, especially big data sets, and in effectively communicating insights about data. Topics include: the R environment, Python, visualizing data, UNIX, bash, regular expressions, SQL, XML and scraping data from the internet, as well as selected advanced topics, as time permits.**Credits:** 1.00

TDM 21100 - Corporate Partners III

Credit Hours: 3.00. Students in The Data Mine Corporate Partners Learning Community will work in groups with Corporate Partner mentors on a variety of projects. They will analyze real data related to questions that the Corporate Partner proposes. Most projects will last for a full academic year (late August through late April), with multiple reports and presentations given more frequently. The mentor is expected to meet with the students weekly by Microsoft Teams, or (more rarely) in person. Students are expected to actively participate in these meetings and in all individual and group work. The goal of the course is to help students build impactful industry related skills in data science, visualization, and data engineering. The Data Mine staff also has data scientists who can assist students with technical questions focused on the skills being built and the research conducted. Students can work on real-world industry facing issues that have a high value add for the corporate partner.**Credits:** 3.00

TDM 21200 - Corporate Partners IV

Credit Hours: 3.00. Students in The Data Mine Corporate Partners Learning Community will work in groups with Corporate Partner mentors on a variety of projects. They will analyze real data related to questions that the Corporate Partner proposes. Most projects will last for a full academic year (late August through late April), with multiple reports and presentations given more frequently. The mentor is expected to meet with the students weekly by Microsoft Teams, or (more rarely) in person. Students are expected to actively participate in these meetings and in all individual and group work. The goal of the course is to help students build impactful industry related skills in data science, visualization, and data engineering. The Data Mine staff also has data scientists who can assist students with technical questions focused on the skills being built and the research conducted. Students can work on real-world industry facing issues that have a high value add for the corporate partner.**Credits:** 3.00

TDM 29000 - The Data Mine Special Topics

Credit Hours: 1.00 to 3.00. The Data Mine is a supportive environment for students in any major from any background who want to learn some data science skills. Students will gain hands-on experience with computational tools for representing, extracting, manipulating, interpreting, transforming, and visualizing data, especially big data sets, and in effectively communicating insights

about data. Topics include: the R environment, Python, visualizing data, UNIX, bash, regular expressions, SQL, XML and scraping data from the internet, as well as selected advanced topics, as time permits.**Credits:** 1.00 to 3.00

TDM 30100 - The Data Mine Seminar V

Credit Hours: 1.00. The Data Mine is a supportive environment for students in any major from any background who want to learn some data science skills. Students will gain hands-on experience with computational tools for representing, extracting, manipulating, interpreting, transforming, and visualizing data, especially big data sets, and in effectively communicating insights about data. Topics include: the R environment, Python, visualizing data, UNIX, bash, regular expressions, SQL, XML and scraping data from the internet, as well as selected advanced topics, as time permits.**Credits:** 1.00

TDM 30200 - The Data Mine Seminar VI

Credit Hours: 1.00. The Data Mine is a supportive environment for students in any major from any background who want to learn some data science skills. Students will gain hands-on experience with computational tools for representing, extracting, manipulating, interpreting, transforming, and visualizing data, especially big data sets, and in effectively communicating insights about data. Topics include: the R environment, Python, visualizing data, UNIX, bash, regular expressions, SQL, XML and scraping data from the internet, as well as selected advanced topics, as time permits.**Credits:** 1.00

TDM 31100 - Corporate Partners V

Credit Hours: 3.00. Students in The Data Mine Corporate Partners Learning Community will work in groups with Corporate Partner mentors on a variety of projects. They will analyze real data related to questions that the Corporate Partner proposes. Most projects will last for a full academic year (late August through late April), with multiple reports and presentations given more frequently. The mentor is expected to meet with the students weekly by Microsoft Teams, or (more rarely) in person. Students are expected to actively participate in these meetings and in all individual and group work. The goal of the course is to help students build impactful industry related skills in data science, visualization, and data engineering. The Data Mine staff also has data scientists who can assist students with technical questions focused on the skills being built and the research conducted. Students can work on real-world industry facing issues that have a high value add for the corporate partner.**Credits:** 3.00

TDM 31200 - Corporate Partners VI

Credit Hours: 3.00. Students in The Data Mine Corporate Partners Learning Community will work in groups with Corporate Partner mentors on a variety of projects. They will analyze real data related to questions that the Corporate Partner proposes. Most projects will last for a full academic year (late August through late April), with multiple reports and presentations given more frequently. The mentor is expected to meet with the students weekly by Microsoft Teams, or (more rarely) in person. Students are expected to actively participate in these meetings and in all individual and group work. The goal of the course is to help students build impactful industry related skills in data science, visualization, and data engineering. The Data Mine staff also has data scientists who can assist students with technical questions focused on the skills being built and the research conducted. Students can work on real-world industry facing issues that have a high value add for the corporate partner.**Credits:** 3.00

TDM 39000 - The Data Mine Special Topics

Credit Hours: 1.00 to 3.00. The Data Mine is a supportive environment for students in any major from any background who want to learn some data science skills. Students will gain hands-on experience with computational tools for representing, extracting, manipulating, interpreting, transforming, and visualizing data, especially big data sets, and in effectively communicating insights about data. Topics include: the R environment, Python, visualizing data, UNIX, bash, regular expressions, SQL, XML and scraping data from the internet, as well as selected advanced topics, as time permits.**Credits:** 1.00 to 3.00

TDM 40100 - The Data Mine Seminar VII

Credit Hours: 1.00. The Data Mine is a supportive environment for students in any major from any background who want to learn some data science skills. Students will gain hands-on experience with computational tools for representing, extracting, manipulating, interpreting, transforming, and visualizing data, especially big data sets, and in effectively communicating insights about data. Topics include: the R environment, Python, visualizing data, UNIX, bash, regular expressions, SQL, XML and scraping data from the internet, as well as selected advanced topics, as time permits.**Credits:** 1.00

TDM 40200 - The Data Mine Seminar VIII

Credit Hours: 1.00. The Data Mine is a supportive environment for students in any major from any background who want to learn some data science skills. Students will gain hands-on experience with computational tools for representing, extracting, manipulating, interpreting, transforming, and visualizing data, especially big data sets, and in effectively communicating insights about data. Topics include: the R environment, Python, visualizing data, UNIX, bash, regular expressions, SQL, XML and scraping data from the internet, as well as selected advanced topics, as time permits.**Credits:** 1.00

TDM 41100 - Corporate Partners VII

Credit Hours: 3.00. Students in The Data Mine Corporate Partners Learning Community will work in groups with Corporate Partner mentors on a variety of projects. They will analyze real data related to questions that the Corporate Partner proposes. Most projects will last for a full academic year (late August through late April), with multiple reports and presentations given more frequently. The mentor is expected to meet with the students weekly by Microsoft Teams, or (more rarely) in person. Students are expected to actively participate in these meetings and in all individual and group work. The goal of the course is to help students build impactful industry related skills in data science, visualization, and data engineering. The Data Mine staff also has data scientists who can assist students with technical questions focused on the skills being built and the research conducted. Students can work on real-world industry facing issues that have a high value add for the corporate partner.**Credits:** 3.00

TDM 41200 - Corporate Partners VIII

Credit Hours: 3.00. Students in The Data Mine Corporate Partners Learning Community will work in groups with Corporate Partner mentors on a variety of projects. They will analyze real data related to questions that the Corporate Partner proposes. Most projects will last for a full academic year (late August through late April), with multiple reports and presentations given more frequently. The mentor is expected to meet with the students weekly by Microsoft Teams, or (more rarely) in person. Students are expected to actively participate in these meetings and in all individual and group work. The goal of the course is to help students build impactful industry related skills in data science, visualization, and data engineering. The Data Mine staff also has data scientists who can assist students with technical questions focused on the skills being built and the research conducted. Students can work on real-world industry facing issues that have a high value add for the corporate partner.**Credits:** 3.00

TDM 49000 - The Data Mine Special Topics

Credit Hours: 1.00 to 3.00. The Data Mine is a supportive environment for students in any major from any background who want to learn some data science skills. Students will gain hands-on experience with computational tools for representing, extracting, manipulating, interpreting, transforming, and visualizing data, especially big data sets, and in effectively communicating insights about data. Topics include: the R environment, Python, visualizing data, UNIX, bash, regular expressions, SQL, XML and scraping data from the internet, as well as selected advanced topics, as time permits.**Credits:** 1.00 to 3.00

TDM 50100 - The Data Mine Seminar

Credit Hours: 1.00. Intended for any student across campus desiring broad coverage of data science and analytics topics.**Credits:** 1.00

TDM 51100 - Corporate Partners

Credit Hours: 3.00. Students in The Data Mine Corporate Partners Learning Community will work in groups with Corporate Partner mentors on a variety of projects. They will analyze real data related to questions that the Corporate Partner proposes. Most projects will last for a full academic year (late August through late April), with multiple reports and presentations given more frequently. The mentor is expected to meet with the students weekly by Microsoft Teams, or (more rarely) in person. Students are expected to actively participate in these meetings and in all individual and group work. The goal of the course is to help students build impactful industry related skills in data science, visualization, and data engineering. The Data Mine staff also has data scientists who can assist students with technical questions focused on the skills being built and the research conducted. Students can work on real-world industry facing issues that have a high value add for the corporate partner.**Credits:** 3.00

TDM 59000 - The Data Mine Special Topics

Credit Hours: 1.00 to 3.00. Focused topical coverage of data science and analytic topics intended for any student across campus.**Credits:** 1.00 to 3.00

Theatre

THTR 13300 - Acting I

Credit Hours: 3.00. Beginning training and exercises in the basic elements of acting, including vocal and physical preparation, sensory awareness, releasing the imagination, and a basic understanding of action an objective. Staging exercises and terminology are emphasized. **Credits:** 3.00

THTR 15001 - Introduction To Drafting

Credit Hours: 1.00. An introduction to hand and computer-aided drafting techniques for theatre and live entertainment. Permission of Instructor required. **Credits:** 1.00

THTR 15002 - Introduction To Scenery Construction Tools And Techniques

Credit Hours: 1.00. An introduction to common tools, techniques, and practices in scenery production for theatre and live entertainment. Permission of Instructor required. **Credits:** 1.00

THTR 15003 - Introduction To Rigging For Theatre

Credit Hours: 1.00. An introduction to rigging techniques and equipment for theatre and live entertainment. Permission of Instructor required. **Credits:** 1.00

THTR 16000 - Introduction To Scene Design And Technology

Credit Hours: 2.00. This course is designed to introduce the students to the process and tools of scene design and technology. **Credits:** 2.00

THTR 16100 - Introduction To Costume Design And Technology

Credit Hours: 2.00. Introduction to analytical, artistic, and practical skills required when creating costumes for theatre. Beginning training in elements and principles of design, rendering and presentation skills. Elementary instruction in costume construction, including hand and machine sewing, costume crafts, and basic patterning. **Credits:** 2.00

THTR 16200 - Introduction To Light Design And Technology

Credit Hours: 2.00. A course that introduces the student to the basic equipment and design process of stage lighting design. **Credits:** 2.00

THTR 16300 - Introduction To Sound Design And Technology

Credit Hours: 2.00. Introduction to theatre sound design and technology for general theatre students. Involvement in Department of Theatre production program. **Credits:** 2.00

THTR 16400 - Introduction To Theatre Organization And Management

Credit Hours: 2.00. A theoretical study of performing arts management and backstage operations from audition through performance. Techniques of scheduling, production management, stage management, technical direction, house management, safety issues, and emergency procedures. **Credits:** 2.00

THTR 20100 - Theatre Appreciation

Credit Hours: 3.00. Understanding and appreciation of the theatre's role in the modern world, dramatic structure and analysis, the actor, director, designer, and critic; attendance at current stage productions; class discussion of production elements. CTL:IFA 1302 Theatre Appreciation **Credits:** 3.00

THTR 21300 - Voice For The Actor

Credit Hours: 2.00. Designed to heighten the actor's awareness of the vocal instrument. Elementary vocal techniques will be practiced to expand the student's vocal flexibility and range. Emphasis on freeing habitual vocal tensions and teaching the student the fundamentals of vocal health. **Credits:** 2.00

THTR 23300 - Acting II

Credit Hours: 3.00. Continued development of the basic acting tools of objectives, actions, justification, and personalization; continued vocal and physical work; introduction of script and character analysis; and the introduction of audition techniques. The course will use material from contemporary dramatic literature in the rehearsal process. Prerequisite: THTR 133. Instructor permission required for non-majors. **Credits:** 3.00

THTR 23500 - Vocal/Physical Preparation

Credit Hours: 2.00. Vocal/Physical Preparation is designed to increase and deepen student's physical awareness, develop physical and vocal stamina, flexibility and strength, modify habitual modes of expression, expand vocal and physical range, and increase student's ability to respond expressively. **Credits:** 2.00

THTR 25300 - Survey Of Audio Production

Credit Hours: 3.00. An introduction to theories and techniques of audio production. **Credits:** 3.00

THTR 25400 - Drafting For Theatre

Credit Hours: 3.00. Projects course in drafting for the theatre using graphic standards and presentations techniques accepted in the performing arts industry. **Credits:** 3.00

THTR 25600 - Stage Make-Up

Credit Hours: 2.00. Study of facial anatomy, the aging process, the principles of light and shadow, and character analysis. Theory and practice in the basic techniques of applying stage makeup. **Credits:** 2.00

THTR 26300 - Introduction To Sound Studios

Credit Hours: 3.00. An introduction to theories and techniques of audio production. **Credits:** 3.00

THTR 27100 - Interpreting The Play Script

Credit Hours: 3.00. This course introduces several approaches to the creative interpretation of a play script, giving students experience in applying both analytical methods and sensory-intuitive lenses of interpretation. **Credits:** 3.00

THTR 29000 - Special Topics In Theatre

Credit Hours: 1.00 to 3.00. Topics will vary. **Credits:** 1.00 to 3.00

THTR 32300 - Acting: Movement For The Actor

Credit Hours: 3.00. Designed to heighten body awareness in movement and stillness. Characterization techniques will be practiced that expand the student's flexibility, aerobic capacity, strength, agility, and range of self-expression. Emphasis on freeing habitual tension patterns through the exploration of expressive movement. **Credits:** 3.00

THTR 33300 - Acting III

Credit Hours: 3.00. Application of foundational acting techniques to specific disciplines. May be repeated for credit. Instructor permission required for non-majors. **Credits:** 3.00

THTR 33400 - Acting III: Acting For The Camera

Credit Hours: 3.00. Continued development of acting technique, as it relates to challenges unique to acting on film, television and commercials. Students will develop an effective process for on-camera performance. Class exercises/presentations are recorded, viewed and critiqued by the students and the instructor. **Credits:** 3.00

THTR 33600 - Rehearsal And Performance II

Credit Hours: 1.00 or 2.00. The study and practice of rehearsal techniques and stage performance. Students will be assigned to acting and stage management duties in experimental and major stage productions. Permission of instructor required. **Credits:** 1.00 or 2.00

THTR 35300 - Theatre Audio Techniques I

Credit Hours: 3.00. A theoretical and practical study of the technical aspects of audio as they relate to theatre. The course will include specifications, layout and installation techniques, operation, and maintenance of theatre sound systems, etc. Majors have priority. Offered alternate years. **Credits:** 3.00

THTR 35400 - Painting For The Stage

Credit Hours: 3.00. The principles and practice of painting for the stage. Study of tools, media, and techniques used in traditional scenic painting, costume painting, and the creation of dimensionality on various surfaces. Offered alternate years. **Credits:** 3.00

THTR 36000 - Scenic Design

Credit Hours: 3.00. Project course in utilizing the principles of design as they can be formed into an environment for dramatic action. Emphasis on the interrelationship among all aspects of production and how the scenic element becomes a building block toward total picturization. Offered alternate years. **Credits:** 3.00

THTR 36100 - Costume Design

Credit Hours: 3.00. Theory and principles of design specifically applied to stage costume design. Emphasis on the interrelationship of all aspects of production and how the costume becomes a building block toward total picturization. Offered in alternate years. **Credits:** 3.00

THTR 36200 - Light Design

Credit Hours: 3.00. A project course in utilizing the principles of design as they can convey an environment and its qualities to further dramatic action. Emphasis on the interrelationship among all aspects of production and how light becomes a building block toward total picturization. Offered in alternate years. **Credits:** 3.00

THTR 36300 - Sound Design

Credit Hours: 3.00. Project course in utilizing the principles of design as they can be formed into auditory response and environment. Emphasis on the interrelationship among all aspects of production and how sound becomes a building block toward total picturization. Majors have priority. Offered alternate years. **Credits:** 3.00

THTR 36800 - Theatre Production II

Credit Hours: 1.00 to 2.00. The study and application of theatre practices. Students will be assigned to all levels of departmental production of applied practice. Permission of instructor required. **Credits:** 1.00 to 2.00

THTR 38000 - Histories Of Theatre

Credit Hours: 3.00. Variable topics in theatre and performance history. Emphasis on the study of the works, aesthetics, and innovations of a theatrical form/genre alongside social, cultural, economic, and political contexts. **Credits:** 3.00

THTR 38100 - Theatre And Performance Historiography

Credit Hours: 3.00. Historiographic analysis of theatre, drama, and performance of the 20th and 21st centuries. Emphasis on the relationship between modern and contemporary performance to world history from social, political, and cultural perspectives. Course includes both written and practical components. Prerequisites: THTR 201, THTR 271. **Credits:** 3.00

THTR 39000 - Directed Study Of Special Theatre Problems

Credit Hours: 1.00 to 3.00. An undergraduate level, individualized, and intensive study of any aspect of theatre required by the student's plan of study. Permission of instructor required. **Credits:** 1.00 to 3.00

THTR 43300 - Acting IV

Credit Hours: 3.00. Adaptation of acting techniques to professional applications. **Credits:** 3.00

THTR 43400 - Advanced Acting Skills

Credit Hours: 3.00. A specially designed class for the advanced undergraduate actor. Areas of study may include period/style acting; verse performance; mask work; advanced characterization; and audition techniques. **Credits:** 3.00

THTR 44000 - Directing: Page To Stage

Credit Hours: 3.00. This course focuses on theoretical and practical understanding of the essential principles and fundamentals of directing for the stage. Students will learn a proven directorial methodology and engage in essential research and written and practical presentations throughout. Permission of instructor required. **Credits:** 3.00

THTR 45800 - Problems In Theatre Technology

Credit Hours: 1.00 to 3.00. A tutorial in technical theatre. Available for students who wish to do more extensive work in theatre technology. Permission of instructor required. **Credits:** 1.00 to 3.00

THTR 46800 - Problems In Theatre Design

Credit Hours: 1.00 to 3.00. A tutorial in theatre design. Available for students who wish to do more extensive work in the design aspects of production. Permission of instructor required. **Credits:** 1.00 to 3.00

THTR 47902 - Capstone Project

Credit Hours: 3.00. Students will develop, present, and reflect upon a performance event based on the research framework developed in THTR 49701: Capstone Preparation in the subsequent semester. Students will demonstrate their learning through a focused experience that requires the integration and application of the full breadth of skills and knowledge gained during the course of study. These events are ideally collaborative, but solo project proposals are allowed. Capstone Project includes the rehearsal process and performance at the end of the semester, with a reflection submitted during finals week. The instructor will meet with students through the course of the semester to mentor this performance/production-based process. Permission of instructor required.**Credits:** 3.00

THTR 49000 - Special Topics In Theatre

Credit Hours: 1.00 to 3.00. Topics will vary. **Credits:** 1.00 to 3.00

THTR 49701 - Capstone Preparation

Credit Hours: 3.00. Students will build the research-as-practice framework and development structure for a performance that will be realized during THTR 49702: Capstone Project in the subsequent semester. This proposal will evolve out of research that will include examining works related to the research enquiry of the topic identified in their proposal as well as practice-as-research frameworks to determine which frameworks fit the performance. The instructor will meet with students through the course of the semester to mentor this research-based process. All requests for space, equipment, costume and props, production staff and monetary support, as well as the creative idea of the project, must approved by the semester's end. Permission of instructor required.**Credits:** 3.00

THTR 51000 - Stage Dialects

Credit Hours: 2.00. A study of the actor's use of dialects. Learning dialects and their practical use through scene study. Permission of instructor required. Offered in alternate years. **Credits:** 2.00

THTR 51300 - Vocal Production For The Stage I

Credit Hours: 2.00. The study of the voice production mechanism. Emphasis on exercises in relaxation, breath, alignment, and tonal focus. Permission of instructor required. **Credits:** 2.00

THTR 51400 - Vocal Production For The Stage II

Credit Hours: 2.00. Continuation of Vocal Production for the Stage I. Emphasis on exercises in vocal exploration through application to performance. Permission of instructor required. **Credits:** 2.00

THTR 52300 - Creating A Character I

Credit Hours: 2.00. Techniques towards the physical embodiment of a character. Permission of instructor required. **Credits:** 2.00

THTR 52400 - Creating A Character II

Credit Hours: 3.00. Advanced techniques towards the physical embodiment of a character. **Credits:** 3.00

THTR 52500 - Theatrical Characterization

Credit Hours: 3.00. The discovery of a unique performing personality through the use of a wide range of mask and clown characterization techniques. **Credits:** 3.00

THTR 52600 - Advanced Stage Movement

Credit Hours: 2.00 to 3.00. Advanced movement training, including one or more of the following: stage combat, circus skills, gymnastics, period movement, dance, repatterning techniques, martial arts disciplines, and explorations into character. **Credits:** 2.00 to 3.00

THTR 53200 - Professional Issues In Theatre

Credit Hours: 2.00. Training in the techniques of the prepared audition, cold readings, improvisational auditions, and interviews. A survey of various employment opportunities and the demands of the professional theatre, educational theatre, and professional training. Permission of instructor required. Offered in alternate years. **Credits:** 2.00

THTR 53300 - Acting Technique

Credit Hours: 3.00. Intensive study of the internal and external elements of acting through the use of improvisational principles within the context of scene study. **Credits:** 3.00

THTR 53500 - Vocal/Physical Preparation

Credit Hours: 1.00. Practice in the coordination of the vocal and physical apparatus of the actor. Permission of instructor required. **Credits:** 1.00

THTR 53600 - Advanced Problems In Acting

Credit Hours: 2.00 or 3.00. Advanced study of selected problems in acting, including detailed role and play analyses, thorough rehearsals and critiques of performance. Permission of instructor required.**Credits:** 2.00 or 3.00

THTR 53800 - Acting For The Camera

Credit Hours: 3.00. Development of acting styles and audition techniques for the camera. Permission of instructor required. **Credits:** 3.00

THTR 53900 - Period Style For The Actor

Credit Hours: 3.00. Applied focus on theatrical styles of acting. Scene study related to the development of skills necessary to perform work from a variety of periods and a variety of genres. **Credits:** 3.00

THTR 54000 - Advanced Directing

Credit Hours: 3.00. Application of principles of directing to the various types of drama; laboratory practice in directing plays for experimental production. **Credits:** 3.00

THTR 54500 - Directional Process In Production

Credit Hours: 3.00. A study of models the director uses when dealing with the other creative personnel involved in production. Primary emphasis will be placed on the directorial and actoral processes as they relate to the work of the designers and technicians. Offered in alternate years. Permission of instructor required. **Credits:** 3.00

THTR 55000 - Advanced Scenery Technology

Credit Hours: 3.00. A theoretical and practical study of theatrical scenery planning, construction, and stage use. Topics will vary by semester and will include project management techniques, mechanical design, automation systems, show control systems, rigging, and safety issues. Permission of instructor required. **Credits:** 3.00

THTR 55100 - Advanced Costume Techniques

Credit Hours: 3.00. An advanced study of specialized skills and construction techniques used in the creation of theatre costumes.**Credits:** 3.00

THTR 55300 - Theatre Audio Technology II

Credit Hours: 3.00. The study of the technical aspects of audio as they relate to use of, and experimentation with, various techniques in the design, installation, and specification of theatre sound systems, etc. Priority for majors. Offered in alternate years. Permission of instructor required. **Credits:** 3.00

THTR 55400 - Advanced Theatre Drafting

Credit Hours: 3.00. An advanced projects course in drafting for the theatre. Emphasis on accepted theatrical drafting, standards, types of drawing, and presentation formats. Offered in alternate years. **Credits:** 3.00

THTR 55600 - Advanced Stage Makeup

Credit Hours: 3.00. Advanced training and practice in the application of theatrical makeup. Emphasis on problem solving and varied materials and application techniques. Offered in alternate years. **Credits:** 3.00

THTR 55800 - Advanced Problems In Theatre Technology

Credit Hours: 1.00 to 3.00. Advanced study and application of technical theatre problems and practice. Permission of instructor required. **Credits:** 1.00 to 3.00

THTR 56000 - Advanced Scenic Design

Credit Hours: 3.00. Advanced study of the principles of design and their application to specific staging problems. **Credits:** 3.00

THTR 56100 - Advanced Costume Design

Credit Hours: 3.00. Advanced study of the principles of costume design and their application to specific problems. **Credits:** 3.00

THTR 56200 - Advanced Light Design

Credit Hours: 3.00. Advanced study of the principles of light design and their application to specific lighting problems. **Credits:** 3.00

THTR 56300 - Advanced Sound Design

Credit Hours: 3.00. Advanced study of the principles of sound design for theatre and theory application to specific problems. Offered in alternate years. **Credits:** 3.00

THTR 56400 - Theatrical Rendering

Credit Hours: 3.00. Provides advanced training in rendering techniques used by theatrical designers. Students will study perspective drawing, figure drawing, painting, and explore different materials used by designers to communicate their artistic vision. **Credits:** 3.00

THTR 56700 - Model Construction

Credit Hours: 3.00. Model construction is one of many skills required of scene designers and is a preferred communication tool for many directors and designers. This course offers a variety of practical exercises for presenting both blueline and full-color models. **Credits:** 3.00

THTR 56800 - Advanced Problems In Design

Credit Hours: 1.00 to 3.00. A described tutorial in theatrical design or design research. Permission of instructor required. **Credits:** 1.00 to 3.00

THTR 56900 - Special Problems In Audio Production

Credit Hours: 3.00. Advanced study and application of sound studio production techniques to different audio related disciplines. Permission of instructor required. **Credits:** 3.00

THTR 57001 - Statics And Structures For Theatre I

Credit Hours: 3.00. Advanced study of static forces and analysis of the ability of specific structural shapes and materials traditionally used in theatrical scenery construction to resist these forces. This course will be taught both fall and spring semesters once every three years. **Credits:** 3.00

THTR 58000 - Period Style For The Designer

Credit Hours: 3.00. A survey of the major aesthetic developments in art, architecture, interior decor, costume history, and musical styles from Ancient Egypt to the present, intended for the edification of the theatre designer. Permission of instructor required. **Credits:** 3.00

THTR 59000 - Directed Study Of Special Theatre Problems

Credit Hours: 1.00 to 3.00. An individualized and intensive study of any aspect of theatre required by the student's plan of study. Permission of instructor required. **Credits:** 1.00 to 3.00

THTR 59700 - Production And Design Seminar

Credit Hours: 3.00. Training in theatrical design based upon a variety of theatrical presentation forms. The type of presentation alternates, and specific content varies each semester. **Credits:** 3.00

THTR 61300 - Classical Text I

Credit Hours: 3.00. Concentration on increasing vocal flexibility through exploration and preparation of Shakespearean texts. Permission of instructor required. Prerequisite: THTR 51400. **Credits:** 3.00

THTR 61400 - Classical Text II

Credit Hours: 3.00. Continuation of Classical Text I, with emphasis on studio scene work beginning with Shakespeare and progressing through the works of other major classical playwrights. Permission of instructor required. Prerequisite: THTR 61300. **Credits:** 3.00

THTR 63300 - Interpretive Acting Techniques

Credit Hours: 3.00. Advanced work in script and character analysis, character development, interpretation, interaction and relationship dynamics; rehearsal of complex scenes using material from various contemporary forms and theatrical genres. Prerequisite: THTR 53300. Permission of instructor required. **Credits:** 3.00

THTR 64000 - Directing Internship

Credit Hours: 1.00 to 6.00. Practical experience with a university, professional, or community theatre to facilitate the transition from student to professional director. Available for graduate students in their final year. Particular assignment must be approved by the student's major professor. Permission of instructor required. **Credits:** 1.00 to 6.00

THTR 65800 - Special Problems In Technology

Credit Hours: 1.00 to 3.00. A described tutorial leading to postgraduate level project work for those students who are developing advanced theories in stage technology. Prerequisite: THTR 55800. Permission of instructor required. **Credits:** 1.00 to 3.00

THTR 66900 - Tutorial Internship For MFA

Credit Hours: 3.00 to 6.00. Off-campus internship designed to provide practical field experience under professional supervision in selected situations related to the candidate's area of specialization. Arrangements for internship must be approved by the candidate's graduate advisory committee. Permission of instructor required. **Credits:** 3.00 to 6.00

THTR 67000 - Script Interpretation

Credit Hours: 3.00. The study of scripts through several lenses, ranging from Aristotelian analysis to holistic, contemplative practice. The course includes seminar discussion, response papers, group projects, exercises, and a final script interpretation in the form of a formal paper. Prerequisite: THTR 60100. Permission of department required. **Credits:** 3.00

THTR 67100 - Modern Theory And Criticism

Credit Hours: 3.00. A seminar on modern performance theory, aesthetics, and practice. Emphasis on European theatre since 1875 and American theatre after 1960, with application through performance projects. Prerequisite: THTR 60100. Permission of instructor required. **Credits:** 3.00

THTR 69700 - MFA Terminal Project

Credit Hours: 3.00 to 6.00. MFA Terminal Project. Permission of instructor required. **Credits:** 3.00 to 6.00

THTR 69800 - Research MA Or MFA Thesis

Credit Hours: 1.00 to 18.00. Research MA Or MFA Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

Veterinary Clinical Sciences

VCS 22100 - Veterinary Nursing Techniques For The Normal Animal (SA & LA)

Credit Hours: 4.00. The course will introduce the students to concepts related to normal, healthy large and small animal patients. The course includes both lecture and laboratory components. **Credits:** 4.00

VCS 22200 - Dentistry-VN

Credit Hours: 0.50. This course is an introduction to veterinary dentistry for the technician, with emphasis on basic dental anatomy, pathologies and treatments, dental charting, intraoral radiography, dental cleaning and periodontal disease management.**Credits:** 0.50

VCS 22300 - Surgical Nursing-VN

Credit Hours: 1.00. This course is an introduction to the surgical environment and all aspects related to the principles of asepsis and the practice of sterile technique. Students will learn using a variety of teaching modalities (lecture, group work, laboratory experience).**Credits:** 1.00

VCS 22400 - Small Animal Nursing I

Credit Hours: 2.00. This course will introduce students to nursing and diagnostic techniques for small animals and the body response to disease. **Credits:** 2.00

VCS 22500 - Large Animal Nursing I

Credit Hours: 2.00. This course builds on concepts learning in VCS 22100 related to normal, healthy large animal patients. It also introduces the students to higher level patient care for the large animal patient. **Credits:** 2.00

VCS 22600 - Principles Of Anesthesia-VN

Credit Hours: 2.00. This course is an introduction to surgical nursing and anesthesia. The principles of asepsis and sterile technique will be introduced and demonstrated by staff and in some cases, practiced by the student. The basics of anesthesia will be introduced and practiced by the student.**Credits:** 2.00

VCS 22800 - Small And Large Animal Nutrition-VN

Credit Hours: 1.00. This course will introduce students to an overview of nutritional concepts as it applies to common domestic small and large animal species and selected exotic companion/avian pets. Basic concepts for understanding nutritional needs for all species will be introduced as well as therapeutic use of diets as it relates to animal nursing.**Credits:** 1.00

VCS 25100 - Introduction To Diagnostic Imaging-VN

Credit Hours: 0.50. This course is an introduction to veterinary diagnostic imaging and is designed to instruct the veterinary technician student in the basic principles of imaging, necessary to perform imaging tasks within a veterinary hospital. This course will introduce the fundamentals needed in the clinical imaging rotations and in practice.**Credits:** 0.50

VCS 25200 - Diagnostic Imaging-VN

Credit Hours: 2.00. Provides an introduction to imaging of domestic animals. Emphasis will be placed on radiological principles and techniques, darkroom procedures and design, preparing technique charts for various X-ray units, animal positioning, and radiation safety. **Credits:** 2.00

VCS 32100 - Large Animal Nursing II

Credit Hours: 2.00. This course build on concepts learned in VCS 22100 and VCS 22500 related to normal, healthy large animals patients. It also introduces the student to higher level patient care for the large animal patient. **Credits:** 2.00

VCS 32200 - Small Animal Nursing II

Credit Hours: 2.00. This course will cover management of hospitalized patients, client education, and preventative medicine programs. Emphasis will be on the role of the veterinary technician in the veterinary hospital. **Credits:** 2.00

VCS 41800 - Applied Small Animal Behavior-VN

Credit Hours: 2.00. Clinical applications of canine and feline behavior problems. The normal and common abnormal behaviors of domestic dogs and cats will be presented. Emphasis will be on taking clinical history from owner, observing animals, and establishing behavioral modification treatment plans as part of the veterinary team.**Credits:** 2.00

VCS 46700 - Medical Equipment & Maintenance-VN

Credit Hours: 2.00. A laboratory in the utilization, care, and maintenance of electronic equipment used in veterinary diagnostics.**Credits:** 2.00

VCS 46800 - Advanced Emergency And Critical Care For Veterinary Nurses

Credit Hours: 2.00. This course is a culmination of previously studied clinical skills, disease processes, and small animal nursing that is focused on transferring knowledge to practical use. The course will be taught utilizing emergency and critical care case

studies to highlight disease processes, physiology, critical thinking skills, and the role of the veterinary nurse in providing high level patient care. The course goal is to prepare graduates to respond to emergent and critical patient scenarios in all types of small animal veterinary practices. **Credits:** 2.00

VCS 60200 - Problems In Clinical Medicine And Surgery

Credit Hours: 1.00 to 5.00. Individualized topics selected from the various areas of Veterinary Clinical Sciences. May include directed readings, discussion, and other intensive studies in specialized topics. Prerequisite: DVM degree. Permission of instructor required. **Credits:** 1.00 to 5.00

VCS 60300 - Introduction To Clinical Research, Trials and Translational Research

Credit Hours: 1.00. This course is designed for students entering the Graduate Program in the Department of Veterinary Clinical Sciences. During the course, lectures are presented which introduce students to the elements and scope of clinical research, including the methods used in clinical research, trials and translational research. Topics covered will explain the principles of safe and ethical conduct of clinical research. Students will also be introduced to the principles of data collection, management and interpretation. Permission of instructor required. **Credits:** 1.00

VCS 60400 - Animal Models In Translational Research

Credit Hours: 1.00. This course is designed for students in the Graduate Program in the Department of Veterinary Clinical Sciences. During the course, lectures are presented which help students obtain a working knowledge of the use of animal models in research. Topics covered will explain the principles of using animals in research and as a model for human diseases. Students will also be exposed to the principle elements of translational research, methods used in translational research and trials, and the principles of data collection, management and interpretation. Prerequisite: VCS 60300. Permission of department required. **Credits:** 1.00

VCS 60500 - Supervised Surgical Laboratory Training In Small Animal Surgical Techniques And Approaches

Credit Hours: 1.00. Small animal neurosurgical, orthopedic and soft tissues approaches, techniques, and procedures practiced in cadaver labs. Only graduate students enrolled in an American College of Veterinary Surgeons or American College of Veterinary Internal Medicine - Neurology/Neurosurgery residency will be eligible. Permission of instructor required. **Credits:** 1.00

VCS 61000 - Clinical Training In Veterinary Clinical Sciences

Credit Hours: 2.00 to 6.00. Veterinary Clinical Sciences (VCS) residents working in specific specialty areas rotate through relevant specialty clinical services in the Veterinary Teaching Hospital (or other specialty facilities) as determined by the resident committee and the requirements of each specialty college. Rotation lengths are 2.5 to 5 weeks. Residents are closely supervised by VCS faculty and gradually are given more individual responsibility as decision-making and clinical skills develop. Permission of instructor required. **Credits:** 2.00 to 6.00

VCS 62000 - Seminar In Clinical Medicine And Surgery

Credit Hours: 1.00 to 3.00. Seminars provide a forum for discussion of current concepts and research results in clinical medicine and surgery, and other aspects of veterinary medicine. Permission of instructor required. **Credits:** 1.00 to 3.00

VCS 62100 - Topics In Advanced Medicine

Credit Hours: 1.00 to 3.00. Advanced study and investigation of the pathophysiology, occurrence, diagnosis, treatment, management, and prevention of animal diseases. Emphasis will be given to the medical aspects of diseases by body system (e.g., renal, gastrointestinal, etc.) and by medical discipline (e.g., oncology, ophthalmology, etc.). Permission of instructor required. **Credits:** 1.00 to 3.00

VCS 63000 - Current Topics In Veterinary Clinical Sciences

Credit Hours: 1.00 to 6.00. One-two hour sessions organized and conducted weekly by VCS residents, with input/discussion from the attending VCS faculty. Alternating weekly topic sessions may include journal club and morbidity and mortality patient rounds or other topics appropriate to the specialty. Permission of instructor required. **Credits:** 1.00 to 6.00

VCS 69800 - Research MS Thesis

Credit Hours: 1.00 to 18.00. Research MS Thesis. Permission of instructor required. **Credits:** 1.00 to 18.00

VCS 69900 - Research PhD Thesis

Credit Hours: 1.00 to 18.00. Research PhD Thesis. Permission of Department required. **Credits:** 1.00 to 18.00

VCS 80100 - Behavior, Husbandry, And Diagnostic Techniques I

Credit Hours: 1.50. Introduction to behavior, husbandry, and diagnostic techniques of domesticated animals. Behavioral patterns and methods of management of various breeds of companion animals and animals used in the production of food, fiber, and feathers; restraint techniques, methods of collecting samples for diagnostic purposes, and methods of medication appropriate to a given species; concepts of population and production medicine and the importance of regulatory medicine. **Credits:** 1.50

VCS 80110 - Veterinary Skills And Competencies I

Credit Hours: 2.50. This course is designed to allow students to develop competence in communication, husbandry, diagnostic, and therapeutic skills of veterinary medicine and surgery. In addition, instruction will be delivered in the areas of veterinary business, professionalism, and health professional wellness. Instruction will be provided by online modules, hands-on laboratories using models, cadavers, and live animals, as well as, self-paced training in the veterinary skills lab. Students will further develop these skills through the care of teaching animals. **Credits:** 2.50

VCS 80120 - Veterinary Skills And Competencies II

Credit Hours: 2.00. This course is designed to allow students to develop competence in communication, husbandry, diagnostic, and therapeutic skills of veterinary medicine and surgery. In addition, instruction will be delivered in the areas of veterinary business, professionalism and health professional wellness. Instruction will be provided by online modules, hands-on laboratories using models, cadavers, and live animals, as well as, self-paced training in the veterinary skills lab. Students will further develop these skills through the care of teaching animals. **Credits:** 2.00

VCS 80130 - Introduction To Population Medicine And Veterinary Ethics

Credit Hours: 2.00. This course will introduce first year veterinary students to the fundamental principles of population medicine. This will include concepts behind population versus individual animal medicine, population animal industries and their management practices, population animal diseases, outbreak investigation, regulatory medicine, and interactions between wild and domestic animals. Following an introduction to population medicine, students will shift to a discussion of veterinary ethics and its application to various animal industries. Students will explore basic concepts in animal use ethics and welfare, ethical and moral reasoning, and critical thinking and problem solving in population medicine. **Credits:** 2.00

VCS 80140 - Fundamental Principles Of Comparative Nutrition

Credit Hours: 2.00. This course will cover fundamental aspects of comparative nutrition building on knowledge from veterinary comparative anatomy and physiology courses. Multiple species will be discussed to provide the student a broad-based foundational knowledge in key nutritional concepts, including feeds and feeding assessment and the animal's physiologic state/lifestage. The student will learn how physiologic status will impacts energy needs and nutritional adequacy, on an individual and/or group basis. The student will also develop skills in forage identification, pet food assessment, and when the individual/group is at risk of nutrient deficiency. **Credits:** 2.00

VCS 80200 - Behavior, Husbandry, And Diagnostic Techniques II

Credit Hours: 1.50. A continuation of VCS 80100. Intermediate studies of behavior, husbandry, and diagnostic techniques. Behavioral patterns and methods of management of various breeds of companion animals and animals used in the production of food, fiber, and feathers; restraint techniques, methods of collecting samples for diagnostic purposes, and methods of medication appropriate to a given species; concepts of population and production medicine and the importance of regulatory medicine. **Credits:** 1.50

VCS 80201 - Professional Skills I

Credit Hours: 1.00. This course builds on the skills taught in VCS 80100 and VCS 80200 Behavior, Husbandry and Diagnostic Techniques I and II. Students will be taught additional clinical skills and practice them in the clinical skills laboratory. Communication skills will be taught with the opportunity to practice them in role-plays. Financial management, professionalism and wellness topics will also be discussed. Students will participate in the care of teaching animals. **Credits:** 1.00

VCS 80202 - Professional Skills II

Credit Hours: 2.00. This course builds on VCS 80201 Professional Skills I. Students will be taught additional clinical skills and practice them in the clinical skills laboratory. Communication skills will be taught with the opportunity to practice them in role-plays. Financial management, professionalism and wellness topics will also be discussed. Students will participate in the care of teaching animals. **Credits:** 2.00

VCS 80210 - Veterinary Skills And Competencies III

Credit Hours: 2.00. This course is designed to allow students to develop competence in communication, husbandry, diagnostic, and therapeutic skills of veterinary medicine and surgery. In addition, instruction will be delivered in the areas of veterinary business, professionalism and health professional wellness. Instruction will be provided by online modules, hands-on laboratories using models, cadavers, and live animals, as well as, self-paced training in the veterinary skills lab. Students will further develop these skills through the care of teaching animals. Students will also complete observational assignments and treatment duties in the Veterinary Teaching Hospital. **Credits:** 2.00

VCS 80220 - Veterinary Skills And Competencies IV

Credit Hours: 2.00. This course is designed to allow students to develop competence in communication, husbandry, diagnostic, and therapeutic skills of veterinary medicine and surgery. In addition, instruction will be delivered in the areas of veterinary business, professionalism and health professional wellness. Instruction will be provided by online modules, hands-on laboratories using models, cadavers, and live animals, as well as, self-paced training in the veterinary skills lab. Students will further develop these skills through the care of teaching animals. Students will also complete observational assignments and treatment duties in the Veterinary Teaching Hospital. **Credits:** 2.00

VCS 80300 - Behavior, Husbandry, And Diagnostic Techniques III

Credit Hours: 1.00. A continuation of VCS 80200. Behavior, husbandry, and diagnostic techniques related to preventive medicine and production systems of domesticated animals. Behavioral patterns and methods of management of various breeds of companion animals and animals used in the production of food, fiber, and feathers; restraint techniques, methods of collecting samples for diagnostic purposes, and methods of medication appropriate to a given species; concepts of population and production medicine and the importance of regulatory medicine. **Credits:** 1.00

VCS 80301 - Veterinary Clinical Skills I

Credit Hours: 2.00. This course introduces students to the clinical environment in the Veterinary Teaching Hospital (VTH). Students will assist with treatments of patients and participate in activities of the various clinical services. Students will be assigned daytime and after-hours shifts. Laboratory sessions will address clinical skills, client communication skills, financial management, professionalism and wellness. **Credits:** 2.00

VCS 80302 - Veterinary Clinical Skills II

Credit Hours: 2.00. This course is a continuation of VCS 80301 Clinical Skills I. Students will work with 4th year veterinary students in VTH. Students will assist with treatments of patients and participate in activities of the various clinical services. Students will be assigned daytime and after-hours shifts. Laboratory sessions will address clinical skills, client communication skills, financial management, professionalism and wellness. **Credits:** 2.00

VCS 80310 - Veterinary Skills And Competencies V

Credit Hours: 2.00. This course is designed to allow students to develop competence in communication, husbandry, diagnostic, and therapeutic skills of veterinary medicine and surgery. In addition, instruction will be delivered in the areas of veterinary business, professionalism and health professional wellness. Instruction will be provided by online modules, hands-on laboratories using models, cadavers, and live animals, as well as, self-paced training in the veterinary skills lab. Students will also complete observational assignments and treatment duties in the Veterinary Teaching Hospital. **Credits:** 2.00

VCS 80320 - Veterinary Skills And Competencies VI

Credit Hours: 2.00. This course is designed to allow students to develop competence in communication, husbandry, diagnostic, and therapeutic skills of veterinary medicine and surgery. In addition, instruction will be delivered in the areas of veterinary business, professionalism and health professional wellness. Instruction will be provided by online modules, hands-on laboratories using models, cadavers, and live animals, as well as, self-paced training in the veterinary skills lab. Students will also complete observational assignments and treatment duties in the Veterinary Teaching Hospital. **Credits:** 2.00

VCS 80400 - Behavior In Domestic Animals

Credit Hours: 1.00. Instruction in basic principles of behavior; factors determining normal and abnormal behavior; and the different types of learning. The main domestic species will be characterized in terms of their normal behavior with which behavior problems are most important in the different species. **Credits:** 1.00

VCS 80500 - Small Animal Behavioral Therapy

Credit Hours: 1.00. Provides information on the diagnosis, treatment, and prevention of behavior problems of dogs and cats, with emphasis on differential diagnosis of behavioral problems and behavioral pharmacology. Topics include aggression, anxiety related problems, inappropriate elimination, client counseling, and problem prevention. Client interaction and the question of euthanasia for behavioral problems is also discussed. **Credits:** 1.00

VCS 80600 - Small Animal Medicine And Surgery I

Credit Hours: 3.50. An overview of clinical approach to common medical and surgical diseases of dogs and cats. A systems approach is used to teach the major concepts of diseases affecting each body system. The focus is on diagnosis and treatment of common diseases encountered in small animal clinical practice. **Credits:** 3.50

VCS 80610 - Small Animal Medicine I

Credit Hours: 3.50. This course is the first in a series that provides an overview of clinical approaches to common medical diseases of dogs and cats. A systems approach is used to teach the major concepts of diseases affecting each body system. The focus of this course is disease recognition based on initial medical information (ex. signalment, presenting complaint, physical examination), diagnosis, and treatment of common diseases encountered in small animal clinical practice. **Credits:** 3.50

VCS 80616 - Small Animal Clinical Nutrition

Credit Hours: 1.00. This nutrition course presents the established knowledge of metabolism and physiological chemistry pertaining to nutrients and the control of biochemical pathways at the gene, cell, organ, and system level. The goal of this course is to provide the fundamentals of nutrient metabolism while discussing nutritional modification in the management of disease. At the completion of this course, the veterinary student should be proficient in recognizing a nutrition-related problem in a clinical patient, conducting a thorough nutritional assessment, and constructing appropriate nutritional strategies for both the pet and client. The veterinary student will achieve an understanding of systemic metabolism that can be applied to the contemporary practice of veterinary medicine. **Credits:** 1.00

VCS 80620 - Small Animal Medicine II

Credit Hours: 1.50. This is the second course in a series providing an overview of clinical approaches to common medical diseases of dogs and cats. A systems approach is used to teach the major concepts of diseases affecting each body system. The focus of this course is disease recognition based on initial medical information (ex. signalment, presenting complaint, physical examination), diagnosis, and treatment of common diseases encountered in small animal clinical practice. **Credits:** 1.50

VCS 80630 - Small Animal Surgery

Credit Hours: 2.50. This course will teach basic surgical principles applicable across species such as suture materials and patterns and principles of hemostasis. Common surgical diseases affecting the various body systems of dogs and cats will be discussed with a focus on pre- and postoperative care. Routinely performed surgical procedures (neuter, spay, C-section) will be discussed. Orthopedic topics will include bone healing, management of musculoskeletal trauma, fracture management, and fundamentals of external and internal fracture stabilization techniques for dogs and cats. The course will conclude with discussions of select musculotendinous conditions, principles of amputation and joint and limb salvage, and an introduction to principles of physical therapy. **Credits:** 2.50

VCS 80700 - Small Animal Medicine And Surgery II

Credit Hours: 2.00. An overview of clinical approach to common medical and surgical diseases of dogs and cats. A systems approach is used to teach the major concepts of disease affecting each body system. The focus is on diagnosis and treatment of common diseases encountered in small animal clinical practice. **Credits:** 2.00

VCS 80800 - Equine Medicine And Surgery

Credit Hours: 2.50. Diagnostic methods and prevention, control, and treatment regimens for common diseases affecting horses. Issues related to diseases of regulatory importance (epidemic and exotic) are discussed. Students also learn about surgical correction of selected problems and elective surgical procedures. **Credits:** 2.50

VCS 80801 - Equine Medicine

Credit Hours: 2.50. Core course focused on the major equine diseases and preventive medicine/herd health (biosecurity, vaccination, parasite control, dental disease). The course will cover pathogenesis, diagnosis, and treatment/management of these conditions or syndromes. **Credits:** 2.50

VCS 80900 - Ruminant Medicine And Surgery

Credit Hours: 2.00. Diagnostic methods and prevention, control, and treatment regimens for common diseases affecting ruminants. Issues related to food quality assurance and safety, and diseases of regulatory importance (epidemic and exotic). Surgical correction of selected problems and elective surgical procedures. **Credits:** 2.00

VCS 80910 - Food Animal Medicine

Credit Hours: 4.00. This course focuses on the major infectious, metabolic, and parasitic diseases of ruminants, camelids, swine, poultry and other avian flocks. The pathogenesis, diagnosis, and treatment of these conditions or syndromes will be reviewed. Additionally, the course will cover proper management, including vaccinations and animal husbandry, to prevent the development of these conditions. **Credits:** 4.00

VCS 80920 - Large Animal Surgery

Credit Hours: 2.50. This course will cover the core fundamentals of surgical diseases of multiple large animal species, including the horse, bovine, small ruminants and camelids. Case management approaches are utilized to provide examples of disease conditions affecting these large animal species. **Credits:** 2.50

VCS 81000 - Swine Production Medicine

Credit Hours: 1.00. Diagnostic methods and prevention, control, and treatment regimens for common diseases affecting swine. Issues related to food quality assurance and safety and diseases of regulatory importance (epidemic and exotic) are discussed. **Credits:** 1.00

VCS 81100 - General Surgery Laboratory

Credit Hours: 1.00. Introduction to basic skills in surgery and anesthesia. Models are used to learn basic skills of instrument use, tissue handling, dissection, and suturing. Students will progress to common anesthetic and surgical procedures on live and cadaver animals. **Credits:** 1.00

VCS 81101 - Small Animal Surgery Lab I

Credit Hours: 1.50. Introduction to basic skills in surgery and anesthesia. Models are used to learn basic skills of instrument use, ligation, dissection, and suturing. Students will progress to common anesthetic and surgical procedures on live and cadaver animals. The live animal surgery will teach physical examination, formulating an anesthetic plan, anesthetic induction, maintenance and recovery, as well as feline spay and neuter. **Credits:** 1.50

VCS 81200 - Principles Of Anesthesia, Surgery, And Emergency Medicine

Credit Hours: 2.00. Introduction to basic principles of anesthesiology and surgical practice. The principles of aseptic technique, operating room protocol, tissue handling, hemostasis, and wound repair. Principles of emergency medicine, including shock therapy, fluid therapy, and trauma management. **Credits:** 2.00

VCS 81201 - Principles Of Veterinary Anesthesiology

Credit Hours: 2.00. Introduction to basic principles of anesthesiology. Pharmacology of anesthesia and analgesic drugs, anesthetic equipment, monitoring, regional and local anesthetic techniques, pain management and anesthesia care of multiple species and special disease considerations will be covered. **Credits:** 2.00

VCS 81210 - Small Animal Primary Care And Wellness

Credit Hours: 2.00. This course will discuss conditions that are commonly treated in small animal primary care practice. Topics will include wellness and preventative care for dogs and cats at all lifestages, dental care, diagnosis and management of common oral and skin diseases, and emergency medicine. Humane euthanasia and palliative care will also be discussed. **Credits:** 2.00

VCS 81300 - Diagnostic Imaging

Credit Hours: 1.00. In the first half of the core diagnostic imaging course, emphasis is on how images are made using current technology. Although radiography is emphasized, imaging modalities such as ultrasonography, computed tomography, magnetic resonance imaging, scintigraphy, and thermography are discussed. In the second half of the course, types of lesions that can be observed in large and small animals with the various imaging modalities are explained. The course is offered once annually, and its successful completion is required for any of the elective courses offered by Diagnostic Imaging. **Credits:** 1.00

VCS 81400 - Comparative Theriogenology

Credit Hours: 1.00. Basic aspects of reproduction in large and small animals, including obstetrics and genital diseases, on a single animal or group basis are covered. **Credits:** 1.00

VCS 81410 - Comparative Theriogenology

Credit Hours: 2.00. This course develops a broad clinical knowledge of common reproductive management strategies and clinical conditions associated with reproduction in the major domestic species. It provides information and strategies for the conduct of breeding soundness examinations and infertility work-ups in the male; estrous cycle characteristics, diagnostics and control in females; breeding management strategies, pregnancy diagnosis, and management of gestation; investigation and control strategies for pregnancy loss; management of parturition and treatment of dystocia; normal postpartum changes and diseases of the peripartum period and the pathophysiology and treatment of uterine infections. Material will be presented in both comparative and species-specific manner. Students should review reproductive anatomy and physiology notes in preparation for this course. **Credits:** 2.00

VCS 81500 - Ophthalmology

Credit Hours: 1.00. This course is an introduction to veterinary comparative ophthalmology. It covers the anatomy of the eye, diagnosis, pathophysiology, and treatment of the ocular diseases commonly seen in companion and food animal species: canine, feline, equine, avian, bovine, caprine, ovine, porcine, lagomorphs. Covers pharmacology as it relates to medications used to treat ocular disease. **Credits:** 1.00

VCS 81700 - Achieving Success In Private Practice

Credit Hours: 1.50. Provides a foundation for the application of practice management principles. Focuses on operations management, financial management, human resource management, and marketing management. **Credits:** 1.50

VCS 81800 - Small Animal Surgery Laboratory I

Credit Hours: 0.50. Common orthopedic and soft tissue surgical procedures are performed on cadaver and live animals. **Credits:** 0.50

VCS 81802 - Small Animal Surgery Laboratory II

Credit Hours: 1.50. This course will build on VCS 81100 by emphasizing the importance of proper basic surgical skills (instrument carriage, suturing, knot tying). Surgical skills will be expanded by performing several procedures on cadaveric tissue: abdominal approaches, gastrointestinal surgery, urogenital surgery, wound management, amputations. One lab will be dedicated to ophthalmologic procedures. Ovariohysterectomies and castrations will be performed on live dogs and cats to further develop the students' surgical skills as well as skills in physical examination, formulating an anesthetic plan, anesthetic induction, maintenance & recovery and postoperative care. **Credits:** 1.50

VCS 81900 - Small Animal Dentistry

Credit Hours: 3.00. Students will be involved with the evaluation and treatment of small animal dentistry patients. Patient activity will occur during four days of the week. On the fifth day, procedure labs using cadaver specimens will be held. Daily patient discussions will occur, topic/additional patient rounds may also be presented on the fifth day. A complete spectrum of small animal dentistry treatments is provided by the clinical service. Therefore, the students will be involved with all levels of dental/oral care. For students enrolled in Small Animal/Companion Animal and mixed animal tracks. Total clinic hours 129.**Credits:** 3.00

VCS 82000 - Small Animal Surgery Laboratory II

Credit Hours: 0.50. More advanced soft tissue and orthopedic surgical techniques are practiced on cadaver and live animals. **Credits:** 0.50

VCS 82100 - Clinical Neurology

Credit Hours: 3.00. Students will be directly or indirectly involved in the evaluation, treatment and care of patients present to the neurology/neurosurgery service. Cadaver work may supplement the clinical experience. Students will be expected to accomplish the objectives of the Neurology/Neurosurgery block and to develop greater knowledge, clinical judgment, diagnostic capabilities and neurologic examination skills that would enable them to manage more complex cases, such as intervertebral disc disease, seizures, encephalopathies and neuropathies.**Credits:** 3.00

VCS 82200 - Large Animal Surgery I

Credit Hours: 0.50. Basic surgical training in large animals, including both soft tissue and orthopedic procedures. **Credits:** 0.50

VCS 82300 - Large Animal Surgery II

Credit Hours: 0.50. More advanced surgical training in large animals, including both soft tissue and orthopedic procedures. **Credits:** 0.50

VCS 82500 - Ruminant Theriogenology

Credit Hours: 0.50. All aspects of ruminant reproduction are covered, including obstetrics and genital diseases on a single animal or group basis. **Credits:** 0.50

VCS 82501 - Ruminant Theriogenology

Credit Hours: 1.50. This course will cover clinically pertinent aspects of ruminant reproduction in more detail than prerequisite courses, including obstetrics and genital diseases on an individual and group basis. The laboratory portion will teach the proper techniques for rectal palpation and reproductive ultrasound in ruminants. Principles of embryo recovery and transfer will be practiced. **Credits:** 1.50

VCS 82700 - Small Animal Imaging

Credit Hours: 2.00. A continuation of VCS 81300. Specific diseases of small animals where imaging is part of the diagnosis are discussed. Emphasis is on radiography and ultrasonography. The use of alternate imaging modalities is discussed where appropriate. **Credits:** 2.00

VCS 82701 - Diagnostic Imaging

Credit Hours: 3.00. This course covers basic mechanisms of image generation and interpretation. The first half of the course deals with principles of image formation and the introduction to advanced imaging modalities. A synopsis of the principles of radiobiology and radiation safety is offered. The second part of the course features imaging interpretation based on previously mastered imaging principles. The third part of the course builds the foundation of film reading and interpretation such as radiographic anatomy and radiographic signs of specific disease conditions. This course serves as a foundation for the fourth-year diagnostic radiology rotation. **Credits:** 3.00

VCS 82800 - Clinical Rotation In Neurology And Physical Rehabilitation

Credit Hours: 3.00. The first week of the 3-week block, students will spend 100% of the time on the neurology service. Weeks 2 and 3 of the block, the students will spend 100% of the time on the physical rehabilitation service. The course is a 3.0-credit elective clinical rotation. Currently, the neurology service receives three days per week (M, W, F), and the physical rehabilitation service receives new appointments one day per week (T) and recheck appointments daily (M-F). A PVM clinician will lead this elective rotation. The majority of cases will be small animal patients, but some exposure to large animal, equine and small ruminant cases may take place. Students are also expected to practice clinical and technical skills which are required for each service.**Credits:** 3.00

VCS 82900 - Equine Imaging

Credit Hours: 1.00. A continuation of VCS 81300. Specific diseases of horses where imaging is part of the diagnosis are discussed. Emphasis is on radiography and ultrasonography. The use of alternate imaging modalities is discussed where appropriate. **Credits:** 1.00

VCS 83100 - Equine Theriogenology Laboratory

Credit Hours: 1.00. This elective course provides the student with the opportunity to become proficient in all aspects of mare reproductive management. Palpation of the mare's reproductive tract will be emphasized. It also allows students to enhance their abilities to recognize reproductive problems and to formulate and carry out a diagnostic and therapeutic plan. **Credits:** 1.00

VCS 83200 - Equine Lameness

Credit Hours: 0.50. Advanced study of equine lameness, with a focus on the performance horse. Physical examination of the locomotor system, lameness diagnosis, and the establishment of a prognosis are emphasized. **Credits:** 0.50

VCS 83201 - Equine Lameness

Credit Hours: 2.00. Advanced study of equine lameness with a focus on the performance/sport horse. Physical examination of the locomotor system (axial and appendicular), diagnosis, treatment, and establishment of a prognosis are emphasized through lecture and laboratory sessions. **Credits:** 2.00

VCS 83300 - Advanced Equine Medicine

Credit Hours: 1.00. A continuation of VCS 50800. **Credits:** 1.00

VCS 83400 - Food Animal Surgery

Credit Hours: 0.50. A continuation of Large Animal Surgery for students with a selected interest in large animal/mixed practice. Surgical diseases of cattle are emphasized. **Credits:** 0.50

VCS 83700 - Clinical Nutrition For Ruminants And Swine

Credit Hours: 1.00. Current information on nutritional requirements of cattle and pigs, along with the relationships between nutrients and outcomes when nutrients are under- or oversupplied in different phases of the life cycle of cattle and pigs. Specific rations and nutritional requirements of cattle and pigs. Students will be expected to evaluate nutritional problems. **Credits:** 1.00

VCS 83800 - Swine Production Medicine

Credit Hours: 1.00. Introduction to production and health management in swine herds. The concept of the model herd is introduced, and the use of records in the diagnosis of problems and maximizing production efficiency is covered. The focus is herd-based and includes problem-solving. **Credits:** 1.00

VCS 83901 - Beef Production Medicine

Credit Hours: 1.00. The goal of this course is to present the concepts of beef production medicine to prepare the student to formulate plans to solve herd problems. The topics of herd health, fertility, nutrition, records, genetics, marketing and environment will be discussed and students will work in groups to solve real herd issues. An optional herd visit will also be available to all students. **Credits:** 1.00

VCS 83902 - Dairy Production Medicine

Credit Hours: 1.00. The goal of this course is to present the concepts of dairy production medicine to prepare the student to formulate plans to solve herd problems. The topics of dairy cow nutrition (including ration balancing programs), calf nutrition and management, records analysis including the use of PCDart computer program, vaccination programs, and animal welfare evaluations. Additionally, students will be exposed to team troubleshooting and performing farm evaluations. Outside speakers may be used as content experts. **Credits:** 1.00

VCS 83903 - Cattle Production Medicine

Credit Hours: 1.50. "Production medicine" is an important part of modern bovine veterinary practice. This course will demonstrate this role of production medicine in bovine practice and the potential value to the producer and veterinarian. Topics discussed during the class will include cattle nutrition (including exposure to ration balancing programs), calf nutrition and management, records analysis including the use of computer programs, mastitis and milk quality measurements, economics, and animal welfare evaluations exposure to different facets of the beef industry (cow/calf, stocker, feedlot) and the differences in management in those systems, genomics, and immunology/vaccinology. Additionally, students will be exposed to team troubleshooting and performing farm evaluations. Outside speakers may be used as content experts. **Credits:** 1.50

VCS 84000 - Small Ruminant/Llama Medicine

Credit Hours: 1.00. The pathogenesis, diagnosis, treatment, and prevention of common diseases of small ruminants and llamas. **Credits:** 1.00

VCS 84101 - Advanced Ophthalmology

Credit Hours: 0.50. This course is an advanced course in ophthalmology covering topics not covered in the core ophthalmology course. Species discussed will include canine, feline, equine, bovine, ovine, caprine and exotic species. Topics include vision and neuro-ophthalmology, surgery, ocular emergencies, ocular manifestations of systemic disease, ocular examination, and diagnostic techniques and modalities specific to diseases of the eye. **Credits:** 0.50

VCS 84300 - Successful Practice Skills

Credit Hours: 0.50. Builds upon the foundation for the application of practice management principles learned in VCS 51700. Focus is in the areas of communications and relationships with clients, staff, and colleagues; leadership development; and key essentials of practice operation for the prospective associate (or practice director). **Credits:** 0.50

VCS 84400 - Client Communications - Companion Animal Practice

Credit Hours: 0.50. The course will be taught in a discussion format utilizing small group exercises and role-plays. The goal is to demonstrate and describe effective client communication skills. Because effective client communication is a learned skill, the course will provide multiple opportunities for students to practice and refine their skills. Students who participate in this course will be videotaped working through a scenario with a simulated client. While being videotaped and then watching oneself can be very uncomfortable and potentially embarrassing, it is a great way to improve communication skills and is worth the potential momentary discomfort. **Credits:** 0.50

VCS 84500 - Small Animal Medicine Laboratory

Credit Hours: 0.50. A guided experience in the performance of diagnostic procedures used in small animal practice. Intended for those who will work with dogs and cats as professionals. Designed to introduce some advanced procedures and to provide an opportunity for refinement of procedures introduced earlier in the curriculum. **Credits:** 0.50

VCS 84600 - Advanced Small Animal Medicine

Credit Hours: 2.00. An advanced course dealing with selected diseases of dogs and cats. Designed for the student who is focusing on small animal or companion animal practice. A systems approach is used to teach the major concepts of diseases affecting each body system. Focuses on diagnosis and treatment of diseases commonly encountered in small animal clinical practice. Topics covered in this elective include endocrinology, nephrology, gastroenterology, and immune-mediated diseases. **Credits:** 2.00

VCS 84601 - Small Animal Medicine III

Credit Hours: 2.00. An advanced elective course focused on selected diseases of dogs and cats. Designed for the student who is considering entering either small animal exclusive practice, mixed animal practice, or companion animal practice. A systems approach is used to teach the major concepts of diseases affecting each body system while developing a deeper understanding of common diseases in the dog and cat. This course will concentrate on the diagnosis and treatment of diseases commonly encountered in small animal clinical practice. Topics in this elective include nephrology, urology, oncology, endocrinology, infectious diseases, cardiology, gastroenterology (includes liver and pancreas). **Credits:** 2.00

VCS 84700 - Advanced Small Animal Specialties

Credit Hours: 2.00. An advanced course dealing with selected diseases of dogs and cats. Designed for the student who is focusing on small animal or companion animal practice. A systems approach is used to teach the major concepts of diseases affecting each body system. Focuses on diagnosis and treatment of diseases commonly encountered in small animal clinical practice. Topics included in this elective include cardiology, dermatology, neurology, and oncology. **Credits:** 2.00

VCS 84701 - Small Animal Medicine IV

Credit Hours: 2.00. An advanced elective course focused on selected diseases of dogs and cats. Designed for the student who is considering entering either small animal exclusive practice, mixed animal practice, or companion animal practice, following graduation. A systems approach is used to teach the major concepts of diseases affecting each body system while developing a deeper understanding of common diseases in the dog and cat. This course will concentrate on the diagnosis and treatment of diseases commonly encountered in small animal clinical practice. Topics in this elective include neurology, respiratory, oncology, dermatology, and immune-mediated diseases. **Credits:** 2.00

VCS 84800 - Advanced Small Animal Surgery

Credit Hours: 1.50. An advanced course dealing with selected surgical diseases of dogs and cats. Designed for the student who will be practicing on small animals (small animal, companion animal, or mixed animal track). A systems approach is used to teach important concepts of surgical diseases and procedures affecting each body system. Focuses on the diagnosis and treatment of diseases commonly encountered in small animal practice. **Credits:** 1.50

VCS 85000 - Small Animal Dentistry

Credit Hours: 0.50. A thorough understanding and practical knowledge of the oral examination, dental prophylaxis, and tooth extraction. The principles of endodontics, periodontics, orthodontics, and restorations are discussed. Techniques useful in oral surgery, such as dental bonding and intra-oral splinting are presented. **Credits:** 0.50

VCS 85100 - Medicine And Surgery Of Nontraditional Pets

Credit Hours: 2.00. An overview of clinical approach to common medical and surgical diseases of nontraditional pets. Focuses on diagnosis and treatment of common diseases encountered in small animal clinical practice. **Credits:** 2.00

VCS 85200 - Comparative Theriogenology II

Credit Hours: 1.00. This course is a continuation of VCS 81400 and will cover basic aspects of reproduction in large and small animals, including obstetrics and genital disease on an individual and group basis. **Credits:** 1.00

VCS 85300 - Small Animal Emergency And Critical Care

Credit Hours: 1.00. The emergently-ill pet is a frequent scenario for both primary care private practices and the primary emergency care center. Due to the unpredictable nature of these clinical scenarios, this course provides the veterinary student the knowledge to quickly assess and stabilize pets using standard of care protocols. Common presentations and diseases are used to reinforce key concepts in emergency and critical care medicine. **Credits:** 1.00

VCS 86000 - Emergency Medicine/ICU

Credit Hours: 0.00. Designed to teach principles of intensive medical care. Advanced monitoring, critical care technology, and nursing care principles are applied as appropriate for patients under the supervision of their attending clinician. **Credits:** 0.00

VCS 86001 - Small Animal Emergency And Critical Care

Credit Hours: 3.00. This course is designed to provide an extensive three-week experiential clinical rotation that is focused on small animal emergency and critical care. The student will participate in receiving, triaging, and treating small animal emergency cases, as well as monitoring and treating critically ill small animal patients admitted to the Veterinary Teaching Hospital. Rounds will be topic and case oriented. For students in all tracks.**Credits:** 3.00

VCS 86002 - Small Animal Emergency And Critical Care II

Credit Hours: 3.00. This course is designed to provide an intensive 3-week experiential clinical rotation that is focused on small animal emergency and critical care. The student will participate in receiving, triaging, evaluating emergency cases as well as monitoring and treating critically ill small animal patients admitted to the Veterinary Teaching Hospital. There will be a focus on providing additional opportunities for the student to participate in and perform advanced critical care techniques.**Credits:** 3.00

VCS 86003 - Small Animal After-Hours Care & ICU Rotation

Credit Hours: 3.00. This course is designed to provide experience in the principles of intensive medical care and management of hospitalized small animal cases. This course will provide learning opportunities for students to practice skills and to gain experience assessing and working with hospitalized patients in the intensive care unit (ICU) and hospital wards during after-hours shifts (including evenings, overnights, and weekends dependent upon student numbers) while working with attending clinician(s) and nursing staff. As emergency caseload and ICU populations are unscheduled and their timing is unpredictable, there may be both in-hospital shifts as well as times that students are on call during this rotation. (129 clinical hours)**Credits:** 3.00

VCS 86004 - Large Animal After-Hours & Emergency Rotation

Credit Hours: 3.00. This course is designed to provide experience in the principles of intensive medical care and management of large animal emergency cases. Students will work with the attending clinician(s) and nursing staff to care for the emergency and critical care cases admitted to the hospital. As emergency cases are unscheduled and their timing is unpredictable, there will be both in-hospital shifts as well as times that students are on call during this rotation. (129 clinical hours)**Credits:** 3.00

VCS 86100 - Small Animal Medicine I

Credit Hours: 3.00. Basic clinical experience and training in the art and science of small animal medicine. Total clinic hours 129.**Credits:** 3.00

VCS 86201 - Small Animal Surgery - Soft Tissue I

Credit Hours: 3.00. Students will be expected to participate in the evaluation, treatment, and care of patients, learning from clinical case material, reviewing topics, and reading the surgical literature. Students will perform elective neutering procedures as the primary surgeon and assist in other surgical procedures. Students will participate in surgery rounds at least once each day, with every student researching and discussing the theoretical aspects of cases and making a formal case or topic presentation to other students and faculty at least once during the course. Total clinic hours 129.**Credits:** 3.00

VCS 86202 - Small Animal Surgery - Orthopedic I

Credit Hours: 3.00. Students will be expected to participate in the small animal orthopedic service. Students will be expected to participate in the evaluation, treatment and care of patients, learning from clinical case material, reviewing topics, and reading the surgical literature. Students will gain experience performing orthopedic and neurologic examinations and localizing lesions. Students will participate in surgery rounds at least once each day, with every student researching and discussing the theoretical

aspects of cases and making a formal case or topic presentation to other students and faculty at least once during the course.**Credits:** 3.00

VCS 86203 - Shelter Medicine And Surgery

Credit Hours: 3.00. Students will spend two weeks performing elective surgery on shelter animals in the mobile surgery unit and one week working at an off-campus shelter. The mobile surgery unit, staffed by a DVM faculty member and a full-time RVT will operate 4 days per week, estimated 12 hours per day. Students will perform independent study on the day they do not participate in mobile surgery. During the one week at the shelter, students will work approximately 50 hours spread over 5 days of the week assisting the shelter medicine veterinarian in all aspects of shelter medicine. There will be a limit of 4 students per block, with a maximum of 3 students participating in the mobile surgery unit at any time. Preference will be given to students who are planning to specialize in shelter medicine.**Credits:** 3.00

VCS 86204 - Clinical Rotation In Shelter Medicine At IndyHumane

Credit Hours: 3.00. The course is a 3-week clinical rotation at the Humane Society of Indianapolis, 7929 N. Michigan Road, Indianapolis, IN 46268, under the supervision of on-site staff veterinarians serving as mentors. The student will assist the on-site mentors in ongoing day-to-day veterinary assessment, medical care, surgical treatment including spay/neuter, preventive care including vaccinations, and infectious disease control involving shelter animals (primarily dogs and cats).**Credits:** 3.00

VCS 86300 - Small Animal Community Practice

Credit Hours: 3.00. Provides students with training in outpatient small animal medicine and client communication. Special emphasis is placed on preventive medicine. Students are required to write one paper as arranged with the instructor. Total clinic hours 129.**Credits:** 3.00

VCS 86400 - Dermatology/Behavior

Credit Hours: 3.00. During the 3-week block, students will spend 50% of time in each service (7.5 total contact days for each service). Currently the Dermatology service receives 2 days a week and the Behavior service receives 2 days a week. On the fifth business day the students will take care of follow-ups from clients as well as in-house consultations. Students are also expected to practice clinical and technical skills which are required for each service. This elective rotation provides opportunities in dermatology to perform a thorough dermatologic assessment of the patient including dermatological history and physical examination of the skin and adnexa, identification and description of skin lesions and formulation of a reasonable list of differential diagnoses. The students will be involved in performing and interpreting skin scrapings, trichogram, cytology, bacterial cultures, fungal cultures, skin biopsy, and otoscopic/video-otoscopic exam. In aptitude for diagnosing and treating a variety of dermatologic conditions. Finally, the students will have the opportunity to develop the art of client communication and client education in veterinary dermatology.**Credits:** 3.00

VCS 86502 - Large Animal Medicine I

Credit Hours: 3.00. Clinical training in problem solving of medical diseases, performance of diagnostic procedures, treatment, and care of individual animals. Emphasis on bovine cases. Total clinic hours 129.**Credits:** 3.00

VCS 86600 - Large Animal Surgery I

Credit Hours: 3.00. Students are exposed to, and responsible for, case-oriented problem-solving experiences with large animal surgical diseases, including lameness. Students may have an opportunity to focus on a particular species during a portion of the basic block. The basic block includes the development of skills and capability with the principles of surgery (e.g. anesthesia, asepsis, and wound healing) as applied to large animal patients. The basic block experience is directed to primary level care. Total clinic hours 129.**Credits:** 3.00

VCS 86700 - Equine Field Service I

Credit Hours: 3.00. This course will provide training in outpatient and ambulatory equine medicine, surgery, theriogenology, and preventive medicine.**Credits:** 3.00

VCS 86800 - Equine Field Service II

Credit Hours: 3.00. Provides students with training in outpatient and ambulatory equine medicine, surgery, theriogenology, and preventive medicine. Special emphasis on client communications and computerized practice management is provided. A special project in practice management is required. Total clinic hours 129.**Credits:** 3.00

VCS 87000 - Clinical Cardiology

Credit Hours: 3.00. Students will actively participate in diagnostic and therapeutic procedures in all veterinary species with an emphasis on small animals. Students will be instructed and actively perform such diagnostic and therapeutic procedures including: electrocardiography, echocardiography, blood pressure determination and catheter placement. Students will be given exposure to invasive procedures such as angiography, intracavitary pressure determinations, PDA embolization, balloon valvuloplasty and pacemaker implantation. Students will receive "active" clinical instruction as well as lectures in the form of teaching rounds. Current concepts in cardiovascular medicine will be emphasized. Total clinic hours 129.**Credits:** 3.00

VCS 87100 - Small Animal Medicine II

Credit Hours: 3.00. Additional clinical experience and training in the art and science of small animal medicine. Total clinic hours 129.**Credits:** 3.00

VCS 87102 - Oncology I

Credit Hours: 3.00. This block is designed to provide maximum exposure to clinical and comparative oncology. Students will develop skills necessary to fully evaluate and treat canine and feline cancer patients. Students will receive two weeks of exposure to the medical oncology clinic and one week of exposure to the radiation oncology clinic. Students will gain experience with various biopsy techniques and with therapeutic modalities including chemotherapy and radiation therapy. Independent study of relevant current literature is expected. The oncology student will concentrate on handling oncology patients but will have general internal medicine responsibilities during non-clinic hours.**Credits:** 3.00

VCS 87104 - Clinical Investigation In Oncology II

Credit Hours: 3.00. This elective will allow senior students the opportunity to investigate a problem in clinical oncology. The problem and method of investigation will be defined by the student and instructor. Methods of investigation available could include: 1) prospective or retrospective studies relating to the diagnosis, biological behavior, and treatment of specific canine or feline neoplasms, and 2) in vitro evaluation of tumor cells (e.g. cell culture). Oncology rounds attendance and case responsibility in oncology will also be expected. The experience gained in this course may aid in preparing the student to enter graduate or residency training. An expanded course description for the specific problem to be investigated must be placed on file in the departmental office and in the office of the Associate Dean of Academic Affairs. Total clinic hours 129. Permission of instructor required.**Credits:** 3.00

VCS 87105 - Pet Practice

Credit Hours: 6.00. Advanced instruction and clinical experience in dermatologic medicine. Students participate fully in diagnostics, therapeutics, patient management, drug studies, and research activities. Extensive self-study materials are available. Small Animal Community Practice: Students will receive training in primary care small animal and exotic pet medicine,

behavior, theriogenology, client preventive medicine and overall pet wellness to promote the family-pet bond. Students will be required to write one paper as arranged with instructor. **Credits:** 6.00

VCS 87201 - Clinical Veterinary Anesthesiology

Credit Hours: 3.00. This course will provide clinical training in anesthesiology. Students may focus on large animals, small animals, or a mixture of the both. The students will participate in daily rounds to discuss case work-up as well as advanced topics in anesthesia that are not covered in other courses. Topics may include mechanical ventilation, blood gas interpretation, neuromuscular blockade, and adjunctive anesthetic procedures (epidural analgesia, brachial plexus block, etc.).**Credits:** 3.00

VCS 87202 - Small Animal Surgery - Soft Tissue II

Credit Hours: 3.00. Students will be expected to assume greater responsibility for evaluation, treatment, and care of patients while developing greater knowledge, clinical judgment, and diagnostic capabilities that enable them to manage more complex cases. Students will learn from clinical case material, reviewing topics, and reading the surgical literature and will be given more responsibility for case management. Students will perform elective neutering procedures as the primary surgeon and assist in other surgical procedures. Students will participate in surgery rounds at least once each day, with every student researching and leading case discussions, demonstrating more initiative and independence. Each student will make a formal case or topic presentation to other students and faculty at least once during the course. Total clinic hours 129.**Credits:** 3.00

VCS 87203 - Small Animal Surgery - Orthopedic II

Credit Hours: 3.00. Students will be expected to assume greater responsibility for evaluation, treatment, and care of patients while developing greater knowledge, clinical judgment, and diagnostics capabilities that enable them to manage more complex cases. Students will be expected to learn from clinical case material, reviewing topics, and reading the surgical literature. Students will gain additional experience performing orthopedic examinations.**Credits:** 3.00

VCS 87502 - Large Animal Medicine II

Credit Hours: 3.00. Advanced clinical training in problem-solving of medical diseases, performance of diagnostic procedures, treatment, and care. Students may be allowed to spend up to three working days off campus to work with a veterinarian engaged in practice in the student's area of interest. This off-campus experience should enhance the student's education by complementing experience gained on campus.**Credits:** 3.00

VCS 87600 - Large Animal Surgery II

Credit Hours: 3.00. Students have advanced responsibility for large animal surgical patients with a species focus. Students are expected to conduct the appropriate presurgical physical examination, assist with the surgery, and be responsible for the postoperative care of most primary care level patients and many secondary care level patients. Total clinic hours 129.**Credits:** 3.00

VCS 87700 - Large Animal Lameness

Credit Hours: 3.00. Students are exposed to, and responsible for, case-oriented problem-solving experiences with large animal lamenesses and orthopedic diseases. The case exposure is primarily equine, but lameness students are expected to help with food animal lamenesses and orthopedics, as a comparative biomedical approach to studying locomotion and the musculoskeletal system. Depending upon the availability of lameness cases, lameness students will participate with the general clinic responsibilities and emergency duty in the large animal surgery. Students may be allowed to spend up to three days off campus to work with a veterinarian engaged in practice in the student's area of interest. This off-campus experience should enhance the student's education by complementing experience gained on campus. **Credits:** 3.00

VCS 87800 - Swine Production Medicine I

Credit Hours: 3.00. Advanced training and extensive experience in working with swine herds on a herd health management program. Total clinic hours 129.**Credits:** 3.00

VCS 87900 - Bovine Theriogenology And Production Medicine I

Credit Hours: 3.00. Training and experience in working with reproductive management problems in dairy and beef herds. The importance of herd records in assessing performance and health is stressed, and training is provided in the use of computerized recording systems and ration formulation programs. Total clinic hours 129. **Credits:** 3.00

VCS 87902 - Comparative Theriogenology

Credit Hours: 3.00. Training and experience in working with reproductive management problems in dairy and beef herds. The importance of herd records in assessing performance and health is stressed, and training is provided in the use of computerized recording systems and ration formulation programs. Total clinic hours 129.**Credits:** 3.00

VCS 87903 - Bovine Theriogenology And Production Medicine II

Credit Hours: 3.00. Advanced training in the areas of embryo transfer, embryo grading, artificial insemination, oviduct patency tests, and ultrasound use in ambulatory food animal practice. Training will also focus on repeat breeder cows. Additional responsibilities will be designated in the areas of herd health, production medicine and the recognition of disease processes.**Credits:** 3.00

VCS 87905 - Advanced Beef Cow-Calf Production Medicine

Credit Hours: 3.00. This course is designed to provide an intensive 3-week experiential clinical rotation that is focused on beef cow-calf production medicine. The students will spend about 50% of the time on herd visits and about 50% on research and writing up herd reports. Each student will be responsible for a specific area of focus on each herd visit. Purdue students taking the block will be available for back-up emergency duty on days when they are on campus.**Credits:** 3.00

VCS 87910 - Bovine Field Service I

Credit Hours: 3.00. Students will be trained and experience working with individual animal and herd health issues in an ambulatory setting. Students will have the opportunity to participate in after-hours emergencies on a voluntary basis. In addition, students will have the opportunity to provide routine veterinary services at the Purdue ASREC Dairy and Beef Unit. Students may elect to schedule up to five business days of the rotation at a farm animal focused private practice.**Credits:** 3.00

VCS 87920 - Bovine Field Service II

Credit Hours: 3.00. Advanced training in the areas of embryo transfer, embryo grading, artificial insemination, oviduct patency tests and ultrasound use in ambulatory food animal practice. Training will also focus on repeat breeder cows. Additional responsibilities will be designated in the areas of herd health, production medicine and the recognition of disease processes. **Credits:** 3.00

VCS 88000 - Ruminant (Dairy) Production Medicine I

Credit Hours: 3.00. Training and faculty-directed independent study in dairy production medicine. Emphasis is on health and management from the newborn calf to the lactating dairy cow. Particular attention is paid to nutritional management, herd monitoring, and herd records analysis. Additionally, vaccination programs, facilities, and welfare auditing will be covered. The

block may be customized according to the interests of the students enrolled. A limited amount of time is spent on individual animal care. Farm visits to observe different management styles and to provide troubleshooting of herd problems will also be scheduled during the block. Students may be allowed to spend up to five working days off-campus to work with a veterinarian engaged in practice in the student's area of interest. This off-campus experience should enhance the student's education by complementing experience gained on campus.**Credits:** 3.00

VCS 88001 - Ruminant (Dairy) Production Medicine II

Credit Hours: 3.00. This course is meant to build on the knowledge gained in VCS 88000 and is directed at students that are focused on future intensive dairy practice. The structure of the block will be similar to VCS 88000, but there will be more in-depth discussion of ration building, records analysis, and mild quality. Additional farm visits will also be performed to provide exposure to different types of dairy farms that will be encountered in dairy practice.**Credits:** 3.00

VCS 88002 - Clinical Veterinary Services For The Indiana State Fair

Credit Hours: 3.00. The course is a 3-credit clinical rotation. A PVM clinician will lead this elective 3-week clinical rotation. Students will spend 3 weeks providing veterinary care to all exhibition animals at the Indiana State Fair. The veterinary services provided include health assessment during check-in, assessment of ill animals, and on-call service after business hours. The majority of cases will be swine and cattle, but can also include horses, poultry, and small ruminants.**Credits:** 3.00

VCS 88100 - Small Animal Medicine III

Credit Hours: 3.00. Further clinical exposure with emphasis on cases in the student's area of interest. A faculty mentor will be assigned to each student. Total clinic hours 129.**Credits:** 3.00

VCS 88300 - Clinical Investigation In Theriogenology

Credit Hours: 3.00. Provides senior students an opportunity to investigate a clinical problem in a laboratory situation. The student is expected to apply one of the many research techniques available in the school to address the question. The experiences gained may allow the candidate to pursue graduate and residency training in theriogenology. An expanded course description for the specific problem to be investigated must be placed on file in the departmental office and in the office of the associate dean of academic affairs. Total clinic hours 129.**Credits:** 3.00

VCS 88400 - Equine Theriogenology Clinical Rotation

Credit Hours: 3.00. This 3-week rotation will offer students the opportunity to work directly with the Equine Theriogenology in-house service. Students will be able to observe and manage both mares and stallions with reproductive conditions commonly seen in practice. The rotation may include management of hospitalized high-risk mares during their gestation, mares with hospitalized neonates that need reproductive evaluation and treatment, and dystocia diagnosis and treatment. **Credits:** 3.00

VCS 88500 - Large Animal Medicine III

Credit Hours: 3.00. Advanced clinical training with focused interest in a specialized type of practice, in-depth training in internal medicine, or participation in large animal related research activities. Students may be allowed to spend up to three working days off campus to work with a veterinarian engaged in practice in the student's area of interest. This experience should enhance the student's education by complementing experience gained on campus. The short off-campus experience should be arranged with the professor of record of the course at least 30 days prior to the beginning of the block.**Credits:** 3.00

VCS 88600 - Large Animal Surgery III

Credit Hours: 3.00. Students at this level are expected to function with greater independence, carrying out the history, physical examination, and postoperative care of all elective and certain emergency/intensive care patients of the species of their choice. Depending upon the capabilities and competence of the student, as determined by the surgery faculty and staff, he or she will have the opportunity to conduct supervised surgical procedures. Students may be allowed to spend up to three days off campus to work with a veterinarian engaged in practice in the student's area of interest. This off-campus experience should enhance the student's education by complementing experience gained on campus.**Credits:** 3.00

VCS 88601 - Large Animal Surgery III Food Animal

Credit Hours: 3.00. This course will focus on food animal surgery and lameness and will only be offered 1-2 times per year. Students will be expected to function with greater independence than during LAS I and II, carrying out the history, physical examination and postoperative care of elective and certain emergency/intensive care patients. Depending upon the capabilities and competence of the student, as determined by the surgery faculty and staff, he/she will have the opportunity to conduct supervised surgical procedures. This block will focus on food animal surgical diseases through seminars, in-clinic hands-on laboratory sessions, rounds discussions and an emphasis on food animal clinical cases. Total clinic hours 129. **Credits:** 3.00

VCS 88602 - Clinical Veterinary Services At Caesars Entertainment Equine Specialty Hospital

Credit Hours: 3.00. In this 3-week rotation students will assist the staff with diagnosis and treatment of sports-related conditions including lameness diagnosis and treatment, evaluation and treatment of upper respiratory diseases, and diagnosis and treatment of a variety of surgical conditions such as lacerations and traumatic injuries to the musculoskeletal system. Students will assist in advanced diagnostic imaging including nuclear imaging and CT imaging with a unit that allows horses to be imaged while standing. A dynamic endoscope is available for use on the track to evaluate upper respiratory disease while the horse is exercising. Students will perform lameness examinations under guidance of the staff clinicians and will be expected to participate in after-hours emergencies. Rounds will be held daily when horses are hospitalized. The caseload is not limited to racing Thoroughbred horses but includes a diverse population of sport horses including Standardbred racehorses, working Quarter Horses, and hunter-jumper and dressage horses.**Credits:** 3.00

VCS 88800 - Swine Production Medicine II

Credit Hours: 3.00. This course is a faculty-directed independent study. Students are expected to use campus, state, and national resources to deal with herd problems. The goal is to bring the knowledge base of the student to the entry level expected for a swine practitioner. Emphasis is placed on veterinary services needed to maintain top production efficiency in swine herds. Total clinic hours 129. **Credits:** 3.00

VCS 89100 - Diagnostic Imaging

Credit Hours: 3.00. Clinical training and experience in radiology and ultrasound imaging as it contributes to the practice of veterinary medicine. Seminars are based on small animal imaging. Total clinic hours 129.**Credits:** 3.00

VCS 89101 - Veterinary Diagnostic - Ultrasound

Credit Hours: 3.00. This rotation will provide opportunity for hands-on small animal ultrasound imaging. The student will have the opportunity to pre-scan the patients prior to actual scan by the radiologist. By doing so, the student will learn the ultrasound scanning techniques and real-time interpretation of ultrasonography. In addition, students will observe the scanning of veterinary patients by the radiologist and will be asked to participate in ultrasonography interpretation. **Credits:** 3.00

VCS 89200 - Veterinary Forensic Medicine

Credit Hours: 1.00. The definition of forensic medicine is a science that deals with the relation and application of medical facts to legal problems. The primary role of a forensic specialist is to provide law enforcement officials, judges, and jury members with the information necessary to make decisions (decision to prosecute, render a verdict, etc.) regarding a case. This elective course is designed to expose students to the many situations where veterinary medicine and the law intersect. **Credits:** 1.00

VCS 89300 - Shelter Animal Medicine

Credit Hours: 1.00. The Shelter Animal medicine course will be offered to second and third year veterinary students. The course will cover topics essential to understanding the complexity of population medicine in a shelter environment and related welfare issues. Topics to be covered include animal shelter models (no-kill/adoption guarantee, tradition, etc.), population medicine and disease control as it relates to the environment and the animals, critical care in a shelter environment, foster care, neonatal care of shelter animals, population statistics, animal behavior and relinquishment issues, abuse and cruelty, legal and ethical issues, euthanasia, and developing and implementing animal disaster plans. **Credits:** 1.00

VCS 89400 - Comparative Ophthalmology I

Credit Hours: 3.00. Students are given the opportunity to develop the technical skills needed to test for vision and examine each ocular structure for abnormalities. The rotation includes clinical experience and instruction in veterinary (comparative) ophthalmology with participation in the diagnosis, therapy, and management of clinical cases and various research activities. A seminar presentation and/or special project is required. Total clinic hours 129.**Credits:** 3.00

VCS 89500 - Purdue Veterinary Hospital Practicum

Credit Hours: 0.00. Students will be assigned to work on a service in the Purdue Veterinary Hospital (PVH) over one-half of the December-January holiday period. The student will gain hands-on practical experience in the diagnosis and treatment of patients presented to the PVH. The student will also gain some experience managing emergent cases. Total clinic hours 45.**Credits:** 0.00

Veterinary Medicine

VM 10200 - Careers In Veterinary Medicine

Credit Hours: 1.00. Overview of the field of veterinary medicine presently and as anticipated for the future. Presentations will include descriptions and discussions of the nature of the professional activity, organization of veterinary medicine, career opportunities, issues confronting the profession, and the admission requirements of the profession. **Credits:** 1.00

VM 10500 - Intro To Veterinary Nursing - DL

Credit Hours: 1.00. An introduction to the profession of Veterinary Technology will be presented. It will include the many roles of veterinary technicians on the veterinary teams in practice and non-practice areas. Learning skills with an emphasis on medical terminology will be covered to help the student develop a foundation of medical vocabulary for future courses. **Credits:** 1.00

VM 10800 - Veterinary Nursing Career Exploration

Credit Hours: 1.00. This course will introduce students to basic concepts related to the veterinary technology profession. The course will provide an introduction to the various career opportunities within the veterinary healthcare profession as well as a general introduction to the attributes and traits of veterinary medical professionals. Veterinary technology as a career will be explored to promote understanding of the responsibilities of the veterinary technician and technologist in the veterinary medical field. Enrollment restricted to non-veterinary technology majors and first-year veterinary technology students. Second through fourth-year veterinary technology students may not register for this course.**Credits:** 1.00

VM 10900 - Veterinary Nursing Learning Community

Credit Hours: 1.00. This Learning Community course is designed for freshman in the Veterinary Nursing Program and is focused on new student integration, providing resources available on campus to facilitate student success in the first year, creating community, and introduce students to Purdue and the Program. **Credits:** 1.00

VM 11400 - Anatomy I - DL

Credit Hours: 2.00. This course is the first of two courses in the distance learning program that presents an introduction to the study of the major body systems and topographic relationships of the major domesticated species, with emphasis on the carnivore.**Credits:** 2.00

VM 11600 - Anatomy II - DL

Credit Hours: 2.00. This course is the second of two courses in the distance learning program that presents an introduction to the study of the major body systems and topographic relationships of the major domesticated species, with emphasis on the carnivore.**Credits:** 2.00

VM 13500 - Physiology I - DL

Credit Hours: 1.00. This course is the first of two courses in the distance learning program that presents an introduction to general physiology of the mammalian body systems and the general physiological process with emphasis on domestic animals. This course will address the functions of the different systems and homeostasis; the functions of the cell; the different compartments and solute transport; blood and defense; general functions of the nervous system, reflexes and special senses; the function of the nerve and muscle; cardiovascular system; and digestive system.**Credits:** 1.00

VM 13600 - Physiology II - DL

Credit Hours: 1.00. This course is the second of two courses in the distance learning program that addresses the functions of the kidney and its role in regulation of extracellular volume and acid-base; respiration, mechanics of respiration and its control, transport of gases and hypoxia; physiology of the endocrine system, functions of the gonads, fertilization, pregnancy, parturition and lactation.**Credits:** 1.00

VM 14000 - Introduction To Veterinary Technology

Credit Hours: 1.00. This course provides an orientation to the profession of Veterinary Technology. **Credits:** 1.00

VM 14001 - Small Animal Nursing I - DL

Credit Hours: 3.00. This is the first of two courses involving nursing and management of the small animal patient. This is the introduction to small animal patient care and treatment that a technician will be expected to provide in a veterinary practice. It includes techniques, equipment, client education, management of the hospitalized patient and preventative medicine. Emphasis will be on the role of the veterinary technician in the veterinary hospital. **Credits:** 3.00

VM 14700 - Surgical Nursing - DL

Credit Hours: 1.00. This course is designed to instruct veterinary technician students in the basic principles of veterinary operating room protocols and sterilization of surgical supplies commonly used within a veterinary hospital. Emphasis will be placed upon key concepts of surgical preparation of the patient, and the role of the circulating nurse and surgical nurse. In addition, the concepts of proper instrument care, sterilization procedures and inventory rotation will be covered. **Credits:** 1.00

VM 14801 - Large Animal Nursing I - DL

Credit Hours: 2.00. This is the first of two courses involving nursing and health management of the large animal patient. This is the introduction to large animal patient care and treatment that a technician will be expected to provide in a veterinary practice. It includes techniques, equipment, client education, management of the hospitalized patient and preventative medicine. Emphasis will be on the role of the veterinary technician in the veterinary facility. **Credits:** 2.00

VM 15001 - Clinical Pathology I - DL

Credit Hours: 2.00. This course is the second course that provides basic instruction in the concepts of Clinical Pathology to the veterinary technician student. This course will include hemostasis; immunohematology; the basic concepts of clinical chemistry; urinalysis evaluation; and the fundamentals of cytological sample handling and evaluation.**Credits:** 2.00

VM 20100 - Introduction To Veterinary Nursing

Credit Hours: 1.50. A didactic course which presents the basic skills that will be used in all nursing courses and in the overall curriculum. The course will provide an introduction to the various opportunities within the veterinary healthcare profession as well as a general introduction to the attributes and traits of veterinary medical professionals. In addition, the course introduces medical math and terminology used in veterinary medicine. Students will complete exercises utilizing math concepts used for dosage calculations, conversions, proper notation, dispensing medications, fluid therapy calculations, and percent solutions. Students will use medical terminology including prefixes, roots, and suffixes of medical terms to complete exercises. This knowledge will be utilized in didactic courses and labs as well as in clinical rotations. Students will learn normal temperature, pulse and respiration values for various species. There will be both in-class and self-study components. This course combines content previously presented in VM 14000 and VM 25100.**Credits:** 1.50

VM 20200 - Pharmacy Procedures - DL

Credit Hours: 1.00. This course introduces students to the concepts of pharmacy procedures used in veterinary practice. Concepts covered in this course include basic record keeping, safe handling of drugs and chemicals, inventory control, calculation of amount of drugs to be dispensed or dosed, reading prescriptions, labeling drug containers, compounding, and drug regulatory matters that impact the veterinary hospital pharmacy. **Credits:** 1.00

VM 20500 - Small Animal Nursing Mentorship I - DL

Credit Hours: 1.50. This is the first of three clinical mentorships in small animal nursing. This clinical mentorship will require the veterinary technician student to work with a small animal veterinary care facility to practice several tasks under the supervision of a clinical mentor. This clinical mentorship focuses on the principles of history taking, physical examination, simple diagnostic sample collection, parenteral and oral administration of medication, and venipuncture. Permission of department required. **Credits:** 1.50

VM 20600 - Small Animal Nursing Mentorship II - DL

Credit Hours: 1.00. This is the second of three clinical mentorships in small animal nursing. This mentorship requires the student to work with a small animal veterinary care facility to practice several tasks under the supervision of a clinical mentor. This clinical mentorship focuses on the principles of venipuncture, catheter placement, various methods of urine collection, vaginal cytology, dental prophylaxis, and ECG tracings. Permission of department required. **Credits:** 1.00

VM 20700 - Small Animal Nursing Mentorship III - DL

Credit Hours: 1.00. This is the third of three clinical mentorships in small animal nursing. This mentorship will require the student to work with a small animal veterinary care facility to practice several tasks under the supervision of a clinical mentor. This clinical mentorship focuses on the principles of oncology, dermatology, ophthalmology, and emergency care procedures. Permission of department required. **Credits:** 1.00

VM 20800 - Farm Animal Nursing Mentorship - DL

Credit Hours: 1.00. This clinical mentorship focuses on the principles of basic handling, nursing, and diagnostic techniques used in large animal medicine. Permission of department required. **Credits:** 1.00

VM 20900 - Equine Nursing Mentorship - DL

Credit Hours: 1.00. This clinical mentorship focuses on the principles of handling, restraint, and equine nursing care. Tasks to be documented include restraint and handling techniques, data collection, basic nursing care, and administration of medication and treatments. Permission of department required. **Credits:** 1.00

VM 21000 - Small Animal Anesthesia Mentorship - DL

Credit Hours: 2.00. This mentorship will require the student to work with a small animal veterinary care facility to practice several tasks under the supervision of a clinical mentor. This mentorship focuses on the principles of anesthesia from induction, maintenance to recovery. Permission of department required. **Credits:** 2.00

VM 21100 - Food Animal And Equine Anesthesia-Clinical Mentorship-DL

Credit Hours: 1.00. This mentorship focuses on the principles of large animal anesthesia from induction and maintenance to recovery. Students will be required to complete projects and participate in discussions related to large animal anesthesia cases.**Credits:** 1.00

VM 21200 - Surgical Nursing Mentorship - DL

Credit Hours: 0.50. This clinical mentorship will require the student to work in a veterinary care facility to practice several tasks under the supervision of a clinical mentor. This mentorship focuses on the principles of operating room procedures, patient and instrument preparation for surgery and the duties of the circulating nurse and the scrub nurse. Permission of department required. **Credits:** 0.50

VM 21300 - Microbiology Mentorship - DL

Credit Hours: 0.50. This Clinical Mentorship will require the student to practice several tasks under the supervision of a clinical mentor (veterinarian, credentialed veterinary technician, or microbiologist). This Clinical Mentorship focuses on the motor skills required to obtain samples, prepare specimens for examination, and perform technician-level diagnostic techniques. Permission of department required. **Credits:** 0.50

VM 21400 - Parasitology Mentorship - DL

Credit Hours: 0.50. This Clinical Mentorship will require the student to practice several tasks under the supervision of a clinical mentor (veterinarian, credentialed veterinary technician, or parasitologist). This Clinical Mentorship focuses on the motor skills required to obtain samples, prepare specimens for examination, and perform technician-level diagnostic techniques. **Credits:** 0.50

VM 21500 - Small Animal Diagnostic Imaging Mentorship I - DL

Credit Hours: 1.00. This is the first of two clinical mentorships in diagnostic imaging. This mentorship will require the student to work with a small animal veterinary care facility to practice several tasks under the supervision of a clinical mentor. This mentorship focuses on the principles of film loading, processing, presentation for viewing radiographs, care and maintenance of processors, and imaging of the thorax and abdomen. Permission of department required. **Credits:** 1.00

VM 21600 - Small Animal Diagnostic Imaging Mentorship II - DL

Credit Hours: 1.50. This is the second clinical mentorship in small animal diagnostic imaging. This mentorship requires the student to work with a small animal veterinary care facility to practice several tasks under the supervision of a clinical mentor. This mentorship focuses on the preparation of a technique chart, imaging of the shoulder, radius, ulna, stifle, spine, skull, and pelvis. Permission of department required. **Credits:** 1.50

VM 21700 - Equine Diagnostic Imaging Mentorship - DL

Credit Hours: 0.50. This clinical mentorship will require the student to work with a food animal/equine veterinary care facility to practice several tasks under the supervision of a clinical mentor. This mentorship focuses on the imaging of the carpus, fetlock, tarsus, navicular projection, P3 views, and the dorsoproximal-palmarodistal view. Permission of department required. **Credits:** 0.50

VM 22100 - Laboratory Animal Health II -DL

Credit Hours: 1.00. This course is the second of two courses that provide basic instruction in the concepts of laboratory animal health management to the veterinary technician student. This course will place an emphasis on the care of laboratory animals as well as specific procedures that are used in laboratory animal medicine. **Credits:** 1.00

VM 22300 - Pharmacy Mentorship - DL

Credit Hours: 0.50. This clinical mentorship will require the veterinary technician student to work with a veterinary care facility to practice tasks under the supervision of a clinical mentor. This clinical mentorship focuses on the principles of drug order fulfillment, reconstitution of medications, correct storage of medications (including controlled substances), safe handling of hazardous medications, and inventory control procedures. Permission of department required. **Credits:** 0.50

VM 22400 - Necropsy Mentorship - DL

Credit Hours: 0.50. This clinical mentorship focuses on the motor skills and techniques in performing a basic prosection (necropsy). Tasks include basic necropsy technique, techniques for sample collection and storage, and safety issues related to handling animal specimens. Course is offered as Distance Learning. Permission of department required. **Credits:** 0.50

VM 22500 - Advanced Clinical Mentorship - DL

Credit Hours: 1.50. This clinical mentorship will require the student to complete 120 hours of additional work experience while completing a series of selected projects related to veterinary medicine. Permission of department required.**Credits:** 1.50

VM 22501 - Parasitology - DL

Credit Hours: 2.00. This course provides basic instruction in the concepts of parasitology to the veterinary technician student. Emphasis will be on the basic information needed to accurately identify parasites commonly encountered in veterinary medicine. Emphasis will also be placed on life cycles and zoonotic aspects of the parasites covered.**Credits:** 2.00

VM 22600 - Lab Animal Mentorship - DL

Credit Hours: 1.00. This clinical mentorship focuses on the motor skills involved with the basic handling, restraint, administration of medication and nursing care of laboratory animals. Permission of department required. **Credits:** 1.00

VM 22700 - Clinical Pathology Mentorship - DL

Credit Hours: 2.00. This clinical mentorship will require the student to work with a laboratory, small or large animal veterinary care facility to practice several tasks under the supervision of a clinical mentor. This clinical mentorship focuses on the principles of blood film evaluation for different species, manual and automated CBCs, normal and abnormal cellular morphology, urinalysis, chemistry panels, and differentials. Permission of department required.**Credits:** 2.00

VM 22800 - Integrations - DL

Credit Hours: 2.00. This course will provide instruction in the concepts problem based learning for the nursing process (patient evaluations, interventions, and desire resolutions) using a cased based approach. This course will integrate foundational knowledge form anatomy, physiology, with the information in the veterinary nursing courses. Cases will involve different domestic animal species.**Credits:** 2.00

VM 22900 - Lab Animal Medicine - DL

Credit Hours: 2.00. This course will provide instruction in the concepts of Laboratory Animal Health Management to the veterinary technician student. This course will place an emphasis on the information needed to work with laboratory animals as well as issues that apply to laboratory animal medicine along with the care of laboratory animals and exotics and specific procedures that are used in laboratory animal and exotic pet medicine. Students are expected to achieve a level of understanding of laboratory animal care and management so that they will be able to communicate effectively with the veterinarian and other individuals. **Credits:** 2.00

VM 23000 - Public & Occupational Health -DL

Credit Hours: 1.00. This is the first of two courses that provide basic instruction in the concepts of workplace safety related to the veterinary technician. This course will place an emphasis on the basic information needed to recognize hazards commonly encountered and the steps that should be taken to reduce the risk of exposure to hazards. Other practical aspects of public health will be discussed.**Credits:** 1.00

VM 23001 - Small Animal Nursing II - DL

Credit Hours: 2.50. This is the second of two courses involving nursing and management of the small animal patient. This course continues the concepts of small animal patient care and treatment that a technician will be expected to provide in a veterinary practice. It includes techniques, equipment, client education, management of the hospitalized patient and preventative medicine. Emphasis will be on the role of the veterinary technician in the veterinary hospital. **Credits:** 2.50

VM 23100 - Diagnostic Imaging - DL

Credit Hours: 3.00. This course involves principles of imaging that are necessary for the performance of diagnostic imaging procedures in a veterinary hospital. This course provides an introduction to x-ray generation, image formation, exposure factors, scatter radiation, grids, film, screens, safety, basic terminology, positioning, darkroom techniques, artifact identification, advanced positioning techniques for the small animal, large animal techniques, contrast techniques, technique charts, basic ultrasound, diagnostic imaging in exotic animals. **Credits:** 3.00

VM 23200 - Principles Of Anesthesia - DL

Credit Hours: 3.00. This course involves the basic principles of anesthesia and anesthetic delivery for the veterinary technician. This course focuses on the preparation of the patient for anesthesia, the agents used as pre-anesthetics, induction agents and general anesthesia, the physiologic impacts of anesthesia on the body, multi-species anesthetic techniques (small animal, large animal/equine, pocket pets), managing high risk patients, anesthetic complications, and pain management. **Credits:** 3.00

VM 23300 - Optho, Derm & Oncology - DL

Credit Hours: 1.00. This course involves the instruction of nursing and management of small animal patients related to ophthalmology, dermatology, and oncology. It presents concepts of small animal patient care and treatment that a technician will be expected to provide in a veterinary practice. It includes techniques, equipment, client education, management of the hospitalized patient, and preventative medicine related to these specific clinical disciplines. Emphasis will be on the role of the veterinary technician in the veterinary hospital. **Credits:** 1.00

VM 23400 - Microbiology - DL

Credit Hours: 2.00. This course is designed to enable the veterinary technician to satisfactorily collect and process specimens, and characterize and identify microorganisms that may be encountered in veterinary practice situations. This course will introduce microorganisms commonly encountered in veterinary medicine. Different laboratory techniques will be illustrated.**Credits:** 2.00

VM 23500 - Pharmacology I - DL

Credit Hours: 1.00. This course is the first of two courses in the distance learning program that presents an introduction to the principles of pharmacy and pharmacology for the veterinary technician. Emphasis will be placed upon key concepts of how drugs work, terminology commonly used with therapeutic agents, important mechanisms and side effects of commonly used veterinary drugs, and dosage calculations.**Credits:** 1.00

VM 23600 - Pharmacology II - DL

Credit Hours: 1.00. This course is the second of two courses in the distance learning program that presents an introduction to the principles of therapeutics and pharmacology for the veterinary technician. Emphasis will be placed upon key concepts of how drugs work, terminology commonly used with therapeutic agents, important mechanisms and side effects of commonly used veterinary drugs.**Credits:** 1.00

VM 23701 - Large Animal Nursing II - DL

Credit Hours: 3.00. This is the second of two courses involving nursing and health management of the large animal patient. This is the introduction to large animal patient care and treatment that a technician will be expected to provide in a veterinary practice. It includes techniques, equipment, client education, management of the hospitalized patient and preventative medicine. Emphasis will be on the role of the veterinary technician in the veterinary facility. **Credits:** 3.00

VM 23900 - Dentistry - DL

Credit Hours: 0.50. This course is an introduction to veterinary dentistry for the technician, with emphasis on basic dental anatomy, pathologies and treatments, dental charting, intraoral radiography, dental cleaning and periodontal disease management. **Credits:** 0.50

VM 24000 - Nutrition - DL

Credit Hours: 1.00. This course will provide an overview of nutritional concepts as they apply to common domestic small and large animal species and selected exotic companion/avian pets. Basic concepts for understanding nutritional needs for all species will be introduced as well as the therapeutic use of diets as they relate to animal nursing. **Credits:** 1.00

VM 24100 - Occupational & Public Health I

Credit Hours: 1.00. This course will cover selected zoonotic diseases, occupational hazards and safety issues, related to the veterinary health care team and veterinary facility.**Credits:** 1.00

VM 24200 - Integrations I

Credit Hours: 1.00. An introduction to problem based learning of the nursing process (patient evaluations, interventions, and desired resolutions) using a case based approach. This course will integrate foundational knowledge from anatomy, physiology, with information in the veterinary nursing courses. Cases will involve different domestic animal species. Students will learn using a variety of teaching modalities (lecture, group work, problem based learning). **Credits:** 1.00

VM 24300 - Clinic Rotations I

Credit Hours: 1.50. This course will provide the basic learning situations for developing the techniques required of veterinary technicians in pharmacy, radiology, surgery, medical nursing, and ancillary areas. Total clinic hours 9/week.**Credits:** 1.50

VM 24400 - Clinical Rotations II

Credit Hours: 1.50. This course will provide clinical learning situations for developing techniques required for veterinary technicians in surgery, medical nursing, clinical pathology, radiology, pharmacy, and ancillary areas.**Credits:** 1.50

VM 24500 - Veterinary Management Topics - DL

Credit Hours: 1.50. This course is the first of two courses that provide basic instruction in the concepts of a veterinary technician's role in the management of day-to-day operations of a veterinary clinic. This course will emphasize problems related to ethical and liability issues, medical records, inventory, marketing and fees, writing cover letters and resumes, and job interviews. Students must be currently working/volunteering at least 10-15 hours a week at a veterinary facility. **Credits:** 1.50

VM 24800 - Animal Disease - DL

Credit Hours: 2.00. This course is a survey of common small animal and large animal diseases, their clinical signs, and how these signs can be explained by physiology and pathophysiology. The zoonotic potential for the disease and the role of the veterinary technician in the treatment, management, and education of client/owner of the affected animal is also emphasized.**Credits:** 2.00

VM 24900 - Clinical Rotations III

Credit Hours: 3.50. This course will provide clinical learning situations for developing techniques required for veterinary technicians in surgery, medical nursing, clinical pathology, radiology, pharmacy, and ancillary areas.**Credits:** 3.50

VM 25001 - Clinical Pathology II - DL

Credit Hours: 2.00. This course is the second course that provides basic instruction in the concepts of Clinical Pathology to the veterinary technician student. This course will include hemostasis; immunohematology; the basic concepts of clinical chemistry; urinalysis evaluation; and the fundamentals of cytological sample handling and evaluation.**Credits:** 2.00

VM 25100 - Medical Math And Terminology For Veterinary Technicians

Credit Hours: 0.50. This course will introduce students to fundamental medical terminology and basic math and dosage calculations commonly used in veterinary medicine. The course includes both classroom and on-line components. **Credits:** 0.50

VM 32300 - Laboratory Animals & Exotic Pet Medicine-VN

Credit Hours: 2.00. This course will cover the proper methods of restraint, daily care, nursing techniques, and housing needs for the common species of laboratory animals.**Credits:** 2.00

VM 34200 - Integrations II

Credit Hours: 1.00. A continuation to problem based learning of the nursing process using a case based approach. This course will integrate foundational knowledge from anatomy, physiology, veterinary nursing courses, clinical pathology, pharmacology, anesthesia diagnostic imaging, microbiology and parasitology. Cases will involve different domestic animal species and laboratory animals. Students will learn using a variety of teaching modalities (lecture, group work, problem-based learning). **Credits:** 1.00

VM 34210 - Integrations-VN

Credit Hours: 2.00. This course will give an introduction to problem-based learning of the nursing process (patient evaluations, interventions, and desire resolutions) using a case-based approach. This course will integrate foundational knowledge from anatomy, physiology, and information in the veterinary nursing courses. This course will draw on fundamentals and concepts learned from all courses to this point including pharmacology, diagnostic imaging, parasitology, small animal nursing, and large animal nursing, so as to enable you to apply knowledge of understanding of clinical cases. Cases will involve different domestic animal species.**Credits:** 2.00

VM 34300 - Clinic Rotations IV-VN

Credit Hours: 5.00. This course will provide clinical learning situations for developing techniques required for veterinary technicians in surgery, medical nursing, clinical pathology, radiology, pharmacy, and ancillary areas.**Credits:** 5.00

VM 34400 - Clinic Rotations V-VN

Credit Hours: 5.00. This course will provide clinical learning situations for developing techniques required for veterinary technicians in surgery, medical nursing, clinical radiology, pharmacy, and ancillary areas.**Credits:** 5.00

VM 34500 - Veterinary Management Topics I-VN

Credit Hours: 1.50. The course will introduce students to concepts related to working in and managing a veterinary practice. Emphasis will be on client communication and education as well as facilitating a job search, interviewing and cover letter and resume creation.**Credits:** 1.50

VM 36500 - Laboratory Animal Management-VN

Credit Hours: 3.00. This course will cover the principles of laboratory animal science for the technologist (veterinary and LATG). Concepts of facility management, animal health and diseases, regulatory issues, compliance, and instrumentation will be presented.**Credits:** 3.00

VM 39000 - Practicum

Credit Hours: 4.00. Veterinary technologist level off-campus experience in one area of interest totaling 480 hours over 12 weeks. **Credits:** 4.00

VM 40900 - International Veterinary Medicine

Credit Hours: 0.50. The course will consist of a series of lectures and discussions addressing international aspects of veterinary medicine. The course will include the following topics: foreign animal diseases, biosecurity, animal welfare and ethics, veterinary medicine around the world, food security, and cultural competence. **Credits:** 0.50

VM 41001 - International Practicum

Credit Hours: 4.00. The student will experience an integrated employment situation combined with veterinary team interaction to augment his/her specialized CoVM clinical learning experiences. The student will work under the direct supervision of a licensed veterinarian or credentialed veterinary technician designee of tech veterinarian. The student is required to complete a pre-departure orientation with the PVM Director of International Programs. **Credits:** 4.00

VM 41003 - International Veterinary Medicine for the Veterinary Nurse - Directed Experience

Credit Hours: 0.50 to 2.00. This course allows veterinary technology students to participate in a unique faculty/staff-led veterinary learning experience in an international location. Credit will be assigned on the basis of 0.5 credit for each 45-60 hours of student effort, up to a max of 2 credits. In most instances, one week of experience will equal 0.5 credit. Each veterinary learning experience will be designed by the faculty/staff leader to accomplish specific learning goals in the focused area of study. The course will vary in length from 1-4 weeks depending on the specific experience.**Credits:** 0.50 to 2.00

VM 42500 - Veterinary Technician Grand Rounds

Credit Hours: 0.00. Provides a regular forum to bring those in the college together, focused around their common interest in veterinary medicine. Case-based presentations emphasize the basic pathophysiology of disease and clinical investigation and demonstrate the interactions between the clinical and basic sciences. **Credits:** 0.00

VM 44100 - Occupational & Public Health II-VN

Credit Hours: 1.00. The course covers selected aspects of public health and safety related to the veterinary health care team, patient, client and public.**Credits:** 1.00

VM 44200 - Veterinary Management Topics II-VN

Credit Hours: 1.50. This course is a continuation of the first veterinary practice management course. It will introduce students to concepts related to leading a veterinary medical team and managing the day-to-day management of the veterinary practice. Emphasis will be on human resources, marketing and financial management.**Credits:** 1.50

VM 44300 - Clinic Rotations VI-VN

Credit Hours: 2.00. This course will provide clinical learning situations for developing techniques required for veterinary technicians in surgery, medical nursing, clinical pathology, radiology, pharmacy, and ancillary areas.**Credits:** 2.00

VM 44400 - Veterinary Technology Clinical Orientation

Credit Hours: 3.00. This course is an intensive experience and clinical orientation to the Veterinary Teaching Hospital for graduates from another AVMA accredited Veterinary Technology program who wish to complete a BS degree at Purdue University. This course is a four week long, full day rotation (40 hours per week). **Credits:** 3.00

VM 44500 - Senior Project-VN

Credit Hours: 4.00. This is an independent study course in which the student engages in learning activities to enhance their knowledge in a particular area of veterinary technology of their choosing, demonstrate effective oral and written communication, and apply analysis, integration, and syntheses to achieve a solution.**Credits:** 4.00

VM 45000 - Animals in Emergencies - Disaster Management-VN

Credit Hours: 1.00. The course is intended to assist animal care providers in understanding the incident command system and developing plans that improve the care of and mitigating the impact of disasters on livestock and pets.**Credits:** 1.00

VM 45100 - Contemporary Topics In Life Skills-VN

Credit Hours: 1.00. This course will introduce the student to a variety of different skills needed to be successful after graduating from college. It will introduce students to concepts related to managing a job search and evaluating job offers, establishing and using credit, investing, saving, risk assessment and managing college debt.**Credits:** 1.00

VM 45300 - The Role Of The Clinical Research Technician

Credit Hours: 1.00. This course is aimed for the student with a strong interest in clinical trial research. The student will gain a broader knowledge of regulatory bodies involved in research and the vital team role the clinical research technician/nurse plays during clinical trials. The student will gain exposure to histology preparations, microtome use and immunohistological staining procedures as well as receiving clinical cases from current oncology trials. Enrollment will be capped to four students per semester. **Credits:** 1.00

VM 45400 - Animal Rehabilitation And Physiotherapy

Credit Hours: 1.00. This course is an introduction to physical rehabilitation of the veterinary patient. It is designed to instruct students in the basic principles of rehabilitation. This course will introduce the fundamentals needed in clinical practice. **Credits:** 1.00

VM 45500 - Equine Behavior-VN

Credit Hours: 1.00. This course is an in-depth look at equine behavior beyond the basics covered in the nursing courses. It is designed to show how the environment in which the horse is kept can affect its behavior. This course will also demonstrate how the study of behavior is applied in equine welfare and to the solution of practical problems and problem behavior in the equine patient.**Credits:** 1.00

VM 45600 - Advanced Ophthalmology-VN

Credit Hours: 1.00. This course is an in-depth look at ocular anatomy and physiology, use of exam equipment, diagnostic techniques, imaging, pharmacology, surgical instrument identification, cleaning, and care of instruments, surgical nursing, surgical procedures, anesthesia protocols and concerns that are associated with these procedures. **Credits:** 1.00

VM 45700 - Advanced Neurology-VN

Credit Hours: 1.00. This course will focus on neuroanatomy and neurophysiology as well as explore a variety of common neurologic diseases and the basic pathophysiology behind those disease processes. Students will also learn proper nursing care techniques associated with patients with these diseases. **Credits:** 1.00

VM 45800 - Advanced Surgical Nursing And Anesthesia

Credit Hours: 1.00. This course is an in-depth look at small animal surgical nursing, surgical procedures, surgical instrumentation, wound management and the physiological reason certain anesthetic protocols are used. Students will learn using a variety of teaching modalities. **Credits:** 1.00

VM 49000 - Topics In Veterinary Medicine

Credit Hours: 0.50 to 5.00. Advanced study in the field of animal health and practice of veterinary medicine. Permission of instructor required. **Credits:** 0.50 to 5.00

VM 80900 - International Veterinary Medicine

Credit Hours: 0.50 or 1.00. The course will consist of eight lectures addressing international aspects of the following topics: zoonotic diseases, food hygiene, biosecurity, animal welfare, animal husbandry, infectious diseases, cultural competence, veterinary medical education, and role of international organizations in animal health. Participating students will be required to choose an internationally relevant topic of interest to research. The last session of the course will be a poster session in which each student will present and discuss a poster. The posters will be evaluated by a panel of 3-4 faculty members and a grade assessed. Permission of Department required. **Credits:** 0.50 or 1.00

VM 81000 - Veterinary Externship

Credit Hours: 6.00. A six-week or 280-contact-hour work experience, under the direct supervision of a veterinarian, in a facet of veterinary medicine selected as a career goal by the student. **Credits:** 6.00

VM 81001 - International Veterinary Experience

Credit Hours: 1.00 to 6.00. This course will allow veterinary students to establish a unique veterinary learning experience in their area of interest in an international location. Each veterinary learning experience will be designed by the student with input from faculty advisor and the professor of record. Permission of instructor required. **Credits:** 1.00 to 6.00

VM 81002 - Veterinary Medicine Service Learning-VIDA

Credit Hours: 2.00. This 10 day service learning study abroad program is designed for veterinary students to gain practical experience by performing spay neuters of small animals as well as addressing wellness needs of both small and large animals. **Credits:** 2.00

VM 81003 - International Veterinary Medicine- Directed Experience

Credit Hours: 1.00 to 6.00. This course allows veterinary students to participate in a unique faculty-led veterinary learning experience in an international location. Credit will be assigned on the basis of 1 credit for each 45-50 hours of student effort up to a maximum of 6 credits. In most instances, one week of experience will equal one credit. Each veterinary learning experience will be designed by the faculty leader to accomplish specific learning goals in the focuses area of study. The course will be offered in the summer and will vary in length from 1-6 weeks depending on the specific experience. **Credits:** 1.00 to 6.00

VM 81004 - Conservation Medicine And Exotic Pet Medicine And Surgery In Czech Republic And Austria

Credit Hours: 3.00. This course is a 3-week international rotation for 2nd and 3rd year DVM students in Czech Republic and Austria. Students will spend 4-8 days in UVPS clinics and several days onsite at Zoo Brno. Additional lectures, animal science and behavior experience in both countries. Permission of department required. **Credits:** 3.00

VM 81005 - Pre-Clinical Practicum In Veterinary Medicine

Credit Hours: 1.00 to 3.00. This practicum will provide international students with hands-on experience working in a modern veterinary practice or other veterinary medical setting. The student will gain experience working as a member of the veterinary team and participate in wellness care as well as diagnosis and treatment of disease using contemporary equipment and facilities.**Credits:** 1.00

VM 81006 - Veterinary Externship I

Credit Hours: 3.00. A three-week (140 contact hour) work experience, under the direct supervision of a veterinarian, in a facet of veterinary medicine selected as a career goal by the student. Students are required to spend the entire three weeks at externship site(s). Splitting time between two externship sites is permitted by approval by Instructor of Record. Arrangements for the externship are the responsibility of the student and the supervising veterinarian. All cost are paid by the student, but the student may receive compensation (stipend or hourly) from the veterinarian. **Credits:** 3.00

VM 81007 - Veterinary Externship II

Credit Hours: 3.00. A three-week (140 contact hour) work experience, under the direct supervision of a veterinarian, in a facet of veterinary medicine selected as a career goal by the student. Students are required to spend the entire three weeks at externship site(s). Splitting time between two externship sites is permitted by approval by Instructor of Record. Arrangements for the externship are the responsibility of the student and the supervising veterinarian. All cost are paid by the student, but the student may receive compensation (stipend or hourly) from the veterinarian. **Credits:** 3.00

VM 82000 - Applications And Integrations I

Credit Hours: 2.00. This course uses a small group tutorial, problem-oriented approach to understanding how basic science concepts are integrated into clinical aspects of veterinary medicine. Students are expected to identify learning issues, resolve identified gaps in their knowledge base, integrate information across disciplines, and practice/develop problem-solving skills using simulated case materials. Evaluation of students will be based upon, but not limited to, tutorial group evaluation, peer evaluation, self-evaluation, and comprehensive content and process examinations. Introductory session on hematology, clinical chemistry and radiography will be included to facilitate student interpretation of testing used in the cases. **Credits:** 2.00

VM 82500 - Current Issues In Veterinary Medicine

Credit Hours: 0.00. This course provides a regular forum to bring PVM students and faculty together to discuss current issues facing the veterinary profession. Topics will vary depending upon current events and opportunities to feature guest lecturers. Time-shifting may be done to accommodate special events such as PVM Research Day. **Credits:** 0.00

VM 83000 - Applications And Integrations II

Credit Hours: 2.00. This course uses a small group tutorial, problem-oriented approach to understanding how basic science concepts are integrated into clinical aspects of veterinary medicine. Students are expected to identify learning issues, resolve identified gaps in their knowledge base, integrate information across disciplines, and practice/develop problem-solving skills using simulated case materials and research problems. Evaluation of students will be based upon, tutorial group evaluation, peer evaluation, self-evaluation, and a comprehensive content and process evaluation, which will include material from VM 82000 and other current DVM courses (anatomy, physiology, etc.). **Credits:** 2.00

VM 84000 - Applications And Integrations III

Credit Hours: 2.00. This course uses a small group tutorial, problem-oriented approach to understanding how basic science concepts are integrated into clinical aspects of veterinary medicine. Students are expected to identify learning issues, resolve identified gaps in their knowledge base, integrate information across disciplines, and practice/develop problem-solving skills using simulated case materials. Evaluation of students will be based upon, tutorial group evaluation, peer evaluation, self-evaluation, and a comprehensive content and process evaluation, which will include materials from previous classes (VM 82000/83000 and other freshman DVM courses) as well as the current DVM coursework (hematology, parasitology, bacteriology, pharmacology and pathology).**Credits:** 2.00

VM 85000 - Applications and Integrations IV

Credit Hours: 2.00. Small group tutorial, problem-oriented approach to understanding how basic science concepts are integrated into clinical aspects of veterinary medicine. Students are expected to identify learning issues, resolve identified gaps in their knowledge base, integrate information across disciplines, and practice/develop problem-solving skills using simulated case materials and research problems at a higher level of performance than in VM 82000, VM 83000, and VM 84000. Evaluation of students will be based upon, but not limited to, tutorial group evaluation, peer evaluation, self-evaluation, and a comprehensive content and process examination that will include material fromVM 82000, VM 83000, and VM 84000. The final examination will contain an oral component. **Credits:** 2.00

VM 86000 - Early Origins Of Veterinary Medicine Seminar

Credit Hours: 1.00. Students will study the very early origins of man's fascination with animals from the Paleolithic era, and the roots of veterinary medicine in Mesopotamia, Ancient Egypt, and East and South Asia. Particular attention will be paid to works of art that help demonstrate man's fascination with animals and their well-being. This course is appropriate for students with no previous study of history or art history. **Credits:** 1.00

VM 86500 - History Of Veterinary Medicine From Marshals, Horse Doctors, Cow Leeches, The First Schools Of VM

Credit Hours: 1.00. The students will study the history of marshals, horse doctors, cow leeches, and authors, an emphasis on the launching of European veterinary education with a rationale for a veterinary profession, and the history of the first official schools of veterinary medicine in France (Lyon and Alfort), concluding with the history of the increasing demand for veterinary schools. Particular attention will be paid to works that help demonstrate man's fascination with animals and their well-being. This course is appropriate for students with no previous study of history or art history. Special note: This syllabus and course schedule is subject to revisions as needed throughout the semester. Students will be given advance notice of any change. **Credits:** 1.00

VM 86600 - Pathogenic Bacteria, Viruses, Mayhew, Darwin, And Mendel

Credit Hours: 1.00. Students will study the golden age of pathogenic bacteriology from the 1860s to the end of the nineteenth century; the discovery of viruses; the development of immunological products; intractable vector-borne hemoprotozoal parasitic diseases; horse-doctoring in the nineteenth century; care of animals used in transport, war and sport; and will conclude with

Darwin's natural selection and Mendel's fractional inheritance. Particular attention will be paid to works that help demonstrate man's fascination with animals and their well-being. This course is appropriate for students with no previous study of history or art history. **Credits:** 1.00

VM 86700 - Veterinary Medicine Comes Of Age

Credit Hours: 1.00. Students will study early veterinary contributions to biomedical science; how livestock production was enhanced by veterinary specialists; companion animal medicine; bioethics, animal experimentation, and sentience; overcoming the exclusion of women, and the evolving spectrum of opportunity in veterinary careers. Particular attention will be paid to works that help demonstrate man's fascination with animals and their well-being. This course is appropriate for students with no previous study of history or art history. **Credits:** 1.00

VM 87000 - History Of Veterinary Medicine From The Ancient Greeks Through The Renaissance Seminar

Credit Hours: 1.00. The students will study the contributions of the ancient Greeks and Romans to the development of animal doctors. The veterinary highpoint during the Byzantine Empire and Arabian medical and veterinary progress will also be studied. Animals in the Dark Ages, equine and canine medicine in Medieval Europe, and the Italian roots of the Renaissance in medical sciences will be studied. Particular attention will be paid to works of art that help demonstrate man's fascination with animals and their well-being. This course is appropriate for students with no previous study of history or art history. **Credits:** 1.00

VM 87800 - Swine Herd Health And Diagnostic Pathology

Credit Hours: 3.00. Arrange total clinic hours 129. Advanced training and experience in working with swine herds on a herd health management program (see VCS 87800, 129 clinic hours) and advanced training in diagnostic approaches to identification of the causes and pathogenesis of disease of mammals (see VCS 88600, 129 clinic hours). **Credits:** 3.00

VM 89000 - Topics In Veterinary Medicine

Credit Hours: 0.50 to 5.00. Advanced study in the field of animal health and practice of veterinary medicine. Permission of instructor required. **Credits:** 0.50 to 5.00

VM 89100 - Special Topics In Veterinary Medicine Arranged

Credit Hours: 3.00. Opportunities for as many as 50 off-campus, three-week blocks are available for each fourth-year class. Only educational experiences that have no comparable coverage in the Purdue DVM curriculum will be acceptable. Permission of instructor required. **Credits:** 3.00

VM 89200 - Principles Of Professionalism, Jurisprudence, And Ethics

Credit Hours: 1.00. Presentation/discussion format dealing with a broad spectrum of ethical, legal, and professional issues that impact the veterinary profession. Students are challenged to analyze the role they play as responsible members of the veterinary professional community. **Credits:** 1.00

VM 89400 - International Veterinary Medicine- Directed Clinical Experience

Credit Hours: 1.00 to 3.00. This course allows veterinary students to participate in a unique faculty-led veterinary learning experience in an international location. Credit will be assigned on the basis of 1 credit for each 45-50 hours of student effort up to a maximum of 3 credits. In most instances, one week of experience will equal one credit. Each veterinary learning experience will be designed by the faculty leader to accomplish specific learning goals in the focuses area of study. The course will be

offered at various times during the clinical year and will vary in length from 1-3 weeks depending on the specific experience. **Credits:** 1.00 to 3.00

VM 89401 - Clinical Rotation In Small Animal Medicine In Switzerland

Credit Hours: 3.00. This course is a 3-credit clinical rotation. A faculty member will lead this elective 3-week clinical rotation in Switzerland. Students will spend one week each participating in rotations in small animal medicine and related disciplines at the University of Zurich, University of Bern, and one or two private veterinary clinics in Switzerland or southern Germany. The Purdue faculty member leading the rotation each year will spend one week at each rotation site. During time that the Purdue faculty member is not with the students at rotation sites, on-site mentors will supervise the students' clinical experience. **Credits:** 3.00

VM 89500 - Clinical Applications

Credit Hours: 2.00. Introduction to the Veterinary Teaching Hospital (VTH) and the Animal Disease Diagnostic Laboratory. Students rotate through various sections of the VTH and participate in the evaluation and management of patients. Problem-solving skills and application of material from the basic sciences are emphasized. **Credits:** 2.00

VM 89900 - Veterinary Medicine Topics

Credit Hours: 0.50 to 6.00. This is a variable title/variable credit course for VM.**Credits:** 0.50 to 6.00

Women's Gender and Sexuality Studies

WGSS 28000 - Women's, Gender, And Sexuality Studies: An Introduction

Credit Hours: 3.00. An introductory survey of the concepts and research data in the new scholarship on women. Topics covered include biology, sexuality, socialization, family and work, creativity, and politics. **Credits:** 3.00

WGSS 28100 - Variable Topics In Women's, Gender, And Sexuality Studies

Credit Hours: 1.00 to 4.00. This course examines in-depth particular topics from the introductory course in Women's Studies. It addresses gender issues for both men and women. Possible topics include gender and popular culture, women's bodies, body image, and health, masculinities, queering gender and gender transgression.**Credits:** 1.00 to 4.00

WGSS 28200 - Introduction To LGBTQ Studies

Credit Hours: 3.00. (ANTH 28200) This course offers students an introduction to the interdisciplinary study of lesbian, gay, bisexual, transgender and queer lives. It provides a basic grounding in theories of sexuality and LGBT histories, identities and movements in the U.S. and globally. **Credits:** 3.00

WGSS 38000 - Comparative Studies In Gender And Culture

Credit Hours: 3.00. This course expands students' understanding of gender issues by exploring the multicultural diversity of women's lives. It examines how race, class, sexuality, and culture interact and shape society and ecology in the United States and in a global context. **Credits:** 3.00

WGSS 38100 - Women Of Color In The United States

Credit Hours: 3.00. Explores the diversity of racial and ethnic groups in the United States with a particular emphasis on the histories, experiences, and cultural contributions of women of color. Provides a broad introduction to the intersections of gender, race and ethnicity. **Credits:** 3.00

WGSS 38200 - Love, Sex And Sexuality

Credit Hours: 3.00. Explores intimate relationships and marriage practices in Western and non-Western societies from a historical and comparative perspective. Examines the changes in love and marriage in Greco-Roman societies, medieval and modern Europe, China, India and the Muslim world, among others. **Credits:** 3.00

WGSS 38300 - Women, Work, And Labor

Credit Hours: 3.00. Examines race, class and gender issues as they affect working women in America. Covering women's work from domestic labor to informal economies to factories, topics include women's participation in trade unions, wage inequalities, family leave policies and sexual harassment.**Credits:** 3.00

WGSS 39000 - Variable Topics In Women's, Gender And Sexuality Studies

Credit Hours: 1.00 to 4.00. Variable topics under the direction of an instructor in a particular field of specialization. **Credits:** 1.00 to 4.00

WGSS 48000 - Feminist Theory

Credit Hours: 3.00. Intensive study of a variety of contemporary and international feminist theories from an interdisciplinary perspective. Provides an overview of major trends, critical approaches, and diverse viewpoints in the field of feminist theory. **Credits:** 3.00

WGSS 48200 - Interdisciplinary Studies In Sexuality

Credit Hours: 3.00. This course offers an interdisciplinary introduction to recent work in lesbian and gay studies in various fields, including literature, history, film, cultural theory, medicine, law, and studies of sexuality.**Credits:** 3.00

WGSS 48300 - Feminisms In Global Perspective

Credit Hours: 3.00. Explores feminist struggles through the writings of First and Third World feminist scholars. Focuses on feminist projects within and against colonial, nationalist, religious and global contexts. Includes Third World feminist critiques of Western feminisms. **Credits:** 3.00

WGSS 48500 - Feminist Perspectives On Film

Credit Hours: 3.00. In this course, students investigate the gendered and intersectional meanings ascribed to or generated by popular cinematic and other mass-distributed visual texts, with particular attention to the way that visual media have impacted women's participation in public culture over the last century and a half. This course is highly conceptual, asking students to learn to recognize power relations hiding within visual entertainments and embedded within the experience of everyday life, with the goal of deepening their understanding and appreciation of the experience of spectatorship and visuality as a central element of modern American and contemporary global mass culture.**Credits:** 3.00

WGSS 49200 - Practicum In Women's, Gender, and Sexuality Studies

Credit Hours: 2.00 to 4.00. This course is designed to integrate knowledge derived from women's studies scholarship with practical experience. Students will define their own projects in consultation with women's studies faculty. Periodic conferences and written reports required. Permission of instructor required. **Credits:** 2.00 to 4.00

WGSS 49900 - Independent Study In Women's, Gender And Sexuality Studies

Credit Hours: 1.00 to 4.00. Special topics or projects under the direction of the instructor in a particular field of specialization. Permission of instructor required.**Credits:** 1.00 to 4.00

WGSS 59900 - Selected Topics In Women's Gender And Sexuality Studies

Credit Hours: 3.00. A study of selected topics taught by an instructor in whose particular field of specialization the content of the course falls. Permission of instructor required. **Credits:** 3.00

WGSS 68000 - Feminist Theory

Credit Hours: 3.00. This course focuses on feminist theories at an advanced level and in a global perspective. Graduate students engage with key theoretical issues in contemporary feminist studies, and examine how feminist scholars have theorized women and gender issues across disciplines. **Credits:** 3.00

WGSS 68100 - Contemporary Issues In Feminist Scholarship

Credit Hours: 3.00. Applies feminist theory, knowledge, and methods to the examination of selected contemporary issues. Emphasizes ways in which theory and practice interact in feminist scholarship. Content may vary according to the issues examined. Prerequisite: WGSS 68000. **Credits:** 3.00

WGSS 68200 - Issues In Feminist Research And Methodology

Credit Hours: 3.00. This course provides a methodological framework for theorizing, constructing and executing research from a feminist perspective. Students acquire knowledge of the diversity of feminist research projects and methods; they learn to pose research questions; and they will be able to prepare a research or grant proposal drawing on interdisciplinary methods. The course is designed to meet the needs of graduate students in Women's Studies and is open to students in other programs who are interested in feminist research. The course deals with both theoretical and practical issues in methodology. Prerequisites: WGSS 68000. **Credits:** 3.00

Vertically Integrated Projects

VIP 17910 - First-Year Participation In Vertically Integrated Projects (VIP) Lim

Credit Hours: 1.00. This course provides an opportunity for undergraduate students to engage in authentic and extended research and design projects related to active research areas of Purdue faculty members and national, international, and industry-sponsored design challenges. Students will work on interdisciplinary and vertically integrated teams (first year through seniors) with faculty and graduate student mentors to address these real-world research and design challenges. Students will participate in a limited number of professional development activities that include topics related to design, research, documentation and technical writing, communication, leadership and teamwork, ethics, project management, intellectual property, information literacy, and introduction to a broad range of applicable research topics, technologies, and development tools. Permission of department required. **Credits:** 1.00

VIP 17911 - First Year Participation In Vertically Integrated Projects (VIP) I

Credit Hours: 1.00. This course provides an opportunity for undergraduate students to engage in authentic and extended research and design projects related to active research areas of Purdue faculty members and national, international, and industry-sponsored design challenges. Students will work on interdisciplinary and vertically-integrated teams (first-year through seniors) with faculty and graduate student mentors to address these real-world research and design challenges. Students will participate in weekly lectures and professional development activities that include topics related to design, research, documentation and technical writing, communication, leadership and teamwork, ethics, project management, intellectual property, information literacy, and introduction to a broad range of applicable research topics, technologies and development tools. **Credits:** 1.00

VIP 17912 - First Year Participation In Vertically Integrated Projects (VIP) II

Credit Hours: 1.00. This course provides an opportunity for undergraduate students to engage in authentic and extended research and design projects related to active research areas of Purdue faculty members and national, international, and industry-sponsored design challenges. Students will work on interdisciplinary and vertically-integrated teams (first-year through seniors) with faculty and graduate student mentors to address these real-world research and design challenges. Students will participate in weekly lectures and professional development activities that include topics related to design, research, documentation and technical writing, communication, leadership and teamwork, ethics, project management, intellectual property, information literacy, and introduction to a broad range of applicable research topics, technologies and development tools. **Credits:** 1.00

VIP 17920 - First Year Participation In Vertically Integrated Projects (VIP)

Credit Hours: 2.00. This course provides an opportunity for undergraduate students to engage in authentic and extended research and design projects related to active research areas of Purdue faculty members and national, international, and industry-sponsored design challenges. Students will work on interdisciplinary and vertically-integrated teams (first-year through seniors) with faculty and graduate student mentors to address these real-world research and design challenges. Students will participate in weekly lectures and professional development activities that include topics related to design, research, documentation and technical writing, communication, leadership and teamwork, ethics, project management, intellectual property, information literacy, and introduction to a broad range of applicable research topics, technologies and development tools. **Credits:** 2.00

VIP 27910 - Sophomore Participation In Vertically Integrated Projects (VIP) Lim

Credit Hours: 1.00. This course provides an opportunity for undergraduate students to engage in authentic and extended research and design projects related to active research areas of Purdue faculty members and national, international, and industry-sponsored design challenges. Students will work on interdisciplinary and vertically integrated teams (first year through seniors) with faculty and graduate student mentors to address these real-world research and design challenges. Students will participate in a limited number of professional development activities that include topics related to design, research, documentation and technical writing, communication, leadership and teamwork, ethics, project management, intellectual property, information literacy, and introduction to a broad range of applicable research topics, technologies and development tools. **Credits:** 1.00

VIP 27920 - Sophomore Participation In Vertically Integrated Projects (VIP)

Credit Hours: 2.00. This course provides an opportunity for undergraduate students to engage in authentic and extended research and design projects related to active research areas of Purdue faculty members and national, international, and industry-sponsored design challenges. Students will work on interdisciplinary and vertically-integrated teams (first-year through seniors) with faculty and graduate student mentors to address these real-world research and design challenges. Students will participate in weekly lectures and professional development activities that include topics related to design, research, documentation and technical writing, communication, leadership and teamwork, ethics, project management, intellectual property, information literacy, and introduction to a broad range of applicable research topics, technologies and development tools. **Credits:** 2.00

VIP 27930 - Sophomore Participation In Vertically Integrated Projects (VIP) Ext

Credit Hours: 3.00. This course provides an opportunity for undergraduate students to engage in authentic and extended research and design projects related to active research areas of Purdue faculty members and national, international, and industry-sponsored design challenges. Students will work on interdisciplinary and vertically integrated teams (first year through seniors) with faculty and graduate student mentors to address these real-world research and design challenges. Students will participate in professional development activities that include topics related to design, research, documentation and technical writing, communication, leadership and teamwork, ethics, project management, intellectual property, information literacy, and introduction to a broad range of applicable research topics, technologies and development tools. **Credits:** 3.00

VIP 37910 - Junior Participation In Vertically Integrated Projects (VIP) Lim

Credit Hours: 3.00. This course provides an opportunity for undergraduate students to engage in authentic and extended research and design projects related to active research areas of Purdue faculty members and national, international, and industry-sponsored design challenges. Students will work on interdisciplinary and vertically integrated teams (first year through seniors) with faculty and graduate student mentors to address these real-world research and design challenges. Students will participate in a limited number of professional development activities that include topics related to design, research, documentation and technical writing, communication, leadership and teamwork, ethics, project management, intellectual property, information literacy, and introduction to a broad range of applicable research topics, technologies and development tools. **Credits:** 1.00

VIP 37920 - Junior Participation In Vertically Integrated Projects (VIP)

Credit Hours: 2.00. This course provides an opportunity for undergraduate students to engage in authentic and extended research and design projects related to active research areas of Purdue faculty members and national, international, and industry-sponsored design challenges. Students will work on interdisciplinary and vertically-integrated teams (first-year through seniors) with faculty and graduate student mentors to address these real-world research and design challenges. Students will participate in weekly lectures and professional development activities that include topics related to design, research, documentation and technical writing, communication, leadership and teamwork, ethics, project management, intellectual property, information literacy, and introduction to a broad range of applicable research topics, technologies and development tools. **Credits:** 2.00

VIP 37930 - Junior Participation In Vertically Integrated Projects (VIP) Ext

Credit Hours: 3.00. This course provides an opportunity for undergraduate students to engage in authentic and extended research and design projects related to active research areas of Purdue faculty members and national, international, and industry-sponsored design challenges. Students will work on interdisciplinary and vertically-integrated teams (first-year through seniors) with faculty and graduate student mentors to address these real-world research and design challenges. Students will participate in professional development activities that include topics related to design, research, documentation and technical writing, communication, leadership and teamwork, ethics, project management, intellectual property, information literacy, and introduction to a broad range of applicable research topics, technologies and development tools.**Credits:** 3.00

VIP 47910 - Senior Participation In Vertically Integrated Projects (VIP) Lim

Credit Hours: 1.00. This course provides an opportunity for undergraduate students to engage in authentic and extended research and design projects related to active research areas of Purdue faculty members and national, international, and industry-sponsored design challenges. Students will work on interdisciplinary and vertically integrated teams (first year through seniors) with faculty and graduate student mentors to address these real-world research and design challenges. Students will participate in a limited number of professional development activities that include topics related to design, research, documentation and technical writing, communication, leadership and teamwork, ethics, project management, intellectual property, information literacy, and introduction to a broad range of applicable research topics, technologies and development tools. **Credits:** 1.00

VIP 47920 - Senior Participation In Vertically Integrated Projects (VIP)

Credit Hours: 2.00. This course provides an opportunity for undergraduate students to engage in authentic and extended research and design projects related to active research areas of Purdue faculty members and national, international, and industry-sponsored design challenges. Students will work on interdisciplinary and vertically-integrated teams (first-year through seniors) with faculty and graduate student mentors to address these real-world research and design challenges. Students will participate in weekly lectures and professional development activities that include topics related to design, research, documentation and technical writing, communication, leadership and teamwork, ethics, project management, intellectual property, information literacy, and introduction to a broad range of applicable research topics, technologies and development tools. **Credits:** 2.00

VIP 47921 - Senior Design Participation In Vertically Integrated Projects (VIP) I

Credit Hours: 2.00. This course provides an opportunity for undergraduate students to engage in authentic and extended research and design projects related to active research areas of Purdue faculty members and national, international, and industry-sponsored design challenges. Students will work on interdisciplinary and vertically-integrated teams (first-year through seniors) with faculty and graduate student mentors to address these real-world research and design challenges. Students will participate in weekly lectures and professional development activities that include topics related to design, research, documentation and technical writing, communication, leadership and teamwork, ethics, project management, intellectual property, information literacy, and introduction to a broad range of applicable research topics, technologies and development tools. **Credits:** 2.00

VIP 47922 - Senior Design Participation In Vertically Integrated Projects (VIP) II

Credit Hours: 2.00. This course provides an opportunity for undergraduate students to engage in authentic and extended research and design projects related to active research areas of Purdue faculty members and national, international, and industry-sponsored design challenges. Students will work on interdisciplinary and vertically-integrated teams (first-year through seniors) with faculty and graduate student mentors to address these real-world research and design challenges. Students will participate in weekly lectures and professional development activities that include topics related to design, research, documentation and technical writing, communication, leadership and teamwork, ethics, project management, intellectual property, information literacy, and introduction to a broad range of applicable research topics, technologies and development tools. **Credits:** 2.00

VIP 47930 - Senior Participation In Vertically Integrated Projects (VIP) Ext

Credit Hours: 3.00. This course provides an opportunity for undergraduate students to engage in authentic and extended research and design projects related to active research areas of Purdue faculty members and national, international, and industry-sponsored design challenges. Students will work on interdisciplinary and vertically-integrated teams (first-year through seniors) with faculty and graduate student mentors to address these real-world research and design challenges. Students will participate in professional development activities that include topics related to design, research, documentation and technical writing, communication, leadership and teamwork, ethics, project management, intellectual property, information literacy, and introduction to a broad range of applicable research topics, technologies and development tools.**Credits:** 3.00

Healthcare Engineering Technology Management

HETM 22500 - Healthcare Technology Diagnostics And Repair

Credit Hours: 3.00. This course will explore fundamental repair theory and applications of technology used in the clinical setting, switching logic and controls, and systems repair in medical devices. Typically offered Fall.**Credits:** 3.00

HETM 24000 - The Technology Of Patient Care

Credit Hours: 3.00. This course provides an overview of medical equipment used in the hospital and other medical environments to diagnose and treat patients. Sensors and physiological signals will be explained. Equipment found in various hospital

departments and medical specialties will also be discussed. Patient safety and regulations will be emphasized. Typically offered Fall Spring Summer.**Credits:** 3.00

HETM 31500 - Introduction To Imaging Modalities

Credit Hours: 3.0. The fundamentals of diagnostic imaging equipment will be explored. The principles of x-ray based systems will be explored. Components and features of MRI, ultrasound, PET, and nuclear medicine will be discussed. Image storage and communication protocols will be presented. Typically offered Fall.**Credits:** 3.00

HETM 40200 - Healthcare Device System Security

Credit Hours: 3.00. Students explore the clinical applications of computer networks, integrated medical devices, interoperability, and electronic medical records. Special emphasis will be on security and HIPAA compliance associated with physiological data. Hands-on learning will involve campus-area hospitals. Typically offered Fall Spring.**Credits:** 3.00

HETM 44000 - Codes, Regulations And Patient Safety

Credit Hours: 3.00. This course explores applicable NFPA 99, JCAHO, CLIA, FDA and other regulatory agencies and their regulations governing medical equipment in the clinical environment. Case studies will be used to provide examples of interpretation and application. Typically offered Fall.**Credits:** 3.00

HETM 46000 - Systems Engineering Technology For Healthcare

Credit Hours: 3.00. Participants will gain insight into the analysis of multiple-entity clinical systems involving healthcare technology. Focus will include process analysis and improvement to satisfy clinical customer needs. Course content will explore the interdisciplinary efforts related to support the development, verification, deployment, integration, operations and user training of complex systems involving healthcare technology, as well as the creation of information about system performance associated with management decision making. Typically offered Fall, Spring.**Credits:** 3.00

HETM 49000 - Project Planning And Design

Credit Hours: 1.00. Students are expected to prepare an individual design in collaboration with industry and/or the clinical setting. This course will introduce the applications of project management to the student's design. Topics include project scope, scheduling, resource limitations, stakeholder interactions, delivery and quality assurance. Typically offered Fall Spring.**Credits:** 1.00

HETM 49300 - Healthcare Engineering Technology Management Ethics And Professionalism

Credit Hours: 1.00. Students will explore ethical, social, political, legal and ecological issues that practicing BMET's may encounter. Particular emphasis will be placed on patient safety and privacy issues. Typically offered Fall Spring.**Credits:** 1.00

Interior Architecture

INT 10300 - Introduction To Interior Design

Credit Hours: 3.00. An overview of the field of interior design, its history, and theory. An application of the principles and elements of interior design. Basic hand drafting. This course is for those who are seeking or considering a degree in Interior Design.**Credits:** 3.00

INT 12400 - Space Planning For Interiors

Credit Hours: 3.00. Introduction to the fundamentals of design for human activity, standards for space, programming, and graphic communication. Requirements for ADA and Universal Design will be included.**Credits:** 3.00

INT 12500 - Color And Lighting Of Interiors

Credit Hours: 3.00. Exploration of the physiological, psychological, and phenomenal aspects of color and light in interior spaces. Application includes specification and selection of lighting fixtures and light sources.**Credits:** 3.00

INT 15100 - Textiles For Interiors

Credit Hours: 3.00. An extensive study of textiles: fiber types, yarn production, fabric construction, finishing, coloring, and printing. Application of textiles for use in residential and commercial interiors.**Credits:** 3.00

INT 20200 - Interior Materials And Applications

Credit Hours: 3.00. Analyzes information related to use of surfacing materials applied as interior finishes in interior design projects. The role of green design is introduced, and ecological issues are integrated into each category of materials analyzed.**Credits:** 3.00

INT 20400 - History Of Interiors And Furniture I

Credit Hours: 3.00. A survey of historical development of interiors, furniture and decorative arts from early history to 1800 (early neoclassic). Emphasis on design motifs, ornamentation and furniture styles.**Credits:** 3.00

INT 22400 - Residential Interior Design Studio

Credit Hours: 3.00. This studio class will emphasize the design of residential space, recognizing design development as a process. Space design, working drawings, plans, and client presentations also will be covered. The course will utilize computer-aided drafting and design (CAD).**Credits:** 3.00

INT 22600 - Commercial Interiors I

Credit Hours: 3.00. This studio course emphasizes the elements used by designers in the development of nonresidential space. Studies include technological and building requirements; building and life-safety codes; square footage and space planning standards. Organizational, ergonomic, technical, spatial and environmental factors will be considered.**Credits:** 3.00

INT 30400 - History Of Interiors And Furniture II

Credit Hours: 3.00. The continuation of a survey of historical development of interiors, furniture, and decorative arts beginning with 1650 Colonial America through the 20th century. Emphasis is on design motifs, ornamentation, and furniture styles. Adaptation and use of period styles within contemporary design are included.**Credits:** 3.00

INT 32400 - Residential II: Housing Design

Credit Hours: 3.00. This studio class will emphasize the design of residential space, recognizing design development as a process. Space design, working drawings, plans, and client presentations also will be covered.**Credits:** 3.00

INT 32600 - Commercial Interior Design Studio II

Credit Hours: 3.00. This studio course emphasizes the elements used in development of nonresidential space. Studies include technological and building requirements; building and life-safety codes, ADA guidelines, square footage and space planning standards.**Credits:** 3.00

INT 42600 - Evidence-Based Design

Credit Hours: 3.00. This studio-based course emphasizes the principles of evidence-based design in modern practice. Students will acquire working knowledge of best practices with relation to healthcare or similar environments based on empirical data.**Credits:** 3.00

INT 42800 - Interior Design Capstone Design Project

Credit Hours: 3.00. In this B.S. Capstone course the designer tackles a semester long advanced design problem by applying the design process from project obtainment through construction documents. This class is team-taught and must be taken in conjunction with INTR 48000.**Credits:** 3.00

INT 45200 - Interior Building Systems

Credit Hours: 3.00. A survey course of building systems that covers the design implications of heating, air-conditioning, plumbing and electrical systems of both residential and commercial buildings. Sustainable technologies such as solar energy for heating, cooling, or hot water heating, day-lighting, and recycling systems will be included.**Credits:** 3.00

INT 45300 - Business Practices Of Interior Design

Credit Hours: 3.00. Business principles and practices as they relate to the interior design profession. Includes business formation and management, professional ethics and organization, certification and licensing issues, design liability, and project management.**Credits:** 3.00

INT 48000 - Senior Portfolio

Credit Hours: 3.00. This course will assist the student with developing a professional level portfolio and related materials which may be used in interviewing for an Interior Design position, and provides an opportunity to showcase all academic work created at this institution. Topics and activities include branding, resume preparation, website design, social media management, interviewing, and the creation of various related portfolio materials.**Credits:** 3.00

INT 49500 - Sustainable Design In Engineering And Technology

Credit Hours: 3.00. In this multidisciplinary course students will create industrial ecological solutions within their unique disciplines. A theoretical framework on Green Design is used to identify and apply green concepts while working on multidisciplinary teams. Environmental concerns for better air quality and global environmental issues are explored.**Credits:** 3.00

Business - IU (BUS)

BUS A2000 - Foundations Of Accounting

Credit Hours: 3.00 to 5.00. The course addresses the role of accounting in society and business, with a special emphasis on fundamental concepts and the basic design of accounting systems. This course is intended for non-business majors who are interested in learning about how accounting affects their lives and businesses. Credit not given for both BUS A2000 and either BUS A2010 or BUS A2020.**Credits:** 3.00 to 5.00

BUS F1510 - Personal Finances Of The College Student

Credit Hours: 1.00. This course is an introduction to the basic planning tools and concepts for college-age financial literacy. Emphasis on financial decisions and challenges facing a typical college student. Topics include careers, goal setting, budgeting, tax planning and credit, including options for financing higher education. Foundation of the Financial Literacy Curriculum.**Credits:** 1.00

BUS F1520 - Basic Financial Planning And Investment

Credit Hours: 1.00. Introduction to the basic planning tools and concepts for financial literacy into adulthood and retirement. Emphasis on analyzing, selecting and managing investments over a lifetime. Topics include, time value of money, financial statements, retirement objectives, and investing in various financial assets. Part of the Financial Literacy Curriculum.**Credits:** 1.00

BUS F3000 - Introduction To Financial Management

Credit Hours: 3.00. Broad survey of finance for non-School of Business students. Topics include the determinants of interest rates and the time value of money; the sources and uses of financial information; the structure, role, and regulation of financial markets; monetary policy; the pricing of risk in financial markets; goals of investors; and how firms manage their financial affairs, including planning, budgeting, and decision making.**Credits:** 3.00

BUS L2030 - Commercial Law I

Credit Hours: 3.00. Includes the nature of law, torts, contracts, the sale of goods, and the legal regulation of business competition. The purpose of this course is to examine the legal framework for business activity and to explore how to manage that framework in a rapidly changing legal environment. The areas of the law studied include contracts, torts, employment law, intellectual property, forms of business enterprises, and the legal regulation of business competition. Credit not given for both BUS L2010 and BUS L2030.**Credits:** 3.00

BUS M3000 - Introduction To Marketing

Credit Hours: 3.00. Examination of the market economy and marketing institutions in the United States. Decision making and planning from the manager's point of view; impact of marketing actions from the consumer's point of view. No credit toward a degree in business.**Credits:** 3.00

BUS P3000 - Introduction To Operations Management

Credit Hours: 3.00. Offered for students with a formal minor in business. The operations function is concerned with the activity associated with the production of goods and services. Provides an overview of operating decisions and practices in both manufacturing- and service-oriented firms. While no attempt is made to cover any particular area in depth, standard terms and concepts required to communicate effectively with operating personnel are introduced. No credit toward a degree in business.**Credits:** 3.00

BUS W2000 - Introduction To Business And Management

Credit Hours: 3.00. Business administration from the standpoint of the manager of a business firm operating in the contemporary economic, political, and social environment. No credit for Kelley Business students when taken concurrently with or after the integrative core.**Credits:** 3.00

BUS X1000 - Business Administration: Introduction

Credit Hours: 3.00. Business administration from the standpoint of the manager of a business firm operating in the contemporary economic, political, and social environment. No credit for Kelley School of Business students when taken concurrently with or after the integrative core.**Credits:** 3.00

BUS Z3400 - Introduction To Human Resources

Credit Hours: 3.00. Covers the nature of human resource development and utilization in American society and organizations; government programs and policies, labor force statistics, organizational personnel department, personnel planning, forecasting, selection, training, development, and integration of government and organizational human resource programs.**Credits:** 3.00

Heron Art - IU (HER)

HER E1050 - Beginning Painting I

Credit Hours: 2.00 or 3.00. Introduction to the techniques of painting. Aspects of pictorial composition; wide range of media. Painting from still life and live model. Will not count toward a Herron B.F.A. degree.**Credits:** 2.00 or 3.00

HER E1090 - Color & Interior Design

Credit Hours: 3.00. Aimed primarily at the person wishing to use color with an understanding of its effects in daily life. Survey of traditional meanings in various cultures. Concept of color as energy. Group and individual experiments included in an investigation of color, with regard to motivation and physical and emotional response factors.**Credits:** 3.00

HER E2010 - Photography I For Non-Art Majors

Credit Hours: 1.00 to 3.00. Introduction to the basics of black, and, white fine art photography for non, art majors only. Students provide their own fully manual 35mm camera. Will not count toward a Herron B.F.A. degree.**Credits:** 1.00 to 3.00

Tourism, Event, and Sport Management - IU (TESM)

TESM H3280 - Beers Of The World

Credit Hours: 3.00. Explore the world's great beer styles, including imports and craft beers, as well as beer flavors and off-flavors, the brewing process, ingredients, history, beer and food pairing, competitions, judging and more. Sampling and field trips will be required. Students will also be prepared to take the Certified CiceroneR exam. **Credits:** 3.00

TESM T2080 - Tourism Geography

Credit Hours: 3.00. Explores principal geographic features, population centers and attractions including travel destinations across the world.**Credits:** 3.00

TESM T2340 - Cultural Heritage Tourism

Credit Hours: 3.00. Analyzes visitor and host community dynamics and the management of tangible and intangible cultural heritage assets. Elements examined include management and development of cultural tourism attractions and links to community.**Credits:** 3.00