College of Engineering

College of Engineering

Overview

Highly Ranked

U.S. News and World Report ranked both our graduate and undergraduate programs in the Top 10 nationwide. Purdue's College of Engineering is among the largest in the United States and includes 13 academic programs all with high rankings. And we're accelerating the speed at which we progress. Together, we're bringing our college from excellence to preeminence.

Aggressive Growth

Purdue's College of Engineering is embarking on a period of remarkable growth. With the support of the Provost and Board of Trustees, we expect to increase the size of the CoE faculty by as much as 30% and the CoE staff by 28% over the next five years. Growth on this scale is an opportunity for Transformational change. More information can be found on our Strategic Growth Initiative page.

Interdisciplinary, Global, and Diverse

Our growth, fueled by our alumni and friends, is giving us the tools and room to develop more revolutionary technologies that are already changing the world around us. We are **cutting across the established boundaries of Purdue's engineering and related disciplines.** In doing so, we're incorporating all perspectives. We're taking advantage of our own diverse makeup, and we're approaching issues from a world point of view. We're **equipping our students** with the capacity **to perform in a fast-changing and increasingly global economy.**

To find out more about Purdue Engineering, check out the rest of this Web site. You can also contact us, or please come for a visit to see what Purdue and you can do together.

Engineering Degrees

Aeronautical & Astronautical Engineering	Electrical Engineering
Agricultural Engineering	Environmental & Ecological Engineering
Biological Engineering	Industrial Engineering
Biomedical Engineering	Interdisciplinary Engineering (*BS only)*
Civil Engineering	Materials Engineering

Chemical Engineering	Mechanical Engineering
Computer Engineering	Multidisciplinary Engineering
Construction Engineering Management	Nuclear Engineering

Admissions

http://www.admissions.purdue.edu/majors/colleges.php?ClgCd=ENGR

First-Year Engineering at Purdue

The First-Year Engineering (FYE) Program of the School of Engineering Education is the entry point for all beginning engineering students. In the FYE program, students complete foundational coursework in math, science, engineering, and communications (oral and written). After this common first year, students choose their discipline of engineering and start to follow the plan of study of a particular degree program. The mission of this student-oriented program is to advise, prepare, and retain outstanding students for degree programs in Purdue's College of Engineering.

Advising Information

Talk to an FYE Advisor

- make an appointment to meet with your FYE advisor
- learn about the walk-in schedule for FYE advisors or for Student Representatives of Professional Engineering Schools
- other common advisor questions

Requirements for First-Year Engineering

The requirements listed here are applicable for students with a "catalog term" of 201710 or higher (typically students who first entered Purdue in the Fall 2016 term or later). To complete FYE and be eligible for consideration for entry into an Engineering degree program, a student must complete the following courses:

- ENGR 13100, ENGR 14100 , or (EPCS 11100 and EPCS 12100)
- ENGR 13200, ENGR 14200, or ENGR 13300
- MA 16100 or MA 16500
- MA 16200, MA 16600, or MA 17300
- CHM 11500 or (CHM 11100 and CHM 11200)
- PHYS 17200
- A Science Selective course, chosen from:
    - CHM 11600
    - CS 15900
    - BIOL 11000
    - BIOL 11100
    - BIOL 13100
    - BIOL 12100 and BIOL 13500
    - ENGR 14100 and ENGR 14200 for students who entered Purdue prior to Fall 2016 only

- Two of the following four courses:
    - A course that meets the Written Communication foundational outcome, typically ENGL 10600 or ENGL 10800
    - A course that meets the Oral Communication foundational outcome, typically COM 11400
    - GS 10000 (available only to students with a TOEFL score on record, this course also meets the Humanities foundational outcome)
    - GS 10100 (available only to students with a TOEFL score on record)

There are some accepted substitutions to the courses listed above (mostly discontinued course numbers or course numbers for parallel courses at regional campuses of Purdue University); students should consult the FYE website (www.purdue.edu/fye) or an FYE advisor for details.

Minimum Grades: Earned grades must be C- or better for any course used to meet the requirements above, if the grade posts to the Purdue transcript.

Grade Average: To complete FYE, the student's cumulative GPA must be of 2.00 or greater, and an Engineering Admissions Index (EAI) must be 2.00 or greater. Calculation of the EAI is equivalent to the calculation of GPA for courses used to meet all FYE requirements above. If a student meets a requirement in more than one way, only one will be used to calculate the EAI. The FYE Curriculum Committee will be responsible for keeping an updated, clear, and universal set of rules for determining which course is used in EAI for these situations. These rules are available to students in the FYE Advising office.

Total Number of Credits: Students must earn a total of at least 30 credits.

Typical plan of study

The requirements listed above are designed to be completed in two semesters (typically fall and spring) of full-time on-campus study. Individual plans of study may vary depending on student interest and ability, and on previously earned credit (through AP, dual-credit high school courses, etc.). However, a standard plan of study is listed below. The semesters (fall and spring) are listed for a typical student beginning FYE in the fall term, but all courses are offered in both terms.

- Semester 1 (typically Fall)
    - ENGR 13200 (2 cr)
    - CHM 11500 (4 cr)
    - MA 16100 or MA 16500 (4-5 cr)
    - Written or Oral Communication (usually ENGL 10600 or COM 11400, 3-4 cr)
- Semester 2 (typically Spring)
    - ENGR 13200 (2 cr)
    - PHYS 17200 (4 cr)
    - MA 16200 or MA 16600 (4-5 cr)
    - Written or Oral Communication (usually ENGL 10600 or COM 11400, 3-4 cr)
    - Science Selective (usually CHM 11600 or CS 15900, 3-4 cr)

Transitioning to a degree program

After completion of the FYE program, students may transition to one of fifteen degree programs in engineering (i.e., Mechanical, Electrical, Chemical, Civil, etc.); this happens through the "Transition to Major" (or T2M) process. As a student nears completion of FYE, he or she will inform FYE of their preferred choices of degree program/major. If the degree program is not at capacity, all students completing FYE requirements and requesting that degree program will be admitted. If the program is at capacity, admission will be based on academic record, including GPA, EAI, and grades in specific courses. In recent years, more than 90% of FYE students are placed into their first choice degree program.

Even though the FYE program is designed to be completed in two semesters, students may remain in FYE for up to four semesters before transitioning to a degree program.

Contact Information

Office of the Dean of Engineering

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For additional faculty and staff contact information, consult our directory.

School of Aeronautics and Astronautics

Aeronautical and Astronautical Engineering

The Aeronautics and Astronautics curriculum emphasizes the disciplines of aerodynamics, aerospace systems, astrodynamics and space applications, propulsion, structures and materials, dynamics and control, and further provides courses that integrate these disciplines into the design of flight vehicles to perform the required mission.

The field of aeronautical and astronautical engineering addresses the challenging problems encountered in the design and operation of many types of aircraft, missiles, and space vehicles and places a constant demand on research and development groups for an even greater understanding of basic physical phenomena.

Employers from around the world contact the School of Aeronautics and Astronautics with information regarding positions available within their organizations.

Mission Statement

To serve the State of Indiana and our Nation by providing degree granting programs - recognized as innovative learning experiences - that prepare students to be exceptional, recognized contributors to aeronautical and astronautical engineering in industry, government laboratories and universities.

To develop and maintain quality graduate research programs in technical areas relevant to Aeronautics and Astronautics and to foster a collegial and challenging intellectual environment necessary to conduct enabling and breakthrough research for aerospace systems.

Faculty

https://engineering.purdue.edu/AAE/People/Faculty

Contact Information

Reception

Armstrong Hall of Engineering
Room 3300
(765) 494-5117 *Phone*
(765) 494-0307 *FAX*

Undergraduate Student Services

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Graduate Information

For Graduate Information please see Aeronautics and Astronautics Graduate Program Information.

Aeronautics and Astronautics Engineering, BSAAE

About the Program

The field of aeronautical and astronautical engineering includes the challenging problems encountered in the design and operation of many types of aircraft, missiles, and space vehicles and puts a constant demand on research and development groups for an even better understanding of basic physical phenomena.

Aeronautical education has existed on at least a small scale at Purdue University since about 1920. Aeronautical Engineering degrees were first offered at Purdue by the School of Mechanical & Aeronautical Engineering during WWII, and the first B.S. Degrees were awarded in 1943. The School of Aeronautics was established as a separate entity on July 1, 1945. (For a complete history visit the School's history page.)

During the first sixty years of its existence, the School of Aeronautics and Astronautics has awarded 5,824 BS degrees, 1,439 MS degrees and 474 PhD degrees. These graduates have made significant contributions to the aerospace field, and have held positions of high responsibility in government and private industry. Twenty-three graduates of Purdue have become astronauts, and of these, fourteen have been graduates of the School of Aeronautics and Astronautics.

The Aeronautical and Astronautical Engineering curriculum concentrates on the fundamental subject areas necessary to the research, development, design, and operation of the aerospace industry. The curriculum is designed to emphasize the disciplines of aerodynamics, propulsion, structures, dynamics, and control, and further provides design courses to integrate these disciplines into the design of flight vehicles that will perform the required mission. A strong background in mathematics and physics is required to pursue these disciplines, and extensive use of computers and programming skills is a necessity.

The future holds many interesting challenges. The record shows that our graduates have demonstrated their ability to provide technical leadership in a variety of successfully completed projects. A degree from Purdue University in the School of Aeronautics and Astronautics promises to prepare our future graduates for the 21st century in the aerospace field.

Degree Requirements and Supplemental Information

The full Program Requirements for 2016-17 Aeronautic and Astronautic Engineering include all Supplemental Information and selective lists of those categories which a student must fulfill in order to earn their degree. These are intended to be printer-friendly, but include less descriptive course detail.

Please see below for program requirements and the necessary degree fulfillments.

code - BS-AAE

Code-XXX

130 Credits for Graduation

Students must have a graduation index of 2.0

AAE Engineering Major Courses (41 credits)

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Spring.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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). Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall.

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. Typically offered Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

AAE Technical Electives (6 credits)

AAE Major/Minor Electives (15 credits)

Other Departmental /Program Course Requirements (50 credits)

CGT 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. Typically offered Fall Spring.

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

CS 15900 - Programming Applications For Engineers

Credit Hours: 3.00. Fundamental principles, concepts, and methods of programming (C and MATLAB), 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. Typically offered Summer Fall Spring.

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). Typically offered Fall Spring Summer.

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

ENGL 10600 - First-Year Composition

Credit Hours: 4.00. Extensive practice in writing clear and effective prose. Instruction in organization, audience, style, and research-based writing. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400.

ENGL 10800 - Accelerated First-Year Composition

Credit Hours: 3.00. An accelerated composition course that substitutes for ENGL 10600 for students showing superior writing ability. Typically offered Summer Fall Spring.

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Fall Spring Summer.

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 MA 27100 . Typically offered Fall Spring Summer.

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 MA 35100. Typically offered Fall Spring Summer.

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, MA 36000, 36100, or MA 36600. Typically offered Fall Spring Summer.

MA 30400 - Differential Equations And Analysis Of Nonlinear Systems For Engineering And The Sciences

Credit Hours: 3.00. This is a differential equations course designed to follow MA 26500-MA 26600. Same description as MA 30300 except that material on the qualitative behavior of solutions to nonlinear systems is substituted for material on Laplace transforms. Not open to students with credit in MA 30300. Typically offered Summer Fall Spring.

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. Typically offered Spring Summer Fall.

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring.

Note

COM 11400 is a highly recommended general elective and is counted separately from the 18 credits of Gen Ed requirement. Therefore the Gen Ed requirement is 18 + 3 credits = 21 when including COM 11400. AAE also requires students to complete a business elective and a communications/writing elective at the 300-level or higher.

General Electives (18 credits)

- G.E.-I - Credit Hours: 3.00
- G.E.-II - Credit Hours: 3.00
- G.E.-III - Credit Hours: 3.00
- G.E.-IV - Credit Hours: 3.00
- G.E.-V - Credit Hours: 3.00
- G.E.-VI - Credit Hours: 3.00

University Core Requirements

- Human Cultures/Humanities
- Human Cultures Behavioral/Social Science
- Information Literacy - ENGR 13100
- Science Selective - PHYS 17200
- Science Selective - CHM 11500
- Science, Technology & Society Selective
- Written Communication - ENGL 10600/10800
- Oarl Communication - COM 11400
- Quantitative Reasoning - MA 26500

Program Requirements

Fall 1st Year

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

ENGL 10600 - First-Year Composition

Credit Hours: 4.00. Extensive practice in writing clear and effective prose. Instruction in organization, audience, style, and research-based writing. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400.

ENGL 10800 - Accelerated First-Year Composition

Credit Hours: 3.00. An accelerated composition course that substitutes for ENGL 10600 for students showing superior writing ability. Typically offered Summer Fall Spring.

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). Typically offered Fall Spring Summer.

CGT 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. Typically offered Fall Spring.

15 Credits

Spring 1st Year

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

CS 15900 - Programming Applications For Engineers

Credit Hours: 3.00. Fundamental principles, concepts, and methods of programming (C and MATLAB), 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. Typically offered Summer Fall Spring.

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

16 Credits

Fall 2nd Year

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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 MA 27100 . Typically offered Fall Spring Summer.

- Gen Elective I - Credit Hours: 3.00

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 MA 35100. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

16 Credits

Spring 2nd Year

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

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, MA 36000, 36100, or MA 36600. Typically offered Fall Spring Summer.

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. Typically offered Spring Summer Fall.

- Gen Elective II - Credit Hours: 3.00

16 Credits

Fall 3rd Year

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

MA 30400 - Differential Equations And Analysis Of Nonlinear Systems For Engineering And The Sciences

Credit Hours: 3.00. This is a differential equations course designed to follow MA 26500-MA 26600. Same description as MA 30300 except that material on the qualitative behavior of solutions to nonlinear systems is substituted for material on Laplace transforms. Not open to students with credit in MA 30300. Typically offered Summer Fall Spring.

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. Typically offered Fall.

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. Typically offered Fall Spring.

- Gen Elective III - Credit Hours: 3.00

16 Credits

Spring 3rd Year

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Spring.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

- Gen Elective IV - Credit Hours: 3.00

16 Credits

Fall 4th Year

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). Typically offered Fall Spring.

- Major/Minor Electives - Credit Hours: 6.00
- Gen Elective V - Credit Hours: 3.00
- Tech Elective - Credit Hours: 3.00

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. Typically offered Fall Spring.

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. Typically offered Fall.

17 Credits

Spring 4th Year

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. Typically offered Spring.

- Major/Minor Electives - Credit Hours: 9.00
- Gen Elective VI - Credit Hours: 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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

18 Credits

Note

*Satisfies a University Core Requirement
**Satisfies a Non-departmental Major Course Requirement

++Students must earn a "C-" or better

130 semester credits required for Bachelor of Science degree.

2.0 Graduation GPA required for Bachelor of Science degree.

Degree Requirements

The student is ultimately responsible for knowing and completing all degree requirements.

Degree Works is knowledge source for specific requirements and completion

Critical Course

The ♦ course is considered critical. A Critical Course is one that a student must be able to pass to persist and succeed in a particular major.

Foreign Language Courses

Foreign Language proficiency requirements vary by program. For acceptable languages and proficiency levels, see your advisor:

American Sign Language, Arabic, Chinese, French, German, (ancient) Greek, Hebrew, Italian, Japanese, Latin, Portuguese, Russian, Spanish

Department of Agricultural and Biological Engineering

Overview

Welcome to the Department of Agricultural & Biological Engineering at Purdue University. Our mission is to prepare students, citizens, and industry for the future through innovative education and extension/outreach programs and the discovery of knowledge.

Our cross-disciplinary strengths include academic and research programs in agriculture, biology, and engineering, as well as dual degree programs. Our engineering degrees are granted by the College of Engineering and our agricultural systems management degree is granted by the College of Agriculture. The job market remains strong for our graduates who have excellent career opportunities, and demand for our graduates is very high.

Our faculty, students and staff are pursuing cutting-edge research that improves quality of life as well as advances scientific and engineering frontiers. Our extension programs are helping citizens of Indiana and beyond improve their lives.

Overview of Agricultural & Biological Engineering

Agricultural Systems Management

The Agricultural Systems Management program prepares graduates to develop and manage technology-intensive agricultural production and processing systems. ASM graduates are problem solvers. They benefit from a diverse applied agricultural curriculum that includes opportunities for extensive career-related experience at home and abroad.

Biological Engineering

This program deals with the applications of basic scientific and engineering principles to the design, development and operation of large scale manufacture of food and biologically-based products. Such products are environmentally friendly, renewable and represent a future wave of consumer demand for better health and environment. In addition to learning the engineering aspects of food and biological processing, you will also learn the basic principles in biochemistry and food sciences.

Dual Degree programs with Biological Engineering and Biochemistry or Pharmaceutical Sciences are also offered - these programs require an additional year of courses leading to two degrees.

Agricultural Engineering - emphasis in Environmental & Natural Resources Engineering

This emphasis area prepares engineers with specialized expertise to design and analyze new and environmentally sound ways to produce food and fiber while conserving our natural resources. Students gain expertise in areas such as watershed management, geographic information systems, computer-based watershed modeling, and contaminant transport models, and soil and water conservation engineering practices.

Agricultural Engineering - emphasis in Machine Systems Engineering

This emphasis area prepares students with a background in mechanical design, hydraulics, instrumentation and control, finite element analysis, electronics and sensors to design, develop, analyze and operate machines and systems for agricultural and biological products and processes, materials handling, construction and mining, forestry, lawn- and ground-care, and food and fiber production and processing.

Faculty

https://engineering.purdue.edu/ABE/People/ptFaculty

Contact Information

Purdue University
Agricultural & Biological Engineering
225 South University Street
West Lafayette, IN 47907-2093
Phone: (765) 494-1162
Fax: (765) 496-1115
www.purdue.edu/abe

Graduate Information

For Graduate Information please see Agricultural and Biological Engineering Graduate Program Information.

Undergraduate Information

For undergraduate programs and information, please see the College of Agriculture, or the Department of Agricultural and Biological Engineering page.

Weldon School of Biomedical Engineering

Biomedical Engineering

Students in Biomedical Engineering learn to apply tools from engineering and life sciences to design solutions for challenges in human biology, medicine, and healthcare delivery.

Biomedical Engineering students complete coursework in math, physics, chemistry and the life science in combination with engineering principles and design courses to understand the physical and chemical properties of human tissues, computational modeling and analyses, molecular transport, biomechanics, human physiology, and biomedical systems and instrumentation. Essential experiential and practical training includes small group problem-based learning, study abroad programs, internships with a broad range of medically related companies, research in faculty labs, and engineering design projects to solve real medical needs.

The home for the **Weldon School of Biomedical Engineerin**g is a state-of-the-art building specifically designed to enhance both teaching and research. The $25-million, 91,000-square-foot facility accommodates the continued growth of biomedical engineering in the 21st century.

Programs of focus and faculty expertise include imaging, instrumentation, engineered biomaterials and biomechanics, and quantitative cellular and systems engineering.

Faculty

https://engineering.purdue.edu/BME/People

Contact Information

Weldon School of Biomedical Engineering
Purdue University
206 S. Martin Jischke Drive
West Lafayette, IN 47907-2032
Phone: (765) 494-2995
Email: WeldonBME@purdue.edu
Weldon BME Undergraduate Program
BME Undergraduate Webpage

WeldonBMEUndergrad@purdue.edu

Graduate Information

For Graduate Information please see Biomedical Engineering Graduate Program Information.

Biomedical Engineering, BSBME

About the Program

Students in Biomedical Engineering learn to apply tools from engineering and life sciences to design solutions for challenges in human biology, medicine, and healthcare delivery.

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Degree Requirements and Supplemental Information

The full Program Requirements for 2016-17 Biomedical Engineering include all Supplemental Information and selective lists of those categories which a student must fulfill in order to earn their degree. These are intended to be printer-friendly, but include less descriptive course detail.

Please see below for program requirements and the necessary degree fulfillments.

Code-BME
130 Credits for Graduation
*** Courses used to calculate BME Major GPA**

Required Biomedical Engineering Courses (41 credits)

https://engineering.purdue.edu/BME/Academics/BMEUndergraduateProgram/AcademicDocuments/PlanofStudy

BME Courses (29 credits) *

BME 20100 - 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, electrostatis interactions along with other weak interactions discussed with reference to their importance in biomolecular systems in an engineering context. Typically offered Fall.

BME 20500 - Biomolecular And Cellular Systems 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. Typically offered Fall.

BME 29000 - 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 experimental 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. Typically offered Fall.

BME 20400 - Biomechanics Of Hard And Soft Tissues

Credit Hours: 3.00. Covers the mechanics of biological materials, with applications in the musculo-skeletal system, nerves, spinal cord, and vascular tissue, down to the level of the cell. Topics include center of mass, moment of inertia, basic understanding of stresses, strains, and deformations, axial elements, pressure vessels, beams, torsion, viscoelasticity, and thermal stress. Case studies and problem solving sessions used to emphasize the unique biological criteria which must be considered when mechanically analyzing both soft and hard tissues. Typically offered Spring.

BME 20600 - Biomechanics And Biomaterials Laboratory

Credit Hours: 1.00. Provides hands-on training in engineering and biological principles of biomaterials and biomechanics. Topics

include evaluation and interpretation of experimental results, modeling and testing of tissue and body mechanics, and interactions of living (e.g., tissue/cell) and nonliving (e.g., biomaterial) systems. Typically offered Spring.

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. Typically offered Spring.

BME 30100 - 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. Typically offered Fall.

BME 30400 - Biomedical Transport Fundamentals

Credit Hours: 3.00. Fundamental concepts and principles of momentum, heat, and mass transport phenomena in the context of biomedical applications. Integrated biological topics include transport of physiological fluids (e.g. blood), mass transport (e.g. oxygen and nutrients), forced convection (e.g. hemodialysis) and unsteady-state molecular diffusion (e.g. drug delivery mechanisms). Typically offered Fall.

BME 30500 - Bioinstrumentation Circuit And Measurement Principles

Credit Hours: 3.00. Introduction of laboratory instruments used to measure physiological events. Stimulation and conduction of electric signals within the 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. Fundamental analog measurement concepts include adequate bandwidth and amplitude and phase linearity. An integrative two-week design project addresses the practical aspects of quantitative physiological measurements. Typically offered Fall.

BME 30600 - Biotransport Laboratory

Credit Hours: 2.00. Practical experience with transport principles related to physiological systems is presented through inquiry-based modules. Modules contain elements of computer simulation, experimental design, implementation, and data analysis and address biomedical applications. Typically offered Spring.

BME 39000 - Professional Development And Design In Biomedical Engineering

Credit Hours: 1.00. 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). Typically offered Spring.

BME 48800 - Preliminary Senior Project Design

Credit Hours: 1.00. The preliminary stages of design are completed during these lab hours. Students will work with their teammates to develop a problem statement with appropriate technical specifications, complete the relevant literature and market analysis, derive and justify a preliminary design, and outline a plan to successfully complete the project. The resulting preliminary design is presented and evaluated through an oral presentation and a written report. Typically offered Fall.

BME 48900 - Senior Design Project Lab

Credit Hours: 2.00. The biomedical engineering design process is completed starting from a preliminary system design. Student 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. Typically offered Fall Spring.

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. Typically offered Fall.

Core Engineering Courses (12 credits) *

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. Friction. Distributed forces. Centers of gravity and centroids. Applications from structural and machine elements, such as bars, trusses, and friction devices. Kinematics and equations of motion of a particle for rectilinear and curvilinear motion. Typically offered Fall Spring Summer.

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. Typically offered Spring Summer Fall.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

Selectives (21 credits)

- Engineering Selectives (Including Quantitative Breadth Requirement) - Credit Hours: 15.00
- Life Sciences Core Selectives - Credit Hours: 6.00

Other Program Course Requirements (65 credits)

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Fall Spring Summer.

MA 17300 - Calculus And Analytic Geometry II

Credit Hours: 5.00. Calculus of transcendental functions, techniques of integration, conic sections, polar coordinates, parametric equations, infinite series. Admission restricted to those who have extablished credit in Calculus I. Typically offered Fall.

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 MA 27100 . Typically offered Fall Spring Summer.

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 MA 26600. Typically offered Fall Spring Summer.

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 35000, STAT 50100, and in no more than one of STAT 50300 and STAT 51100. Prerequisite: Two semesters of college calculus. Typically offered Fall Spring.

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

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. Typically offered Fall Spring Summer. CTL:IPS 1722 General Chemistry II w/lab

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. Advanced Placement chemistry credit (level 4 or 5) or admission to the honors program in Science or Engineering or a score of at least 70% on the CHM 11500 test-out exam. 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. Typically offered Fall.

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

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. Typically offered Fall.

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). Typically offered Fall Spring Summer.

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). Typically offered Fall Spring.

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

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, team work, and modern engineering tools (e.g., C, Excel®, LabView®, MATLAB®, and Python). Typically offered Fall Spring.

CS 15900 - Programming Applications For Engineers

Credit Hours: 3.00. Fundamental principles, concepts, and methods of programming (C and MATLAB), 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. Typically offered Summer Fall Spring.

ENGL 10600 - First-Year Composition

Credit Hours: 4.00. Extensive practice in writing clear and effective prose. Instruction in organization, audience, style, and research-based writing. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400.

ENGL 10800 - Accelerated First-Year Composition

Credit Hours: 3.00. An accelerated composition course that substitutes for ENGL 10600 for students showing superior writing ability. Typically offered Summer Fall Spring.

- Ethics/Healthcare Policy Selective - Credit Hours: 3.00
- G.E.-II - Credit Hours: 3.00
- G.E.-III - Credit Hours: 3.00
- G.E.-IV - Credit Hours: 3.00
- G.E.-V - Credit Hours: 3.00
- G.E.-VI - Credit Hours: 3.00

Electives (3 credits)

University Core Requirements

- Human Cultures Humanities
- Human Cultures Behavioral/Social Science
- Information Literacy
- Science #1
- Science #2
- Science, Technology, and Society
- Written Communication
- Oral Communication
- Quantitative Reasoning
- For a complete listing of course selectives, visit the Provost's Website or click here.

Program Requirements

Fall 1st Year

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 MA 27100 , or the honors calculus course

MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

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). Typically offered Fall Spring Summer.

ENGL 10600 - First-Year Composition

Credit Hours: 4.00. Extensive practice in writing clear and effective prose. Instruction in organization, audience, style, and research-based writing. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400.

ENGL 10800 - Accelerated First-Year Composition

Credit Hours: 3.00. An accelerated composition course that substitutes for ENGL 10600 for students showing superior writing ability. Typically offered Summer Fall Spring.

17/18 Credits

Spring 1st Year

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Fall Spring Summer. CTL:IPS 1722 General Chemistry II w/lab

CS 15900 - Programming Applications For Engineers

Credit Hours: 3.00. Fundamental principles, concepts, and methods of programming (C and MATLAB), 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. Typically offered Summer Fall Spring.

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

- General Elective - Credit Hours: 3.00

16 Credits

Fall 2nd Year

BME 20100 - 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, electrostatis interactions along with other weak interactions discussed with reference to their importance in biomolecular systems in an engineering context. Typically offered Fall.

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. Typically offered Fall.

BME 20500 - Biomolecular And Cellular Systems 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. Typically offered Fall.

BME 29000 - 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 experimental 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. Typically offered Fall.

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 MA 27100 . Typically offered Fall Spring Summer.

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. Friction. Distributed forces. Centers of gravity and centroids. Applications from structural and machine elements, such as bars, trusses, and friction devices. Kinematics and equations of motion of a particle for rectilinear and curvilinear motion. Typically offered Fall Spring Summer.

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

18 Credits

Spring 2nd Year

BME 20400 - Biomechanics Of Hard And Soft Tissues

Credit Hours: 3.00. Covers the mechanics of biological materials, with applications in the musculo-skeletal system, nerves, spinal cord, and vascular tissue, down to the level of the cell. Topics include center of mass, moment of inertia, basic understanding of stresses, strains, and deformations, axial elements, pressure vessels, beams, torsion, viscoelasticity, and thermal stress. Case studies and problem solving sessions used to emphasize the unique biological criteria which must be considered when mechanically analyzing both soft and hard tissues. Typically offered Spring.

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. Typically offered Fall Spring.

BME 20600 - Biomechanics And Biomaterials Laboratory

Credit Hours: 1.00. Provides hands-on training in engineering and biological principles of biomaterials and biomechanics. Topics include evaluation and interpretation of experimental results, modeling and testing of tissue and body mechanics, and interactions of living (e.g., tissue/cell) and nonliving (e.g., biomaterial) systems. Typically offered Spring.

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. Typically offered Spring.

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 MA 26600. Typically offered Fall Spring Summer.

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. Typically offered Spring Summer Fall.

17 Credits

Fall 3rd Year

BME 30100 - 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. Typically offered Fall.

BME 30500 - Bioinstrumentation Circuit And Measurement Principles

Credit Hours: 3.00. Introduction of laboratory instruments used to measure physiological events. Stimulation and conduction of electric signals within the 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. Fundamental analog measurement concepts include adequate bandwidth and amplitude and phase linearity. An integrative two-week design project addresses the practical aspects of quantitative physiological measurements. Typically offered Fall.

BME 30400 - Biomedical Transport Fundamentals

Credit Hours: 3.00. Fundamental concepts and principles of momentum, heat, and mass transport phenomena in the context of biomedical applications. Integrated biological topics include transport of physiological fluids (e.g. blood), mass transport (e.g. oxygen and nutrients), forced convection (e.g. hemodialysis) and unsteady-state molecular diffusion (e.g. drug delivery mechanisms). Typically offered Fall.

- BME Technical Elective - Credit Hours: 3.00
- General Education or Ethics Selective - Credit Hours: 3.00

15 Credits

Spring 3rd Year

BME 30600 - Biotransport Laboratory

Credit Hours: 2.00. Practical experience with transport principles related to physiological systems is presented through inquiry-based modules. Modules contain elements of computer simulation, experimental design, implementation, and data analysis and address biomedical applications. Typically offered Spring.

BME 39000 - Professional Development And Design In Biomedical Engineering

Credit Hours: 1.00. 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). Typically offered Spring.

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. Typically offered Fall Spring Summer.

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 35000, STAT 50100, and in no more than one of STAT 50300 and STAT 51100. Prerequisite: Two semesters of college calculus. Typically offered Fall Spring.

- BME Technical Selective - Credit Hours: 3.00
- General Elective or Ethics Selective - Credit Hours: 3.00

16 Credits

Fall 4th Year

BME 48800 - Preliminary Senior Project Design

Credit Hours: 1.00. The preliminary stages of design are completed during these lab hours. Students will work with their teammates to develop a problem statement with appropriate technical specifications, complete the relevant literature and market analysis, derive and justify a preliminary design, and outline a plan to successfully complete the project. The resulting preliminary design is presented and evaluated through an oral presentation and a written report. Typically offered Fall.

BME 48900 - Senior Design Project Lab

Credit Hours: 2.00. The biomedical engineering design process is completed starting from a preliminary system design. Student 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. Typically offered Fall Spring.

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. Typically offered Fall.

- BME Technical Selective (Q.B) - Credit Hours: 3.00
- General Elective - Credit Hours: 3.00
- Life Science Elective - Credit Hours: 3.00
- Unrestricted Elective - Credit Hours: 3.00

16 Credits

Spring 4th Year

- BME Technical Selective - Credit Hours: 3.00
- BME Technical Elective - Credit Hours: 3.00
- Life Science Selective - Credit Hours: 3.00
- General Elective - Credit Hours: 3.00
- General Elective - Credit Hours: 3.00

15 Credits

Note

130 semester credits required for Bachelor of Science in Biomedical Engineering degree.

A minimum Graduation Index and BME Major GPA of at least 2.0 is required to qualify for graduation with a BSBME.

All required First Year Engineering (FYE) courses must be completed with a C- or above for entry into BME.

Degree Requirements

The student is ultimately responsible for knowing and completing all degree requirements.

Degree Works is knowledge source for specific requirements and completion

Critical Course

The ♦ course is considered critical. A Critical Course is one that a student must be able to pass to persist and succeed in a particular major.

Foreign Language Courses

Foreign Language proficiency requirements vary by program. For acceptable languages and proficiency levels, see your advisor:

American Sign Language, Arabic, Chinese, French, German, (ancient) Greek, Hebrew, Italian, Japanese, Latin, Portuguese, Russian, Spanish

School of Chemical Engineering

Chemical Engineering Overview

Chemical Engineering remains a premier source of well-educated, well-prepared chemical engineers, educating students using innovative technologies and fostering an environment that inspires leading-edge research.

Chemical engineers work in a wide range of industries with worldwide impact. Applications include energy; pharmaceuticals and biological materials; the nutritional value of food; environmental protection and restoration; materials for computing, sensing, and communications; personal care, home care, and home health products; and system and data management.

Chemical engineers rely on their knowledge of mathematics and science - particularly chemistry - to overcome technical problems in industry and society. While the chemist studies basic chemical reactions, the chemical engineer applies the results of chemical research and transforms laboratory processes into efficient, full-scale processes or facilities. With their strong problem-solving skills and fundamental background in mathematics, physics, chemistry and biology, chemical engineers can seize opportunities to translate industrial problems into competitive advantages. Currently, chemical engineers demand among the highest salaries for college graduates with a bachelor's degree.

Research here is currently being conducted with polymers and materials, nanoscale science and engineering, fluid mechanics, catalyst design and engineering, sensors, biotechnology, and many others.

Faculty

https://engineering.purdue.edu/ChE/People/ptFaculty

Contact Information

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Graduate Information

For Graduate Information please see Chemical Engineering Graduate Program Information.

Chemical Engineering, BSCHE

About the Program

Chemical Engineering remains a premier source of well-educated, well-prepared chemical engineers, educating students using innovative technologies and fostering an environment that inspires leading-edge research.

Chemical engineers work in a wide range of industries with worldwide impact. Applications include energy; pharmaceuticals and biological materials; the nutritional value of food; environmental protection and restoration; materials for computing, sensing, and communications; personal care, home care, and home health products; and system and data management.

Chemical engineers rely on their knowledge of mathematics and science - particularly chemistry - to overcome technical problems in industry and society. While the chemist studies basic chemical reactions, the chemical engineer applies the results of chemical research and transforms laboratory processes into efficient, full-scale processes or facilities. With their strong problem-solving skills and fundamental background in mathematics, physics, chemistry and biology, chemical engineers can seize opportunities to translate industrial problems into competitive advantages. Currently, chemical engineers demand among the highest salaries for college graduates with a bachelor's degree.

Research here is currently being conducted with polymers and materials, nanoscale science and engineering, fluid mechanics, catalyst design and engineering, sensors, biotechnology, and many others.

Degree Requirements and Supplemental Information

The full Program Requirements for 2016-17 Chemical Engineering include all Supplemental Information and selective lists of those categories which a student must fulfill in order to earn their degree. These are intended to be printer-friendly, but include less descriptive course detail.

Please see below for program requirements and the necessary degree fulfillments.

BSChE
CHE-BSE
130 Credits for Graduation

Students must have a graduation index of a 2.0

Major Required Courses (41 credits)

CHE 20000 - Chemical Engineering Seminar

Credit Hours: 0.00. 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. Typically offered Fall.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

CHE 30000 - Chemical Engineering Seminar

Credit Hours: 0.00. Continuation of CHE 20000. Lectures to acquaint the junior students with professional ethics, career choices, including graduate studies, and services of professional societies. Typically offered Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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.Typically offered Fall.

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. Typically offered Fall.

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. Typically offered Fall Spring.

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. Typically offered Spring.

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. Typically offered Fall.

Other Departmental Courses (89 credits)

- Biology Selective (Select from List) - Credit Hours: 3.00
- Chemical Engineering Selective (Select from List) - Credit Hours: 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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

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. Typically offered Fall Spring Summer. CTL:IPS 1722 General Chemistry II w/lab

CHM 26100 - Organic Chemistry

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. Typically offered Fall.

CHM 26300 - Organic Chemistry Laboratory

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. Typically offered Fall.

CHM 26200 - Organic Chemistry

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. Typically offered Spring.

CHM 26400 - Organic Chemistry Laboratory

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. Typically offered Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

ENGL 10600 - First-Year Composition

Credit Hours: 4.00. Extensive practice in writing clear and effective prose. Instruction in organization, audience, style, and research-based writing. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400.

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). Typically offered Fall Spring Summer.

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

- Engineering Selective (select from list) - Credit Hours: 3.00
- Engineering Selective (select from list) - Credit Hours: 3.00

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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 MA 27100 . Typically offered Fall Spring Summer.

- Math Selective I (select from list) - Credit Hours: 4.00
- Math Selective II (select from list) - Credit Hours: 3.00

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

(satisfies FYE Science Selective)

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

- Technical Selective - Select from Supplemental List - Credit Hours: 3.00
- General Education Elective I (satisfies Human Cultures: Humanities for core) - Select from Supplemental List - Credit Hours: 3.00
- General Education Elective II (satisfies Human Cultures: Behavioral Social Science for core) - Select from Supplemental List - Credit Hours: 3.00

- General Education Elective III (satisifies Science, Technology, & Society for core) - Select from Supplemental List - Credit Hours: 3.00
- General Education Elective IV - Select from Supplemental List - Credit Hours: 3.00
- General Education Elective V - Upper Level - Select from Supplemental List - Credit Hours: 3.00
- General Education Elective VI - Upper Level - Select from Supplemental List - Credit Hours: 3.00

Program Requirements

Fall 1st Year

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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ENGL 10600 - First-Year Composition

Credit Hours: 4.00. Extensive practice in writing clear and effective prose. Instruction in organization, audience, style, and research-based writing. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400.

ENGR 13100 - Transforming Ideas To Innovation I

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14 Credits

Spring 1st Year

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Fall Spring Summer. CTL:IPS 1722 General Chemistry II w/lab

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

17 Credits

Fall 2nd Year

CHE 20000 - Chemical Engineering Seminar

Credit Hours: 0.00. 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. Typically offered Fall.

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. Typically offered Fall Spring Summer.

CHM 26100 - Organic Chemistry

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. Typically offered Fall.

CHM 26300 - Organic Chemistry Laboratory

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. Typically offered Fall.

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 MA 27100 . Typically offered Fall Spring Summer.

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

- General Education Elective I - Credit Hours: 3.00

18 Credits

Spring 2nd Year

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

CHM 26200 - Organic Chemistry

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. Typically offered Spring.

CHM 26400 - Organic Chemistry Laboratory

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. Typically offered Spring.

- Math Selective I - Credit Hours: 3.00 or 4.00
- General Education Elective II - Credit Hours: 3.00

18 Credits

Fall 3rd Year

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

- Math Selective II - Credit Hours: 3.00
- Biology Selective - Credit Hours: 3.00

16 Credits

Spring 3rd Year

CHE 30000 - Chemical Engineering Seminar

Credit Hours: 0.00. Continuation of CHE 20000. Lectures to acquaint the junior students with professional ethics, career choices, including graduate studies, and services of professional societies. Typically offered Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

- Technical Elective - Credit Hours: 3.00
- Engineering Elective - Credit Hours: 3.00
- General Education Elective III - Credit Hours: 3.00

17 Credits

Fall 4th Year

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.Typically offered Fall.

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. Typically offered Fall.

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. Typically offered Fall Spring.

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. Typically offered Fall.

- General Education Elective IV - Credit Hours: 3.00

14 Credits

Spring 4th Year

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. Typically offered Spring.

- CHE Elective - Credit Hours: 3.00
- ENGR Elective - Credit Hours: 3.00
- General Education Elective V - Upper Level - Credit Hours: 3.00
- General Education Elective VI - Upper Level - Credit Hours: 3.00

16 Credits

Note

Students must earn a "C" or better in CHE 20500 to enroll in any other CHE course.

Students must earn a "C-" or better in CHE 21100, CHE 30600, CHE 32000, CHE 34800, CHE 37700, CHE 37800 to enroll in upper level CHE courses.

130 semester credits required for Bachelor of Science degree in Chemical Engineering.

2.0 Graduation GPA required for Bachelor of Science degree.

Students may take General Education Elective IV, V, and VI for a letter grade or pass/ no pass option.

3 credits of CHE 41100, 41200, 49800, or 49900 may be used to complete the Chemical Engineering Selective.

3 credits of CHE 41100, 41200, 49800, or 49800 may be used to complete the Engineering or Technical Selective.

Degree Requirements

The student is ultimately responsible for knowing and completing all degree requirements.

Degree Works is knowledge source for specific requirements and completion

Critical Course

The ♦ course is considered critical. A Critical Course is one that a student must be able to pass to persist and succeed in a particular major.

Foreign Language Courses

Foreign Language proficiency requirements vary by program. For acceptable languages and proficiency levels, see your advisor:

American Sign Language, Arabic, Chinese, French, German, (ancient) Greek, Hebrew, Italian, Japanese, Latin, Portuguese, Russian, Spanish

Free Electives (0 - 5 credits)

- Free Elective (for students who complete ENGL 10800) - Credit Hours: 1.00
- Free Elective (for students who complete MA 26500 for Math Selective I) - Credit Hours: 1.00
- Free Elective (for students who complete a course that fulfills both Science, Technology, & Society and Technical Elective) - Credit Hours: 3.00

University Core Requirements

- Human Cultures/Humanities - General Education Elective I
- Human Cultures Behavioral/Social Science - General Education Elective II
- Information Literacy - ENGR 13100
- Science Selective - CHM 11500
- Science Selective - PHYS 17200
- Science, Technology & Society Selective - General Education Elective III
- Written Communication - ENGL 10600
- Oarl Communication - COM 11400
- Quantitative Reasoning - MA 16500

Lyles School of Civil Engineering

About Civil Engineering

Civil engineers design and construct the world's infrastructure: buildings and bridges; tunnels, dams, and levees; harbors and canals; water-supply and waste-disposal systems; airports, highways, and railroads; pipelines and power lines.

As a Civil Engineering undergraduate student you have many opportunities to plan your curriculum and even more opportunities to build your future in civil engineering!

You can explore the nine areas of study within civil engineering along with selecting the courses to design your own plan of study. You and your advisor can discuss your career goals to tailor a program to meet your goals. See our curriculum flow charts for a glimpse of the courses you can choose within these areas of civil engineering.

Instructional laboratories in structural behavior, hydraulics, surveying, and civil engineering materials are offered in the sophomore and junior years. Further study includes 30 credits of technical electives allowing students to tailor their studies to their specialty area of choice. Speciality areas include architectural, construction, environmental, geomatics, geotechnical, hydraulics, materials, structures, transportation, and infrastructure system engineering.

Senior design projects consist of real-world applications in theoretical role play. Recent projects have included designing possible layouts for the US-231 bypass that runs around the perimeter of campus to connect its north and south ends. Another project explored adding box seats to our basketball arena by raising the roof to make room. Another project explored a reuse design for the Tippecanoe County Superfund Site Sanitary Landfill. Students participate in these projects from site exploration, to budget management, to mock designs.

Faculty

https://engineering.purdue.edu/CE/People/Faculty

Contact Information

Lyles School of Civil Engineering
Delon and Elizabeth Hampton Hall of Civil Engineering
550 Stadium Mall Drive
West Lafayette, IN 47907-2051
CE Main Office: (765) 494-2166
CE Main Office Fax: (765) 494-0395

Graduate Information

For Graduate Information please see Civil Engineering Graduate Program Information.

Civil Engineering, BSCE

About the Program

Civil engineers design and construct the world's infrastructure: buildings and bridges; tunnels, dams, and levees; harbors and canals; water-supply and waste-disposal systems; airports, highways, and railroads; pipelines and power lines.

As a Civil Engineering undergraduate student you have many opportunities to plan your curriculum and even more opportunities to build your future in civil engineering!

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Senior design projects consist of real-world applications in theoretical role play. Recent projects have included designing possible layouts for the proposed US-231 bypass that will run around the perimeter of campus to connect its north and south ends. Another project explored adding box seats to our basketball arena by raising the roof to make room. Another project explored a reuse design for the Tippecanoe County Superfund Site Sanitary Landfill. Students participate in these projects from site exploration, to budget management, to mock designs.

Degree Requirements and Supplemental Information

The full Program Requirements for 2016-17 Civil Engineering include all Supplemental Information and selective lists of those categories which a student must fulfill in order to earn their degree. These are intended to be printer-friendly, but include less descriptive course detail.

Please see below for program requirements and the necessary degree fulfillments.

Code-BSCE
132 Credits for Graduation
Students must have a graduation index of 2.0 and a CE index of 2.0

Civil Engineering Major Courses

Required CE Courses [Grade of C- or better required] (61 credits)

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

CGT 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. Typically offered Fall Spring.

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 MA 27100 . Typically offered Fall Spring Summer.

CE 20300 - Principles And Practice Of Geomatics

Credit Hours: 4.00. Basic surveying measurements and computations for engineering project control, mapping, and construction layout; theory of observational errors and error propagation; fundamental concepts of horizontal and vertical control systems; use of topographic maps and plan-profile sheets; computation of horizontal and vertical curves; introduction to computer tools used in Civil Engineering. Typically offered Fall Spring.

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. Typically offered Fall Spring.

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring.

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 MA 35100. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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, MA 36000, 36100, or MA 36600. Typically offered Fall Spring Summer.

CE 33100 - Engineering Materials II

Credit Hours: 3.00. A continuation of CE 23100. Typically offered Fall Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Summer Fall Spring.

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 35000, STAT 50100, and in no more than one of STAT 50300 and STAT 51100. Prerequisite: Two semesters of college calculus. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

- Basic Science Selective - Credit Hours: 3.00

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. Typically offered Spring Summer Fall.

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. Typically offered Fall Spring.

CE Technical Electives (30 credits)

https://engineering.purdue.edu/CE/Academics/Undergraduate/PlanStudy/technical-electives

- Technical Elective I - Credit Hours: 3.00
- Technical Elective II - Credit Hours: 3.00
- Technical Elective III - Credit Hours: 3.00
- Technical Elective IV - Credit Hours: 3.00
- Technical Elective V - Credit Hours: 3.00
- Technical Elective VI - Credit Hours: 3.00
- Technical Elective VII - Credit Hours: 3.00
- Technical Elective VIII - Credit Hours: 3.00

- Technical Elective IX - Credit Hours: 3.00
- Technical Elective X - Credit Hours: 3.00

Other Departmental / Program Course Requirements (27-30 credits)

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Fall Spring Summer.

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

ENGL 10600 - First-Year Composition

Credit Hours: 4.00. Extensive practice in writing clear and effective prose. Instruction in organization, audience, style, and research-based writing. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400.

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). Typically offered Fall Spring Summer.

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

CS 15900 - Programming Applications For Engineers

Credit Hours: 3.00. Fundamental principles, concepts, and methods of programming (C and MATLAB), 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. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring Summer. CTL:IPS 1722 General Chemistry II w/lab

General Education Electives (15 credits)

(plus 1 cr from CE 29202 and 2 cr CE 39201)

https://engineering.purdue.edu/CE/Academics/Undergraduate/PlanStudy/Curriculum-Flowchart-General-Fall-2014.pdf

- General Education Elective I - Credit Hours: 3.00
- General Education Elective II - Credit Hours: 3.00
- General Education Elective III - Credit Hours: 3.00
- General Education Elective IV - Credit Hours: 3.00
- General Education Elective V - Credit Hours: 3.00

University Foundational Core Requirements

- Human Cultures - Humanities - Gen Ed I
- Human Cultures - Behavioral/Social Science - Gen Ed II

ENGL 10600 - First-Year Composition

Credit Hours: 4.00. Extensive practice in writing clear and effective prose. Instruction in organization, audience, style, and research-based writing. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400.

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

- Science, Technology & Society Selective - Basic Science Select

- Written Communication - ENGL 10600 - First-Year Composition

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

Program Requirements

Fall 1st Year

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

ENGL 10600 - First-Year Composition

Credit Hours: 4.00. Extensive practice in writing clear and effective prose. Instruction in organization, audience, style, and research-based writing. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400.

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). Typically offered Fall Spring Summer.

- General Education Elective I - Credit Hours: 3.00

17 Credits

Spring 1st Year

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

- FYE Science Selective - Credit Hours: 3.00

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

16 Credits

Fall 2nd Year

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 MA 27100 . Typically offered Fall Spring Summer.

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring.

CE 20300 - Principles And Practice Of Geomatics

Credit Hours: 4.00. Basic surveying measurements and computations for engineering project control, mapping, and construction layout; theory of observational errors and error propagation; fundamental concepts of horizontal and vertical control systems; use of topographic maps and plan-profile sheets; computation of horizontal and vertical curves; introduction to computer tools used in Civil Engineering. Typically offered Fall Spring.

CGT 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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

18 Credits

Spring 2nd Year

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 MA 35100. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

- General Education Elective II - Credit Hours: 3.00

16 Credits

Fall 3rd Year

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, MA 36000, 36100, or MA 36600. Typically offered Fall Spring Summer.

CE 33100 - Engineering Materials II

Credit Hours: 3.00. A continuation of CE 23100. Typically offered Fall Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Summer Fall Spring.

- Technical Elective I (Breadth) - Credit Hours: 3.00
- General Education Elective III - Credit Hours: 3.00

16 Credits

Spring 3rd Year

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 35000, STAT 50100, and in no more than one of STAT 50300 and STAT 51100. Prerequisite: Two semesters of college calculus. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

- Technical Elective II (Breadth) - Credit Hours: 3.00
- Technical Elective III (Design) - Credit Hours: 3.00
- Basic Science Selective - Credit Hours: 3.00

17 Credits

Fall 4th Year

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. Typically offered Spring Summer Fall.

- Technical Elective IV (Breadth) - Credit Hours: 3.00
- Technical Elective V (Design) - Credit Hours: 3.00
- Technical Elective VI - Credit Hours: 3.00
- Technical Elective VII - Credit Hours: 3.00
- General Education Elective IV - Credit Hours: 3.00

18 Credits

Spring 4th Year

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. Typically offered Fall Spring.

- Technical Elective VIII (Breadth) - Credit Hours: 3.00
- Technical Elective IX (Design) - Credit Hours: 3.00
- Technical Elective X - Credit Hours: 3.00
- General Education Elective V - Credit Hours: 3.00

15 Credits

Note

132 semester credits required for Bachelor of Science in Civil Engineering degree.

Students must have a graduation index of 2.0 and a CE index (CE courses only) of 2.0.

Degree Requirements

The student is ultimately responsible for knowing and completing all degree requirements.

MyPurduePlan is a knowledge source for specific requirements and completion.

Foreign Language Courses

Foreign Language proficiency requirements vary by program. For acceptable languages and proficiency levels, see your advisor:

American Sign Language, Arabic, Chinese, French, German, (ancient) Greek, Hebrew, Italian, Japanese, Latin, Portuguese, Russian, Spanish

Critical Course

The ♦ course is considered critical. A Critical Course is one that a student must be able to pass to persist and succeed in a particular major.

Architectural Engineering Minor

A Minor in Architectural Engineering is available to all students in the College of Engineering except students in the School of Civil Engineering. The Minor is focused on high performance buildings and will be granted on the completion of the following 18 crs (6 courses).

Required (4) courses (12 crs)

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 hygrothermal analysis of building enclosures, air conditioning processes in heating, ventilating and air conditioning systems, building illumination, and building acoustics. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

Elective (2) courses (6 crs) from the following list

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. Typically offered Fall Spring.

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). Typically offered Fall Spring.

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 functions, 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 systems. The course provides a hands-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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

CE 59700 - Civil Engineering Projects

Arrange Hours and Credit. Hours and credits to be arranged. Permission of instructor required. Typically offered Fall Spring Summer.

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. Typically offered Fall.

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. Typically offered Fall Spring Summer.

Note

Provided that the 18 credit hrs are successfully completed with a grade of "C" or better in all of the courses, then an Architectural Engineering Minor will be awarded. A grade of "C- or lower" in any of the above courses is not adequate to fulfill the Minor.

All of the above prescribed minor courses must be taken at the Purdue West Lafayette campus.

Land Surveying Minor

The Land Surveying (LS) minor is available to any student at Purdue who has met the co- and/or pre-requisites for courses in the LS course sequence. The LS Minor consists of 7 courses (21 credits).

When the minor is combined with the BSCE degree program, the minor will likely add 1 to 4 courses to the student's program of study. Working with an LS advisor during the junior and senior undergraduate years will minimize the impact on the student's time to graduation.

Once a student has proposed a sequence of courses for the LS minor, the proposal will be submitted to the CE Undergraduate Committee for approval. When the student has successfully completed the approved sequence of courses (earning at least a 2.0 grade point average over the entire sequence), the student will be granted a minor in LS.

The requirements for the LS minor program are outlined as follows:

Core

Required courses

CE 20300 - Principles And Practice Of Geomatics

Credit Hours: 4.00. Basic surveying measurements and computations for engineering project control, mapping, and construction layout; theory of observational errors and error propagation; fundamental concepts of horizontal and vertical control systems; use of topographic maps and plan-profile sheets; computation of horizontal and vertical curves; introduction to computer tools used in Civil Engineering. Typically offered Fall Spring.

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. Typically offered Spring.

CE 49700 - Civil Engineering Projects

Arrange Hours and Credit. Topics vary. Permission of instructor required. Typically offered Fall Spring Summer.

Elective

Min 2 of following courses

CE 30600 - Analysis Of Survey Observations

Credit Hours: 3.00. Analysis of survey measurement systems and methods for observing distances, directions, angles, elevations, and positions. Introduction to instrument calibration, error propagation methods, and control survey design. Typically offered Fall.

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. Typically offered Fall.

- CE 49700 - Imaging Applications in Civil Engineering*

CE 49700 - Civil Engineering Projects

Arrange Hours and Credit. Topics vary. Permission of instructor required. Typically offered Fall Spring Summer.

CE 59700 - Civil Engineering Projects

Arrange Hours and Credit. Hours and credits to be arranged. Permission of instructor required. Typically offered Fall Spring Summer.

- CE 59700 - Introduction to Geodesy and Map Projections *

Planning and Design

Min 2 of following courses

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. Typically offered Fall Spring.

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. Typically offered Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall.

CE 51200 - The Comprehensive Urban Planning Process

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. Typically offered Spring.

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. Typically offered Spring.

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. Typically offered Spring.

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. Typically offered Fall Spring Summer.

Note

* These courses are currently offered under the 49700 or 59700 special study number. Course numbers will be assigned when the course proposals are approved.

Division of Construction Engineering and Management

About Construction Engineering and Management

The Division of Construction Engineering and Management (CEM) offers a degree in Construction Engineering (BSCNE) which is tailored to prepare graduates for professional work in the construction industry. The Construction Engineering curriculum includes about 80 percent engineering courses and 20 percent management courses focused on the knowledge necessary for construction careers.

Construction engineers design and execute processes for building and maintaining the infrastructure of our world. The tools of the trade for today's successful construction engineer include the following: strong math, science, and computer skills; creativity; an aptitude for applying science and engineering methods to solve problems; a love of building structures such as bridges, airports, buildings, dams, and highways; an interest in working indoors and outdoors; initiative and a strong work ethic; the ability to collaborate with diverse people; good communications skills; and a desire to learn in a constantly changing environment. Students in the Construction Engineering program have the opportunity to develop additional expertise in

mechanical, electrical, and other areas of engineering through minors in these fields. Construction Engineering students complete three 12-week paid internships, usually during the summer and away from home. They work as paid employees of construction contractors and construction managers and perform increasingly responsible duties in field operations, office operations, and project management

For over 18 years in a row BSCNE graduates have been hired at a 100-percent rate upon graduation by some of the 100 top U.S. construction firms.

Many construction engineers move into senior management, attaining executive positions and even ownership in a construction firm. These professionals have a passion for building structures and collaborating with a wide range of people, as well as a desire to learn in a constantly changing world.

Faculty

https://engineering.purdue.edu/CEM/People

Contact Information

Division of Construction Engineering and Management
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Construction Engineering and Management, BSCNE

About the Program

The Division of Construction Engineering and Management (CEM) offers a degree in Construction Engineering (BSCNE) which is tailored to prepare graduates for professional work in the construction industry. The Construction Engineering curriculum includes about 80 percent engineering courses and 20 percent management courses focused on the knowledge necessary for construction careers.

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For over 18 years in a row BSCNE graduates have been hired at a 100-percent rate upon graduation by some of the 100 top U.S. construction firms.

Many construction engineers move into senior management, attaining executive positions and even ownership in a construction firm. These professionals have a passion for building structures and collaborating with a wide range of people, as well as a desire to learn in a constantly changing world.

Degree Requirements and Supplemental Information

The full Program Requirements for 2016-17 Construction Engineering and Management include all Supplemental Information and selective lists of those categories which a student must fulfill in order to earn their degree. These are intended to be printer-friendly, but include less descriptive course detail.

Please see below for program requirements and the necessary degree fulfillments.

Code-BSCNE
130 Credits for Graduation

Students must have a graduation index of 2.0

Construction Engineering Major Courses

Required CEM Courses (58 credits)

CE 20300 - Principles And Practice Of Geomatics

Credit Hours: 4.00. Basic surveying measurements and computations for engineering project control, mapping, and construction layout; theory of observational errors and error propagation; fundamental concepts of horizontal and vertical control systems; use of topographic maps and plan-profile sheets; computation of horizontal and vertical curves; introduction to computer tools used in Civil Engineering. Typically offered Fall Spring.

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. Typically offered Fall Spring.

CGT 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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall.

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. Typically offered Fall Spring.

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. Typically offered Spring.

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. Typically offered Fall.

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. Typically offered Fall Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Spring.

CEM 42500 - Construction Practice Project

Credit Hours: 3.00. 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. Typically offered Fall.

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. Typically offered Fall Spring.

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. Typically offered Spring Summer Fall.

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. Typically offered Fall.

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. Typically offered Summer Fall Spring.

CE 47300 - Reinforced Concrete Design

Credit Hours: 4.00. Design and behavior of reinforced concrete beams, one-way slabs, and columns. Typically offered Fall Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Summer Fall Spring.

CEM technical Electives - (6 credits)

- Technical Elective I - Credit Hours: 3.00
- Technical Elective II - Credit Hours: 3.00

Other Departmental /Program Course Requirements (48-50 credits)

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

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. Typically offered Fall Spring Summer. CTL:IPO 1801 Accounting I

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 MA 27100 . Typically offered Fall Spring Summer.

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 MA 35100. Typically offered Fall Spring Summer.

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, MA 36000, 36100, or MA 36600. Typically offered Fall Spring Summer.

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

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 35000, STAT 50100, and in no more than one of STAT 50300 and STAT 51100. Prerequisite: Two semesters of college calculus. Typically offered Fall Spring.

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

ENGL 10800 - Accelerated First-Year Composition

Credit Hours: 3.00. An accelerated composition course that substitutes for ENGL 10600 for students showing superior writing ability. Typically offered Summer Fall Spring.

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). Typically offered Fall Spring Summer.

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

- Science Selective (satisfies FYE requirement) - Credit Hours: 3.00

General Education Electives (18 credits)

- General Education Elective I - Credit Hours: 3.00
- General Education Elective II - Credit Hours: 3.00
- General Education Elective III - Credit Hours: 3.00
- General Education Elective IV - Credit Hours: 3.00
- General Education Elective V - Credit Hours: 3.00
- General Education Elective VI (CEM 28000 & CEM 38000) - Credit Hours: 3.00

University Foundational Core Requirements

(http://www.purdue.edu/provost/initiatives/curriculum/course.html)

- Human Cultures - Humanities (H) - Gen Ed I
- Human Cultures - Behavioral/Social Science (BSS) - Gen Ed II

ENGL 10800 - Accelerated First-Year Composition

Credit Hours: 3.00. An accelerated composition course that substitutes for ENGL 10600 for students showing superior writing ability. Typically offered Summer Fall Spring.

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

- Science, Technology & Society (STS) - Gen Ed III
- Written Communication (WC) - ENGL 10800 - Accelerated First-Year Composition

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

Program Requirements

https://engineering.purdue.edu/CEM/Academics

Fall 1st Year

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

ENGL 10800 - Accelerated First-Year Composition

Credit Hours: 3.00. An accelerated composition course that substitutes for ENGL 10600 for students showing superior writing ability. Typically offered Summer Fall Spring.

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). Typically offered Fall Spring Summer.

13 Credits

Spring 1st Year

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

- Science Selective - Credit Hours: 3.00

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

16 Credits

Summer 1st Year

- CEM 19100 - Construction Internship I

Fall 2nd Year

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 MA 27100 . Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

CE 20300 - Principles And Practice Of Geomatics

Credit Hours: 4.00. Basic surveying measurements and computations for engineering project control, mapping, and construction layout; theory of observational errors and error propagation; fundamental concepts of horizontal and vertical control systems; use of topographic maps and plan-profile sheets; computation of horizontal and vertical curves; introduction to computer tools used in Civil Engineering. Typically offered Fall Spring.

CGT 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. Typically offered Fall Spring.

16 Credits

Spring 2nd Year

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, MA 36000, 36100, or MA 36600. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

CEM 28000 - Construction Engineering Professional Development I

Credit Hours: 2.00. This course will prepare the student for professional practice in construction engineering including information on Careers and Issues in Construction; 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; Students 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. Typically offered Spring.

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. Typically offered Fall Spring Summer. CTL:IPO 1801 Accounting I

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

18 Credits

Summer 2nd Year

- CEM 29100 - Construction Internship II
- Gen Ed Elective I - Credit Hours: 3.00

Fall 3rd Year

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 MA 35100. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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 35000, STAT 50100, and in no more than one of STAT 50300 and STAT 51100. Prerequisite: Two semesters of college calculus. Typically offered Fall Spring.

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). Typically offered Fall.

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. Typically offered Fall.

14 Credits

Spring 3rd Year

- Technical Elective I - Credit Hours: 3.00

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. Typically offered Summer Fall Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Spring.

16 Credits

Summer 3rd Year

- CEM 39100 - Construction Internship III
- Gen Ed Elective II - Credit Hours: 3.00

Fall 4th Year

- Technical Elective II - Credit Hours: 3.00

CE 47300 - Reinforced Concrete Design

Credit Hours: 4.00. Design and behavior of reinforced concrete beams, one-way slabs, and columns. Typically offered Fall Spring.

CEM 42500 - Construction Practice Project

Credit Hours: 3.00. 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. Typically offered Fall.

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. Typically offered Fall.

- General Education Elective III - Credit Hours: 3.00

16 Credits

Spring 4th Year

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. Typically offered Fall.

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. Typically offered Fall Spring.

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. Typically offered Spring Summer Fall.

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. Typically offered Spring.

- General Education Elective IV - Credit Hours: 3.00
- General Education Elective V - Credit Hours: 3.00

15 Credits

Note

130 semester credits required for Bachelor of Science in Construction Engineering degree.

Students must have a graduation index of 2.0.

Degree Requirements

The student is ultimately responsible for knowing and completing all degree requirements.

MyPurduePlan is a knowledge source for specific requirements and completion.

Critical Course

The ♦ course is considered critical. A Critical Course is one that a student must be able to pass to persist and succeed in a particular major.

Foreign Language Courses

Foreign Language proficiency requirements vary by program. For acceptable languages and proficiency levels, see your advisor:

American Sign Language, Arabic, Chinese, French, German, (ancient) Greek, Hebrew, Italian, Japanese, Latin, Portuguese, Russian, Spanish

School of Electrical and Computer Engineering

About Electrical and Computer Engineering

Electrical and Computer engineering encompasses all areas of research, development, design, and operation of electrical and electronic systems and their components, including software. Emphasis in such varied areas as bioengineering, circuit theory, communication sciences, computers and automata, control systems, electromagnetic fields, energy sources and systems, and materials and electronic devices is available. Two degree programs are offered by the School: Bachelor of Science in Electrical Engineering (BSEE) and Bachelor of Science in Computer Engineering (BSCmpE).

Engineers in both fields must have a strong background in mathematics and physics, a broad base in the humanities, and a command of the English language in order to provide the scope of knowledge essential for optimum professional growth. The curriculum offered by the School of Electrical and Computer Engineering meets these objectives.

Graduates from the School of Electrical and Computer Engineering are sought after by all major industries. Electrical engineers hold many unusual and challenging positions in the aerospace, chemical, nuclear, automotive, medical, metallurgical, textile, railway, petroleum, and other basically non-electrical industries, as well as in computers, electronics, communications, power, and other electrical industries. Their professional roles span industrial activity, research, development, design, production, marketing, operation, field testing, and maintenance of many types of equipment for government, industry, farm, and home.

Two degree programs are offered by the school:

Electrical Engineering encompasses the development, design, research, and operation of electrical and electronic systems and components. Disciplines include VLSI and circuit design, communication and signal processing, computer engineering, automatic control, fields and optics, energy sources and systems, and microelectronics and nanotechnology.

Computer Engineering is a specialization within electrical and computer engineering offering an in-depth education in both hardware and software aspects of modern computer systems.

Electrical and Computer Engineering provides students with a versatile education that will prove valuable looking toward a professional future. Along with problem-solving and design skills, students develop a strong foundation in math, science, and core electrical/computer engineering fundamentals. This skillset prepares them for research and development positions in industry, management, sales, teaching, medical school, and law school.

At Birck Nanotechnology Center, engineers and scientists conduct research in emerging fields where new materials and tiny structures are built atom by atom or molecule by molecule.

Faculty

https://engineering.purdue.edu/ECE/People/Faculty

Contact Information

Purdue University
School of Electrical and Computer Engineering
Electrical Engineering Building
465 Northwestern Ave.
West Lafayette, Indiana 47907-2035
ph (765) 494-3540

Graduate Information

For Graduate Information please see Electrical and Computer Engineering Graduate Program Information.

Computer Engineering, BSCMPE

About the Program

Electrical and Computer engineering encompasses all areas of research, development, design, and operation of electrical and electronic systems and their components, including software. Emphasis in such varied areas as bioengineering, circuit theory, communication sciences, computers and automata, control systems, electromagnetic fields, energy sources and systems, and materials and electronic devices is available. Two degree programs are offered by the School: Bachelor of Science in Electrical Engineering (BSEE) and Bachelor of Science in Computer Engineering (BSCmpE).

Engineers in both fields must have a strong background in mathematics and physics, a broad base in the humanities, and a command of the English language in order to provide the scope of knowledge essential for optimum professional growth. The curriculum offered by the School of Electrical and Computer Engineering meets these objectives.

Graduates from the School of Electrical and Computer Engineering are sought after by all major industries. Electrical engineers hold many unusual and challenging positions in the aerospace, chemical, nuclear, automotive, medical, metallurgical, textile, railway, petroleum, and other basically non-electrical industries, as well as in computers, electronics, communications, power, and other electrical industries. Their professional roles span industrial activity, research, development, design, production, marketing, operation, field testing, and maintenance of many types of equipment for government, industry, farm, and home.

Two degree programs are offered by the school:

Electrical Engineering encompasses the development, design, research, and operation of electrical and electronic systems and components. Disciplines include VLSI and circuit design, communication and signal processing, computer engineering, automatic control, fields and optics, energy sources and systems, and microelectronics and nanotechnology.

Computer Engineering is a specialization within electrical and computer engineering offering an in-depth education in both hardware and software aspects of modern computer systems.

Electrical and Computer Engineering provides students with a versatile education that will prove valuable looking toward a professional future. Along with problem-solving and design skills, students develop a strong foundation in math, science, and core electrical/computer engineering fundamentals. This skillset prepares them for research and development positions in industry, management, sales, teaching, medical school, and law school.

At Birck Nanotechnology Center, engineers and scientists conduct research in emerging fields where new materials and tiny structures are built atom by atom or molecule by molecule.

Degree Requirements and Supplemental Information

The full Program Requirements for 2016-17 Computer Engineering include all Supplemental Information and selective lists of those categories which a student must fulfill in order to earn their degree. These are intended to be printer-friendly, but include less descriptive course detail.

Please see below for program requirements and the necessary degree fulfillments.

Code - BSCmpE

125 Credits

Students must earn an overall graduation GPA of at least 2.000

Major Courses (49 credits)

(An overall 2.000 cumulative GPA or better in these courses is required)

Required ECE Courses (47 credits)

ECE 20000 - Electrical And Computer Engineering Seminar

Credit Hours: 0.00. An introduction to the School of Electrical and Computer Engineering, ECE program objectives and outcomes, BSEE & BSCmpE degree requirements, and professional development. Typically offered Fall Spring.

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 everage power, complex power, power factor correction, and maximum power transfer. Instantaneous and average power. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

ECE 30200 - Probabilistic Methods In Electrical And Computer Engineering

Credit Hours: 3.00. An introductory treatment of probability theory, including distribution and density functions, moments, and random variables. Applications of normal and exponential distributions. Estimation of means, variances, correlation, and spectral density functions. Random processes and responses of linear systems to random inputs. Typically offered Fall Summer Spring.

ECE 33700 - ASIC Design Laboratory

Credit Hours: 2.00. Introduction to standard cell design of VLSI (Very Large Scale Integration) digital circuits using the VHDL hardware description language (Very High Speed Integrated Circuits Hardware Description Language). Emphasis on how to write VHDL that will map readily to hardware. Laboratory experiments using commercial grade computer-aided design (CAD) tools for VHDL based design, schematic based logic entry, logic and VHDL simulation, automatic placement and routing, timing analysis, and testing. Typically offered Fall Spring.

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.

ECE 36400 - Software Engineering Tools Laboratory

Credit Hours: 1.00. To acquaint the students with a variety of current software engineering tools, scripting languages, and application programming languages. Students are expected to use their previous programming experience to design and test software programs using the techniques learned in this course. Typically offered Fall Spring.

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. Typically offered Fall Spring.

ECE 40000 - Professional Development And Career Guidance

Credit Hours: 1.00. A lecture-demonstration series emphasizing evaluation of career options, identification and development of professional skills. Examples of career-related topics include choosing a job, and post-graduate education in engineering or other disciplines. Examples of professional skill topics covered include interviewing, writing, intellectual property and ethics. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall.

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. Typically offered Spring.

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. Typically offered Fall Spring.

Computer Engineering Selective (2 credits)

Other Department/Program Course Requirements (70 credits)

General Engineering Requirement (10 cr.)

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). Typically offered Fall Spring Summer.

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

CS 15900 - Programming Applications For Engineers

Credit Hours: 3.00. Fundamental principles, concepts, and methods of programming (C and MATLAB), 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. Typically offered Summer Fall Spring.

- Engineering Breadth Selective (See link to 2016-17 Plan of Study above) - Credit Hours: 3.00

Mathematics Requirement (21 cr.)

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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 MA 27100 . Typically offered Fall Spring Summer.

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, MA 36000, 36100, or MA 36600. Typically offered Fall Spring Summer.

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 MA 35100. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

Science Requirement (15 cr.)

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

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. Typically offered Fall Spring.

- ECE Science Selective (See link to 2016-17 Plan of Study above) - Credit Hours: 3.00

ECE General Education Requirement (24 cr.)

Foundational Core

(http://www.purdue.edu/provost/initiatives/curriculum/course.html)

- 3.00 Credits - satisfy Written Communication for core
- 3.00 Credits - satisfy Oral Communication for core
- 3.00 Credits - satisfy Human Cultures: Humanities for core
- 3.00 Credits - satisfy Human Cultures: Behavioral/Social Science for core
- 3.00 Credits - satisfy Science, Technology, & Society Selective for core

ECE General Education Electives

See link to 2016-17 Plan of Study above.

Complimentary Electives (6 credits)

University Core Requirements

(included above) (http://www.purdue.edu/provost/initiatives/curriculum/course.html)

- Human Cultures Humanities
- Human Cultures Behavioral/Social Science
- Information Literacy
- Science #1
- Science #2
- Science, Technology & Society Selective
- Written Communication
- Oral Communication
- Quantitative Reasoning

Program Requirements

Fall 1st Year

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). Typically offered Fall Spring Summer.

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

CS 15900 - Programming Applications For Engineers

Credit Hours: 3.00. Fundamental principles, concepts, and methods of programming (C and MATLAB), 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. Typically offered Summer Fall Spring.

- Oral Communication Foundational Outcome - Credit Hours: 3.00 *

16 Credits

Spring 1st Year

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

- Foundational Gen Ed - Credit Hours: 3.00 *
- Written Communication Foundational Outcome - Credit Hours: 3.00 *

16 Credits

Fall 2nd Year

ECE 20000 - Electrical And Computer Engineering Seminar

Credit Hours: 0.00. An introduction to the School of Electrical and Computer Engineering, ECE program objectives and outcomes, BSEE & BSCmpE degree requirements, and professional development. Typically offered Fall Spring.

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 everage power, complex power, power factor correction, and maximum power transfer. Instantaneous and average power. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

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 MA 27100 . Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

15 Credits

Spring 2nd Year

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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, MA 36000, 36100, or MA 36600. Typically offered Fall Spring Summer.

- ECE Science Selective- Credit Hours: 3.00 **

16 Credits

Fall 3rd Year

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

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.

ECE 40000 - Professional Development And Career Guidance

Credit Hours: 1.00. A lecture-demonstration series emphasizing evaluation of career options, identification and development of professional skills. Examples of career-related topics include choosing a job, and post-graduate education in engineering or other disciplines. Examples of professional skill topics covered include interviewing, writing, intellectual property and ethics. Typically offered Fall Spring.

- Foundational Gen Ed - Credit Hours: 3.00 *

15 Credits

Spring 3rd Year

ECE 30200 - Probabilistic Methods In Electrical And Computer Engineering

Credit Hours: 3.00. An introductory treatment of probability theory, including distribution and density functions, moments, and random variables. Applications of normal and exponential distributions. Estimation of means, variances, correlation, and spectral density functions. Random processes and responses of linear systems to random inputs. Typically offered Fall Summer Spring.

ECE 33700 - ASIC Design Laboratory

Credit Hours: 2.00. Introduction to standard cell design of VLSI (Very Large Scale Integration) digital circuits using the VHDL hardware description language (Very High Speed Integrated Circuits Hardware Description Language). Emphasis on how to write VHDL that will map readily to hardware. Laboratory experiments using commercial grade computer-aided design (CAD) tools for VHDL based design, schematic based logic entry, logic and VHDL simulation, automatic placement and routing, timing analysis, and testing. Typically offered Fall Spring.

ECE 36400 - Software Engineering Tools Laboratory

Credit Hours: 1.00. To acquaint the students with a variety of current software engineering tools, scripting languages, and application programming languages. Students are expected to use their previous programming experience to design and test software programs using the techniques learned in this course. Typically offered Fall Spring.

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. Typically offered Fall Spring.

- Foundational Gen Ed - Credit Hours: 3.00 *
- ECE Gen Ed Elective - Credit Hours: 3.00 **

15 Credits

Fall 4th Year

Adv. CmpE -

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. Typically offered Fall Spring.

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. Typically offered Fall.

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. Typically offered Fall Spring.

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 MA 35100. Typically offered Fall Spring Summer.

- ECE Gen Ed Elective - Credit Hours: 3.00 **
- Complementary Elective - Credit Hours: 3.00 **

17 Credits

Spring 4th Year

Adv CmpE -

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. Typically offered Fall Spring.

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. Typically offered Spring.

- Computer Engineering Elective - Credit Hours: 2.00
- Engr. Breadth Elective - Credit Hours: 3.00 **
- ECE Gen Ed Elective - Credit Hours: 3.00 **
- Complimentary Elective - Credit Hours: 3.00 **

15 Credits

Note

*Satisfies a University Core Requirement

**Satisfies a Non-departmental Major Course Requirement

125 semester credits required for Bachelor of Science degree.

2.0 ECE and Graduation GPA required for Bachelor of Science degree.

Degree Requirements

The student is ultimately responsible for knowing and completing all degree requirements.

Degree Works is knowledge source for specific requirements and completion

Critical Course

The ♦ course is considered critical. A Critical Course is one that a student must be able to pass to persist and succeed in a particular major.

Foreign Language Courses

Foreign Language proficiency requirements vary by program. For acceptable languages and proficiency levels, see your advisor:

American Sign Language, Arabic, Chinese, French, German, (ancient) Greek, Hebrew, Italian, Japanese, Latin, Portuguese, Russian, Spanish

Electrical Engineering, BSEE

About the Program

Electrical and Computer engineering encompasses all areas of research, development, design, and operation of electrical and electronic systems and their components, including software. Emphasis in such varied areas as bioengineering, circuit theory, communication sciences, computers and automata, control systems, electromagnetic fields, energy sources and systems, and materials and electronic devices is available. Two degree programs are offered by the School: Bachelor of Science in Electrical Engineering (BSEE) and Bachelor of Science in Computer Engineering (BSCmpE).

Engineers in both fields must have a strong background in mathematics and physics, a broad base in the humanities, and a command of the English language in order to provide the scope of knowledge essential for optimum professional growth. The curriculum offered by the School of Electrical and Computer Engineering meets these objectives.

Graduates from the School of Electrical and Computer Engineering are sought after by all major industries. Electrical engineers hold many unusual and challenging positions in the aerospace, chemical, nuclear, automotive, medical, metallurgical, textile, railway, petroleum, and other basically non-electrical industries, as well as in computers, electronics, communications, power, and other electrical industries. Their professional roles span industrial activity, research, development, design, production, marketing, operation, field testing, and maintenance of many types of equipment for government, industry, farm, and home.

Two degree programs are offered by the school:

Electrical Engineering encompasses the development, design, research, and operation of electrical and electronic systems and components. Disciplines include VLSI and circuit design, communication and signal processing, computer engineering, automatic control, fields and optics, energy sources and systems, and microelectronics and nanotechnology.

Computer Engineering is a specialization within electrical and computer engineering offering an in-depth education in both hardware and software aspects of modern computer systems.

Electrical and Computer Engineering provides students with a versatile education that will prove valuable looking toward a professional future. Along with problem-solving and design skills, students develop a strong foundation in math, science, and core electrical/computer engineering fundamentals. This skillset prepares them for research and development positions in industry, management, sales, teaching, medical school, and law school.

At Birck Nanotechnology Center, engineers and scientists conduct research in emerging fields where new materials and tiny structures are built atom by atom or molecule by molecule.

Degree Requirements and Supplemental Information

The full Program Requirements for 2016-17 Electrical Engineering include all Supplemental Information and selective lists of those categories which a student must fulfill in order to earn their degree. These are intended to be printer-friendly, but include less descriptive course detail.

Please see below for program requirements and the necessary degree fulfillments.

Code: ECEB

124 Credits

Students must earn an overall graduation GPA of at least 2.000

Major Courses (47 credits)

(https://engineering.purdue.edu/ECE/Academics/Undergraduates/UGO/pdf/bsee.pdf)

(An overall 2.000 cumulative GPA or better in these courses is required)

Required ECE Courses (28 cr.)

ECE 20000 - Electrical And Computer Engineering Seminar

Credit Hours: 0.00. An introduction to the School of Electrical and Computer Engineering, ECE program objectives and outcomes, BSEE & BSCmpE degree requirements, and professional development. Typically offered Fall Spring.

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 everage power, complex power, power factor correction, and maximum power transfer. Instantaneous and average power. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

ECE 30200 - Probabilistic Methods In Electrical And Computer Engineering

Credit Hours: 3.00. An introductory treatment of probability theory, including distribution and density functions, moments, and random variables. Applications of normal and exponential distributions. Estimation of means, variances, correlation, and spectral density functions. Random processes and responses of linear systems to random inputs. Typically offered Fall Summer Spring.

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. Typically offered Fall Spring.

ECE 40000 - Professional Development And Career Guidance

Credit Hours: 1.00. A lecture-demonstration series emphasizing evaluation of career options, identification and development of professional skills. Examples of career-related topics include choosing a job, and post-graduate education in engineering or other disciplines. Examples of professional skill topics covered include interviewing, writing, intellectual property and ethics. Typically offered Fall Spring.

ECE 40200 - Electrical Engineering Design Projects

Credit Hours: 3.00. 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 a 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). Completion of BS EE or BS CmpE core curriculum. Typically offered Fall Spring.

Adv. EE Selectives - Select 3 of the following courses (9-11 cr.)

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

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.

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. Typically offered Fall Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring.

Other Electrical Engineering Course Requirements (8-10 cr.)

(Must include 3 upper level labs - fewer if chosen Adv EE Selectives include ECE 36200 and/or ECE 43800/ECE 44000)

Other Department/Program Course Requirements (67 credits)

General Engineering Requirement (10 cr.)

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). Typically offered Fall Spring Summer.

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

CS 15900 - Programming Applications For Engineers

Credit Hours: 3.00. Fundamental principles, concepts, and methods of programming (C and MATLAB), 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. Typically offered Summer Fall Spring.

- Engineering Breadth Selective (https://engineering.purdue.edu/ECE/Academics/Undergraduates/UGO/pdf/eng.pdf) - Credit Hours: 3.00

Mathematics Requirement (18 cr.)

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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 MA 27100 . Typically offered Fall Spring Summer.

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 MA 35100. Typically offered Fall Spring Summer.

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, MA 36000, 36100, or MA 36600. Typically offered Fall Spring Summer.

Science Requirement (15 cr.)

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

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. Typically offered Fall Spring.

- ECE Science Selective (https://engineering.purdue.edu/ECE/Academics/Undergraduates/UGO/pdf/sci.pdf) - Credit Hours: 3.00

ECE General Education Requirement (24 cr.)

Foundational Core

(http://www.purdue.edu/provost/initiatives/curriculum/course.html)\

- (satisfies Written Communication for core) - Credit Hours: 3.00
- (satisfies Oral Communication for core) - Credit Hours: 3.00
- (satisfies Human Cultures: Humanities for core) - Credit Hours: 3.00
- (satisfies Human Cultures: Behavioral/Social Science for core) - Credit Hours: 3.00
- (satisfies Science, Technology & Society Selective for core) - Credit Hours: 3.00

ECE General Education Electives

(https://engineering.purdue.edu/ECE/Academics/Undergraduates/UGO/CourseInfo/coursesGEE#LIST)

Electives (10 credits)

University Core Requirements

(included above) (http://www.purdue.edu/provost/initiatives/curriculum/course.html)

- Human Cultures Humanities
- Human Cultures Behavioral/Social Science
- Information Literacy
- Science #1
- Science #2
- Science, Technology & Society Selective
- Written Communication
- Oral Communication
- Quantitative Reasoning

Program Requirements

Fall 1st Year

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). Typically offered Fall Spring Summer.

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

CS 15900 - Programming Applications For Engineers

Credit Hours: 3.00. Fundamental principles, concepts, and methods of programming (C and MATLAB), 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. Typically offered Summer Fall Spring.

- Oral Communication Foundational Outcome - Credit Hours: 3.00 *

16 Credits

Spring 1st Year

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

- Foundational GenEd - Credit Hours: 3.00*
- Oral Communication Foundational Outcome - Credit Hours: 3.00*

16 Credits

Fall 2nd Year

ECE 20000 - Electrical And Computer Engineering Seminar

Credit Hours: 0.00. An introduction to the School of Electrical and Computer Engineering, ECE program objectives and outcomes, BSEE & BSCmpE degree requirements, and professional development. Typically offered Fall Spring.

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 everage power, complex power, power factor correction, and maximum power transfer. Instantaneous and average power. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

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 MA 27100 . Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

- Foundational GenEd - Credit Hours: 3.00 *

15 Credits

Spring 2nd Year

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

- ECE Sci Selective* - Creidt Hours: 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, MA 36000, 36100, or MA 36600. Typically offered Fall Spring Summer.

- Foundational GenEd - Credit Hours: 3.00 *

17 Credits

Fall 3rd Year

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

- Adv. EE Selective - Credit Hours: 3.00
- ECE Elective - Credit Hour: 1.00
- Complimentary Ele - Credit Hours: 3.00 **

ECE 40000 - Professional Development And Career Guidance

Credit Hours: 1.00. A lecture-demonstration series emphasizing evaluation of career options, identification and development of professional skills. Examples of career-related topics include choosing a job, and post-graduate education in engineering or other disciplines. Examples of professional skill topics covered include interviewing, writing, intellectual property and ethics. Typically offered Fall Spring.

15 Credits

Spring 3rd Year

ECE 30200 - Probabilistic Methods In Electrical And Computer Engineering

Credit Hours: 3.00. An introductory treatment of probability theory, including distribution and density functions, moments, and random variables. Applications of normal and exponential distributions. Estimation of means, variances, correlation, and spectral density functions. Random processes and responses of linear systems to random inputs. Typically offered Fall Summer Spring.

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. Typically offered Fall Spring.

- Adv. EE Selective - Credit Hours: 3.00
- ECE Elective (lab) - Credit Hour: 1.00

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 MA 35100. Typically offered Fall Spring Summer.

- ECE GenEd Elective - Credit Hours: 3.00 **

16 Credits

Fall 4th Year

ECE 40200 - Electrical Engineering Design Projects

Credit Hours: 3.00. 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 a 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). Completion of BS EE or BS CmpE core curriculum. Typically offered Fall Spring.

- ECE Elective - Credit Hours: 3.00
- ECE GenEd Elective - Credit Hours: 3.00 **
- Complimentary Ele. - Credit Hours: 3.00 **
- Engr. Breadth Elective - Credit Hours: 3.00**

15 Credits

Spring 4th Year

- Adv. EE Selective w/lab - Credit Hours: 4.00
- ECE Elective w/lab - Credit Hours: 4.00
- ECE GenEd Elective - Credit Hours: 3.00 **
- Complimentary Ele. - Credit Hours: 4.00 **

15 Credits

Note

*Satisfies a University Core Requirement

**Satisfies a Non-departmental Major Course Requirement

124 semester credits required for Bachelor of Science degree.

2.0 Graduation GPA required for Bachelor of Science degree.

Degree Requirements

The student is ultimately responsible for knowing and completing all degree requirements.

Degree Works is knowledge source for specific requirements and completion

Critical Course

The ♦ course is considered critical. A Critical Course is one that a student must be able to pass to persist and succeed in a particular major.

Foreign Language Courses

Foreign Language proficiency requirements vary by program. For acceptable languages and proficiency levels, see your advisor:

American Sign Language, Arabic, Chinese, French, German, (ancient) Greek, Hebrew, Italian, Japanese, Latin, Portuguese, Russian, Spanish

Electrical and Computer Engineering Minor

All Majors Except BME

Requirements for a minor in Electrical and Computer Engineering (only for students not majoring in Biomedical Engineering)

- Before applying for an ECE minor, *(application must be made in person in EE 136. Call 765-494-3390 for an appointment)*, students must have completed MA 16500, MA 16600, and PHYS 17200 (or their equivalents) with a 'C-' grade or better in each. If the application is approved, a minor in Electrical and Computer Engineering will be granted upon completion of the following 17 credit hours of coursework.
- All requisites for these courses must be met (non-engineering students may apply for a prerequisite override for ENGR 13100 in ECE 20100) in order to enroll in these courses. Click the link for each course to see the required requisites.
- Transfer credit may be accepted for up to two of the "Required Courses" (this includes IUPUI, the regional campuses, and study abroad credit).
- A minimum overall GPA of 2.0 is required in ECE courses to qualify for the minor. Approval of the ECE minor may be revoked if the ECE GPA falls below 2.0.

- Enrollment in all ECE courses is subject to space availability. Students requesting space in restricted ECE courses must submit an application and may need to wait until 'Open Enrollment' to register. Electrical Engineering and Computer Engineering majors are given priority.

Required Courses (13 credits)

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 everage power, complex power, power factor correction, and maximum power transfer. Instantaneous and average power. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

Elective Course(s) (4 credits)

Choose one of the following options:

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

- ECE 20700 - Electronic Measurement Techniques

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. Typically offered Fall Spring Summer.

- ECE 20700 - Electronic Measurement Techniques

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.

For BME Majors Only

Requirements for a minor in Electrical and Computer Engineering (only for students majoring in Biomedical Engineering)

- Before applying for an ECE minor, *(application must be made in person in EE 136. Call 765-49-43390 for an appointment)*, students must have completed MA 16500, MA 16600, and PHYS 17200 (or their equivalents) with a 'C-' grade or better in each. If the application is approved, a minor in Electrical and Computer Engineering will be granted upon completion of the following 17-18 credit hours of coursework.

- All requisites for these courses must be met (non-engineering students may apply for a prerequisite override for ENGR 13100 in ECE 20100) in order to enroll in these courses. Click the link for each course to see the required requisites.
- Transfer credit may be accepted for up to two of the "Required Courses" (this includes IUPUI, the regional campuses, and study abroad credit).
- A minimum overall GPA of 2.0 is required in ECE courses to qualify for the minor. Approval of the ECE minor may be revoked if the ECE GPA falls below 2.0.
- Enrollment in all ECE courses is subject to space availability. Students requesting space in restricted ECE courses must submit an application and may need to wait until 'Open Enrollment' to register. Electrical Engineering and Computer Engineering majors are given priority.

Required Courses (11 credits)

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

Elective Courses (2 courses)

Choose two of the following course options:

ECE 30200 - Probabilistic Methods In Electrical And Computer Engineering

Credit Hours: 3.00. An introductory treatment of probability theory, including distribution and density functions, moments, and random variables. Applications of normal and exponential distributions. Estimation of means, variances, correlation, and spectral density functions. Random processes and responses of linear systems to random inputs. Typically offered Fall Summer Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

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.

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. Typically offered Summer Fall Spring.

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. Typically offered Fall.

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. Typically offered Fall.

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. Typically offered Fall.

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.

School of Engineering Education

The School of Engineering Education

Interdisciplinary Engineering offers two distinct degree options: Interdisciplinary Engineering Studies (IDES), and Multidisciplinary Engineering (MDE). Each degree is unique, in that they are serving student populations with different career interests. In particular, the IDES degree is often referred to as a "pre-professional school" program, which offers a bachelor of science degree and is not ABET accredited. Alternatively, the MDE degree is an ABET accredited program, conferring a bachelor of science in engineering degree. Further details of each program follow below.

The **Multidisciplinary Engineering Program's** mission, goals, objectives and outcomes are designed to prepare graduates to practice engineering. Typically, a plan of study is developed around a focused concentration. Students may develop their own individual plan of study or select one of these established, ABET-approved concentrations:

- Acoustical Engineering
- Engineering Management
- General Engineering
- Visual Design Engineering
- Lighting Engineering
- Nano-Engineering

The **Interdisciplinary Engineering Studies Program** is for students who want an engineering education but do not plan to practice engineering. Students may develop their own individual plan of study or select one of these established concentrations:

- Technical Communications Engineering Studies
- Engineering Mathematics Studies
- Visual Design Engineering Studies
- Supervisory Engineering Studies
- Computer Graphics Engineering Studies
- Pre-Chiropractic Engineering Studies
- Pre-Physical Therapy Engineering Studies
- Pre-Medical Engineering Studies
- Pre-Optometry Engineering Studies
- Pre-Law Engineering Studies
- Pre-Veterinary Medicine Engineering Studies

Detailed information on enrollment and graduation statistics for the MDE program, as well as MDE program accreditation with ABET is available for review.

Students must complete the requirements of the First-Year Engineering Program and take additional engineering courses, but may also take several courses from other schools at Purdue. Students will graduate with either a Bachelor of Science in Engineering (BSE) or a Bachelor of Science (BS) degree and may advance to graduate school or pursue a career in industry.

Features of these undergraduate programs include:

- Flexible plan of study that can be tailored to include its own title and selection of courses
- Limited enrollment (fewer than 100 total students), so the program remains counseling-intensive
- Bachelor of Science in Engineering (BSE) or Bachelor of Science (BS) degree
- Frequently Asked Questions
- Plans of Study
- Requirements
- Student Awards

Questions? Contact us by email at ide@ecn.purdue.edu or by phone at (765) 494-7422. You may also make an appointment with the MDE/IDE Advisor, by clicking: Chris Pekny

Faculty

https://engineering.purdue.edu/ENE/People/Faculty

Contact Information

School of Engineering Education
Purdue University
Neil Armstrong Hall of Engineering, Room 1300
701 W. Stadium Avenue
West Lafayette, IN 47907
e-mail: engr-info@purdue.edu
phone: (765) 494-9713
fax: (765) 494-5819

Graduate Information

For Graduate Information please see Engineering Education Graduate Program Information.

Interdisciplinary Engineering Studies - Pre-Med Engineering Studies Concentration (BS only)

About the Program

Interdisciplinary engineering studies (IDES) is for students who want an engineering education but do not plan to practice engineering. The program offers considerable flexibility and permits you to develop an individual plan of study to meet educational goals that require working at the interface between engineering and other disciplines. Established options in the program include pre-medical engineering studies among many others. IDES is not an ABET accredited program plan of study.

Link to https://engineering.purdue.edu/ENE/Academics/Undergrad

Degree Requirements and Supplemental Information

The full Program Requirements for 2016-17 Interdisciplinary Engineering, Pre-Med Engr include all Supplemental Information and selective lists of those categories which a student must fulfill in order to earn their degree. These are intended to be printer-friendly, but include less descriptive course detail.

Please see below for program requirements and the necessary degree fulfillments.

BS/IDES

IDE-BS
120 Credits for Graduation

Students need Cumulative GPA of 2.0 to Graduate

Required Engineering Courses - Selectives & Electives (30 credits)

- Economcs Selective: IE 34300 or (ECON 25100 and ECON 25200) +[4] - Credit hours: 3.00
- IDE 30100 - Professional Preparation In Interdisciplinary Engineering - Junior (Must be taken at Purdue - West Lafayette) - Credit Hours: 1.00
- Engineering Design (30000+ level): Must be approved by ENE dept. (e.g. ABE 33000, AAE 25100, CE 45600, IE 38600, etc.) - Credit Hours: 3.00
- Engineering Elective courses to meet students educational objectives: Engineering courses only) - Credit Hours: 23.00

Must Total (>=30) Credits of Engineering Coursework; **Note:** 30 credits of 20000+ level engineering courses, of which at least 15 credits are 30000+

Other Departmental /Program Course Requirements (44-50 credits)

* can be substituted with approved alternative FYE courses (i.e. ENGR 14100/14200, etc.)

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Fall Spring Summer.

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

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). Typically offered Fall Spring Summer.

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

ENGL 10600 - First-Year Composition

Credit Hours: 4.00. Extensive practice in writing clear and effective prose. Instruction in organization, audience, style, and research-based writing. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400.

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

CS 15900 - Programming Applications For Engineers

Credit Hours: 3.00. Fundamental principles, concepts, and methods of programming (C and MATLAB), 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. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring Summer. CTL:IPS 1722 General Chemistry II w/lab

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 MA 27100 . Typically offered Fall Spring Summer.

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 MA 26600. Typically offered Fall Spring Summer.

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 MA 35100. Typically offered Fall Spring Summer.

(satisfies math (MBSE) requirement) and

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, MA 36000, 36100, or MA 36600. Typically offered Fall Spring Summer.

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Fall.

Statistics Selective:

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 MOE statistics elective. Permission of instructor is required. Typically offered Spring.

or approved equivalent (IE 23000 / 33000 / ECE 30200 / CHE32000 / STAT 35000 / STAT 51100) (if non-engineering statistics selective, it counts as MBSE; if ENGR, count as additional ENGR course)

Area Electives (29 credits maximum)

Coursework chosen to satisfy student's educational objectives - Credit Hours: 29.00

- CGT 11000, CGT 16300 or CGT 16400 are very highly recommended.

Math, Basic Science, & Engineering - MBSE (44 credits total min. from across entire POS excluding FYE)

- Engineering, CS, mathematics, or science courses as needed, *that are not used to fulfill FYE requirement*

General Education (24 credits)

NOTE: : includes ENGL 106 and COM 114 (7 cr) listed above, plus 17-18 credits

- GE 1 - HSS - Credit Hours: 3.00
- GE 2 - BSS - Credit Hours: 3.00
- GE 3 - STS - Credit Hours: 3.00
- GE 4 - Credit Hours: 3.00
- GE 5 - Credit Hours: 3.00
- GE 6 - Credit Hours: 2.00 - 3.00
- Engl 10600 - Credit Hours: 4.00
- Com 11400 - Credit Hours: 3.00

University Core Requirements

- Human Cultures Humanities - GE 1
- Human Cultures Behavioral/Social Science - GE 2

ENGL 10600 - First-Year Composition

Credit Hours: 4.00. Extensive practice in writing clear and effective prose. Instruction in organization, audience, style, and research-based writing. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400.

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

- Science, Technology & Society - GE 3
- Written Communication - ENGL 10600 - First-Year Composition

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Typically offered Fall Spring Summer.

Note

Minimum engineering credits = 30; Maximum AREA electives = 29; **Minimum** Math, Basic Science & Engr (MBSE) includes mathematics, CS, and engineering credits **that are not already used to fulfill FYE requirement** = 44 - more may be taken to meet program total of 120 credits. All plans of study must be approved by the School of Engineering Education. All other Purdue University graduation requirements must be satisfied.

IDES/MDE web pages and Advisor are knowledge sources for specific requirements and completion

The student is ultimately responsible for knowing and completing all degreee requirements.

Program Requirements

Fall 1st Year

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

ENGL 10600 - First-Year Composition

Credit Hours: 4.00. Extensive practice in writing clear and effective prose. Instruction in organization, audience, style, and research-based writing. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400.

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). Typically offered Fall Spring Summer.

14 Credits

Spring 1st Year

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

CS 15900 - Programming Applications For Engineers

Credit Hours: 3.00. Fundamental principles, concepts, and methods of programming (C and MATLAB), 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. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring Summer. CTL:IPS 1722 General Chemistry II w/lab

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

16/17 Credits

Fall 2nd Year

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 MA 27100 . Typically offered Fall Spring Summer.

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

- Sci Sel - Credit Hours: 3.00 †
- Area Elective 1 †1 - Credit Hours: 3.00
- Area Elective 2 †1 - Credit Hours: 3.00
- Engineering Class 20000+ Level Elective - Credit Hours: 3.00 †2

16 Credits

Spring 2nd Year

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 MA 26600. Typically offered Fall Spring Summer.

- Engineering Class 20000+ Level - Credit Hours:2.00 †2
- Engineering Class 20000+ Level Elective - Credit Hours:3.00 †2
- Area Elective 3 - Credit Hours: 3.00†1
- Area Elective 4 - Credit Hours: 3.00†1

15 Credits

Fall 3rd Year

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. Typically offered Spring.

- General Education Class 1 (Foundational Outcome H) - Credit Hours: 3.00
- Engineering Class 20000+ Level Elective - Credit Hours: 3.00 †2
- Area Elective 5 - Credit Hours: 3.00 †1
- Area Elective 6 - Credit Hours: 3.00 †1
- Area Elective 7 - Credit Hours: 2.00 †1

15 Credits

Spring 3rd Year

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 MOE statistics elective. Permission of instructor is required. Typically offered Spring.

- Engineering Class 30000+ Level Elective - Credit Hours: 3.00 †2
- General Education 2 (Foundational Outcome BSS) - Credit Hours: 3.00
- General Education 3 (Foundational Outcome STS) - Credit Hours: 3.00
- Area Elective 8 - Credit Hours: 3.00 †1

15 Credits

Fall 4th Year

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. Typically offered Summer Fall Spring.

- Engineering Design 30000+ - Credit Hours: 3.00†5
- General Education 4 (30000 level or non-intro) - Credit Hours: 3.00 †3

- General Education 5 - Credit Hours: 2.00 †3
- Area Elective 9 - Credit Hours: 3.00 †1

14 Credits

Spring 4th Year

- Engineering Class 30000+ Level Elective - Credit Hours: 3.00 †2
- Engineering Class 30000+ Level Elective - Credit Hours: 3.00 †2
- General Education 6 (30000 level or non-intro) - Credit Hours: 3.00 †3
- Area Elective 10 - Credit Hours: 3.00 †1
- MBSE Elective - Credit Hours: 3.00

15 Credits

Grand Total = 120 Credits

*Satisfies a University Core Requirement **Satisfies a Non-departmental Major Course Requirement. †Multiple options are available - the most common is listed. †1 statics options, †2 thermodynamics options †3 area electives are chosen with aid of adviser to advance the student's educational objectives †4 dynamics options †5 engineering selectives are chosen with aid of adviser to advance the student's educational objectives †6 fluids option †7 materials options †8 statistics options †9 design selective †10 Capstone design selective.

Note

†Multiple options are available: common option listed. †1 Area electives are chosen with aid of advisor to advance the student's educational objectives. Area classes for this plan of study are used to complete the requirements to take the MCATS and attend medical school. Courses to be completed include but are not limited to: 2 semesters General Biology with labs (minimum - should take more); 2 semesters General Chemistry with labs; 2 semesters Organic Chemistry with labs; 2 semesters Physics with labs; 2 semesters English Composition; 1 semester Biochemistry (no lab required; (* IU MD and Marian DO programs will require as of fall 2015); Anatomy and Physiology (not required but highly recommended for MCAT); 1 semester General Psychology (*IU MD and Marian DO programs will require as of fall 2015); 1 semester sociology (* IU MD and Marian DO programs will require as of fall 2015); other recommended courses Statistics. Generally, a grade below a C is not acceptable for a prerequisite course.

†2 engineering electives are chosen with aid of advisor to advance the student's educational objectives. †3 General Education courses can be taken from CLA, Krannert or Honors - consult advisor. †4 statistics selective could be approved equivalent (IE 23000/33000 /ECE 30200 /CHE 32000 /STAT 35000 /STAT 51100 - (if non engineering statistics selective chosen fulfills MBSE, but would require another 3 credit engineering course to be taken); †5 design selective - consult advisor for course selection. Engineering courses (30 credits of 20000+ level engineering courses, of which at least 15 credits are 30000+; MAX credits allowed in any one engineering discipline is 24.)

120 semester credits required for Bachelor of Science degree.

Graduation Index of 2.0 or higher and a min. GPA of 2.0 in Engineering courses at 20000+ level included in the POS. All other Purdue University graduation requirements including "There must be 32 credits of 30000+ level for graduation" must be satisfied.

*THE PLAN OF STUDY FROM 3RD SEMESTER ONWARDS SHOULD BE FILLED BY STUDENT AFTER CONSULTATION WITH ACADEMIC ADVISER.

Degree Requirements

The student is ultimately responsible for knowing and completing all degree requirements.

Degree Works is knowledge source for specific requirements and completion

Critical Course

The ♦ course is considered critical. A Critical Course is one that a student must be able to pass to persist and succeed in a particular major.

Foreign Language Courses

Foreign Language proficiency requirements vary by program. For acceptable languages and proficiency levels, see your advisor:

American Sign Language, Arabic, Chinese, French, German, (ancient) Greek, Hebrew, Italian, Japanese, Latin, Portuguese, Russian, Spanish

Multidisciplinary Engineering, BSE

About the Program

Multidisciplinary engineering is for students who plan to practice engineering as a career but whose specific career goals cannot be accommodated within one of the traditional engineering fields. The program offers considerable flexibility and permits you to choose from an established plan of study, or develop an individual plan of study to meet educational goals that can require bringing together multiple engineering disciplines, or non-engineering disciplines, at an advanced level to solve societal challenges. Established plans of study in the program include acoustical engineering, engineering management, visual design engineering, and general engineering, to name a few.

Link to https://engineering.purdue.edu/ENE/Academics/Undergrad

Degree Requirements and Supplemental Information

The full Program Requirements for 2016-17 Multidisciplinary Engineering include all Supplemental Information and selective lists of those categories which a student must fulfill in order to earn their degree. These are intended to be printer-friendly, but include less descriptive course detail.

Please see below for program requirements and the necessary degree fulfillments.

BSE/ IDE BSE

120 Credits for Graduation

Students need Cumulative GPA of 2.0 to Graduate

Multidisciplinary Engineering Major Courses

(45 credits of 20000+ level engineering courses, of which at least 18 credits are 30000+, and 6 credits 40000+; MAX credits allowed in any one engineering discipline is 24)

MUST TOTAL 45 CREDITS OF ENGINEERING COURSEWORK

Required Engineering Core (18-26 credits)

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 everage power, complex power, power factor correction, and maximum power transfer. Instantaneous and average power. Typically offered Fall Spring Summer.

- or Equivalent - Credit Hours: 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. Friction. Distributed forces. Centers of gravity and centroids. Applications from structural and machine elements, such as bars, trusses, and friction devices. Kinematics and equations of motion of a particle for rectilinear and curvilinear motion. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

or

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. Typically offered Fall Spring.

or

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

ME 30900 - Fluid Mechanics

Credit Hours: 4.00. Continuum, velocity field, fluid statics, manometers, basic conservation laws for systems and control volumes, dimensional analysis. Euler and Bernoulli equations, viscous flows, boundary layers, flow in channels and around submerged bodies, one-dimensional gas dynamics, turbomachinery. Typically offered Fall Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

- or Equivalent - Credit Hours: 3.00

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. Typically offered Spring Summer Fall.

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. Typically offered Spring.

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. Typically offered Fall Spring.

- or Equivalent - Credit Hours: 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. Typically offered Summer Fall Spring.

IDE 48300 - Multidisciplinary Engineering Analysis & 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. Permission of department required. Typically offered Fall.

- or Equivalent - Credit Hours: 1.00 - 3.00

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. Typically offered Fall, Spring.

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 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 41100. Typically offered Fall, Spring.

or

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. Typically offered Fall.

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. Typically offered Spring.

- or Equivalent - Credit Hours: 3.00 - 4.00 (Must be taken at Purdue West Lafayette)

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. Typically offered Spring.

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. Permission of instructor required. Typically offered Fall.

Engineering Selectives (8 credits)

Engineering Design (3 credits)

(Must be approved by Department of Engineering Education)

Examples:

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. Typically offered Spring.

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. Typically offered Fall Spring.

CE 45600 - Water And Wastewater Treatment

Credit Hours: 3.00. Fundamental concepts and design procedures for the treatment of municipal and industrial water and wastewaters. Problem assessment; determination of water and wastewater characteristics, biological, physical, and chemical treatment methods, process design, and disposal of residues. Typically offered Fall.

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. Typically offered Fall Spring.

Hands-on (not computer) Lab (2 credits)

Examples:

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

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. Typically offered Summer Fall Spring.

ME 30900 - Fluid Mechanics

Credit Hours: 4.00. Continuum, velocity field, fluid statics, manometers, basic conservation laws for systems and control volumes, dimensional analysis. Euler and Bernoulli equations, viscous flows, boundary layers, flow in channels and around submerged bodies, one-dimensional gas dynamics, turbomachinery. Typically offered Fall Spring.

Engineering Courses in materials/strength of materials (3 credits)

Examples:

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

Engineering AREA Selective/Elective Courses (21 or 20 credits)

One of these beginning courses (3-4 credits)

Examples:

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. Typically offered Spring.

BME 20100 - 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, electrostatis interactions along with other weak interactions discussed with reference to their importance in biomolecular systems in an engineering context. Typically offered Fall.

CE 20300 - Principles And Practice Of Geomatics

Credit Hours: 4.00. Basic surveying measurements and computations for engineering project control, mapping, and construction layout; theory of observational errors and error propagation; fundamental concepts of horizontal and vertical control systems; use of topographic maps and plan-profile sheets; computation of horizontal and vertical curves; introduction to computer tools used in Civil Engineering. Typically offered Fall Spring.

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. Nodern applications of nuclear technology, including nuclear medicine, food preservation, space reactors and propulsion. Typically offered Fall Spring.

A follow up to core courses (3 credits)

Examples:

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 servovalves, servomechanism, and manually controlled systems. Typically offered Fall.

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. Typically offered Fall Spring.

AAE 37200 - Jet Propulsion Power Plants

Credit Hours: 3.00. Basic operating principles and analysis of performance characteristics of jet propulsion systems (air breathing and rocket). Ramjet, turbojet, and turbofan cycle analysis. Analysis of flow through inlets, combustors, nozzles, compressors, turbines. Component matching. Liquid and solid propellant rockets. Not open to students with credit in ME 43800 . Typically offered Spring.

BME 30400 - Biomedical Transport Fundamentals

Credit Hours: 3.00. Fundamental concepts and principles of momentum, heat, and mass transport phenomena in the context of biomedical applications. Integrated biological topics include transport of physiological fluids (e.g. blood), mass transport (e.g. oxygen and nutrients), forced convection (e.g. hemodialysis) and unsteady-state molecular diffusion (e.g. drug delivery mechanisms). Typically offered Fall.

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. Typically offered Fall Spring.

One additional advanced (30000+) course (3 credits)

Examples:

ABE 30100 - Numerical And Computational Modeling 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. Typically offered Fall Spring.

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. Typically offered Fall.

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. Typically offered Spring.

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. Typically offered Fall.

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. Typically offered Spring.

Engineering Elective courses to meet students educational objectives (3-10 credits)

Engineering courses only.

Other Departmental/Program Course Requirements (47-54 credits)

* (can be substituted with approved alternative FYE courses: i.e. ENGR 141/142, etc.)

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Fall Spring Summer.

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

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). Typically offered Fall Spring Summer.

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

CS 15900 - Programming Applications For Engineers

Credit Hours: 3.00. Fundamental principles, concepts, and methods of programming (C and MATLAB), 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. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring Summer. CTL:IPS 1722 General Chemistry II w/lab

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 MA 26600. Typically offered Fall Spring Summer.

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 MA 35100. Typically offered Fall Spring Summer.

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, MA 36000, 36100, or MA 36600. Typically offered Fall Spring Summer.

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 MA 27100 . Typically offered Fall Spring Summer.

ENGL 10600 - First-Year Composition

Credit Hours: 4.00. Extensive practice in writing clear and effective prose. Instruction in organization, audience, style, and research-based writing. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400.

Choose One (Sophomore Science Selective)

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Fall.

Statistics Selective (3 credits)

Counts as either engineering or basic science & math

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. Typically offered Fall Spring.

IE 33000 - Probability And Statistics In Engineering II

Credit Hours: 3.00. Continuation of IE 23000. Introduction to statistical inference and experimental design. Correlation, regression, single and multi-factor ANOVA, non-parametric methods. Applications to statistical quality control. Typically offered Fall Spring.

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 MOE statistics elective. Permission of instructor is required. Typically offered Spring.

ECE 30200 - Probabilistic Methods In Electrical And Computer Engineering

Credit Hours: 3.00. An introductory treatment of probability theory, including distribution and density functions, moments, and random variables. Applications of normal and exponential distributions. Estimation of means, variances, correlation, and spectral density functions. Random processes and responses of linear systems to random inputs. Typically offered Fall Summer Spring.

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. Typically offered Fall Spring.

STAT 35000 - 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, 35000, 50100, and in no more than one of STAT 50300 and STAT 51100. Prerequisite: two semesters of college calculus. Typically offered Fall Spring.

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 35000, STAT 50100, and in no more than one of STAT 50300 and STAT 51100. Prerequisite: Two semesters of college calculus. Typically offered Fall Spring.

Hands-on (not computer) Lab (1 credit)

1 credit from CHM 11600, THTR Sound Studio, AD, Engineering Lab, etc.

Area Electives (1-12 credits)

Chosen to satisfy student's educational objectives

CGT 11000, CGT 16300, or CGT 16400 (2-3 credits) are required area course(s) for General Engineering.

Note: General Education (24 credits)

(Include ENGL 10600 and COM 11400 listed above)

- GE 1 - Credit Hours: 3.00
- GE 2 - Credit Hours: 3.00
- GE 3 - Credit Hours: 3.00
- GE 4 - Credit Hours: 3.00
- GE 5 - Credit Hours: 3.00
- GE 6 - Credit Hours: 3.00
- ENGL 10600
- COM 11400

All Must Total 120 Credits or more to Graduate

University Core

- Human Cultures Humanities - GE 1
- Human Cultures Behavioral/Social Science - GE 2
- Information Literacy - ENGL 10600
- Science Selective - CHM 11500
- Science Selective - PHYS 17200
- Science, Technology, & Society - GE 3
- Written Communication - ENGL 10600
- Oral Communication - COM 11400
- Quantitative Reasoning - MA 16500 or 16100

Program Requirements

Fall 1st Year

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

ENGL 10600 - First-Year Composition

Credit Hours: 4.00. Extensive practice in writing clear and effective prose. Instruction in organization, audience, style, and research-based writing. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400.

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). Typically offered Fall Spring Summer.

14 Credits

Spring 1st Year

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

CS 15900 - Programming Applications For Engineers

Credit Hours: 3.00. Fundamental principles, concepts, and methods of programming (C and MATLAB), 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. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring Summer. CTL:IPS 1722 General Chemistry II w/lab

16-17 Credits

Fall 2nd Year

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 MA 27100 . Typically offered Fall Spring Summer.

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. Friction. Distributed forces. Centers of gravity and centroids. Applications from structural and machine elements, such as bars,

trusses, and friction devices. Kinematics and equations of motion of a particle for rectilinear and curvilinear motion. Typically offered Fall Spring Summer.

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. Typically offered Spring Summer Fall.

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

- Area Elective - Credit Hours: 3.00 +3

16 Credits

Spring 2nd Year

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 MA 26600. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

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 everage power, complex power, power factor correction, and maximum power transfer. Instantaneous and average power. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

CGT 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. Typically offered Fall Spring.

- Area Elective - Credit Hours: 2.00 +3

15 Credits

Fall 3rd Year

- Engineering Class (Intro) - Credit Hours:3.00 +5

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. Typically offered Summer Fall Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Spring.

- General Education 1 (Core outcome H) - Credit Hours: 3.00

14 Credits

Spring 3rd Year

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 MOE statistics elective. Permission of instructor is required. Typically offered Spring.

- Engineering Class (follow-up) - Credit Hours: 1.00 +5
- Engineering Class (follow-up) - Credit Hours: 2.00 +9
- General Education 4 (30000 level or non-intro) - Credit Hours: 3.00
- General Education 2 (Core Outcome BSS) - Credit Hours: 3.00
- Area Elective - Credit Hours: 3.00

15 Credits

Fall 4th Year

IDE 48300 - Multidisciplinary Engineering Analysis & 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. Permission of department required. Typically offered Fall.

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. Typically offered Fall.

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. Permission of instructor required. Typically offered Fall.

- Engineering Class 40000+ level (advanced) - Credit Hours: 3.00 +5
- General Education 3 (Core Outcome STS) - Credit Hours: 3.00
- General Education 5 - Credit Hours: 3.00
- Area Elective - Credit Hours: 3.00

15 Credits

Spring 4th Year

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. Typically offered Spring.

- AREA MBS or other - Credit Hours: 3.00
- Area Elective - Credit Hours: 3.00
- Engineering Class 30000+ level: Credit Hours: 3.00
- General Education 6 (30000+ level or non-intro) - Credit Hours: 3.00

15 Credits

Note

** Satsifies a non-departmental Major Course Requirement.

+Multiple Options are available - the most common is listed.

+1 statics options

+2 thermodynamics options

+3 area electives are chosen with aid of advisor to advance the student's educational objectives

+4 dynamics options

+5 engineering selectives are chosen with aid of advisor to advance the student's educational objectives

+6 fluids option

+7 materials options

+8 statistics options

+9 design selective

+10 Capstone design selective

120 Semester Credits Required for Bachelor of Science in Engineering Degree.

2.0 Graduation GPA required for Bachelor of Science in Engineering Degree.

THE PLAN OF STUDY FROM THIRD SEMESTER ONWARDS SHOULD BE FILLED BY STUDENT IN CONSULTATION WITH ACADEMIC ADVISOR.

Degree Requirements

The student is ultimately responsible for knowing and completing all degree requirements.

Degree Works is knowledge source for specific requirements and completion

Critical Course

The ♦ course is considered critical. A Critical Course is one that a student must be able to pass to persist and succeed in a particular major.

Foreign Language Courses

Foreign Language proficiency requirements vary by program. For acceptable languages and proficiency levels, see your advisor:

American Sign Language, Arabic, Chinese, French, German, (ancient) Greek, Hebrew, Italian, Japanese, Latin, Portuguese, Russian, Spanish

Engineering Leadership Minor

With a launch date of January 2013, the 16-credit Engineering Leadership Minor offers undergraduate engineering students opportunities to engage in experiential leadership experiences, faculty coaching, and technical leadership across a variety of contexts.

Program Requirements

Students must complete 16 credit hours. Seven (7) credits include core courses, and nine (9) credits must include one experiential courses AND courses representing 1 or 2 concentration areas. A grade of "C" or higher is mandatory for courses counting towards minor.

Minor courses must be taken at the Purdue West Lafayette campus. The only exceptions are as follows:

- one equivalent transfer course from another university can be used if accepted by the ELP Director.
- one equivalent university substitution may be used if equivalent to an approved minor course.

No more than one substitution from either of the above two categories is acceptable.

Engineering Leadership Minor Concentrations

(Select 1 or 2 concentration areas.)

Communication

Communication concentration courses focus on the development of students' professional skills and engagement with technical and nontechnical audiences.

Creativity and Innovation

Creativity and Innovation concentration courses incorporate entrepreneurial and business principles with engineering leadership

Global and Societal Impact

Global and Societal Impact concentration courses explore the impact of leadership across diverse stakeholders and national and global communities

Ethics

Ethics concentration courses align closely with regulatory, legal, and policy-related aspects of engineering

Approved Courses

View the Approved Courses for Purdue College of Engineering's Engineering Leadership Minor here.

Division of Environmental and Ecological Engineering

About Environmental and Ecological Engineering

Environmental and Ecological engineers use the principles of systems engineering, biology, and chemistry to develop strategies to protect human and environmental health, and design sustainable systems and technologies. Our unique name, Environmental and Ecological Engineering, was chosen to highlight our approach to managing complex problems with an integrated perspective that considers both environmental issues and ecological interactions. In the undergraduate curriculum there is an early focus on systems thinking and systems understanding with the inclusion of significant course requirements in ecology,

sustainability, and industrial ecology. The EEE program strives for resilient design thinking that takes into account complexity and connectivity between systems.

Employment opportunities for EEE graduates are excellent. Most businesses, industries, all levels of government and many international organizations hire environmental and ecological engineers. Graduates are prepared to enter a wide-range of employment sectors in environmental and engineering fields including the industrial and construction, government, consulting, municipal and public service, non-governmental organizations (NGOs) and education sectors. Common career pathways center around:

Water and Watershed Stewardship: Ensuring that engineered systems and ecological systems interact sustainably.

Pollution Control, Monitoring, Abatement and Remediation: Wastewater, soil and air treatment/control, industrial waste control and recycling.

Industrial Ecology: Optimize industrial resource use; analyze and control of complete life-cycles of materials; industrial system redesign; energy efficiency optimization.

Sustainability: Provide for current needs without sacrificing future ability to meet needs. Consider the whole system, including complex interactions of environmental, technological and societal systems.

The U.S. Dept. of Labor projects substantial growth in jobs for the foreseeable future. Starting salaries are comparable to other Engineering fields and opportunities for advancement to positions of responsibility are excellent. Among the 14 **"Grand Challenges of Engineering"** announced by the National Academy of Engineering six of the 14 are explicitly in the domain of Environmental and Ecological engineering. Environmental engineering has a clear impact on societies and quality of life. Students interested in engineering that can make a positive difference for people should consider Environmental and Ecological Engineering. Meet with an advisor or faculty member to craft an individualized plan of study to meet your career goals.

Research within Environmental and Ecological Engineering may be characterized as being multidisciplinary and focused on cutting edge issues. The EEE discovery mission is positioned to respond to society's need to understand the world we live in, and to develop strategies for sustainably managing Earth's limited resources and ecosystems so that they will be available for generations to come. Topics emphasized within the EEE research portfolio include: environmental fate of air, water, and soil contaminants; sustainable urban design; renewable energy and the water-energy nexus; water and wastewater treatment; sustainable industrial systems; water, air, and nutrient cycling; sustainability engineering education; bio-based materials and products; industrial ecology and industrial processes; air quality.

Mission Statement

The Division of Environmental and Ecological Engineering (EEE) furthers the learning, discovery, and engagement missions of the Purdue College of Engineering with a focus on understanding the ways in which all engineering activities affect and are affected by the environment. EEE will help the College fulfill the responsibility of service to the state, the nation, and the world through innovative and comprehensive undergraduate and graduate education, collaborative and wide-reaching research and discovery, and the assumption of ever-greater levels of leadership in addressing global environmental and ecological problems.

Faculty

https://engineering.purdue.edu/EEE/People

Contact Information

Division of Environmental & Ecological Engineering
Purdue University
Potter Engineering Center, Room 364
500 Central Drive

West Lafayette, IN 47907-2022
Phone: (765) 496-9697

Fax: (754) 494-4482
Email: eee@purdue.edu

Environmental and Ecological Engineering, BSEEE

About the Program

Environmental and Ecological engineers use the principles of systems engineering, biology, and chemistry to develop strategies to protect human and environmental health, and design sustainable systems and technologies. Our unique name, Environmental and Ecological Engineering, was chosen to highlight our approach to managing complex problems with an integrated perspective that considers both environmental issues and ecological interactions. In the undergraduate curriculum there is an early focus on systems thinking and systems understanding with the inclusion of significant course requirements in ecology, sustainability, and industrial ecology. The EEE program strives for resilient design thinking that takes into account complexity and connectivity between systems.

Employment opportunities for EEE graduates are excellent. Most businesses, industries, all levels of government and many international organizations hire environmental and ecological engineers. Graduates are prepared to enter a wide-range of employment sectors in environmental and engineering fields including the industrial and construction, government, consulting, municipal and public service, non-governmental organizations (NGOs) and education sectors. Common career pathways center around:

Water and Watershed Stewardship: Ensuring that engineered systems and ecological systems interact sustainably.

Pollution Control, Monitoring, Abatement and Remediation: Wastewater, soil and air treatment/control, industrial waste control and recycling.

Industrial Ecology: Optimize industrial resource use; analyze and control of complete life-cycles of materials; industrial system redesign; energy efficiency optimization.

Sustainability: Provide for current needs without sacrificing future ability to meet needs. Consider the whole system, including complex interactions of environmental, technological and societal systems.

The U.S. Dept. of Labor projects substantial growth in jobs for the foreseeable future. Starting salaries are comparable to other Engineering fields and opportunities for advancement to positions of responsibility are excellent. Among the 14 "**Grand Challenges of Engineering**" announced by the National Academy of Engineering six of the 14 are explicitly in the domain of Environmental and Ecological engineering. Environmental engineering has a clear impact on societies and quality of life. Students interested in engineering that can make a positive difference for people should consider Environmental and Ecological Engineering. Meet with an advisor or faculty member to craft an individualized plan of study to meet your career goals.

Research within Environmental and Ecological Engineering may be characterized as being multidisciplinary and focused on cutting edge issues. The EEE discovery mission is positioned to respond to society's need to understand the world we live in, and to develop strategies for sustainably managing Earth's limited resources and ecosystems so that they will be available for generations to come. Topics emphasized within the EEE research portfolio include: environmental fate of air, water, and soil contaminants; sustainable urban design; renewable energy and the water-energy nexus; water and wastewater treatment; sustainable industrial systems; water, air, and nutrient cycling; sustainability engineering education; bio-based materials and products; industrial ecology and industrial processes; air quality.

Mission Statement

The Division of Environmental and Ecological Engineering (EEE) furthers the learning, discovery, and engagement missions of the Purdue College of Engineering with a focus on understanding the ways in which all engineering activities affect and are affected by the environment. EEE will help the College fulfill the responsibility of service to the state, the nation, and the world through innovative and comprehensive undergraduate and graduate education, collaborative and wide-reaching research and discovery, and the assumption of ever-greater levels of leadership in addressing global environmental and ecological problems.

Program Educational Objectives

Graduates of the EEE Undergraduate Program will:

• Be prepared to assume immediate employment in the fields of environmental and ecological engineering or to continue education in an advanced degree program;

• Participate fully and ethically in the advancement of the profession within five years of graduation, as measured by one or more of the following:

- Achievement of, or significant progress toward, professional licensure
- Achievement of, or significant progress toward, an advanced degree
- Publication of research results and/or field reports
- Advancement to leadership roles within an engineering organization
- Professional participation in international engineering activities
- Participation with organizations, agencies, or companies who offer solutions to major societal and environmental issues.

Program Outcomes

Upon graduation, graduates of EEE will show:

- An ability to apply knowledge of mathematics, science and engineering,
- An ability to design and conduct experiments, as well as to analyze and interpret data,
- An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- An ability to function on multidisciplinary team
- An ability to identify, formulate, and solve engineering problems
- An understanding of professional and ethical responsibility
- An ability to communicate effectively
- The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- A recognition of the need for, and an ability to engage in life-long learning
- A knowledge of contemporary issues
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
- A knowledge of the roles and responsibilities of public institutions and private organizations pertaining to environmental and ecological engineering
- A knowledge of sustainability tools used in all engineering thought, and an ability to use these tools in the design process

Degree Requirements and Supplemental Information

The full Program Requirements for 2016-17 Environmental and Ecological Engineering include all Supplemental Information and selective lists of those categories which a student must fulfill in order to earn their degree. These are intended to be printer-friendly, but include less descriptive course detail.

Please see below for program requirements and the necessary degree fulfillments.

BSEEE
EEE
128 Credits

Departmental/Program Major Courses (46 credits)

Required Major Courses (23 credits)

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.

EEE 29000 - Introduction to Environmental And Ecological Engineering Seminar

Credit Hours: 1.00. Seminar lectures and discussions to introduce students to the program and aspects of professional planning within Environmental and Ecological Engineering. 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. Typically offered Fall.

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. Typically offered Spring.

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. Typically offered Fall Spring Summer.

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.

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. Typically offered Spring.

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.

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.

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. Typically offered Spring.

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.

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. Typically offered Fall Spring.

- EEE 48000 - Environmental And Ecological Engineering Senior Design - Credit Hours: 2.00

Major Selectives (18cr) & Technical Electives (5cr)

- EEE Selective I - Column A - Credit Hours: 3.00
- EEE Selective II - Column B - Credit Hours: 3.00
- EEE Selective III - Column C - Credit Hours: 3.00
- EEE Selective IV - Credit Hours: 3.00
- EEE Selective V - Credit Hours: 3.00
- EEE Selective VI - Credit Hours: 3.00
- Technical Elective I - Credit Hours: 2.00
- Technical Elective II - Credit Hours: 3.00

Other Departmental/Program Course Requirements (55 credits)

(*satisfies FYE requirement)

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). Typically offered Fall Spring Summer.

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

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. Typically offered Fall Spring Summer. CTL:IPS 1722 General Chemistry II w/lab

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

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 MA 27100 . Typically offered Fall Spring Summer.

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 MA 26600. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Spring Summer Fall.

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. Typically offered Fall Spring.

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. Typically offered Fall.

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. Typically offered Summer Fall Spring.

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. Typically offered Summer Fall Spring.

STAT 35000 - 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, 35000, 50100, and in no more than one of STAT 50300 and STAT 51100. Prerequisite: two semesters of college calculus. Typically offered Fall Spring.

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. Typically offered Spring.

BIOL 58500 - Ecology

Credit Hours: 3.00. Ecological processes and dynamics of populations, communities, and ecosystems; physical, physiological, behavioral, and population genetic factors regulating population and community structure; case studies; field studies, and simulation models of life history attributes, competition, predation, parasitism, and mutualism. Typically offered Fall.

EEE General Education Electives (24 credits) and Free Elective (2-3)

- Satisy (H) - Credit Hours: 3.00
- Satisfy (BSS) - Credit Hours: 3.00
- *Satisfy (WC) - CreditHours: 3.00 - 4.00
- *Satisfy (OC) - Credit Hours: 3.00
- EEE intersection Society/Environment - Credit Hours: 3.00
- Additional 3 Credit Hours
- Additional 3 Credit Hours
- Additional 3 Credit Hours
- Free Elective - Credit Hours: 2.00 - 3.00

University Core Requirements

http://www.purdue.edu/provost/initiatives/curriculum/course.html

- Human Cultures Humanities - EEE Gen Ed (H)
- Human Cultures Behavioral/Social Science - EEE Gen Ed (BSS)
- Information Literacy - ENGR 13100
- Science #1 - CHM 11500
- Science #2 - PHYS 17200
- Science, Technology, and Society - BIOL 12100
- Written Communication - EEE Gen Ed (WC)
- Oral Communication - EEE Gen Ed (OC)
- Quantitative Reasoning - MA 16500

Program Requirements

Fall 1st Year

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). Typically offered Fall Spring Summer.

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

- Free Elective - Credit Hours: 1.00 - 2.00
- University Core (Written Communication) - Credit Hours: 3.00 - 4.00

15 Credits

Spring 1st Year

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Fall Spring Summer. CTL:IPS 1722 General Chemistry II w/lab

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

- University Core (Oral Communication) - Credit Hours: 3.00

17 Credits

Fall 2nd Year

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.

EEE 29000 - Introduction to Environmental And Ecological Engineering Seminar

Credit Hours: 1.00. Seminar lectures and discussions to introduce students to the program and aspects of professional planning within Environmental and Ecological Engineering. 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. Typically offered Fall.

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.

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. Typically offered Fall.

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 MA 27100 . Typically offered Fall Spring Summer.

- General Education Elective - Credit Hours: 3.00

16 Credits

Spring 2nd Year

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.

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 MA 26600. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Spring Summer Fall.

- General Education Elective - Credit Hours: 3.00

16 Credits

Fall 3rd Year

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.

STAT 35000 - 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, 35000, 50100, and in no more than one of STAT 50300 and STAT 51100. Prerequisite: two semesters of college calculus. Typically offered Fall Spring.

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. Typically offered Fall Spring.

- Technical Elective I - Credit Hours: 2.00
- EEE Selective I - Column A - Credit Hours: 3.00
- General Education Elective - Credit Hours: 3.00

17 Credits

Spring 3rd Year

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. Typically offered Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Spring.

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.

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. Typically offered Spring.

- EEE Selective II - Column B - Credit Hours: 3.00

16 Credits

Fall 4th Year

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. Typically offered Fall Spring.

- EEE Selective III - Column C - Credit Hours: 3.00
- EEE Selective IV - Credit Hours: 3.00

BIOL 58500 - Ecology

Credit Hours: 3.00. Ecological processes and dynamics of populations, communities, and ecosystems; physical, physiological, behavioral, and population genetic factors regulating population and community structure; case studies; field studies, and simulation models of life history attributes, competition, predation, parasitism, and mutualism. Typically offered Fall.

- General Education Elective - Credit Hours: 3.00
- Technical Elective II - Credit Hours: 3.00

16 Credits

Spring 4th Year

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. Typically offered Fall Spring.

- EEE Selective V - Credit Hours: 3.00
- EEE Selective VI - Credit Hours: 3.00
- General Education Elective - Credit Hours: 3.00
- General Education Elective - Credit Hours: 3.00
- Free Elective - Credit Hours: 1.00

15 Credits

Note

128 semester credits required for Bachelor of Science degree.

Students must have 32 credits at the 30000 level or above taken at Purdue.

2.0 Graduation GPA required for Bachelor of Science degree.

2.0 in College of Engineering courses at the 20000-level and above

Degree Requirements

The student is ultimately responsible for knowing and completing all degree requirements.

Degree Works is knowledge source for specific requirements and completion

Critical Course

The ♦ course is considered critical. A Critical Course is one that a student must be able to pass to persist and succeed in a particular major.

Foreign Language Courses

Foreign Language proficiency requirements vary by program. For acceptable languages and proficiency levels, see your advisor:

American Sign Language, Arabic, Chinese, French, German, (ancient) Greek, Hebrew, Italian, Japanese, Latin, Portuguese, Russian, Spanish

Environmental and Ecological Engineering Minor

EEE offers a minor in Environmental and Ecological Engineering, as a mechanism for students in all branches of engineering, and other related fields, to gain expertise and qualifications in EEE fields. The minor is most appropriate for students who have particular environmental interests in engineering, or who want to develop a career at the interface of EEE and their chosen major field. Environmental concerns touch all aspects of engineering, making this an attractive option for many students, and an attractive set of qualifications for many prospective employers.

The minor in EEE consists of six courses (17 or 18 credits), and is available to any student at Purdue who has met the co- and/or pre-requisites for courses in the EEE course sequence.

Students interested in the EEE minor should contact the Associate Director of Advising with any questions or for advice about appropriate courses.

Course requirements for the EEE minor

Option of:

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.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall.

Required:

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. Typically offered Spring.

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.

Option of:

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. Typically offered Fall Spring Summer.

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.

Required:

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. Typically offered Spring.

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. Typically offered Spring Fall Summer.

- Selective - Course from EEE Minor Selective List - Credit Hours: 3.00
- Selective - Course from EEE Minor Selective List - Credit Hours: 3.00

Note

Students successfully completing their sequence of courses, with at least a 2.0 grade point average for the sequence, will be granted a minor in Environmental and Ecological Engineering.

Depending on the course requirements for the student's major, several of these courses may also meet major requirements. Thus, students may need less than 6 additional courses beyond their major requirements to earn the EEE minor. For example, several engineering majors offer environment-related courses that are on the EEE Minor Selective List, and several majors allow the required courses for the EEE minor to count as technical or engineering electives for the major.

Students should note:

1. Many of the required courses have pre-requisites. Most (if not all) engineering students will meet the prerequisites for EEE/CE 35000, EEE/CE 35500, EEE 43000, and ME 59700. However, ABE 32500 requires AGRY 25500 (Soil Science), a course not typically taken by engineering majors except ABE students, and BIOL 28600 requires one or more of several introductory biology courses. The simplest pathway for engineering students who are not taking biology courses for other reasons is to take BIOL 12100, a two credit course offered every fall. BIOL 12100 alone is an accepted pre-requisite for BIOL 28600.
2. Students may propose additional courses to be added to the EEE Minor Selective List. The purpose of this requirement is to allow students to explore upper-level technical courses in their major that have an environmental theme, an environmental context, or an important environmental application. Many courses that may be appropriate, including special topics, experimental, study abroad, and independent study/research courses are added every semester, and EEE welcomes proposals from students to be able to count these courses for the EEE minor. Students should contact the Associate Director of Advising with questions, or if they have a course they would like to propose.

School of Industrial Engineering

About Industrial Engineering

Industrial engineers design, analyze, and manage complex human-integrated systems such as manufacturing systems, supply chain networks, and service systems. These systems typically consist of a combination of people, information, material, and equipment. In such systems industrial engineers determine how to optimize the system for maximum efficiency, effectiveness, throughput, safety, or some other objective of interest to the stakeholders of the system. To achieve these objectives, an industrial engineer draws upon knowledge of mathematics, along with physical, engineering, management, and behavioral sciences to function as a problem-solver, innovator, designer, coordinator, and system integrator. Industrial engineers are employed in and apply their skills in an extremely wide range of organizations, including manufacturing industries, service industries, and governmental agencies.

The complexity of these organizations and the emphasis on increased effectiveness, efficiency, and productivity have led to a growing need for industrial engineering analysis and design, resulting in an increased demand for industrial engineering graduates. This increased demand recognizes the modern industrial engineer's versatility and responsiveness to the challenges of a rapidly changing society. Industrial engineering is one of the nation's largest and most rapidly growing engineering professions.

The industrial engineering program prepares graduates for careers in all phases of industrial engineering and enables them to perform both technical and managerial functions that require scientific and engineering backgrounds. By combining the study of science, mathematics, engineering fundamentals, design, and management principles, an industrial engineering education provides a unique background and a sound basis for lifelong career development in engineering practice, research, or management.

Senior design projects consist of a real-world application of IE principles by teaming students with a local industry in Indiana. Teams have taken on full-scale projects like designing floor layouts for factories and hospitals, designing operations to improve system efficiency, reducing time and waste in processing, allocating resources to optimize system performance, and developing a safety plan for preventing work-related injuries.

Faculty

https://engineering.purdue.edu/IE/People/Faculty

Contact Information

Main Office

School of Industrial Engineering
Purdue University
315 N. Grant Street
West Lafayette, IN 47907-2023
Phone: +1 (765) 494-5400
Fax: +1 (765) 494-6802

Graduate Information

For Graduate Information please see Industrial Engineering Graduate Program Information.

Industrial Engineering, BSIE

About the Program

Industrial engineers design, analyze, and manage complex human-integrated systems such as manufacturing systems, supply chain networks, and service systems. These systems typically consist of a combination of people, information, material, and equipment. In such systems industrial engineers determine how to optimize the system for maximum efficiency, effectiveness, throughput, safety, or some other objective of interest to the stakeholders of the system. To achieve these objectives, an industrial engineer draws upon knowledge of mathematics, along with physical, engineering, management, and behavioral sciences to function as a problem-solver, innovator, designer, coordinator, and system integrator. Industrial engineers are employed in and apply their skills in an extremely wide range of organizations, including manufacturing industries, service industries, and governmental agencies.

The complexity of these organizations and the emphasis on increased effectiveness, efficiency, and productivity have led to a growing need for industrial engineering analysis and design, resulting in an increased demand for industrial engineering graduates. This increased demand recognizes the modern industrial engineer's versatility and responsiveness to the challenges of a rapidly changing society. Industrial engineering is one of the nation's largest and most rapidly growing engineering professions.

The industrial engineering program prepares graduates for careers in all phases of industrial engineering and enables them to perform both technical and managerial functions that require scientific and engineering backgrounds. By combining the study of science, mathematics, engineering fundamentals, design, and management principles, an industrial engineering education provides a unique background and a sound basis for lifelong career development in engineering practice, research, or management.

Senior design projects consist of a real-world application of IE principles by teaming students with a local industry in Indiana. Teams have taken on full-scale projects like designing floor layouts for factories and hospitals, designing operations to improve system efficiency, reducing time and waste in processing, allocating resources to optimize system performance, and developing a safety plan for preventing work-related injuries.

Degree Requirements and Supplemental Information

The full Program Requirements for 2016-17 Industrial Engineering include all Supplemental Information and selective lists of those categories which a student must fulfill in order to earn their degree. These are intended to be printer-friendly, but include less descriptive course detail.

Please see below for program requirements and the necessary degree fulfillments.

code-BSc-IE
123 Credits for Graduation

Students need cumulative GPA of 2.0 to graduate.

Industrial Engineering Major Courses (36 credits)

Required IE Courses (36 credits)

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Summer Fall Spring.

IE 33000 - Probability And Statistics In Engineering II

Credit Hours: 3.00. Continuation of IE 23000. Introduction to statistical inference and experimental design. Correlation, regression, single and multi-factor ANOVA, non-parametric methods. Applications to statistical quality control. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

IE 33600 - Operations Research - Stochastic Models

Credit Hours: 3.00. Introduction to probablistic models in operations research. Emphasis on Markov chains, Poisson processes, and their application to queueing systems. Typically offered Fall Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

IE Technical Electives - (15 credits)

NOTE: 6 credits required in IE courses, Must do two of the first three options listed below

https://engineering.purdue.edu/IE/Academics

IE 47000 - Manufacturing Processes II

Credit Hours: 3.00. The interrelations of materials, processes, and design with various aspects of manufacturing. Typically offered Fall Spring.

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. Typically offered Fall Spring.

- IE 5XX00 - Credit Hours: 3.00 or
- IE 47000 - Manufacturing Processes II or
- IE 48400 - Integrated Production Systems II
- Technical Elective I - Credit Hours: 3.00
- Technical Elective II - Credit Hours: 3.00
- Technical Elective III - Credit Hours: 3.00

Other Departmental/Program Course Requirements (55-57 credits)

Mathematics Requirements (18-20 cr.)

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Fall Spring Summer.

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 MA 27100 . Typically offered Fall Spring Summer.

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 MA 35100. Typically offered Fall Spring Summer.

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, MA 36000, 36100, or MA 36600. Typically offered Fall Spring Summer.

Science Requirements (14 cr.)

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

CS 15900 - Programming Applications For Engineers

Credit Hours: 3.00. Fundamental principles, concepts, and methods of programming (C and MATLAB), 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. Typically offered Summer Fall Spring.

General Engineering/Engineering Science Requirements (16 cr.)

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). Typically offered Fall Spring Summer.

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

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. Friction. Distributed forces. Centers of gravity and centroids. Applications from structural and machine elements, such as bars, trusses, and friction devices. Kinematics and equations of motion of a particle for rectilinear and curvilinear motion. Typically offered Fall Spring Summer.

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. Typically offered Spring Summer Fall.

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. Typically offered Fall Spring Summer.

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 everage power, complex power, power factor correction, and maximum power transfer. Instantaneous and average power. Typically offered Fall Spring Summer.

General Education Elective Requirements (24 cr.)

Foundational Core

(http://www.purdue.edu/provost/initiatives/curriculum/course.html)

- (satisfies Information Literacy selective for core; ENGL 10600/ENGL 10800 strongly recommended) - Credit Hours: 3.00
- (satisfies Written Communication selective for core; ENGL 10600/ENGL 10800 strongly recommended) - Credit Hours: 3.00
- (satisfies Oral Communication selective for core; COM 11400 strongly recommended) - Credit Hours: 3.00
- (satisfies Human Cultures: Humanities selective for core) - Credit Hours: 3.00

- (satisfies Human Cultures: Behavioral/Social Science selective for core) - Credit Hours: 3.00
- (satisfies Science, Technology & Society selective for core) - Credit Hours: 3.00

IE General Education Electives

(https://engineering.purdue.edu/IE/Academics/Undergrad/General%20Education%20Elective%20Program%20Overview)

University Core Requirements

- Human Cultures Humanities
- Human Cultures Behavioral/Social Science
- Information Literacy
- Science #1 - PHYS 17200
- Science #2 - CHM 11500
- Science, Technology & Society
- Written Communication
- Oral Communication
- Quantitative Reasoning - MA 16100/MA 16500

Program Requirements

Fall 1st Year

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

- General Education Elective I - Credit Hours: 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). Typically offered Fall Spring Summer.

14 Credits

Spring 1st Year

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

CS 15900 - Programming Applications For Engineers

Credit Hours: 3.00. Fundamental principles, concepts, and methods of programming (C and MATLAB), 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. Typically offered Summer Fall Spring.

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

- General Education Elective II - Credit Hours: 3.00

16 Credits

Fall 2nd Year

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. Typically offered Fall Spring.

- General Elective III - Credit Hours: 3.00

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 MA 27100 . Typically offered Fall Spring Summer.

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. Typically offered Summer Fall Spring.

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. Friction. Distributed forces. Centers of gravity and centroids. Applications from structural and machine elements, such as bars, trusses, and friction devices. Kinematics and equations of motion of a particle for rectilinear and curvilinear motion. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

16 Credits

Spring 2nd Year

IE 33000 - Probability And Statistics In Engineering II

Credit Hours: 3.00. Continuation of IE 23000. Introduction to statistical inference and experimental design. Correlation, regression, single and multi-factor ANOVA, non-parametric methods. Applications to statistical quality control. Typically offered Fall Spring.

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 MA 35100. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

- General Elective IV - Credit Hours: 3.00

15 Credits

Fall 3rd Year

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 everage power, complex power, power factor correction, and maximum power transfer. Instantaneous and average power. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Summer Fall Spring.

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, MA 36000, 36100, or MA 36600. Typically offered Fall Spring Summer.

- General Elective V - Credit Hours: 3.00

18 Credits

Spring 3rd Year

IE 33600 - Operations Research - Stochastic Models

Credit Hours: 3.00. Introduction to probablistic models in operations research. Emphasis on Markov chains, Poisson processes, and their application to queueing systems. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Spring Summer Fall.

- General Elective VI - Credit Hours: 3.00

15 Credits

Fall 4th Year

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

- Technical Elective I - Credit Hours: 3.00
- Technical Elective II - Credit Hours: 3.00
- General Elective VII - Credit Hours: 3.00

15 Credits

Spring 4th Year

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. Typically offered Fall Spring.

- Technical Elective III - Credit Hours: 3.00
- Technical Elective IV - Credit Hours: 3.00
- Technical Elective V - Credit Hours: 3.00
- General Elective VIII - Credit Hours: 3.00

15 Credits

Note

*Satisfies a University Core Requirement

**Satisfies a Non-departmental Major Course Requirement

123 semester credits required for Bachelor of Engineering degree.

2.0 Graduation GPA required for Bachelor of Engineering degree.

Degree Requirements

The student is ultimately responsible for knowing and completing all degree requirements.

Critical Course

The ♦ course is considered critical. A Critical Course is one that a student must be able to pass to persist and succeed in a particular major.

Foreign Language Courses

Foreign Language proficiency requirements vary by program. For acceptable languages and proficiency levels, see your advisor:

American Sign Language, Arabic, Chinese, French, German, (ancient) Greek, Hebrew, Italian, Japanese, Latin, Portuguese, Russian, Spanish

School of Materials Engineering

An Overview

Materials Engineering

Materials have enabled improvement in the products humans use since the beginning of recorded history. For example without the development of high purity silicon most of today's electronic devices would not exist. New low density, high stiffness composite materials have replaced metals and wood in tennis racquets. The performance of these materials stems from their properties which depend on their microscopic structure, also known as microstructure. Microstructure in turn depends upon materials processing, the fabrication of materials into functional shapes. Materials Engineering is the study of the interrelationships between processing, structure, properties and performance of materials.

Materials engineers study the structure and composition of materials on scales ranging from the electronic and atomic through the microscopic to the macroscopic. They develop new materials, improve traditional materials and are key people in the manufacturing process to produce materials reliably and economically. They seek to understand phenomena and to measure materials properties of all kinds, and they predict and evaluate the performance of real materials as structural or functional elements in engineering systems. Employment opportunities span all types of industry, such as aerospace, automotive, chemical, electronic, energy and primary material-producing companies.

Faculty

https://engineering.purdue.edu/MSE/People/ptFaculty

Contact Information

School of Materials Engineering
Neil Armstrong Hall of Engineering
701 West Stadium Avenue
West Lafayette, IN 47907-2045
Telephone: (765) 494-4100
FAX: (765) 494-1204
E-mail regarding academic programs: vicline@purdue.edu

Graduate Information

For Graduate Information please see Materials Engineering Graduate Program Information.

Materials Engineering, BSMSE

About the Program

Materials Engineering's academic programs have been developed around broad and basic phenomena, applied to all major classes of artificial materials-ceramics, metals, glasses, polymers, and semiconductors. The undergraduate and graduate programs integrate our faculty strengths across the field's four cornerstones: structure, properties, processing, and performance.

The first three years of study provide the basic educational core. In addition to the broad range of basic sciences and general education courses, the core provides a generic approach to the elements of the field. The core exploits the idea that the field is composed of the key elements of the field: synthesis/processing, composition/structure, properties and performance. This concept provides the foundation across all the materials classes: ceramics, metals, polymers, etc. The senior year, consisting of primarily electives, allows students the opportunity to focus their program toward personal goals in the field.

Degree Requirements and Supplemental Information

The full Program Requirements for 2016-17 Materials Engineering include all Supplemental Information and selective lists of those categories which a student must fulfill in order to earn their degree. These are intended to be printer-friendly, but include less descriptive course detail.

Please see below for program requirements and the necessary degree fulfillments.

code-BS-MSE
126 Credits for Graduation
Students must have a graduation index of 2.0
Student must have a minimum average GPA of 2.0 in MSE 200 and 300 level courses

Materials Engineering Major Courses (42 credits)

(https://engineering.purdue.edu/MSE/Academics/Undergrad/undergrad_manual.pdf)

Required MSE Courses (42 credits)

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. Typically offered Fall Spring.

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. Typically offered Fall.

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. Typically offered Spring.

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. Typically offered Spring.

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. Typically offered Spring.

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. Typically offered Spring.

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. Typically offered Fall.

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. Typically offered Fall.

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. Typically offered Spring.

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. Typically offered Fall.

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. Typically offered Spring.

MSE 39000 - Materials Engineering Seminar

Credit Hours: 0.00. Presentation and discussion of current topics in materials engineering. Typically offered Fall Spring.

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. Typically offered Fall.

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. Typically offered Spring.

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. Typically offered Fall.

MSE technical Electives - (18 credits)

(See the MSE undergraduate manual for an approved list.)

- Technical Elective I - Credit Hours: 3.00
- Technical Elective II - Credit Hours: 3.00
- Technical Elective III - Credit Hours: 3.00
- Technical Elective IV - Credit Hours: 3.00
- Technical Elective V or Support Area Elective I - Credit Hours: 3.00
- Technical Elective VI or Support Area Elective II - Credit Hours: 3.00

Other Departmental/Program Course Requirements (66 credits)

General Engineering Requirements (4 credits)

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). Typically offered Fall Spring Summer.

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). Typically offered Fall Spring.

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

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, team work, and modern engineering tools (e.g., C, Excel®, LabView®, MATLAB®, and Python). Typically offered Fall Spring.

Mathematics Requirements (18 credits)

Alternative sequence to MA 26500/266 is MA 26200 followed by either MA 30300 or MA 35100.

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Fall Spring Summer.

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 MA 27100 . Typically offered Fall Spring Summer.

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 MA 35100. Typically offered Fall Spring Summer.

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, MA 36000, 36100, or MA 36600. Typically offered Fall Spring Summer.

Science Requirements (20 credits)

PHYS 25200 may be replaced by another 1-credit hour science laboratory as listed in the MSE undergraduate manual

PHYS 27200 replaces both PHYS 24100 and PHYS 25200

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

- CHM 13600 (satisfies Science Selective for core)

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. Typically offered Fall Spring Summer. CTL:IPS 1722 General Chemistry II w/lab

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. Advanced Placement chemistry credit (level 4 or 5) or admission to the honors program

in Science or Engineering or a score of at least 70% on the CHM 11500 test-out exam. 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. Typically offered Fall.

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. Typically offered Fall Spring. Both CHM 25700 + CHM 25701= CTL:IPS 1723 Organic And Biochemistry w/lab

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring.

PHYS 25200 - Electricity And Optics Laboratory

Credit Hours: 1.00. Selected experiments in electric fields, magnetic fields, steady-state and transient d.c. circuits, thermodynamics, and optics. Typically offered Fall Spring Summer.

MSE General Education Requirement (24 credits)

ENGL 10600 - First-Year Composition

Credit Hours: 4.00. Extensive practice in writing clear and effective prose. Instruction in organization, audience, style, and research-based writing. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400.

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

Foundation Core

- G.E. I (satisfies Human Cultures Humanities for core) - Credit Hours: 3.00
- G.E. II (satisfies Human Cultures Behavioral/Social Science for core) - Credit Hours: 3.00
- G.E. III (satisfies Science, Technology & Society for core) - Credit Hours: 3.00

MSE General Education Electives (see the MSE undergraduate manual for an approved list)

- G.E. IV - Credit Hours: 3.00
- G.E. V - Credit Hours: 3.00
- G.E. VI - Credit Hours: 3.00

University Core Requirements

- Human Cultures Humanities
- Human Cultures Behavioral/Social Science
- Information Literacy
- Science #1
- Science #2
- Science, Technology, and Society
- Written Communication
- Oral Communication
- Quantitative Reasoning
- For a complete listing of course selectives, visit the Provost's Website or click here.

Program Requirements

Fall 1st Year

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 MA 27100 , or the honors calculus course

MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

ENGL 10600 - First-Year Composition

Credit Hours: 4.00. Extensive practice in writing clear and effective prose. Instruction in organization, audience, style, and research-based writing. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400.

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). Typically offered Fall Spring Summer.

14(13) Credits

Spring 1st Year

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

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. Typically offered Fall Spring Summer. CTL:IPS 1722 General Chemistry II w/lab

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

17 Credits

Fall 2nd Year

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. Typically offered Fall Spring.

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. Typically offered Fall.

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 MA 27100 . Typically offered Fall Spring Summer.

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

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 MA 35100. Typically offered Fall Spring Summer.

MSE 39000 - Materials Engineering Seminar

Credit Hours: 0.00. Presentation and discussion of current topics in materials engineering. Typically offered Fall Spring.

16 Credits

Spring 2nd Year

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. Typically offered Spring.

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. Typically offered Spring.

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. Typically offered Spring.

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, MA 36000, 36100, or MA 36600. Typically offered Fall Spring Summer.

- General Elective I - Credit Hours: 3.00

PHYS 25200 - Electricity And Optics Laboratory

Credit Hours: 1.00. Selected experiments in electric fields, magnetic fields, steady-state and transient d.c. circuits, thermodynamics, and optics. Typically offered Fall Spring Summer.

MSE 39000 - Materials Engineering Seminar

Credit Hours: 0.00. Presentation and discussion of current topics in materials engineering. Typically offered Fall Spring.

16 Credits

Fall 3rd Year

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. Typically offered Fall.

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. Typically offered Fall.

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. Typically offered Fall.

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. Typically offered Fall Spring. Both CHM 25700 + CHM 25701= CTL:IPS 1723 Organic And Biochemistry w/lab

- General Elective II - Credit Hours: 3.00

MSE 39000 - Materials Engineering Seminar

Credit Hours: 0.00. Presentation and discussion of current topics in materials engineering. Typically offered Fall Spring.

16 Credits

Spring 3rd Year

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. Typically offered Spring.

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. Typically offered Spring.

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. Typically offered Spring.

- Technical Elective I - Credit Hours: 3.00
- General Elective III - Credit Hours: 3.00

MSE 39000 - Materials Engineering Seminar

Credit Hours: 0.00. Presentation and discussion of current topics in materials engineering. Typically offered Fall Spring.

15 Credits

Fall 4th Year

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. Typically offered Fall.

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. Typically offered Fall.

MSE 39000 - Materials Engineering Seminar

Credit Hours: 0.00. Presentation and discussion of current topics in materials engineering. Typically offered Fall Spring.

- General Elective IV - Credit Hours: 3.00
- Technical Elective II - Credit Hours: 3.00
- Technical Elective III - Credit Hours: 3.00

15 Credits

Spring 4th Year

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. Typically offered Spring.

- Technical Elective IV - Credit Hours: 3.00
- Technical Elective V - Credit Hours: 3.00
- Technical Elective VI - Credit Hours: 3.00
- General Elective V - Credit Hours: 3.00
- General Elective VI - Credit Hours: 3.00

18 Credits

Note

126 semester credits required for Bachelor of Engineering degree.

Students must have a graduation index of 2.0 and must have a minimum average GPA of 2.0 in MSE 20000 and 30000 leve courses.

Degree Requirements

The student is ultimately responsible for knowing and completing all degree requirements.

Degree Works is knowledge source for specific requirements and completion

Critical Course

The ♦ course is considered critical. A Critical Course is one that a student must be able to pass to persist and succeed in a particular major.

Foreign Language Courses

Foreign Language proficiency requirements vary by program. For acceptable languages and proficiency levels, see your advisor:

American Sign Language, Arabic, Chinese, French, German, (ancient) Greek, Hebrew, Italian, Japanese, Latin, Portuguese, Russian, Spanish

Materials Science and Engineering Minor

A minor in Materials Engineering is available to students with an entering cumulative GPA of 3.2 or better. A MSE Minor will be granted on the completion of the following 18 hrs.

The core requirements are

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. Typically offered Fall Spring.

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. Typically offered Spring.

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. Typically offered Spring.

And three of the following electives

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. Typically offered Spring.

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. Typically offered Fall.

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. Typically offered Fall.

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. Typically offered Spring.

- MSE 5xx00 level courses (with Faculty Approval) (Offered Fall and Spring) - Credit Hours: 3.00

Note

No laboratory classes can fulfill the MSE minor requirements. This includes MSE 23500, MSE 33500, MSE 36700, MSE 43000, MSE 44000, and MSE 49900.

Up to two MSE 5xx level courses can be taken to fulfill the 18 credit hours required.

If student is ME, NE, or ChE, then MSE 34000 is not allowed and the 9 credits must be selected from rest of elective list.

A grade of "C" (not "C-") or better in all of the courses taken toward the MSE minor is required.

Generally, all of the above prescribed minor courses must be taken at the Purdue West Lafayette campus.

The pre- and co-requisites for MSE courses relevant to the minor are

Class	Pre- and Co-requisites

MSE 23000	Pre: CHM 11500, MA 16500
MSE 26000	Pre: CHM 11500, MA 16500; Co: MSE 23000
MSE 27000	Pre: MA 26100; Co: MSE 23000, MA 26500
MSE 33000	Pre: MSE 23000; MSE 26000
MSE 34000	Pre: MA 26600
MSE 37000	Pre: MSE 23000, MSE 27000, PHYS 24100
MSE 38200	Pre: MA 26500 and Statics/Dynamics Course
MSE 5xx00	Pre: MSE 23000 and Consent of Instructor[2]

Note

[1] NUCL 32000 and CE 23100 are also acceptable.
[2] Prerequisites for MSE 5xx00 courses will vary by course.

School of Mechanical Engineering

An Overview

Mechanical Engineering comprises a wide range of activities that include researching, designing, developing, manufacturing, managing and controlling engineering systems and their components. The many industrial sectors to which mechanical engineers make substantial contributions include:

- aerospace/defense,
- automotive,
- biotechnology/pharmaceutical,
- chemical/petroleum,
- computers/electronics,
- construction,
- consumer/food products,
- energy/nuclear,
- heavy/off-road equipment,
- engineering consulting,
- thermal systems,
- graduate education,among others.

Beyond these traditional roles, mechanical engineers are increasingly pursuing a number of non-traditional career paths including:

- business/financial services,
- dentistry,

- education,
- engineering and public policy,
- law (patent law and intellectual property), and
- medicine/healthcare (prosthetics, surgical robotics and instruments, human motion kinetics, etc.).

As such, mechanical engineering is the broadest of all of the engineering disciplines and provides the widest range of career opportunities. Graduates of the School of Mechanical Engineering have gone on to become CEOs, entrepreneurs, chief engineers, business analysts, astronauts, faculty, physicians, dentists, patent lawyers and public policy leaders, and entrepreneurs.

Faculty

Students interested in pursuing undergraduate research opportunities in the School of Mechanical Engineering are encouraged to contact faculty who conduct research in their chosen area of interest. A comprehensive list of Mechanical Engineering faculty along with a brief resume for each is provided at the link listed below.

https://engineering.purdue.edu/ME/People/index.html

Contact Information

Questions concerning any aspect of the School of Mechanical Engineering can be directed to any of the following offices.

Undergraduate Office

School of Mechanical Engineering
Purdue University
585 Purdue Mall
West Lafayette, IN 47907-2088
Phone: (765) 494-5689
Fax: (765) 494-0051

meugoff@ecn.purdue.edu

Graduate Office
megradoffice@purdue.edu and megradapps@purdue.edu

Development Office
mealumni@purdue.edu

Administration
mehead@ecn.purdue.edu

Graduate Information

For Graduate Information please see Mechanical Engineering Graduate Program Information .

Mechanical Engineering, BSME

About the Program

Program Educational Objectives and Outcomes

The School of Mechanical Engineering offers coursework leading to the Bachelor of Science in Mechanical Engineering (B.S.ME).

The program educational objectives of the School of Mechanical Engineering are to matriculate graduates who conduct themselves in a responsible, professional and ethical manner (citizenship), and who upon the years following graduation, are committed to:

1. Discovery

- Actively embracing leadership roles in the practice of engineering in industry and government organizations (including both traditional and emerging technical areas).
- Conducting research and development across disciplines (via graduate study or industry) to advance technology and foster innovation in order to compete successfully in the global economy.
- Applying their engineering problem-solving skills to less-traditional career paths (e.g., law, medicine, business, education, start-up ventures, public policy, etc.).

2. Learning

- Actively participating in ongoing professional development opportunities (conferences, workshops, short courses, graduate education, etc.).
- Updating and adapting their core knowledge and abilities to compete in the ever-changing global enterprise.
- Developing new knowledge and skills to pursue new career opportunities.

3. Engagement

- Serving as ambassadors for the engineering profession, inspiring others to develop a passion for engineering.
- Exchanging and applying knowledge to create new opportunities that advance society and solve a variety of technical and social problems.
- Advancing entrepreneurial ventures and fostering activities that support sustainable economic development to enhance the quality of life of people in the state, across the country and around the world.

In order for students to achieve these objectives. the program of study should satisfy the comprehensive set of program outcomes categorized in three areas: engineering foundational skills, professional skills, and emerging skills.

Engineering Foundational Skills

The program should provide students with a solid technical foundation for their careers. This foundation should include:

- Engineering fundamentals.
- Analytical skills.
- Experimental skills.
- Modern engineering tools.
- Design skills.
- Impact of engineering solutions.

Professional Skills

The program should prepare students to be effective engineers in the professional workplace. To this end, students should develop the following professional skills:

- Communication skills.
- Teamwork skills.
- Professional and ethical responsibility.
- Contemporary issues.
- Lifelong learning.

Emerging Skills

The program should assist students in fostering a number of other emerging skills that are becoming increasingly critical to the success of future engineers. These emerging skills include:

- Leadership.
- Global engineering skills.
- Innovation.
- Entrepreneurship.

Mechanical Engineering Program Description

To achieve the above stated objectives and outcomes, the School of Mechanical Engineering has developed a comprehensive, integrated curriculum to provide students with a broad base on which to build an engineering career. It is founded on basic sciences, including physics, chemistry and mathematics; computer science and computer graphics; and oral and written communications skills.

To this foundation, a core of engineering science and design courses are added in three main curriculum stems: mechanical sciences (statics, dynamics, mechanics of materials, and structures and properties of materials), information technologies (electric circuits and electronics, instrumentation, system modeling and controls), and thermal-fluid sciences (thermodynamics, fluid mechanics and heat transfer).

Throughout the core curriculum, students gain extensive laboratory and computer experience via modern facilities in all basic areas of the discipline. In addition, the curriculum provides an integrated innovation, design and entrepreneurship experience. This experience - which begins with a sophomore-level cornerstone course and culminates with a senior-level capstone course - emphasizes innovation, problem-solving, leadership, teamwork, communication skills, practical hands-on experience with various product design processes and entrepreneurship. Students then specialize by selecting two restricted electives that provide additional depth in two of the three main stems of the curriculum. Students can further specialize with 12 credit hours of technical/professional electives in engineering, mathematics, natural sciences, select management courses or individualized project courses (ME 49700).

Just as design experiences are integrated throughout the mechanical engineering curriculum, so too are opportunities to communicate technical information, both orally and in writing. Students experience a variety of communications opportunities in progressing through the mechanical engineering program.

As a freshman, each student is required to take both oral and written communication courses. These courses lay the foundation for future oral and written communications. In the sophomore seminar course (ME 29000), students learn how to create professional documents and correspondence (e.g., resumes, letters, memos, etc.), develop personal interview skills, learn the basics of Web publishing and develop a global engineering professional profile. In ME 26300, the cornerstone design course, student teams prepare formal design reports, give oral presentations and maintain individual design notebooks. The communications experiences culminate in the capstone design course (ME 46300), in which student teams prepare presentations and reports for the sponsors of their selected design projects and compete in an innovation competition.

A major feature of the curriculum is the flexible 39-credit-hour elective program, of which 24 credit hours are taken during the senior year. This allows for a program with considerable breadth while also permitting the depth and specialization in an area of the student's professional interests.

Because of the wide scope of activities in which the mechanical engineer is engaged and because of the broad spectrum of student interests, mechanical engineering graduates may choose either to enter the profession immediately after receiving their bachelor's degree or go directly to graduate school. In either case, the curriculum provides a firm foundation for continuing education and fosters a commitment to lifelong learning, whether it is as a member of the engineering profession, through formal graduate work or through independent study.

Visit the School of Mechanical Engineering website for more current information about the undergraduate programs.

Scholarships

The School of Mechanical Engineering sponsors a broad array of need-based and merit-based scholarships. Eligible candidates (incoming sophomores through senior mechanical engineering students) are invited in mid-spring to submit applications for consideration. To qualify, students are required to have a scholastic index of 2.8 or better on a 4.0 scale. Awards range from $500 to $10,000 and total more than $1 million. This scholarship money is in addition to the University's Trustees and Presidential scholarships in Mechanical Engineering, which, when fully funded, will include more than 300 awards worth a total of more than $2 million.

Professional Student Organizations and Activities

Student organizations provide valuable opportunities for students to enhance organizational, communication, teamwork and leadership skills. Students also are strongly encouraged to become involved in one or more extracurricular activities. Student organizations specific to mechanical engineering include the American Society of Mechanical Engineers (ASME), the Purdue Mechanical Engineering Ambassadors (PMEA), Pi Tau Sigma (the Mechanical Engineering Honor Society) and the Society of Automotive Engineers (SAE).

Professional Practice Program with Industry or Governmental Organizations

The professional practice programs enable qualified students to obtain experiences related to their specific engineering discipline with selected employers while completing the requirements of their undergraduate degree. Students can participate in a five-session co-op, a three-session co-op or an internship program. International internships also are available through the Global Partners in Apprenticeship Learning (G-PAL) Program within the Office Professional Practice (OPP). OPP also offers the GEARE program, which combines domestic and international work experiences, a design project component and an opportunity to study abroad.
For more information, visit the Office of Professional Practice website.

Honors Program
An honors program is available for outstanding mechanical engineering undergraduate students. The honors program is a mechanism for:

- Participating in small enrollment, targeted courses.
- Participating in a directed project in their area of interest.
- Stimulating interest in graduate study and research/academic careers.
- Developing a community of honors scholars.
- Allowing for special recognition of high levels of academic achievement.

The Honors program utilizes the technical, general education and free elective requirements for the B.S.ME degree in a way that is consistent with the honors designation. Admission to the Honors program is automatic for any student meeting the admission requirements for the First-Year Engineering Honors program. Students not in the First-Year Engineering Honors program can apply for admission into the Honors program by completing an honors application and meeting the required cumulative GPA for admission.

Completion of the Honors program requires earning a required minimum number of honor points (credit hours) earned in one of the following manners:

- Take honors courses (including the sophomore and junior honors seminar sequence).
- Complete honors experiences (e.g., study abroad, special work experiences, etc.).
- Take honors strategic initiative courses (defined by the College of Engineering).

Successful completion of the minimum number of honors points will earn a student a certificate and his/her transcript will read, "Bachelor of Science Mechanical Engineering - Honors Program Awarded at West Lafayette."
More details on the Honors program can be found on the ME website.

Study Abroad
Global competency skills are a major focus in the School of Mechanical Engineering. By graduation, roughly 30 percent of ME graduates have international experience (as compared to about 3 percent nationally in engineering). The School of Mechanical Engineering has developed an extensive and multi-faceted study abroad program that ranges from an extensive eight-month

experience abroad to a three-week stint abroad. This staged program allows students to pick and choose the program that best fits their requirements and timing. A brief summary of these programs are provided below. Additional information can be found on the ME Global Programs website.

GEARE Program. The Global Engineering Alliance for Research and Education (GEARE) program is the flagship international program. The GEARE program involves an eight-month experience abroad that includes both a domestic and international internship, a semester of study abroad with fully transferable engineering course credits (all taught in English) and a one-semester to two semester design team project with students from the international partner institution.

ETA Program. The Engineering Term Abroad (ETA) program is a one-semester study abroad at a partner institution and includes fully transferable engineering course credits (all taught in English). This enables participating students to continue with their engineering subjects and thus stay on track for graduation while still gaining international experience. Current partner institutions exist in Australia, China, England, France, Germany, India, New Zealand, Singapore, Spain and Turkey, among other locations and is our most popular international program.

RTA Program. The Research Term Abroad (RTA) program is designed to enable interested students to conduct undergraduate engineering research at a partner institution. Currently our primary partners are Hannover University and Clausthal University of Technology in Germany.

G-PAL Program. The Global Partners in Apprenticeship (G-PAL) program offers a pair of concurrent international internship positions, one for a student from the target international partner country and one for a student from the U.S. Preferably both students will be housed at the international student's home for the duration of the assignment abroad. The G-PAL students can also come from two different academic disciplines. Internships are typically three months to six months in duration.

MTA. Special Maymester Term Abroad (MTA) programs are available to select locations and provide students with a short three-week stint in a foreign country. Brief stints like this enable students to test the waters to see if they would be interested in a more protracted time abroad. As such, this program compliments other existing programs and provides a vehicle for students experience going abroad without a long-term commitment. Currently, the Maymester program involves international experiences in China.

Registration for the Fundamentals of Engineering Examination

Mechanical engineering seniors are strongly encouraged to take the first step to becoming registered professional engineers (PEs) by registering and successfully completing the Fundamentals of Engineering (FE) examination, also called the Engineer in Training (EIT) exam. Seniors can register to take the FE exam at the West Lafayette campus in their senior year prior to graduation. Announcements appear periodically throughout the semester to alert students to this opportunity. The FE exam can be taken daily at Purdue in the months of January/February, April/May, July/August, and October/November. To aid seniors in their preparation for the exam, Chi Epsilon, the Civil Engineering Honor Society organizes annual faculty-taught review sessions on key topics covered on the FE exam. Also, a simple internet search of FE Review Sessions can provide valuable review information available at a student's convenience. Typically, 50 to 75 percent of graduating mechanical engineering seniors register to take the FE exam, and 98 to 100 percent pass the exam on the first attempt.

After passing the FE exam and completing four years of engineering experience after graduation, an engineer is typically eligible to take the professional engineering (PE) licensing examination. Specific information about the EIT exam is available on the School of Mechanical Engineering home page. Questions about the FE Exam or the process to become a registered professional engineer should be directed to the Associate Head of the School of Mechanical Engineering.

Undergraduate Research Opportunities

In addition to the traditional classroom experience, students in the School of Mechanical Engineering have the opportunity to conduct cutting-edge research in one of the thirteen ME Research Areas listed below:

- Acoustics and Noise Control
- Bioengineering
- Combustion
- Design
- Fluid Mechanics and Propulsion
- Heat Transfer
- Heating, Ventilation, Air Conditioning and Refrigeration
- Manufacturing and Materials Processing
- Mechanics and Vibrations
- Nanotechnology
- Robotics
- Solid Mechanics
- Systems, Measurement and Control

Students discover first-hand how research contributes to the advancement of human knowledge. They experience a change of pace from formal classroom activities and gain valuable hands-on skills applicable to both research and non-research careers. In addition, students develop their knowledge of the research process and tools used by professional researchers and increase their proficiencies in technical communication. Such experiences help students connect their summer experience with their future goals, with particular focus on post-graduate education.

Interested students are strongly encouraged to consider participation in the Summer Undergraduate Research Fellowship (SURF) Program or the Discovery Park Undergraduate Research Internship (DURI) Program. To find Purdue faculty who are active in these areas, please visit the Indiana Database of University Research Expertise (INDURE). Use the advanced search to filter results by keyword, area, grants, etc.

Preparation for Graduate Study

The School of Mechanical Engineering also offers graduate work leading to the degrees of Master of Science (M.S.), for students with non-engineering degrees; Master of Science in Engineering (M.S.E), for students with non-mechanical engineering degrees; Master of Science in mechanical engineering (M.S.ME), for students with B.S.ME degrees; and the Doctor of Philosophy (Ph.D.).

The regular undergraduate curriculum (and the honors undergraduate program) provide a strong foundation for graduate study, and students who complete either of the programs with appropriate academic records are encouraged to pursue graduate work. Many graduates have continued their education by pursuing advanced studies in engineering, business, law, medicine, dentistry and public policy.

For answers to your questions about graduate study, visit the Mechanical Engineering Graduate Office in the Mechanical Engineering Building, Room 1003, call 765-494-5730, email megrad@ecn.purdue.edu or visit the ME website.

Combined B.S.ME/M.S.ME Program

A combined B.S.ME/M.S.ME program is available for outstanding mechanical engineering undergraduate students. This program is anticipated to take approximately five years to complete (with the M.S.ME non-thesis option) and result in receiving both the B.S.ME and M.S.ME degrees.

The B.S.ME/M.S.ME program is a mechanism for:

A. Providing a seamless transition from the B.S.ME to the M.S.ME program.
B. Participating in a directed project in their area of interest.
C. Stimulating interest in graduate study and research/academic careers.
D. Allowing for special recognition of high levels of academic achievement.

The B.S.ME/M.S.ME program requires students to take 12 hours of graduate coursework toward their B.S.ME professional elective requirement. This same 12 hours likewise count toward the M.S.ME degree.

Interested students typically apply as an "internal ME applicant" in the second half of their junior year after completion of 81 hours of coursework in the undergraduate program with a cumulative undergraduate GPA of 3.2 or higher. If a GPA of 3.0 has been maintained and grades of "B" or better are received in the first two graduate courses (typically in the seventh semester), the student will be asked to formally apply to the Purdue Graduate School at the beginning of his or her eighth semester of the senior year.

Complete details of the combined B.S.ME/M.S.ME program can be found on the Web. Questions about this information should be directed to Julayne Moser, email: moser@purdue.edu.

B.S.ME/M.B.A. 5-Year Program

The School of Mechanical Engineering in conjunction with the Krannert School of Management offers an integrated five-year B.S.ME/M.B.A. program to high-achieving students, Each year a significant number of engineering graduates pursue M.B.A.s at U.S. business schools. The M.B.A. is seen as a complement to the engineer's technical education, providing an understanding of the business context within which many technical decisions are made. Many employers also have a strong preference for hiring M.B.A.s with engineering backgrounds, particularly in the manufacturing and technology sectors, in which Krannert and the College of Engineering enjoy many longstanding relationships with leading employers. The B.S.ME/M.B.A. combined degree offering will provide top B.S.ME students an efficient and cost-effective path for developing management knowledge as well as the highly valued credential of an M.B.A. degree. It will also open new job opportunities for the program graduates that expedite their progression to high-level management positions.

Basic admission requirements include:

1. Maintaining a 3.5 graduation GPA.
2. Securing at least one session of internship and/or co-op work experience prior to the senior year.
3. Securing advanced credit (preferably math) or willingness to accelerate your ME program by taking summer courses.
4. Completing an application and successfully interviewing for a position with the Krannert School of Management faculty.

More details about the B.S.ME/M.B.A. program are available online.

Degree Requirements and Supplemental Information

The full Program Requirements for 2016-17 Mechanical Engineering include all Supplemental Information and selective lists of those categories which a student must fulfill in order to earn their degree. These are intended to be printer-friendly, but include less descriptive course detail.

Please see below for program requirements and the necessary degree fulfillments.

code-BS-ME
Code-XXX
128 Credits for Graduation
Students need cumulative GPA of 2.0 to graduate.
Students need ME Core GPA of 2.0 to graduate (ME Major + Other School/Department Reqs).

Mechanical Engineering Major Courses (43 credits)

(https://engineering.purdue.edu/ME/Academics/Undergraduate/index.html)

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. Typically offered Spring Summer Fall.

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. Friction. Distributed forces. Centers of gravity and centroids. Applications from structural and machine elements, such as bars, trusses, and friction devices. Kinematics and equations of motion of a particle for rectilinear and curvilinear motion. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

ME 30900 - Fluid Mechanics

Credit Hours: 4.00. Continuum, velocity field, fluid statics, manometers, basic conservation laws for systems and control volumes, dimensional analysis. Euler and Bernoulli equations, viscous flows, boundary layers, flow in channels and around submerged bodies, one-dimensional gas dynamics, turbomachinery. Typically offered Fall Spring.

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. Typically offered Fall Spring.

ME 45200 - Machine Design II

Credit Hours: 3.00. Design and analysis of mechanical systems, for fluctuating loading. Fatigue analysis. Application of design fundamentals to mechanical components, and integration of components to form systems. Typically offered Fall Spring.

ME 47500 - Automatic Control Systems

Credit Hours: 3.00. Controller design in frequency domain with introduction to digital systems and control. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. The laboratory experience provides open-ended projects to reinforce the design process. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

ME Professional Selectives (12 credits)

(https://engineering.purdue.edu/ME/Academics/Undergraduate/METechElects.html)

- Technical Elective I - Credit Hours: 3.00
- Technical Elective II - Credit Hours: 3.00
- Technical Elective III - Credit Hours: 3.00
- Technical Elective IV - Credit Hours: 3.00

First-Year Engineering Course Requirements (29-31 credits)

*(http://www.purdue.edu/provost/initiatives/curriculum/course.html)

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

ENGL 10600 - First-Year Composition

Credit Hours: 4.00. Extensive practice in writing clear and effective prose. Instruction in organization, audience, style, and research-based writing. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400.

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). Typically offered Fall Spring Summer.

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

Science Selective

Select one from list (all options accepted).

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. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring Summer. CTL:IPS 1722 General Chemistry II w/lab

CS 15900 - Programming Applications For Engineers

Credit Hours: 3.00. Fundamental principles, concepts, and methods of programming (C and MATLAB), 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. Typically offered Summer Fall Spring.

Other School/Department Course Requirements (23 credits)

CGT 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. Typically offered Fall Spring.

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 everage power, complex power, power factor correction, and maximum power transfer. Instantaneous and average power. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

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 MA 27100 . Typically offered Fall Spring Summer.

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 MA 26600. Typically offered Fall Spring Summer.

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. Basic techniques for solving systems of linear ordinary differential equations. Series solutions for second order equations, including Bessel functions, Laplace transform, Fourier series, numerical methods, separation of variables for partial differential equations and Sturm-Liouville theory. Not open to students with credit in MA 30400. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

General Education Selectives (18 credits) and Free Elective (3 Credits)

(https://engineering.purdue.edu/ME/Academics/Undergraduate/GenEds.html)

- Econ Sel. (B/SS) - Credit Hours: 3.00
- WAC (*Hum*) - Credit Hours: 3.00
- G.E.-I - Credit Hours: 3.00
- Free Elective - Credit Hours: 3.00
- G.E.-II - Credit Hours: 3.00
- G.E.-III - Credit Hours: 3.00
- G.E.-IV - Credit Hours: 3.00

University Core Requirements

- Human Cultures Humanities - WAC Sel.
- Human Cultures Behavioral/Social Science - ECON Sel.

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). Typically offered Fall Spring Summer.

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

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. Typically offered Fall Spring.

- Written Communication - Written Comm. Sel.
- Oral Communication - Oral Comm. Sel.

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

Program Requirements

Fall 1st Year

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

ENGL 10600 - First-Year Composition

Credit Hours: 4.00. Extensive practice in writing clear and effective prose. Instruction in organization, audience, style, and research-based writing. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400.

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). Typically offered Fall Spring Summer.

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

- General Education Sel. I - Credit Hours: 3.00

16-17 Credits

Spring 1st Year

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

- Science Selective - Credit Hours: 3.00-4.00

16-17 Credits

Fall 2nd Year

CGT 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. Typically offered Fall Spring.

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 MA 27100 . Typically offered Fall Spring Summer.

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. Typically offered Spring Summer Fall.

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. Friction. Distributed forces. Centers of gravity and centroids. Applications from structural and machine elements, such as bars,

trusses, and friction devices. Kinematics and equations of motion of a particle for rectilinear and curvilinear motion. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

16 Credits

Spring 2nd Year

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 everage power, complex power, power factor correction, and maximum power transfer. Instantaneous and average power. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

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 MA 26600. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

- Economics Selective (*B/SS*) - Credit Hours: 3.00

17 Credits

Fall 3rd Year

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. Basic techniques for solving systems of linear ordinary differential equations. Series solutions for second order equations, including Bessel functions, Laplace transform, Fourier series, numerical methods, separation of variables for partial differential equations and Sturm-Liouville theory. Not open to students with credit in MA 30400. Typically offered Fall Spring Summer.

ME 30900 - Fluid Mechanics

Credit Hours: 4.00. Continuum, velocity field, fluid statics, manometers, basic conservation laws for systems and control volumes, dimensional analysis. Euler and Bernoulli equations, viscous flows, boundary layers, flow in channels and around submerged bodies, one-dimensional gas dynamics, turbomachinery. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

- World Affairs and Cultures Selective (*Humanities*) - Credit Hours: 3.00

16 Credits

Spring 3rd Year

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. The laboratory experience provides open-ended projects to reinforce the design process. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

- General Education Selective II - Credit Hours: 3.00
- Technical Elective I - Credit Hours: 3.00

16 Credits

Fall 4th Year

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. Typically offered Fall Spring Summer.

- Restricted Selective I - Credit Hours: 3.00
- Technical Elective II - Credit Hours: 3.00
- General Education Sel. III - Credit Hours: 3.00
- Free Elective - Credit Hours: 3.00

16 Credits

Spring 4th Year

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. Typically offered Fall Spring Summer.

- Restricted Selective II - Credit Hours: 3.00
- Technical Elective III - Credit Hours: 3.00
- Technical Elective IV - Credit Hours: 3.00
- General Education Selective IV - Credit Hours: 3.00

15 Credits

Note

128 semester credits required for Bachelor of Science degree.

2.0 Graduation GPA required for Bachelor of Science degree

2.0 ME Core GPA required for Bachelor of Science degree

Degree Requirements

The student is ultimately responsible for knowing and completing all degree requirements.

Degree Works is knowledge source for specific requirements and completion

Critical Course

The ♦ course is considered critical. A Critical Course is one that a student must be able to pass to persist and succeed in a particular major.

Foreign Language Courses

Foreign Language proficiency requirements vary by program. For acceptable languages and proficiency levels, see your advisor:

American Sign Language, Arabic, Chinese, French, German, (ancient) Greek, Hebrew, Italian, Japanese, Latin, Portuguese, Russian, Spanish

Energy Minor

(Minor Code = ENRY)

A minor in Energy is available to students in the College of Engineering and the Departments of Electrical and Computer Engineering Technology (ECET) and Mechanical Engineering Technology (MET). An Energy Minor will be granted on the completion of the following 18 cr hrs.

The core requirements (12 crs) are

with a grade of "C' or higher*

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

One of the following three courses

with a grade of "C' or higher*

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

And one of the following four courses

with a grade of "C' or higher*

ECET 33100 - Generation And Transmission Of Electrical Power

Credit Hours: 4.00. A study of the generation and transmission of electrical energy. Includes modeling and analysis of synchronous alternators, transformers, and transmission lines, plus analytical and computer methods of solving load flow and fault conditions on balanced and unbalanced three-phase systems. Introduces techniques used by utilities for protection and economic operation of power systems. Typically offered Fall Spring Summer.

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. Typically offered Fall.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall.

And any 6-credit hours of the following approved elective requirements*

Electrical Power and Distribution

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. Typically offered Fall.

ECET 23100 - Electrical Power And Controls

Credit Hours: 4.00. This course introduces magnetic materials and properties followed by analysis of transformers and power conditioning equipment, induction motors, and single-phase and three-phase power systems. Motor control devices, programmable logic controllers, PLC input and output devices, and power systems communications and monitoring are introduced. Typically offered Fall Spring Summer.

ECET 33100 - Generation And Transmission Of Electrical Power

Credit Hours: 4.00. A study of the generation and transmission of electrical energy. Includes modeling and analysis of synchronous alternators, transformers, and transmission lines, plus analytical and computer methods of solving load flow and fault conditions on balanced and unbalanced three-phase systems. Introduces techniques used by utilities for protection and economic operation of power systems. Typically offered Fall Spring Summer.

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. Typically offered Summer Fall Spring.

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.

Power Generation

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. Typically offered Fall.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall.

Sustainable Energy Options

ABE 58000 - Process Engineering Of Renewable Resources

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. Typically offered Spring.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

CHE 59700 - Special Topics In Chemical Engineering

Arrange Hours and Credit. Hours and credits to be arranged. Permission of instructor required. Typically offered Fall Spring Summer.

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.

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. Typically offered Fall Spring Summer.

- ME 59700 - Advanced Mechanical Engineering Projects I Solar Energy
- ME 59700 - Advanced Mechanical Engineering Projects I Bio-energy and Bio-fuels
- ME 59700 - Advanced Mechanical Engineering Projects I Wind Energy and Turbines

Energy Utilization and Equipment

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. Typically offered Fall Spring.

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.

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. Typically offered Spring.

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. Typically offered Spring.

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. Typically offered Fall.

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. Typically offered Spring.

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. Typically offered Spring.

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. Typically offered Fall Spring.

MET 42600 - Internal Combustion Engines

Credit Hours: 3.00. The course deals with the fundamentals of internal combustion engines, with emphasis on performance, efficiency, and emissions. A comprehensive review of engine/vehicle operating systems is conducted. Related topics such as turbocharging, fuel oxygenates, lubrication, and computerized engine management are presented. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

Energy Conversion and Storage

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. Typically offered Fall.

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. Typically offered Spring.

MSE 59700 - Selected Topics In Materials Engineering

Arrange Hours and Credit. Hours and credits to be arranged. Permission of instructor required. Typically offered Fall Spring Summer.

Note

* Provided the 18 hrs are successfully completed with a grade of "C" or better in all of the courses, then an Energy Minor will be awarded. A grade of "C- or lower" in any of the minor courses is not adequate to fulfill the minor.

Generally, all of the above prescribed minor courses must be taken at the Purdue West Lafayette campus to be eligible for the Energy Minor. The only exceptions to this rule are as follows:

1. One equivalent transfer course from another university can be used if it is a core course and comes from an ABET-accredited program, OR
2. One equivalent Purdue substitution may be used if it is deemed equivalent to the prescribed minor course and acceptable by the home School of the student.

No more than one substitution from either of the above two categories is acceptable for the Energy Minor.

Engineering and Public Policy Minor

A minor in Engineering and Public Policy is available to students in the College of Engineering. An Engineering and Public Policy Minor will be granted on the completion of the following 21 cr hrs.

The core requirements (15 crs) are

with a grade of "C" or higher*

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. Typically offered Spring.

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. Typically offered Spring.

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. Typically offered Fall Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring.

And 6-credit hours (3crs public policy and 3crs technical) from the following approved elective requirements*

Public Policy

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

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. Typically offered Summer Fall Spring.

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. Typically offered Summer Fall Spring.

Technical

ABE 58000 - Process Engineering Of Renewable Resources

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. Typically offered Spring.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

CE 35200 - Biological Principles Of Environmental Engineering

Credit Hours: 3.00. Introduction and application of environmental microbiological concepts to the solution of problems of water pollution and its control. Typically offered Fall Spring.

CE 35300 - Physico-Chemical Principles Of Environmental Engineering

Credit Hours: 4.00. This course presents basic physico-chemical aspects of air, water, and wastewater pollution, and pollution

control methods. Topics covered in the course include acid/base chemistry, solubility, colloidal chemistry, sorption processes, and oxidation-reduction. Selected physico-chemical processes and analytical procedures are discussed, demonstrated, and applied in the laboratory. Typically offered Spring.

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. Typically offered Fall Spring.

CE 45600 - Water And Wastewater Treatment

Credit Hours: 3.00. Fundamental concepts and design procedures for the treatment of municipal and industrial water and wastewaters. Problem assessment; determination of water and wastewater characteristics, biological, physical, and chemical treatment methods, process design, and disposal of residues. Typically offered Fall.

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. Typically offered Spring.

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. Typically offered Fall Spring.

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.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

- ME 59700 - Advanced Mechanical Engineering Projects I Solar Energy
- ME 59700 - Advanced Mechanical Engineering Projects I Bio-energy and Bio-fuels
- ME 59700 - Advanced Mechanical Engineering Projects I Wind Energy and Turbines

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. Nodern applications of nuclear technology, including nuclear medicine, food preservation, space reactors and propulsion. Typically offered Fall Spring.

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. Typically offered Spring.

Note

* Provided the 21 hrs are successfully completed with a grade of "C" or better in all of the courses, then an Engineering and Public Policy Minor will be awarded. A grade of "C- or lower" in any of the minor courses is not adequate to fulfill the minor.

Generally all of the above prescribed minor courses must be taken at the Purdue West Lafayette campus to be eligible for the Engineering and Public Policy Minor. The only exceptions to this rule are as follows:

1. One equivalent transfer course from another university can be used if it is a core course and comes from an ABET-accredited program, OR
2. One equivalent Purdue substitution may be used if it is deemed equivalent to the prescribed minor course and acceptable by the home School of the student.

No more than one substitution from either of the above two categories is acceptable for the Engineering and Public Policy Minor.

Engineering students interested in the Public Policy Minor are strongly encouraged to consider pursuing an internship with the **WISE Program** (Washington Internships for Students of Engineering). Go to http://www.wise-intern.org/ for details or google the Program name. Applications for consideration are typically due at the end of December of each year for the upcoming summer.

All students interested in the Public Policy Minor are strongly encouraged to consider pursuing an internship with the **White House Internship Program**. Go to http://www.whitehouse.gov/about/internships/ for details. Submission deadline for applications is typically in March of each year for the upcoming summer.

Students interested in the Engineering and Public Policy Minor are encouraged to become active in the **Purdue Student Pugwash** organization (http://web.ics.purdue.edu/~pugwash/). Pugwash is an organization started by Bertrand Russell, Albert Einstein, and several other eminent scientists committed to social responsibility in science and technology.

Global Engineering Studies Minor

The Global Engineering Studies Minor is designed for engineering students to be able to document significant demonstrated global experience and professional growth while at Purdue.

To qualify for this Minor, students will participate in a comprehensive program integrating substantial on-campus and international (non-native) experiences. To earn the Minor, students must complete ENGR 31000 (Engineering in Global Context) as a core requirement. They will also select and complete: a) any TWO options from the first (Global Engineering Experience) category listed below, and any ONE option from the second (Other Global Experience) category, OR b) any THREE options from the first category (Global Engineering Experience). As a final core requirement, students must enroll in and complete ENGR 49700 (Global Engineering Re-entry).

Core Requirements

- **ENGR 31000** - Completion of ENGR31000, Engineering in Global Context (3 credit-hours, offered most semesters). Students are strongly encouraged to take this course within a year of declaring their intent to pursue the Minor, and prior to any travel-based experiences (e.g., study, work, or research abroad). Students permitted to take ENE 55400 (Globalization and Engineering) may use it as a substitute for this course. Students in the GEARE program may substitute ME 29700 (Global Engineering Orientation - GEARE) for this course.[1]
- **ENGR 49700** - Successful completion of ENGR49700, Global Engineering Re-entry (1 credit-hour, offered on demand). Involves preparation and presentation of final, culminating documentation of the student's experiences and competency development while fulfilling the Minor requirements, such as in the form of an electronic portfolio or poster. Detailed instructions and guidelines related to this requirement are provided to students upon entry to the Minor. For questions about enrolling in ENGR49700, please contact gep@purdue.edu.

Elective Requirements

Global Engineering Experience - Choose any two

- **Engineering Term Abroad** - One term of study abroad with 6 or more credits of engineering-related coursework at a strategic global university partner. The list of strategic global university partners is maintained and continuously updated by the Global Engineering Program Team (GEPT).
- **Departmental Study Abroad** - Short-term study abroad experience offered in the College of Engineering, typically occurring during winter break, spring break, or Maymester. Must involve enrollment in 3 or more credits.
- **International Engineering Internship** - One international internship at a strategic global industry partner or under the auspices of a global organization, of duration two or more months. The list of the strategic industry partners and global organizations is maintained and continuously updated by the Global Engineering Program Team (GEPT).
- **Research Term Abroad** - One term of research abroad (e.g., as in the Hannover or Clausthal programs).

- **International Engineering Design Project** - Successful participation in at least 2 credits of project work with a global partner. The key objective is to enable and recognize the intense, personal experience of working with students and/or professionals from a different culture over an extended period of time on a project where the global context of the work is essential. As part of the global project work, students must submit a written technical report and/or give an oral presentation. Most students will meet this requirement through participation in Global Design Teams (GEP 10000-GEP 40000), global EPICS (EPCS 10100-EPCS 41200), or a senior capstone project.

Other Global Experience - Choose one, OR select a third option from the GEE list

- **Traditional Study Abroad** - One term of any traditional study abroad program is acceptable for this option.
- **Language Proficiency** - Demonstrate proficiency in a second language up to the 202 course level in at least one non-native language. The 12 credit requirement include credits established by examination. The 12 credits of language courses will normally be completed before the student participates in study or professional practice experiences abroad.
- **Cultural Knowledge** - Demonstrate proficiency in an understanding of cultures by completing 12 credits of coursework in culture-oriented courses. The 12 credits can include credits established by examination, but at least 6 of the 12 credits must be taken at Purdue-West Lafayette. A list of approved Cultural Knowledge courses appears as Appendix A below, and will be reviewed and updated annually to reflect ongoing changes in course availability.

Other Requirements

- **Grades** - A grade of "C" or better in all courses that are counted toward the minor.

Notes

[1] Students who leave the GEARE program without completing the global internship/research requirement may still be able to complete the Global Engineering Studies Minor. For details see: "Completing the Global Engineering Studies Minor after withdrawing from GEARE."

Appendix A: Cultural Knowledge Courses

NOTE: This is a representative rather than complete list of Cultural Knowledge courses. If you have questions about whether other courses qualify, contact Prof. Jim Jones (jonesjd@purdue.edu).

African

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. Typically offered Fall Spring.

HIST 34100 - History Of Africa South Of The Sahara

Credit Hours: 3.00. An introductory survey of major movements and problems in the development of the people of sub-Saharan Africa from the dawn of history to the mid-twentieth century. Attention is directed to the response of Africans to their environment and to various external challenges - Islam, European colonization, and the industrial revolution. Typically offered Fall Spring.

HIST 34200 - Africa And The West

Credit Hours: 3.00. The study of Africa's relations with Europe and the Americas, emphasizing economic and cultural crosscurrents from the period of the Atlantic slave trade to the rise of modern nationalism. Typically offered Fall Spring.

HIST 35700 - History Of Southern Africa Since 1400

Credit Hours: 3.00. Course explores the diversity and resilience of the peoples of southern Africa in the face of internal and external challenges, including migrations, state-building, European colonization, industrialization, and apartheid. African liberation movements and the independence revolution are focal points of attention. Typically offered Fall Spring.

HIST 36101 - Violence, War, And Militarism In Modern Africa

Credit Hours: 3.00. Why do African countries always seem to be at war? Is this because Africans are inherently more violent than the rest of the world? Or might there be another set of explanations? This course seeks answers to these troubling questions by examining some of the myths and realities about violence, war, and militarism in Africa. Although these issues are not in any way ¿new¿ or ¿modern¿, our historical gaze will be focused primarily on the last 125 years. Studies can expect to engage with a variety of primary sources including films, novels, memoirs, music, and speeches as well as an array of scholarly literature from various academic disciplines. Typically offered Fall Spring.

HIST 43000 - Women In African History

Credit Hours: 3.00. (WGSS 43000) African women's history is rich and deeply layered. In this course, we will examine the social, political, economic, religious, and cultural experiences of women living in Africa. Although we look at women in the pre-colonial and slave trade eras, the focus will be on women during the nineteenth and twentieth centuries. Much of our reading and discussion will consider not only women, but also gender as we think about women's interactions with men and children. This course is concerned with the historical forces shaping African women's lives, as well as with ways in which women have been active agents in the making of their own histories. Students can expect to engage with a number of different types of texts (e.g. firms, novels, scholarly analyses, and primary sources.) Typically offered Fall, Spring.

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. Typically offered Fall Spring.

Arabic

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. Typically offered Fall Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

HIST 24500 - Introduction To The Middle East History And Culture

Credit Hours: 3.00. A survey of the civilization of the Middle East from the rise of Islam to the present. The political, social, and cultural institutions are examined along with the problem of adjusting these to the pressure of Western civilization in the last two centuries. Typically offered Fall Spring.

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. Typically offered Summer Fall Spring.

HIST 36000 - Gender In Middle East History

Credit Hours: 3.00. Examines the gendered history, politics, and culture of the Middle East and North Africa, the relationship between Islam and patriarchy, representations of women in medieval texts, and late nineteenth- and early twentieth-century struggles for women's rights in the region. Typically offered Fall Spring.

HIST 45500 - Modern Iraq

Credit Hours: 3.00. This course focuses on Iraq's formation as a modern state, and it addresses the following periods: Ottoman Mesopotomia (1908-1920), Colonial Iraq (1915-1932), the Monarchy (1932-1958), Revolutionary Iraq (1958-1968), and Baathist Iraq (1968-2003), the Iraq War (2003-2008). Typically offered Fall Spring.

Chinese

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. Typically offered Fall Spring.

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. Typically offered Fall.

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. Typically offered Spring.

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. Typically offered Spring.

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. Typically offered Spring.

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. Typically offered Fall Summer Spring.

Classics

CLCS 33900 - Literature And The Law

Credit Hours: 3.00. Study of literary texts that shed light on the varied practices and ideals that different ancient and modern societies have regarded as "lawful", "just", and "good". Exploration of questions and conflicts arising from disagreement about these ideals and from the difficulties enacting them through legal systems, political structures, and individual choices. Typically offered Fall Spring Summer.

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. . Typically offered Summer Fall Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

GREK 44600 - Greek Historians

Credit Hours: 3.00. A study of the writings of the classical historians in the original Greek. Typically offered Summer Fall Spring.

LATN 44300 - Roman Satire

Credit Hours: 3.00. Readings and discussion of Roman satire, including selected passages from Horace, Juvenal, Petronius, and Seneca. Typically offered Summer Fall Spring.

European

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

HIST 31200 - The Crusades

Credit Hours: 3.00. A study of the origins and transformation of the medieval crusading ideal as well as the development of western European civilization. Topics examined include warfare, heresy, religion, Islamic and Byzantine worlds, holy war theories, and economic and political history. Typically offered Fall Spring.

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. Typically offered Fall.

HIST 31800 - A History Of The Christian Church And The Expansion Of Christianity II

Credit Hours: 3.00. Continuation of HIST 31700. The Reformation, the major developments in Christianity, and the churches in the modern world. Typically offered Spring.

HIST 32000 - The World Of Charlemagne

Credit Hours: 3.00. This course examines Charlemagne's efforts to create a new European civilization (A.D. 768-814). The course incorporates the perspectives of Saxons, Vikings, Muslims, Byzantines, peasants, aristocrats, popes, bishops, abbots, and emphasizes the interplay between politics and art, culture, religion, and society. Typically offered Fall Spring.

HIST 32200 - Monarchy: Its Rise And Fall

Credit Hours: 3.00. Traces the rise and fall of Europe's great monarchs and monarchies from the Renaissance to the present and examines both the craft of kingship and the relevancy of the institution itself to society's changing needs and values. Typically offered Fall Spring.

HIST 32700 - The Habsburg Legacy: Central Europe, 1500-2000

Credit Hours: 3.00. Examines the emergence of modern east central Europe. Special focus will be given to the region's unique geopolitical, demographic, economic, and ethnic circumstances that explain its current problems. Typically offered Fall.

HIST 32800 - History Of Women In Renaissance Europe

Credit Hours: 3.00. This course studies the history of women in early modern Europe (1500-1800), examining their roles, images, and experiences as wives, mothers, nuns, artisans, peasants, prostitutes, scholars, and sovereigns in the eras of Renaissance, Reformation, and Revolution. Typically offered Fall Spring.

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. Typically offered Fall Spring.

HIST 33000 - History Of The British Empire And Commonwealth, 1783 To 1960

Credit Hours: 3.00. A survey of the expansion and decline of British power overseas from the American war of independence to the mid-twentieth century. Emphasizing economic and military power, it focuses on British rule in Canada, Africa, India, Australia, and the West Indies. Typically offered Fall Spring.

HIST 33700 - Europe In The Age Of The Cold War

Credit Hours: 3.00. Examines the power vacuum created in western and central Europe by the defeat of Nazi Germany and explores the influence of the superpowers' policy on the political, cultural, and economic development of European countries within their respective spheres of influence. Typically offered Fall Spring.

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. Typically offered Fall Spring.

HIST 40400 - Kings And Philosophers: Europe 1618-1789

Credit Hours: 3.00. Study of great European monarchies and transformation of modern thought by the scientific revolution and Enlightenment. Emphasis on key rulers (Louis XIV, Peter and Catherine the Great, Frederick the Great) and great thinkers (Voltaire, Montesquieu, Rousseau). Typically offered Fall Spring.

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 Napolean through various rebellious and romantic personalities, as well as figures who supported conservative or reformist solutions to the upheavals of industrialization, revolution, and nationalism. Typically offered Fall Spring.

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. Typically offered Fall Spring.

HIST 41100 - The Four Horsemen Ride: Crisis And Change In Europe 1300-1648

Credit Hours: 3.00. Upper-division history course on the history of various crises in late medieval and early modern Europe and the changes those crises wrought upon society. Topics include: famine, The Black Death and demographic upheavals, the Hundred Years' War, religious schism, prophecy and divination, apocalyptic expectations, the fracturing of Christendom, new technologies and social change, conflict between Catholics and Protestants, The Thirty Year's War. Typically offered Summer Fall Spring.

HIST 41200 - The Cultural History Of The Middle Ages

Credit Hours: 3.00. The development of new patterns of thought and their manifestation in literature (religious and secular), education, and art from the decline of the ancient world to the fourteenth century inclusive. Typically offered Fall Spring.

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. Typically offered Fall Spring.

HIST 41800 - European Society And Culture 1450-1800

Credit Hours: 3.00. This course will examine European society and culture from 1450-1800. We will explore marriage and the family, sexuality, social status and civility, gender relations, witchcraft, poverty, violence, work and the everyday economy, and resistance and accommodation to political authority. Typically offered Fall Spring.

French

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

HIST 40500 - The French Revolution And Napoleon

Credit Hours: 3.00. A study of revolutionary France from the fall of the ancien 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. Typically offered Fall Spring.

German

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

Hebrew

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. Typically offered Fall Spring Summer.

HIST 39001 - Jews In The Modern World: A Survey Of Modern Jewish Society, Culture, And Politics

Credit Hours: 3.00. This survey of modern Jewish society, culture, and politics from the expulsion from Spain in 1492 until the collapse of the Interwar state system in 1938 examines Jewish responses to modernity with special attention to the Jewish relationship to the state and with the surrounding non-Jewish cultures, and the diversity of the modern Jewish experience. Typically offered Fall Spring.

Italian

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. Typically offered Fall Spring Summer.

ITAL 28100 - The Italian Renaissance And Its Impact On Western Civilization

Credit Hours: 3.00. This course introduces students to the most important literary, cultural, and political 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 is needed. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

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. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring Summer.

Japanese

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. Typically offered Fall Spring.

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. Typically offered Fall.

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. Typically offered Spring.

Latin American

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

Portuguese

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. . Typically offered Summer Fall Spring.

Russian

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. Typically offered Fall Spring Summer.

HIST 39100 - History Of Russian Popular Entertainment

Credit Hours: 3.00. The history of modern mass entertainment and revolutionary experimentation in popular film, the public arts, and daily life in Russia and the Soviet Union (including Central Asia and Siberia) from 1900 to the present. Typically offered Fall Spring.

Spanish

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

HIST 42700 - History Of Spain And Portugal

Credit Hours: 3.00. A study of the evolving social and institutional history of the Iberian peoples, from the Roman colony to the twentieth century. Some emphasis is placed upon the transfer of institutions to the lands of the Spanish and Portuguese empires. Typically offered Fall Spring.

HIST 47200 - History Of Mexico

Credit Hours: 3.00. A history of the Mexican people from the pre-Columbian period to present. Special emphasis is placed on the successful social revolutions that led to the development of today's dynamic nation. Typically offered Fall Spring.

Intellectual Property Law for Engineers Minor

A minor in Intellectual Property Law is available to students in the College of Engineering. An Intellectual Property Law Minor will be granted on the completion of the following 19 cr hrs.

The core requirements (13 crs) are

with a grade of "C" or higher*

ENTR 20000 - Introduction To Entrepreneurship And Innovation

Credit Hours: 3.00. A survey course designed to introduce students to the concept of entrepreneurship and the commercialization of new technology, its importance in the world economy, and related career options. Students completing this course will understand entrepreneurial roles and possibilities, begin developing required skills required of successful entrepreneurs, including leadership and basic business skills, and will develop a sense of their own aptitude for entrepreneurial endeavors, thereby allowing an informed decision regarding the pursuit of the full 15 credit Certificate in Entrepreneurship and Technology Innovation. Typically offered Fall Spring.

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. Typically offered Spring.

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. Typically offered Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

Note

** Students with knowledge of American Government from high school may seek a waiver of the POL 10100 prerequisite. This exception is not guaranteed, but can be sought from the instructor of POL 46000.

And any 6-credit hours (3cr of legal and 3cr of technical courses) from the following approved elective requirements*

Law

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. Typically offered Summer Fall Spring. CTL:ISH 1002 American Government

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Spring.

Technical

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. Typically offered Fall Spring.

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. Typically offered Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Fall.

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. Typically offered Fall Spring.

ME 45200 - Machine Design II

Credit Hours: 3.00. Design and analysis of mechanical systems, for fluctuating loading. Fatigue analysis. Application of design fundamentals to mechanical components, and integration of components to form systems. Typically offered Fall Spring.

ME 47500 - Automatic Control Systems

Credit Hours: 3.00. Controller design in frequency domain with introduction to digital systems and control. Typically offered Fall Spring.

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 parrameters, 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 higherly 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. Typically offered Spring.

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. Typically offered Fall.

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. Typically offered Fall.

ME 56100 - Optimal Design: Theory With Practice

Credit Hours: 3.00. Optimization as an element of engineering design process. Case studies which demonstrate the theory and application of nonlinear programming as a design tool. Comparative examination of unconstrained algorithms. Development and application of methods for the constrained case. Selected contemporary topics. Typically offered Spring.

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.

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. Typically offered Fall.

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. Typically offered Spring.

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. Typically offered Fall.

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. Typically offered Spring.

ME 58500 - Instrumentation For Engineering Measurements

Credit Hours: 3.00. Fundamental concepts of static and dynamic measurements are reviewed. Transducers, signal conditioning, data transmission, and digital data acquisition systems are discussed. Emphasis is on applications and dynamic measurements. Offered in alternate years. Typically offered Fall.

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. Typically offered Fall.

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. Typically offered Fall.

Note

* Provided the 19 hrs are successfully completed with a grade of "C" or better in all of the courses, then an Intellectual Property Law Minor will be awarded. A grade of "C- or lower" in any of the minor courses is not adequate to fulfill the minor.

Generally, all of the above prescribed minor courses must be taken at the Purdue West Lafayette campus to be eligible for the Intellectual Property Law Minor. The only exceptions to this rule are as follows:

1. One equivalent transfer course from another university can be used if it is a core course and comes from an ABET-accredited program, or
2. One equivalent Purdue substitution may be used if it is deemed equivalent to the prescribed minor course and acceptable by the home School of the student.

No more than one substitution from either of the above two categories is acceptable for the Intellectual Property Law Minor.

Advising

Students interested in pursuing a career in a Intellectual Property Law are strongly recommend to contact Mark Janis (BS ChE 1986, Purdue University; Professor of Law and Ira C. Batman Faculty Fellow, Indiana University Maurer School of Law 1989, mdjanis@indiana.edu; http://www.law.indiana.edu/) early in their academic program to discuss specific Schools of interest, the applications process, the interview process, and the admission exam (LSATS, etc.)

Manufacturing Minor

A minor in Manufacturing is available to students in the College of Engineering and School of Technology. A Manufacturing Minor will be granted on the completion of the following 18cr hrs.

The core requirements (9crs) are

with a grade of "C" or better in each course*.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

And one of the following two courses

with a grade of "C" or better in each course*.

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. Typically offered Summer Fall Spring.

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. Typically offered Fall.

And any 9-credit hours of the following approved elective requirements*

Manufacturing Processes, Systems and Planning

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. Typically offered Spring.

IE 47000 - Manufacturing Processes II

Credit Hours: 3.00. The interrelations of materials, processes, and design with various aspects of manufacturing. Typically offered Fall Spring.

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. Typically offered Fall.

MFET 44600 - Advanced Manufacturing Operations

Credit Hours: 3.00. Application and implementation of formal control systems for production and inventory control, advanced manufacturing planning, operations management, and related topics. Topics will include advanced software applications and the integration of planning and control systems for manufacturing. Typically offered Fall Spring Summer.

Automated Manufacturing and Integration

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. Typically offered Spring.

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. Typically offered Spring.

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. Typically offered Fall Spring Summer.

MFET 34800 - Advanced Industrial Robotics

Credit Hours: 3.00. This course introduces the fundamentals of robotics with emphasis on solutions to the basic problems in kinematics, dynamics, and control of robot manipulators of serial type. It covers modeling of rigid body motion, kinematics of articulated multi-body systems, robot dynamics and simulation, sensing and actuation, robot controls, task planning, and robot operations. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

Advanced Manufacturing

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. Typically offered Fall.

MET 44600 - Micro And Nano Manufacturing

Credit Hours: 3.00. Nanomanufacturing, silicon micromachining and fabrication, laser materials processing of microstructures, abrasive micromachining, mechanical micromaching, micro-scale rapid prototyping and sintering are introduced. Emphasis is on developing an understanding of how MEMS and non-electronic micro/nano devices are manufactured. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring Summer.

Computer-Aided Design in Manufacturing

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. Typically offered Fall Spring.

MFET 34200 - Advanced Manufacturing Processes And Practices

Credit Hours: 3.00. This course will address advanced manufacturing processes and practices. Topics include: the impact of product manufacturability upon manufacturing operations, concurrent engineering, rapid prototyping, nontraditional manufacturing processes, and design specifications for manufacturing tooling and machinery. Typically offered Fall Spring Summer.

Quality Control

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. Typically offered Spring Fall Summer.

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. Typically offered Fall Spring Summer.

Note

* Provided the 18cr hrs are successfully completed with a grade of "C" or better in all of the courses, then a Manufacturing Minor will be awarded. A grade of "C-" in any of the minor courses is not adequate to fulfill the minor.

Generally, all of the above prescribed minor courses must be taken at the Purdue West Lafayette campus to be eligible for the Manufacturing Minor. The only exceptions to this rule are as follows:

1. One equivalent transfer course from another university can be used if it is a core course and comes from an ABET-accredited program, OR
2. One equivalent Purdue substitution may be used if it is deemed equivalent to the prescribed minor course and acceptable by the home School of the student.

No more than one substitution from either of the above two categories is acceptable to be eligible for the Manufacturing Minor.

Sustainable Engineering Minor

(Minor Code = SUSE)

A Sustainable Engineering Minor is available to students in the College of Engineering. The minor will be granted on the completion of the following 18 cr hrs.

The core requirements (12 crs) are

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. Typically offered Spring.

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.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

And 6-credit hours (3crs public policy and 3crs technical) from the following approved elective requirements*

Public Policy

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. Typically offered Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Summer Fall Spring.

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. Typically offered Summer Fall Spring.

Sustainable Energy Options

ABE 58000 - Process Engineering Of Renewable Resources

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. Typically offered Spring.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

CHE 59700 - Special Topics In Chemical Engineering

Arrange Hours and Credit. Hours and credits to be arranged. Permission of instructor required. Typically offered Fall Spring Summer.

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.

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. Typically offered Fall Spring Summer.

Variable Title course worth 3 credits each, with the following topics:

- Bio-energy and Bio-fuels
- Solar Energy
- Sustainable Energy Options and Analysis
- Wind Energy and Turbines

Sustainable Design and Construction

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. Typically offered Fall Spring.

BCM 41900 - Sustainable Construction

Credit Hours: 3.00. A study of sustainable construction meeting the needs of the present without compromising the ability of future generations to meet their own needs. This includes evaluating the consumption of resources and environmental depletion and degradation; examining subsidiary issues of materials, energy, water, land use, and the integration of the natural and built environments, including an overview of emerging delivery systems for high performance green buildings. The U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) criteria are discussed in detail. Typically offered Fall Spring Summer.

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 parrameters, 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 higherly 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. Typically offered Spring.

CE 59700 - Civil Engineering Projects

Arrange Hours and Credit. Hours and credits to be arranged. Permission of instructor required. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

Energy Utilization and Equipment

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.

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. Typically offered Spring.

Agricultural/Environmental Sustainability

ASM 33600 - 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. Typically offered Fall.

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. Typically offered Fall.

CE 59700 - Civil Engineering Projects

Arrange Hours and Credit. Hours and credits to be arranged. Permission of instructor required. Typically offered Fall Spring Summer.

Energy Conversion and Storage

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. Typically offered Fall.

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. Typically offered Spring.

MSE 59700 - Selected Topics In Materials Engineering

Arrange Hours and Credit. Hours and credits to be arranged. Permission of instructor required. Typically offered Fall Spring Summer.

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.

Note

* Provided the 18 hrs are successfully completed with a grade of "C" or better in all of the courses, then a Sustainable Engineering Minor will be awarded. A grade of "C- or lower" in any of the minor courses is not adequate to fulfill the minor.

Generally, all of the above prescribed minor courses must be taken at the Purdue West Lafayette campus to be eligible for the Sustainable Engineering Minor. The only exceptions to this rule are as follows:

1. One equivalent transfer course from another university can be used if it is a core course and comes from an ABET-accredited program, OR
2. One equivalent Purdue substitution may be used if it is deemed equivalent to the prescribed minor course and acceptable by the home School of the student.

No more than one substitution from either of the above two categories is acceptable for the Sustainable Engineering Minor.

Finally, as new courses are developed on campus, interested students can request a review by the Undergraduate Chairs Committee of any new courses with substantial engineering sustainability emphasis to be considered as elective options for the minor. Please contact Jim Jones (jonesjd@purdue.edu) in ME to submit your request.

School of Nuclear Engineering

An Overview

Nuclear engineering is firmly grounded in the understanding and application of modern physics. It has demonstrated vast potential for growth in power generation, medicine, industrial processes, plasmas, space technologies, and national defense.

Nuclear engineers at Purdue contribute to such advanced technologies as fission and fusion power generators, new medical technologies and procedures, improved food safety, advanced materials processing, advanced imaging, and the safe treatment and disposal of spent nuclear fuel.

Indiana's first and only nuclear reactor has its home in Purdue University's Electrical Engineering Building. It headlines field trips for high-school juniors and seniors who participate in demonstrations and experiments. Students in the undergraduate program have an opportunity to work with the reactor in their courses.

Faculty

https://engineering.purdue.edu/NE/People/faculty.html

Contact Information

Student Services Office:
School of Nuclear Engineering
Purdue University
400 Central Drive, Room 132G
West Lafayette, IN 47907-2017
Phone: (765) 494-5749
Fax: (765) 494-9570

Email regarding academic programs: nuclss@purdue.edu

General Contact Information:
School of Nuclear Engineering

https://engineering.purdue.edu/NE

Purdue University
400 Central Drive, Room 140
West Lafayette, IN 47907-2017
Phone: (765) 494-5739
Fax: (765) 494-9570

Email regarding general information: ne@purdue.edu
Purdue University
400 Central Drive, Room 140
West Lafayette, IN 47907-2017
Phone: (765) 494-5739
Fax: (765) 494-9570

Graduate Information

For Graduate Information please see Nuclear Engineering Graduate Program Information.

Nuclear Engineering, BSNE

About the Program

Baccalaureate Plan of Study

https://engineering.purdue.edu/NE/academics/undergraduate/pos

Minor Requirements

https://engineering.purdue.edu/NE/academics/undergraduate/pdfs/NE%20Minor.pdf

Degree Requirements and Supplemental Information

The full Program Requirements for 2016-17 Nuclear Engineering include all Supplemental Information and selective lists of those categories which a student must fulfill in order to earn their degree. These are intended to be printer-friendly, but include less descriptive course detail.

Please see below for program requirements and the necessary degree fulfillments.

code-BS-Nucl
Code-XXX
131 Credits for Graduation

Students must have a graduation index of 2.0

Nuclear Engineering Major Courses (56 credits)

(https://engineering.purdue.edu/NE/Academics/Ugradman2010.pdf)

Required NUCL Courses (41 credits)

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. Nodern applications of nuclear technology, including nuclear medicine, food preservation, space reactors and propulsion. Typically offered Fall Spring.

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. Typically offered Spring.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring.

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. Typically offered Fall.

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. Typically offered Fall.

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. Typically offered Spring.

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). Typically offered Fall.

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. Typically offered Fall Spring.

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. Typically offered Spring Summer Fall.

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. Typically offered Fall Spring Summer.

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. Typically offered Fall.

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. Typically offered Fall.

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. Typically offered Fall.

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. Typically offered Fall.

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. Typically offered Spring.

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. Typically offered Spring.

NUCL 39800 - Junior Seminar

Credit Hours: 0.00. Continuation of NUCL 29800. Typically offered Fall Spring.

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. Typically offered Spring.

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. Typically offered Fall.

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. Typically offered Fall.

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. Friction. Distributed forces. Centers of gravity and centroids. Applications from structural and machine elements, such as bars, trusses, and friction devices. Kinematics and equations of motion of a particle for rectilinear and curvilinear motion. Typically offered Fall Spring Summer.

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 everage power, complex power, power factor correction, and maximum power transfer. Instantaneous and average power. Typically offered Fall Spring Summer.

- MA Elective - 30000 level or above - Credit Hours: 3.00

NE Technical Electives - (15 credits)

(https://engineering.purdue.edu/NE/Academics/Undergrad/tech_electives.html)

- Technical Elective I - Credit Hours: 3.00
- Technical Elective II - Credit Hours: 3.00
- Technical Elective III - Credit Hours: 3.00
- Technical Elective IV - Credit Hours: 3.00
- Technical Elective V - Credit Hours: 3.00

Other Departmental/Program Course Requirements (48 credits)

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Fall Spring Summer.

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. Required of students

majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

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. Typically offered Fall Spring Summer. CTL:IPS 1722 General Chemistry II w/lab

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). Typically offered Fall Spring Summer.

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

ENGL 10600 - First-Year Composition

Credit Hours: 4.00. Extensive practice in writing clear and effective prose. Instruction in organization, audience, style, and research-based writing. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400.

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

CS 15900 - Programming Applications For Engineers

Credit Hours: 3.00. Fundamental principles, concepts, and methods of programming (C and MATLAB), 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. Typically offered Summer Fall Spring.

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 MA 27100 . Typically offered Fall Spring Summer.

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 MA 35100. Typically offered Fall Spring Summer.

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, MA 36000, 36100, or MA 36600. Typically offered Fall Spring Summer.

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring.

Note

NOTE: COM 11400 is counted separately from the 15 credits of Gen Ed requirement. Therefore the Gen Ed requirement can be considered to be 12 + 3 credits = 15 when including COM 11400

General Electives (12 credits)

(https://engineering.purdue.edu/NE/Academics/Ugradman2010.pdf) (9 in Social sciences and 9 In Humanities)

- Lower level Humanities - Credit Hours: 3.00
- Upper level Humanities - Credit Hours: 3.00
- Lower level Social Sciences - Credit Hours: 3.00
- Upper level Social Sciences - Credit Hours: 3.00

University Core Requirements

- Human Cultures Humanities
- Human Cultures Behavioral/Social Science
- Information Literacy
- Science #1
- Science #2
- Science, Technology, and Society
- Written Communication
- Oral Communication
- Quantitative Reasoning
- For a complete listing of course selectives, visit the Provost's Website or click here.

Program Requirements

Fall 1st Year

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 MA 27100 , or the honors calculus course MA 18100. Demonstrated competence in college algebra and trigonometry. Typically offered Fall Spring. CTL:IMA 1602 Calculus - Long I

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. Required of students majoring in science and students in engineering who are not in CHM 12300. One year of high school chemistry or one semester of college chemistry required. Typically offered Fall Spring Summer. CTL:IPS 1721 General Chemistry I w/lab

ENGL 10600 - First-Year Composition

Credit Hours: 4.00. Extensive practice in writing clear and effective prose. Instruction in organization, audience, style, and research-based writing. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400.

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). Typically offered Fall Spring Summer.

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. Typically offered Summer Fall Spring. CTL:IPS 1753 Calculus-based Physics I

18 Credits

Spring 1st Year

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. Typically offered Fall Spring. CTL:IMA 1603 Calculus - Long II

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. Typically offered Fall Spring Summer. CTL:IPS 1722 General Chemistry II w/lab

CS 15900 - Programming Applications For Engineers

Credit Hours: 3.00. Fundamental principles, concepts, and methods of programming (C and MATLAB), 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. Typically offered Summer Fall Spring.

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, team work, and modern engineering tools (e.g., Excel and MATLAB). Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer. NOTE: Concurrent registration is not permitted for ENGL 10600 and COM 11400. CTL:ICM 1103 Fundamentals Of Public Speaking

16 Credits

Fall 2nd Year

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. Typically offered Fall Spring.

- General Elective I - Credit Hours: 3.00

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 MA 27100 . Typically offered Fall Spring Summer.

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. Nodern applications of nuclear technology, including nuclear medicine, food preservation, space reactors and propulsion. Typically offered Fall Spring.

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. Friction. Distributed forces. Centers of gravity and centroids. Applications from structural and machine elements, such as bars, trusses, and friction devices. Kinematics and equations of motion of a particle for rectilinear and curvilinear motion. Typically offered Fall Spring Summer.

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. Typically offered Spring Summer Fall.

16 Credits

Spring 2nd Year

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. Typically offered Fall Spring.

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, MA 36000, 36100, or MA 36600. Typically offered Fall Spring Summer.

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. Typically offered Fall Spring Summer.

PHYS 24100 - Electricity And Optics

Credit Hours: 3.00. Electrostatics, current electricity, electromagnetism, magnetic properties of matter. Electromagnetic waves, geometrical and physical optics. Typically offered Summer Fall Spring.

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. Typically offered Fall Spring.

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. Typically offered Fall Spring Summer.

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. Typically offered Spring.

- General Elective II - Credit Hours: 3.00

18 Credits

Fall 3rd Year

NUCL 39800 - Junior Seminar

Credit Hours: 0.00. Continuation of NUCL 29800. Typically offered Fall Spring.

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. Typically offered Fall.

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. Typically offered Fall.

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. Typically offered Fall.

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. Typically offered Fall.

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 MA 35100. Typically offered Fall Spring Summer.

- General Elective III - Credit Hours: 3.00

18 Credits

Spring 3rd Year

NUCL 39800 - Junior Seminar

Credit Hours: 0.00. Continuation of NUCL 29800. Typically offered Fall Spring.

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. Typically offered Spring.

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. Typically offered Spring.

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. Typically offered Spring.

- Math Elective (MA 300+)
- Technical Elective - Credit Hours: 3.00

15 Credits

Fall 4th Year

- Technical Elective - Credit Hours: 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. Typically offered Fall.

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. Typically offered Fall.

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). Typically offered Fall.

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. Typically offered Fall Spring.

- Technical Elective - Credit Hours: 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. Typically offered Fall.

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. Typically offered Fall.

15 Credits

Spring 4th Year

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 everage power, complex power, power factor correction, and maximum power transfer. Instantaneous and average power. Typically offered Fall Spring Summer.

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. Typically offered Spring.

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. Typically offered Fall Spring.

- Technical Elective - Credit Hours: 3.00
- Technical Elective - Credit Hours: 3.00
- General Elective IV - Credit Hours: 3.00

15 Credits

Note

131 semester credits required for Bachelor of Engineering degree.
Students must have a graduation index of 2.0

Degree Requirements

The student is ultimately responsible for knowing and completing all degree requirements.

Degree Works is knowledge source for specific requirements and completion

Critical Course

The ♦ course is considered critical. A Critical Course is one that a student must be able to pass to persist and succeed in a particular major.

Foreign Language Courses

Foreign Language proficiency requirements vary by program. For acceptable languages and proficiency levels, see your advisor:

American Sign Language, Arabic, Chinese, French, German, (ancient) Greek, Hebrew, Italian, Japanese, Latin, Portuguese, Russian, Spanish