COLLEGE OF

ENGINEERING

2010 through 2011 CATALOG

PURDUE
UNIVERSITY

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College of Engineering

2010 through 2011

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Contents

Purdue: A World of Possibilities

Consider the impact of Purdue University on your world!

Some of you are Purdue students, poised on the launch pad of your adult life. Others, high school students still trying to zero in on your career path and life mission. Consider looking at your future through the expansive and engaging field of vision Purdue offers in this increasingly global and technologically advanced world.

Telescopic View of Purdue

- Founded in 1869 as Indiana's land-grant university and named for benefactor John Purdue
- Ranks 22nd among the nation's public universities and 61st among all universities by *U.S.News & World Report* (2009)
- Among the largest universities in the United States with a state system-wide enrollment of more than 74,300 at four campuses and 10 Technology Statewide locations throughout Indiana; about 39,700 at the main campus in West Lafayette
- Ranks 9th in *SmartMoney* magazine's "payback" survey, quantifying the long-term value of a college education — or earnings compared to tuition investment (2009)
- Included in The Princeton Review 100 "best value" ranking for offering a high-quality education at a reasonable price (2009)
- Named among the top 20 by The Princeton Review in a variety of campus-life categories, including best athletics, best college newspaper, and best campus food (2009)

Discover the World at Purdue

- A world of choices: 200 majors
- Highly touted programs and graduates in the STEM disciplines (science, technology, engineering, math) and business, liberal arts, and agriculture; several interdisciplinary options
- Culturally diverse campus, with students from more than 125 countries and all 50 states
- Typically ranks No. 1 or No. 2 in international student enrollment among public institutions in the United States
- First university to have its own airport (1930); also the first university to establish a department of computer science (1962)
- Community service experiences available in 175 courses; Engineering Projects in Community Service (EPICS) founded at Purdue, now a popular program nationally
- Incredible research opportunities for students to learn from, and work with, world-renowned faculty in Discovery Park's enviable interdisciplinary centers and laboratory facilities in nanotechnology, biosciences, information technology, alternative fuels, and the study of learning
- Study Abroad programs in 45 countries
- Number of recognized student organizations: 850
- Member of the Big Ten Conference, noted for both academic excellence and competitive athletic programs
- Nationally recognized career preparation track via Professional Practice (co-op and internship programs)
- Some 700 companies recruit on campus, valuing the work ethic of Purdue's new graduates and alumni who have earned a degree that is respected around the world
- Median salary for graduates three years after graduation of $51,400; median salary 15 years after graduation of $90,500 (data from *SmartMoney* ranking, classes of 2005 and 1993)
- Living alumni network of 410,000 world-wide

Proven World Leader

- To date, 22 alumni chosen for space flight — headlined by Neil Armstrong and Gene Cernan, the first and last humans on the moon
- Two Purdue professors in three years received the World Food Prize, considered the Nobel Prize of Agriculture: Philip Nelson (2007) and Gebisa Ejeta (2009); Nelson developed aseptic storage and distribution of processed fruits and vegetables, and Ejeta's research increased sorghum production, which is one of the world's main cereal grains
- Early work by Purdue researchers led to the first successful transmission of a black-and-white television picture

- Purdue graduate Carol Morgan Pottenger, rear admiral in the U.S. Navy, is one of the first women selected for sea duty and the first woman to lead a combat strike group
- Boilermakers Len Dawson, Bob Griese, Hank Stram, and Rod Woodson are all enshrined in the Pro Football Hall of Fame
- Brian Lamb, who started public-affairs channel C-SPAN 30 years ago, is an alumnus
- Don Thompson, president of McDonald's Corp. USA, has a Purdue engineering degree
- More Forbes 800 corporate chief executive officers hold an undergraduate degree from Purdue than from any other public university
- Aviation pioneer Amelia Earhart was a career counselor to women students on campus; gift funds from the Purdue Research Foundation made possible the purchase of Earhart's "Flying Laboratory" used for her ill-fated around-the-world flight attempt
- Basketball coaching legend John Wooden, an Indiana native, led Purdue to the 1932 National Championship
- Orville Redenbacher, "the Popcorn King," was a Purdue graduate
- Purdue has graduated more women engineers than any other university, and one in 50 engineers in the United States is Purdue-trained

Academic programs at Purdue are organized within colleges and schools. A brief description of each college and school follows, but we encourage you to visit the Purdue Web site — www.purdue.edu. Plan to spend some time discovering Purdue. You'll find, in the online details, information about the University's academic programs and courses. We appreciate your interest and welcome your questions. You're invited to campus for the "real" Boilermaker experience. You'll see a galaxy of opportunities before you — paths similar to many Boilermakers whose impact has taken them to great heights around the world … and high above it!

College of Agriculture

Among the nation's highest ranked and most prestigious institutions, the college offers excellent teaching, research, extension, and international programs. More than 40 programs of study prepare life scientists, engineers, business representatives, producers, information specialists, and resource managers for professional careers in the world's food and natural resource systems. See www.ag.purdue.edu/oap.

College of Consumer and Family Sciences

The college, one of the largest and highest ranked of its kind in the nation, prepares men and women for careers related to the needs of families and consumers. Students can choose a Bachelor of Science degree program from 13 majors in the areas of family studies and child development, consumer sciences and consumer business, hospitality and tourism, nutrition, health and fitness, and education. The Department of Hospitality and Tourism Management also offers an associate degree program. See www.cfs.purdue.edu.

College of Education

The state-accredited and nationally ranked and accredited College of Education prepares outstanding teachers, instructional leaders, administrators, school counselors, counseling psychologists, curriculum specialists, teacher educators, and educational researchers for the essential roles they play in guiding the education of our youth. Through interdisciplinary instructional programs in teacher education, research in the educational process, and engagement with Indiana schools, College of Education graduates are well prepared for a rewarding career in education. The dedicated and experienced faculty members, some of whom are known internationally as experts in their fields, are respected leaders in a wide range of curriculum areas and are actively engaged in research. Together the students and faculty share a passion for learning, teaching, and changing the world. The college offers undergraduate and graduate degrees in a variety of disciplines. In addition to the teacher education programs offered by the College of Education, teacher preparation programs also are offered through other colleges and schools across campus. See www.education.purdue.edu.

College of Engineering

The College of Engineering is internationally known for the quality and scope of its programs. Students launch their careers with a common first-year program in the School of Engineering Education. Once they have completed that program, they choose from undergraduate curricula in aeronautics and astronautics, agricultural, biological, biomedical, chemical, civil, computer, construction engineering and management, electrical, industrial, interdisciplinary, materials, mechanical, or nuclear engineering. Every school within engineering offers graduate degree programs. See www.engineering.purdue.edu.

School of Health Sciences

The school offers a variety of human health-related study areas. Undergraduate programs include environmental health science, general health sciences, medical laboratory science (medical technology), occupational health science (industrial hygiene), and radiological health science (health physics). The general health sciences major requires the selection of a concentration area in pre-medical, pre-dental, pre-occupational therapy, pre-physical therapy, pre-chiropractic, pre-optometry, pre-physician's assistant, or public health. Students completing these programs are prepared to enter the health-related job market or apply to the professional or graduate program of their choosing. At the graduate level, programs of study include health physics, medical physics, occupational and environmental health sciences, radiation biology, and toxicology. See www.healthsciences.purdue.edu.

College of Liberal Arts

The college offers essentially all of the traditional disciplines of the humanities, social and behavioral sciences, and creative arts. Majors and minors are available in the departments of anthropology, audiology and speech sciences, communication, English, foreign languages and literatures, health and kinesiology, history, philosophy, political science, psychological sciences, and sociology; and in the School of Visual and Performing Arts. Students can prepare themselves in more than 50 majors, including 16 undergraduate interdisciplinary programs. See www.cla.purdue.edu.

Krannert School of Management

Degree programs include accounting, management, industrial management, and economics. Accounting and management programs focus on finance, marketing, operations, human resources, and strategic planning. The industrial management program combines management and technical education with a manufacturing management, engineering, or science minor. The accounting program combines a management background with extensive education in accounting principles and practices. All programs include coursework in the arts, humanities, and international and cross-cultural aspects of modern business. See www.krannert.purdue.edu.

School of Nursing

The School of Nursing prepares students from diverse backgrounds for careers as professional nurses. The nationally accredited undergraduate program prepares a student for licensure as a registered nurse (R.N.). A diverse mix of liberal arts, science, and nursing courses gives students a scientific, multidisciplinary education. Small clinical classes give students practical experience in health assessment, maternal child care, mental health, acute care, and community health nursing. This program admits nursing majors at the freshman year and offers early, hands-on clinical courses. The R.N.-to-B.S. program allows registered nurses to complete their baccalaureate requirements. The Second Degree Baccalaureate Program allows students who hold a degree in another field to pursue a B.S. in Nursing. The master's degree program prepares pediatric nurse practitioners and adult nurse practitioners, and offers a post-master's oncology certification. A graduate nursing consortium with the Purdue Schools of Nursing at Calumet and Fort Wayne offers various specializations. The Doctor of Nursing Practice (D.N.P.) delivers a post-baccalaureate to practice doctorate curriculum. See www.nursing.purdue.edu.

School of Pharmacy and Pharmaceutical Sciences

The school offers an accredited professional program leading to the Doctor of Pharmacy degree. This program combines a basic and applied science background as well as clinical experience allowing students to function as licensed pharmacists to provide pharmaceutical care. The prepharmacy curriculum can be taken either through Purdue's prepharmacy program or at another institution. It typically takes a minimum of two to three years of academic study to meet the pre-pharmacy course requirements. The school also has a four-year, non-licensure-eligible B.S. in Pharmaceutical Sciences degree designed for entry-level pharmaceutical industry positions or as a foundation for advanced education. See www.pharmacy.purdue.edu.

College of Science

Actuarial science, biological sciences, chemistry, computer science, earth and atmospheric sciences, mathematics, physics, statistics, math and science secondary school teaching, and inter-

disciplinary science programs prepare students for immediate careers or advanced study. Premedical, pre-dental, and pre-veterinary options; a Professional Practice (co-op) program; study abroad; and honors programs are available. Students may pursue official minors in other areas outside their major. Enrollment in sciences while deciding on a major in any field is encouraged. A highly qualified faculty, state-of-the-art facilities, and ongoing research keep teaching up to date. See www.science.purdue.edu.

College of Technology

The eight departments and 23 concentrations in the College of Technology prepare students to meet the technological needs of business, industry, and government. Technology students begin taking courses in their majors as early as their freshman year. Courses and other opportunities allow students to experience a variety of hands-on, real-world applications. The college awards associate's, bachelor's, and graduate degrees. See www.purdue.edu/technology.

School of Veterinary Medicine

This professional school has assumed a leading position nationally and internationally in educating the veterinary medical team. The school is fully accredited and is one of only 28 in the United States that grant the Doctor of Veterinary Medicine (D.V.M.) degree. The Veterinary Technology Program is accredited by the American Veterinary Medical Association (AVMA) and awards Associate of Science and Bachelor of Science degrees. The Associate of Science degree is also offered via distance learning. The Veterinary Technology Program at Purdue is one of only three AVMA-accredited programs administered by a school of veterinary medicine. See www.vet.purdue.edu.

The Graduate School

The Graduate School oversees more than 70 programs of graduate study and research that lead to advanced degrees. Purdue graduate students engage in relevant coursework and cutting-edge research that lead to master's and doctoral degrees in agriculture, consumer and family sciences, education, engineering, health sciences, liberal arts, management, nursing, pharmacy, science, technology, veterinary medicine, and a variety of exciting interdisciplinary programs. The Graduate School also offers several graduate-level, academic credit certificate programs and combined (undergraduate/graduate) degree programs. For details about the Graduate School at Purdue, visit www.gradschool.purdue.edu.

College of Engineering

History and Organization

Engineering instruction has been offered at Purdue University since the institution opened its doors to students. As a land-grant university, Purdue was founded primarily to teach the agricultural and mechanical arts.

One student was registered in civil engineering in the fall of 1876, and the first engineering degree (C.E.) was awarded in 1878. Since then, the development of the College of Engineering at Purdue has reflected the dynamic growth of the profession of engineering and its increasing specialization. It is now one of the most distinguished engineering colleges in the country, with 6,735 undergraduate students and 2,331 graduate students. The School of Engineering Education is the entry point for all new students, who receive initial advising and academic counseling with staff in First-Year Engineering. Qualified students are admitted to the professional engineering programs after satisfactory completion of the pre-engineering program requirements.

Engineering Instruction

Undergraduate instruction in aeronautics and astronautics, agricultural engineering, biological engineering, biomedical engineering, chemical engineering, civil engineering, computer engineering, electrical engineering, industrial engineering, materials engineering, mechanical engineering, and nuclear engineering leads to the degree of Bachelor of Science (B.S.) in one of those designated areas. The individual schools of engineering that administer these areas of instruction are responsible for the final three years of the particular curriculum and

determine whether students enrolled in each of the schools have acceptably fulfilled the degree requirements. The individual curricula are discussed in detail under separate sections in this college catalog.

The degree of Bachelor of Science in Engineering (B.S.E) or the degree of Bachelor of Science (B.S.) may be awarded to a student who acceptably carries out an interdisciplinary program that cuts across several of the traditional school lines. These programs are administered by the Interdisciplinary Engineering program in the School of Engineering Education. The program, administered by the Division of Construction Engineering and Management, culminates in a degree of Bachelor of Science in Construction Engineering. All Purdue University Schools of Engineering undergraduate educational programs are accredited by ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; telephone: (410) 347-7700; fax: (410) 625-2238.

Engineering as a Profession

Engineering is a professional field that has a large impact on people and influences society. Perhaps no other profession is more truly concerned with safeguarding and improving life, health, property, and public welfare. The goals of the engineering profession — maintenance of high ethical standards and quality performance — are integral to all academic programs in the College of Engineering.

The mission of the College of Engineering is to advance engineering learning, discovery, and engagement in fulfillment of the land-grant promise and the evolving responsibility of a global university.

Purdue engineers will be prepared for leadership roles in responding to the global, technological, economic, and societal challenges of the 21st century. They will be ready to make a difference at home and around the globe by:

- **a.** adding value and innovation to engineering projects and collaborations
- **b.** identifying and addressing significant problems and opportunities
- **c.** learning and broadening professionally and as global citizens throughout life
- **d.** engaging with critical stakeholders, high performance teams, and knowledge networks
- **e.** celebrating diversity and respecting differences in ideas, people, and cultures
- **f.** leading from a global perspective and commitment to a sustainable future

Graduates of engineering programs are expected to acquire and demonstrate the Knowledge, Ability, and Quality attributes of the Purdue Engineer of 2020:

Abilities

- Leadership
- Teamwork
- Communication
- Decision-making
- Recognize and manage change
- Work effectively in diverse and multicultural environments
- Work effectively in the global engineering profession
- Synthesize engineering, business, and societal perspectives

Knowledge Areas

- Science and math
- Engineering fundamentals
- Analytical skills
- Open-ended design and problem-solving skills
- Multidisciplinarity within and beyond engineering
- Integration of analytical, problem-solving, and design skills

Qualities

- Innovative
- Strong work ethic
- Ethically responsible in a global, social, intellectual, and technological context
- Adaptable in a changing environment
- Entrepreneurial and intrapreneurial
- Curious and persistent, continuous learners

Students are encouraged to become student members of their professional societies and to be involved with the student chapters of those societies.

EPICS Program

EPICS, or Engineering Projects in Community Service, is an engineering-centered, multi-disciplinary, academic program that offers courses using service learning to teach design. EPICS students learn design by creating real projects for community partners within the local area. The program was founded by Leah H. Jamieson and Edward J. Coyle at Purdue in 1995.

Teams of EPICS students partner with local not-for-profit community organizations (community partners) to design solutions that will address compelling needs in the local community. Projects are intended to solve real problems and are developed based on needs identified by both the students and community partners. A hallmark of EPICS is that our partnerships are long-term, lasting for a number of years, and many projects may last for a semester or several semesters. Students can take EPICS for as many semesters as they wish, and most choose to take the course for credit for more than one semester. This allows projects to be extended beyond traditional semester boundaries and allows more complex solutions to be developed.

The EPICS courses (EPCS 10100-40200) can be used in many departments as credit toward graduation and in many cases can be substituted for departmental requirements, such as technical electives or capstone requirements, as well as University requirements, such as the entrepreneurship certificate.

EPICS courses operate like small engineering design firms with students in leadership roles such as team leaders who run course meetings, project leaders who create and manage project timelines and schedules, and financial officers who manage budgets. The EPICS curriculum is designed to support the development of projects that make a real impact in the community and provide the professional preparation students need to become leaders in the 21st century.

The EPICS courses are open to all academic levels from first-year students through seniors. First-semester students are given the added benefit of participating in the EPICS Learning Community. A typical section of EPICS consists of a mix of first-year, sophomores, juniors, and seniors and provides opportunities for mentoring among students within the sections. EPICS draws student enrollment from more than 30 majors from engineering and other colleges.

The best way to learn more about EPICS is to read about the different teams and the types of projects they are working on. Visit the Web site at https://engineering.purdue.edu/EPICS.

Office of Professional Practice: Cooperative Education and Internships

The College of Engineering offers numerous work experience programs that allow students to gain a practical understanding of their chosen field. While completing the requirements for their engineering degrees, participating students will experience the challenge, working conditions, and rewards of the engineering profession. Students considering graduate study can gain experience with instrumentation, experimental techniques, and project management that are valuable assets in graduate studies and research. Additionally, students can earn a significant salary that they can apply toward a portion of their college costs by participating in these programs.

Purdue offers work experience programs that are based on both the Internship and Professional Practice models. Internship programs are shorter, project-based experiences designed to provide a brief introduction to an employer and a sense of the culture within a particular segment of the engineering world. Internship experiences have less than one year total on-the-job time, and there is no commitment from the employer for continuation. Internship programs typically utilize the summer terms only. Co-Op experiences are longer, more structured programs. Co-Op students complete more than one year of on-the-job training, and they remain with a single employer throughout their program. Co-Op students get a broader view of a host organization through rotations in a variety of departments. Professional Practice programs typically utilize year-round alternating sessions of work and academic study at domestic and international sites.

All Purdue professional practice programs are optional, by-invitation-only programs. Different programs have different requirements, but as a general rule, the longer the cumulative work experience, the higher the graduation index required for participation. The details of the various program options are available from the Office of Professional Practice or the individual schools within the College of Engineering. Upon completion of a professional practice program, the student will receive, in addition to their bachelor's degree, a certificate of completion for their particular program. There is a nominal work experience fee collected by the Office of the Bursar during the off-campus work terms, and all professional practice experiences are transcript recorded by the Office of the Registrar. The Purdue University Professional Practice Program is nationally recognized for innovation and academic excellence, and it is the largest in the Big Ten Conference. To find out more, visit our Web site at: www.purdue.edu/propractice.

GEARE Program

The Global Engineering Alliance for Research and Education (GEARE) program is a unique and award–winning program that originated in the School of Mechanical Engineering at Purdue. Since 2009, the Office of Professional Practice (OPP) has assumed all GEARE operations and opened up the program to all College of Engineering students and some students in the College of Technology. GEARE is designed to supplement the education of engineers so they are prepared to function immediately in the global workplace. Students in the program participate in an orientation program, including language and culture, one domestic internship, one subsequent international internship at the same company, one semester of study abroad with fully transferable engineering course credits, and a one- to two-semester design team project with design teams that include students from international partner universities working on an industry-inspired project.

Interested students are encouraged to refer to the OPP Web site, https://engineering.purdue.edu/ProPractice.

Global Engineering Program (GEP)

The Global Engineering Program (GEP) at Purdue University offers an integrated vision of engineering through leadership in global learning, discovery, and engagement. GEP is focused on building a sustainable global presence and leadership, founded upon Purdue College of Engineering's recognized excellence in cutting-edge research, the ability to provide every student with global learning opportunities, and offering the Purdue community at large, throughout the state of Indiana, new opportunities for interaction with the international community. GEP recognizes that preeminence in global engineering derives through engagement of the international community through programs that ensure our presence and leadership where it is needed the most. GEP works with all schools and programs within the College of Engineering and with appropriate schools and programs across campus, to facilitate the development of comprehensive global opportunities for faculty, students, and interested community.

GEP is committed to improving the competence and livelihood of the engineering, academic, and business communities in Indiana, the U.S., and the world. GEP seeks out and develops opportunities to strengthen the college's signature as a global engineering hub for strategic research in targeted geographic areas, particularly in those research areas that address and meet global engineering grand challenges of the 21st century and beyond. These global partnerships enable GEP to offer enhanced educational initiatives and research opportunities that will empower the Purdue Engineering community for global impact as scientists, students, and leaders in business and industry.

Recently, strategic research opportunities were identified or redefined in Kenya and throughout Africa, in Mexico and Latin Amer-

ica, in China and India — all regions facing growing humanitarian and environmental grand challenges, emerging economic development, and infrastructure expansion. The global learning portfolio includes opportunities for research and learning experiences, entrepreneurial development, participation in international conferences, and more. GEP is also working on major global research initiatives, for example, the U.S.-French science partnership as a model for binational and multinational research and development platforms.

GEP works closely with the College of Engineering Development office to identify funding opportunities that will enable GEP to effectively address these challenges. The college remains conscious of the threat from the weakened economy and the need to be mindful and proactive in ensuring the continued development of global opportunities and the financial resources to ensure that our students and faculty continue to travel, learn, and contribute.

Within Indiana and the United States, domestic partnerships that will enable strong teams and new business relationships are a priority for GEP and the college. GEP's commitment to engagement is reflected in our activities in developing opportunities in Mexico, Kuwait, France, Germany, Jordan, China, India, Brazil, Columbia, and across the continent of Africa. All have exciting potential, and as we move forward, the tools for evaluating potential and outcomes of all activities also are under development and will be a valuable aid in evaluating the impact of the global experiences of our students and faculty as we work to realize the Engineer 2020 initiative.

Further information about Purdue's global engineering opportunities can be found at: www.engineering.purdue.edu/gep or by contacting gep@purdue.edu.

Women in Engineering Program

Purdue University has one of the largest enrollments of women engineering students in the United States and has actively promoted this diversity since the founding of the Women in Engineering Program (WIEP) in 1969. The Women in Engineering Program offers activities and programs to provide students with resources and opportunities to interact with successful alumnae and build friendships and networks that will enhance their student life experience and knowledge of the engineering profession.

Important components of the WIEP include:

- Pre-college programs
- A living community in two residence halls
- A seminar for first-year students
- Several types of mentoring programs
- A tutoring service
- A merit award program for beginning and continuing students

Purdue also has one of the oldest and largest student sections of the Society of Women Engineers (SWE). Started in 1954, Purdue SWE now averages over 400 members each year. SWE programming includes professional development activities, social activities, community service activities, pre-college activities, and leadership development activities. Although SWE and WIEP are separate organizations, they work in partnership on several programs and events.

Visit the WIEP Web site at www.purdue.edu/WIEP and the Purdue SWE Web site at http://swe.purdue.org.

Minority Engineering Program

Since its inception in the early 1970s, the Minority Engineering Program (MEP) office at Purdue University has developed and successfully implemented various recruitment and retention initiatives geared toward increasing the number of engineering graduates from historically underrepresented groups.

Open to all, the focus is on students who have not traditionally pursued engineering and science. The harvest of embracing diversity and developing the technical expertise housed within the life experience and rich heritage of our nation is dynamic leadership with tremendous global impact.

Four key organizations share in the MEP commitment to diversity: The National Society of Black Engineers, (NSBE) founded at Purdue

in 1975; The Society of Hispanic Professional Engineers (SHPE); The American Indian Science and Engineering Society (AISES); and a new student organization launched in 2009, the Mexican American Engineering Society (MAES).

Purdue engineering recruitment activities include pre-college programs that involve grades 6 through 12. Retention activities consist of incentive and merit awards for undergraduate engineering students, academic and personal advising, a tutoring center staffed by both graduate and undergraduate engineering students, and a freshman orientation course that emphasizes problem solving, leadership, teamwork, and interpersonal skills.

Purdue University's Minority Engineering Program has achieved recognition as a benchmark for many other universities.

Visit the Web site at www.engineering.purdue.edu/MEP.

Research

A vibrant research program in many frontier topics enhances the richness and vitality of the Purdue Engineering undergraduate experience. The multidisciplinary nature of research brings rich examples and projects from diverse fields into the engineering class, laboratory, and homework. Students learn about not only the known engineering solutions but also are introduced to the unknown that may become a part of engineering.

The interplay between research and education contributes significantly to the growth of lifelong learners. Undergraduate students have the opportunity to participate in research in special classes, academic year and summer fellowships including the new and popular Summer Undergraduate Research Fellowships Program (SURF), internships and co-op opportunities, and research laboratory assistant positions. While all classes include some element of discovery, most senior design classes and electives such as Engineering Projects in Community Service (EPICS) provide research experiences that are truly extraordinary.

Purdue Engineering research is supported by many federal agencies, state agencies, private corporations, foundations, and alumni gifts.

The Office of the Associate Dean for Research and Entrepreneurship helps to provide timely information on research opportunities (www.engineering.purdue.edu/Engr/Research). Purdue Engineering research is carried out in the individual schools, in multidisciplinary centers (including two recent National Science Foundation-funded Engineering Research Centers), laboratories, and in Discovery Park (www.purdue.edu/discoverypark).

Research activities within the College of Engineering include innovation; design; materials; control; optimization; management; operation; systems engineering and logistics of aircrafts and spacecrafts; electronics and electronic materials; automotive systems; fuel cells and hydrogen; agricultural products and renewable energy sources; advanced composites such as self-assembling and self-healing materials; high-speed and low-power circuits and electronics; new types of semiconductor materials; optics and photonics; sensing; communications; vision; robotics and automation; computer hardware, middleware, and software; secure wireless communications and secure Internet; chemical and process catalysis; drug discovery and delivery; transportation and highways; environmental engineering; safe structures and earthquake protection; nuclear energy and medical uses of radioactive materials and fusion; heat and mass transfer; fluid mechanics including micro-fluidics; tissue and cellular engineering and biological sensing.

Many research activities within the schools feed into multidisciplinary centers and laboratories as well as into Discovery Park projects.

The National Science Foundation-(NSF) funded network for computational nanotechnology (nCn) promote multidisciplinary research that forms an important part of the Birck Nanotechnology Center. The Engineering Research Center for Structured Organic Compounds is

improving the quality and delivery of granular materials such as pharmaceuticals, and the Engineering Research Center for Compact Hydraulics is reducing energy consumption by hydraulic devices. The Department of Homeland Security (DHS) Center of Excellence for Command, Control, and Interoperability promotes research on visualization sciences to enhance national security. The High-Mach Propulsion University Technology Center (UTC), funded by Rolls-Royce, is investigating jet engine technology for high-speed aircraft that may fly as fast as seven times the speed of sound. A U.S. Department of Transportation-funded Regional Transportation Center is improving safety, durability, and convenience of our highway system.

Multidisciplinary centers and laboratories provide very exciting opportunities for students with diverse sets of interests and passions. The range of interest opportunities spans environmental remediation, renewable energy and resource engineering, wireless sensing and applications, catalyst design and informatics, transportation and transportation safety, advanced laser-based manufacturing, composite materials, acoustics, interactive buildings, prognostics and diagnostics, product life cycle management, information engineering, financial engineering, low-energy neutron source, nuclear reactions, high Mach number propulsion, aeromechanics and propulsion, high-heat flux electronics cooling, boiling and two-phase flows, hydrogen, and fuel cells.

Many of the interdisciplinary activities are conducted in collaboration with other Purdue colleges and schools: Agriculture; Consumer and Family Sciences; Education; Liberal Arts; Management; Pharmacy, Nursing, and Health Sciences; Science; Technology; and Veterinary Medicine.

The collaborations are occurring in brand new buildings and facilities of Discovery Park on the Purdue campus. These collaborations bring very exciting opportunities and continued expansion of the engineering disciplines into new and unknown territories that touch on the limits of size, speed, force, and distance.

Engineering education expands from machines and their physical reality to thought, cognition, and perception. Engineers are not limited to just inorganic and organic lifeless materials any more but must bring their ideas and thoughts to the living. The impact of this interaction is not just on the biological sciences but is flowing back into realms traditionally considered to be purely physical. Products that mimic biology for enhanced performance such as self-healing materials are already here. Nanotechnology; biotechnology; information sciences; and ultimately thought, cognition, and emotion are becoming the realm of engineers. These are exciting times to be an undergraduate engineer and participate in some of these research frontiers.

Admissions

Admissions Inquiries and Procedures

The information that follows is a basic overview of the undergraduate admission process. For the most current information regarding admission procedures, deadlines, and criteria, visit www.admissions.purdue.edu or contact the Office of Admissions; Purdue University; Schleman Hall, 475 Stadium Mall Drive; West Lafayette, IN 47907-2050; admissions@purdue.edu; (765) 494-1776. Prospective students also are encouraged to visit the Web site above to sign up for the Office of Admissions contact list to receive mail and e-mail from Purdue.

Application Deadlines

High school students are strongly encouraged to apply for admission very early in their senior year, and some programs have specific deadlines. There also are specific deadlines for **transfer students**. Current application and scholarship deadlines are posted on the undergraduate admissions Web site.

Freshman Admissions Criteria

Applications are reviewed on an individual and holistic basis. First and foremost, applicants must be prepared academically for the rigors of college and the academic demands of the major to which they are seeking admission. In its review of each applicant, Purdue considers the following factors: high school coursework, grades, strength of curriculum, academic trends, class rank, core and overall grade point average, SAT or ACT test score, personal statement, personal background and experiences, and space availability in the intended major.

Transfer Admissions Criteria

College students who want to transfer must have completed between 12 and 24 semester credit hours of college-level coursework prior to enrollment at Purdue. Minimum credit-hour requirements will vary based on each student's high school and/or college academic credentials. Criteria for transfer admission vary widely based on the major to which the student is applying. All programs have minimum GPA requirements and some college coursework prerequisites. The Office of Admissions Web site has the most current information about admission criteria and processes as well as about transferring credit.

Placement in Courses

Depending upon your background in high school and your career objectives, as a first-year engineering student you will be placed in an academic curriculum by engineering faculty counselors.

Your engineering counselor will try to recommend beginning engineering courses that are particularly applicable to your career interests.

Early Registration — STAR

Student Access, Transition and Success Programs (SATS) invites you to campus for one day of early registration during the summer before your first semester as a new student. Summer Transition, Advising, and Registration (STAR) is a day set aside for you to meet with your academic counselor and register for first-semester classes. The University will mail you a fee statement.

Student Orientation and Support Programs

Student Access, Transition and Success Programs (SATS) is responsible for the coordination of initiatives that help you prepare for, transition into, and succeed as a student in Purdue University's academically rigorous environment.

SATS, a division of the Office of Enrollment Management, offers several programs to help beginning and transfer students adjust to Purdue. Boiler Gold Rush is organized for new, beginning students and transfer students, and it includes a variety of activities designed to help you make a smooth transition into Purdue. Students who begin their studies at other times of the year also have the opportunity to participate in orientation. Invitations to those different programs are mailed to you at the appropriate times.

SATS programs include Summer Transition, Advising, and Registration (STAR); Common Reading; Learning Communities; Orientation Programs (such as Boiler Gold Rush and Welcome Programs); Parent and Family Programs; the Purdue Promise program; and the West Central Indiana Regional Twenty-first Century Scholars site. For more information on any of these programs, please visit www.purdue.edu/sats, e-mail sats@purdue.edu, or phone (765) 494-9328. The SATS address is Stewart Center, Room G77A; 128 Memorial Mall Drive; West Lafayette, IN 47907.

International Students

If you are an applicant from another country, your application and supporting documents will be evaluated by the staff in the Office of International Students and Scholars. You will be admitted on the basis of credentials certifying the completion of preparatory studies comparable to requirements for United States citizens applying at the same entry level. Guidelines for determining admissibility are specified in the "Admissions Criteria" section of this publication. English translations must accompany transcripts and other credentials. You also must submit satisfactory evidence of your ability to comprehend English as shown by a TOEFL (Test of English as a Foreign Language) score of at least 550 (213 computer-based score, 79 Internet-based score). The minimum score for First-Year Engineering applicants is 567 (233 computer-based score, 88 Internet-based score).

You must furnish sufficient evidence of adequate financial support for your studies at Purdue.

The Office of International Students and Scholars will assist you in entering the United States and the University. The office also will provide other services such as orientation programs, immigration advising, and personal and cross-cultural counseling. See the Web site at www.iss.purdue.edu.

Military Training

Reserve Officers' Training Corps (ROTC) is available for all men and women who are full-time students. You can pursue military courses in conjunction with the academic curriculum and receive academic credits. If you complete the program, you will receive a commission as an officer in the Army, Navy, Marine Corps, or Air Force. You do not incur a commitment until you are accepted into the program and enroll in the third-year course or accept an ROTC scholarship. Scholarships that assist with tuition, incidental fees, and textbooks are available through all four services. A monthly allowance is available for students who sign a contract. Additional information is available in the College of Liberal Arts catalog, or you can contact any of the military departments directly. All ROTC offices are located in the Armory.

Proof of Immunization

Indiana state law requires proof of immunization for the following vaccine preventable diseases as condition of enrollment on residential campuses of state universities: measles, mumps, rubella, diphtheria, and tetanus. In addition, international students must provide documentation that they have been tested for tuberculosis after arriving in the United States. Information regarding compliance will be forwarded to all admitted students.

Purdue Across Indiana

The Purdue academic system extends across the state with academic programs at four system campuses and several College of Technology locations.

System Campuses

Admission to these system campuses is administered by the admissions department at each campus. These campuses include:

- Indiana University-Purdue University Indianapolis (IUPUI) — Indianapolis, Indiana
- Indiana University-Purdue University Fort Wayne (IPFW) — Fort Wayne, Indiana
- Purdue North Central — Westville, Indiana
- Purdue Calumet — Hammond, Indiana

College of Technology Statewide

Admission to College of Technology Statewide locations is administered by the Office of Admissions at Purdue's West Lafayette campus. College of Technology Statewide locations include:

- Anderson
- Columbus
- Greensburg
- Indianapolis
- Kokomo
- Lafayette
- New Albany
- Richmond
- South Bend
- Vincennes

For more information about The Purdue System-wide campuses and College of Technology Statewide locations, visit www.purdue.edu and click on "Purdue Across Indiana."

Nondiscrimination Policy Statement

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life.

Purdue University views, evaluates, and treats all persons in any University related activity or circumstance in which they may be involved, solely as individuals on the basis of their own personal abilities, qualifications, and other relevant characteristics.

Purdue University prohibits discrimination against any member of the University community on the basis of race, religion, color, sex, age, national origin or ancestry, marital status, parental status, sexual orientation, disability, or status as a veteran. The University will conduct its programs, services and activities consistent with applicable federal, state and local laws, regulations and orders and in conformance with the procedures and limitations as set forth in Executive Memorandum No. D-1 which provides specific contractual rights and remedies. Additionally, the University promotes the full realization of equal employment opportunity for women, minorities, persons with disabilities and veterans through its affirmative action program.

Any questions or concerns regarding the Nondiscrimination Policy Statement shall be referred to the Vice President for Ethics and Compliance for final determination.

Expenses

The cost of attending Purdue University varies, depending on a variety of factors, including where a student chooses to live; travel expenses; food costs; enrollment in a special program; date of entry; the college or school in which you are enrolled; etc. Basic minimum costs for the two-semester 2009–10 school year on the West Lafayette campus are shown in the following table. Some academic programs may have additional fees. Contact the department if you have questions.

Full-time students are charged a general service fee, a technology fee, and a repair and rehabilitation fee. The general service fee provides students with access to a variety of services and privileges such as access to the Recreational Sports Center and the Boilermaker Aquatic Center for recreational sports activities. It also allows deep-discount ticket prices for most Convocations-sponsored events and for Intercollegiate Athletics contests with presentation of a student ID card.

With payment of full fees, students have access to the Purdue Student Health Center that covers medical clinical office visits, nutrition consultations, health education services, and a limited number of sessions for psychological counseling. Additional fees are charged for lab, x-ray, urgent care, physical therapy, and other services.

The technology fee is used to enhance student access to the campus networks, computer laboratories, and electronic access to information and databases. Technology fee funds are used to equip classrooms with computer and video projection equipment.

The Repair and Rehabilitation fee is assessed to address maintenance funding for buildings and infrastructure on campus, and funds received from the fee will be dedicated to building and infrastructural needs. The establishment of the fee is a result of growing unfunded needs to address critical building and infrastructural upkeep.

Miscellaneous personal expenses include such items as clothing, transportation, telephone, newspapers and magazines, dry cleaning and laundry, entertainment, etc.

2009–10 Estimated Costs West Lafayette Campus (Fall and Spring Semesters)

Items	Indiana Resident	Nonresident
Tuition/Fees	$8,638*†	$25,118*†
Room/Board	8,710	8,710
Books/Supplies	1,220	1,220
Travel	310	480
Miscellaneous	1,760	1,760
Total	**$20,638**	**$37,288**

** First-time students enrolled at the West Lafayette campus beginning in the Summer 2009 Session and thereafter pay these fees. Undergraduate, graduate, and professional students who were enrolled as degree-seeking students prior to the Summer 2009 Session may be eligible for lower fees based upon continuous enrollment. Please see the University Bursar's Web site at www.purdue.edu/bursar for more information regarding rates.*

† Your budget can vary, depending on your state of residence and the type of housing and academic program you select. Some programs have additional fees: Engineering, $1,000; Management, $1,274; Technology, $500; Flight, individual courses in the program have additional fees that can be reviewed at www.purdue.edu/bursar or by contacting the Department of Aviation Technology. International students pay an additional $60 per semester.

Rates and refund schedules are subject to change without published notice.

Refunding of Fees and Tuition

Registered students who find it necessary to cancel their registration before the beginning of classes, upon the recommendation of the registrar, will receive a 100 percent refund of all fees and tuition.

Non-Title IV Aid

Students who withdraw during the first six weeks of a semester, with the recommendation of the registrar, will receive a partial refund of the general service fee and tuition. More specifically, the percentage of refund is determined as follows:

Fall or Spring Semester

1. Withdrawal during the first or second week, 80 percent refund
2. Withdrawal during the third or fourth week, 60 percent refund
3. Withdrawal during the fifth or sixth week, 40 percent refund

No portion of the technology fees, repair and rehabilitation fees, or academic building facilities fee will be refunded once classes begin.

Title IV Aid

Once classes begin, refunds are prorated based on the date of withdrawal from class(es). Refunds are based on a diminishing scale through 60 percent of the semester. Refunds are calculated on all fees and tuition.

Summer Modules

Refunds for summer modules are proportionate on the same basis as semester refunds.

Financial Aid

To ensure that all students have an opportunity to obtain a college education regardless of their financial circumstances, Purdue University, through the Division of Financial Aid, administers a fourfold program of scholarships, grants, employment opportunities, and loans.

The Purdue University Division of Financial Aid administers federal, state, and University financial assistance programs. These programs require students to have a high school diploma or GED. Most types of aid also are based upon financial need and satisfactory academic progress. Students must submit a Free Application for Federal Student Aid (FAFSA) online at www.fafsa.ed.gov to be considered for all types of financial aid. Students should apply early for Purdue financial aid. Eligible FAFSAs submitted by March 1 will receive preference in the awarding of aid.

Families are welcome to visit the campus to discuss the types of available aid and the application procedure. Walk-in counselors are available from 9:00 a.m. to 5:00 p.m. on Monday, Tuesday, Wednesday, and Friday, and from 1:00 to 5:00 p.m. on Thursday. Telephone counselors are available from 8:00 a.m. to 5:00 p.m. Monday through Friday at (765) 494-0998. Computer access to student aid status is available at mypurdue.purdue.edu.

Resident Assistants

University Residences has a plan whereby graduate and undergraduate students who are at least 21 years of age can be hired as a resident assistant (RA). An RA devotes approximately 20 hours each week to his or her duties in this capacity, with most of the time scheduled during evenings and weekends. Compensation for an RA position includes reduced tuition, room and board, and a small stipend. Applications and additional information for those interested in becoming a resident assistant can be found at www.housing.purdue.edu.

Scholarships Awarded by College of Engineering

The College of Engineering awards scholarships based upon merit or merit and need. Once a student has been admitted, he or she should complete the University Scholarship Application. The Free Application for Federal Student Aid (FAFSA) application should also be completed by March 1. All continuing students who want to apply for financial aid, need-based scholarships, or loans should submit a FAFSA each year.

A few scholarships are open to any College of Engineering student and are selected by the dean's office. However, a vast majority of the scholarships are awarded by the individual schools, departments, or programs.

All incoming first-year students are considered for scholarships available to them through the College of Engineering. The information used to determine recipients is drawn from the student application to Purdue and the University Scholarship Application. These scholarships are extremely competitive, with selection beginning in February. Offers are extended based on a holistic review of a student's high school record, SAT or ACT test scores, and past participation in Purdue Engineering outreach programs, among other predictors of success.

Once a student completes the First-Year Engineering program and is accepted into one of the undergraduate professional schools, he or she will become eligible for scholarships through their professional school. Each school has criteria and opportunities unique to that particular school. A student is encouraged to seek out scholarship opportunities from their individual schools early in the spring semester.

International students who are chosen to receive scholarships or awards will have additional required paperwork to be completed due to federal tax laws, and will therefore have a wait of approximately two weeks or more before the request for scholarship funds can work through the system. Information about how to complete this paperwork will come from the school, department, or program that has offered the student the scholarship. It is very important that these students complete the paperwork in a timely fashion, as funds cannot be distributed until the appropriate paperwork is in order.

Questions regarding scholarships given by the University should be directed to the Division of Financial Aid office. Questions regarding scholarship letters received by a specific program, school, or department should be directed to the office from which the letter was sent. All general questions and other undergraduate scholarship questions may be directed to the College of Engineering scholarship administrator.

Living Accommodations

University housing facilities and programs are available to all students based on Purdue's policy of equal opportunity regardless of national origin, race, religion, color, or sexual orientation. It is the University's desire and expectation that all others providing housing or services to Purdue students will do so in a manner consistent with this policy. However, the University does not approve or disapprove specific housing accommodations since it believes that the choice of housing rests with you, the student.

As a Purdue student, you have a variety of choices when it comes to choosing your new home while attending school. You can live in one of 15 University Residences, a fraternity or sorority house, cooperative housing, or in a privately operated facility within the local community.

Apply for on-campus housing as soon as you have a confirmed interest in attending Purdue. You will need to pay a $100 nonrefundable housing application processing fee (not a deposit).

Apply online at www.housing.purdue.edu, where you can fill out your housing application, choose your preferences, and sign your housing contract. The site also will prompt you to fill out an online preference form, which will be used to assign your residence and match you with a compatible roommate. If you want to live with a friend, both you and your friend must rank your residence preferences in the same order and request the other as a roommate.

May 1 is the housing application deadline. Because the University does not guarantee on-campus housing, it is important that students meet this deadline. Students who apply for housing after the May 1 deadline will be assigned to a residence if space is available. First-year students are not required to live on campus.

Students who apply and sign a housing contract by May 1 will be assigned a random number that will be used to establish priority for hall choice in the housing assignment process. Changes to, or cancellation of, your housing contract may be made until 11:59 p.m., April 30.

(Please remember to re-sign the contract if you have made a change to your housing preferences.) Your housing contract becomes binding on May 1. As of that time, your contract can only be cancelled if you do not attend Purdue University during the contract period.

Students requiring special accommodations should contact the University Residences Director's Office at (765) 494-1000 to discuss their particular needs when their housing application is submitted.

The Office of the Dean of Students offers assistance to students seeking off-campus housing. After being admitted, students should contact the Office of the Dean of Students as early as possible to begin their search for off-campus housing: visit www.purdue.edu/odos, e-mail offcampushousing@purdue.edu, or call (765) 494-7663.

University Residences for Undergraduate Men and Women

University Residences provides accommodations for approximately 10,541 single undergraduate men and women.

The all-male residences include Cary Quadrangle, providing accommodations for 1,166 students, and Tarkington, providing space for about 706 students.

Seven University Residences — Earhart, Harrison, Hillenbrand, McCutcheon, Owen, Shreve, and Wiley — house approximately 800 students each, and Meredith Hall accommodates 620 students. These are coeducational units with male and female students assigned to separate areas of each building.

Duhme, Warren, Wood, and Vawter halls comprise the all-women's residences for the 2009–10 academic year and are referred to as Windsor Halls. Windsor Halls provide accommodations for 595 students.

First Street Towers opened to Purdue sophomores, juniors, and seniors for the Fall 2009 Semester. Each of the main residential floors of First Street Towers contains two clusters of 22 single rooms with private baths, for 356 residents.

All University Residences contain generous lounge space, recreation areas, kitchenettes, study spaces, and post office facilities.

As a student, you may choose from four meal plans consisting of 10, 12, 15, or 20 meal swipes a week, as suits your lifestyle. University Residences offers students who are 19 years of age or older by August 21, 2009, the Boiler Block Plan, consisting of a block of 246 meal swipes. With this plan, you may use your meal swipes as often as you wish. All meal plans include Dining Dollars, which may be used to buy additional food items at University Residences' Dining Services retail operations, such as grills and mini-marts. You may eat at any University Residences' Dining Services facility by using your University ID card.

Computer labs are available in McCutcheon, Meredith, and Tarkington halls. In addition, two computers and a public printer are available in every residence that does not have a computer lab so residents are able to check e-mail and print documents as needed. Residents will have ResNet, a high-speed Internet service, in their room without paying an additional fee.

Room and board rates for the 2009–10 academic year vary from $6,906 to $14,204, depending on your chosen meal plan option, residence, and room size.

Approximately 550 spaces in Hawkins Hall are reserved for assignment to older undergraduate students. Meal plans are not available for residents of Hawkins Hall. Residents of Hawkins may purchase either the Open Dining Card or use BoilerExpress for dining in any University Residences dining facility. Accommodations in Hawkins Hall are on a room-only basis. The cost for a room in Hawkins Hall for the 2009–10 academic year ranges from $375 to $696 a month depending on the type of room selected.

More than 1,000 spaces for single undergraduate students are available in Hilltop Apartments. The apartments house two or three students and are available for both single male and female students. All normal policies and regulations of University Residences apply to the apartments. Students living in the apartments may choose a meal plan that allows access to any University Residences Dining Services facility, or they may choose a room-only option. The room and board rate for the 2009–10 academic year in Hilltop Apartments ranges from $8,940 to $10,866 a year depending upon the apartment and meal plan selected.

Rates quoted are subject to change as approved by the Board of Trustees and undoubtedly will be somewhat higher during the 2010–11 period of this publication.

Visit www.housing.purdue.edu for additional information.

Accommodations for Married Students/Families

Purdue Village provides students with families convenient housing within a one-mile walking distance of campus and is convenient to shopping and bus routes. The family apartments, operated by University Residences, are unfurnished and equipped with a stove and refrigerator. There are one-bedroom and two-bedroom apartments for families; the two-bedroom apartments include washers and dryers.

One-bedroom family apartment costs range from $582 to $597 a month. Two-bedroom units range from $717 to $732 a month. Your rent payment covers all utilities, including local telephone service and Boiler TV (cable). These rates are effective during the 2009–10 academic year and are subject to change as approved by the Board of Trustees.

Each apartment is equipped with a connection for the campus cable TV system as well as for the campus computing network. The apartments are not air-conditioned, but tenants may bring or purchase their own air-conditioning unit as long as it meets specified criteria, has compatible voltage ratings, and the apartment's maintenance staff does the installation.

With more than 60 countries represented among the residents, Purdue Village is a global community. Families have the benefit of plenty of yard space and playgrounds, and they can take advantage of Purdue Village Preschool and the English for Speakers of Other Languages (ESOL) Program.

Visit www.housing.purdue.edu for more information about Purdue Village.

Cooperatives

Cooperative houses also provide housing for students. These houses are large residences that are owned and operated by 20 to 50 students. Seven women's houses and five men's houses have been recognized officially by the Office of the Dean of Students, and each house has a live-out faculty or staff advisor.

Students in cooperative houses significantly decrease their housing costs by contributing three to four hours of house duties a week. Residents of cooperatives pay an average of $3,000 per academic year for room and board. New members are selected by current members through a rush process each January.

To obtain information about becoming a cooperative member, contact the Office of the Dean of Students at (765) 494-1231 or at Schleman Hall, Room 250; 475 Stadium Mall Drive; West Lafayette, IN 47907-2050. Details are also available at www.purduecooperatives.org.

Students are expected to complete and return application information by February 1 or earlier for membership the following fall semester.

Fraternities and Sororities

Purdue has 46 fraternities and 24 sororities. Most members live in chapter houses, and membership is by invitation.

Sororities provide an opportunity in the fall for interested women students to join a chapter. Yearly costs for sororities range from $3,300 to $4,380. The average number of women living in a sorority is 88.

In the fall, the Interfraternity Council provides recruitment information through which interested men can become acquainted with the fraternity system. Open recruitment is conducted throughout the academic year. The average number of men belonging to a fraternity is 72, and costs range from $2,000 to $3,500 a semester.

For additional information, contact the Office of the Dean of Students; Purdue University; Schleman Hall, Room 250; 475 Stadium Mall Drive; West Lafayette, IN 47907-2050; or call (765) 494-1232. Online information is available at www.purduegreeks.com.

Student Services

Counseling

Each college or school has a general counseling office and academic advisors who can answer questions about degree requirements, registration, dropping and adding courses, and withdrawal from school.

Mature and qualified faculty and staff, graduate students, and older undergraduate students are employed on the University Residences counseling staffs and live in the halls to assist students with personal and scholastic problems.

The Office of the Dean of Students is staffed by professionally trained counselors who provide personal, educational, and career counseling. They can, for example, offer assistance or refer you to specialized help in such areas as vocational choice, campus activities, scholastic concerns, multicultural programs, assistance for students with disabilities, home and community relationships, and coping strategies.

Other campus services for students include the Counseling and Guidance Center, Counseling and Psychological Services, Financial Advising Service, International Students and Scholars, Learning Center, Marriage and Family Therapy Center, Steer Audiology and Speech-Language Center, Student Health Center, and Writing Lab.

Services for Students with Disabilities

Services for students with disabilities (physical, mental, and learning disabilities) are provided through the Disability Resource Center of the Office of the Dean of Students. Services vary according to the needs of students. They include interpreters, readers, note-taking assistance, accessible class scheduling, parking permits, and help working with professors. For further information, contact the Office of the Dean of Students. The Web site is www.purdue.edu/odos/drc. The general office number is (765) 494-1747, and the TDD number for people with hearing or speech impairments is (765) 494-1247.

Center for Career Opportunities

The staff of the campus-wide Center for Career Opportunities assists students and alumni with their career-related employment search. Counseling, guidance, and a wide variety of job search services related to internships and full-time employment are available.

The center maintains contacts with many industrial and business organizations as well as with governmental and nonprofit agencies. Interviews with employer representatives can be requested, and current openings for internships or full-time positions can be explored. For more information, refer to the center's home page at www.cco.purdue.edu.

For Further Information

University Regulations. The *University Regulations* bulletin will provide details about academic, conduct, and student organization policies and procedures. You can access the Web site at www.purdue.edu/univregs. Printed copies are available from Purdue Marketing and Media, South Campus Courts, Building D, 507 Harrison Street, West Lafayette, IN 47907-2025; (765) 494-2034.

Graduation Rates. Graduation rates for the West Lafayette campus are available by contacting the Office of Enrollment Management, Analysis, and Reporting, Schleman Hall, 475 Stadium Mall Drive, West Lafayette, IN 47907-2050; (765) 494-0292; enrollmentmanagement@purdue.edu. These rates are calculated and made available as required by the Student Right-to-Know and Campus Security Act.

Safety. The University strives to provide a safe and secure environment for students, staff, and visitors. The University distributes an annual security report containing campus crime statistics and information relating to campus safety and security policies and programs. The report is available on the Web at www.purdue.edu/police. A paper copy may be requested by calling (765) 494-8221 or contacting the Purdue University Police Department, Terry House, 205 S. Intramural Drive, Purdue University, West Lafayette, IN 47907-1971.

Information Technology

The Office of the Vice President for Information Technology is in charge of the integrated computing and telecommunications services on the West Lafayette campus. The information technology (IT) program, formally known by the acronym ITaP, serves Purdue students, faculty, staff, and visitors to campus.

Computing services range from the very visible computing laboratories that are located throughout campus to the unseen but essential enterprise applications that facilitate the business of the University. Computing staff install, maintain, operate, and repair computer equipment. They provide such services as career accounts, e-mail, calendaring, directories, and database administration.

In addition to ITaP's laboratory facilities, its instructional services include:

1. The Blackboard and Banner course management system.
2. Technology in the Classroom (TIC) sites.
3. Help in preparing multimedia materials to enhance instruction.
4. Help in training students in particular software applications for classroom assignments.
5. Grants for innovative instructional projects including developing courses online using information technology.
6. The Digital Learning Collaboratory, a joint project with the Purdue University Libraries.
7. The Assistive Technology Center for those with special needs.
8. Web-based access to many software applications through Software Remote.

ITaP also provides high-performance research computing equipment and services for faculty through its Rosen Center for Advanced Computing. Multiple Linux clusters, an SGI Altix 4700, and a SiCortex 5832 serve intensive computational needs ranging from engineering and physics simulations and models to computational biology and chemistry. Support for researchers includes partnership on grant proposals; consulting and collaboration on solutions for projects needing advanced computations; management and storage of large data sets; and development of scientific applications, community tools, and science gateways. The HUBzero platform provides Web-based cyberinfrastructure for education and research and supports simulation and modeling in a variety of disciplines, including nanotechnology, pharmaceuticals, and healthcare.

Distributed computing and grid computing are basic elements in the research computing program. ITaP manages DiaGrid, which harnesses tens of thousands of idle processors on and off campus for research and education purposes. Through ITaP, Purdue also has access to resources nationwide on the TeraGrid, the National Science Foundation's comprehensive cyberinfrastructure for open scientific research, education, and innovation. The optical fiber network known as I-Light links Purdue's West Lafayette campus to Indiana University and Indiana University-Purdue University Indianapolis (IUPUI) and joins computers at Purdue and Indiana into a virtual machine room with teraflop capabilities.

The Envision Center for Data Perceptualization provides scientific visualization and multimedia production services, including animation creation and rendering and virtual environment creation, along with computer-aided design, haptic (touch and feel) interaction capabilities, large-scale data handling, and motion capture. The center provides access to, and training for, many popular commercial applications in those areas and can work with faculty members on grant applications and project management needs. The center's collaboration facilities accommodate on-site and remote participation from multiple locations using technologies such as Polycom, Access Grid, and Web 2.0 technologies.

ITaP also makes video production and audiovisual duplication facilities available as well as satellite uplink and downlink capabilities and broadcast and network services.

ITaP implements and manages campus-wide networks for data and voice communication, improves the security of the data that crosses these networks, and promotes the preservation of personal information security and privacy for all people at Purdue. Telecommunications services provided by ITaP range from basic phone services for campus offices and student residences to telephone operator services and wireless connectivity in the common areas of buildings throughout the campus. ITaP supports the infrastructure that links campus buildings by optical fiber and provides Internet access.

ITaP negotiates contracts and licenses for mass purchases of informational technology equipment and licenses for software used by University personnel. As an additional service, ITaP has negotiated significant discounts for faculty, staff, and students on personal purchases of hardware available through the Web and also for software media sold on campus. The hardware discounts also are available to Purdue alumni. Demonstration computer hardware is displayed at ITaP Shopping Offline in Stewart Center, Room G65. Software is sold at the BoilerCopyMaker in the Purdue Memorial Union, Room 157. Information also is available from www.itap.purdue.edu/shopping.

ITaP offers courses and one-on-one consulting on computing and telecommunications, from selecting phone systems to basic use of Microsoft office applications, programming, visualization, instructional media, e-learning, and research techniques.

For additional information, please consult www.itap.purdue.edu, call (765) 494-4000, or visit the ITaP Customer Service Center in Stewart Center, Room G65; 128 Memorial Mall; West Lafayette, IN 47907-2034.

Libraries

The University Libraries system on the West Lafayette Campus includes 11 subject-oriented libraries, the Hicks Undergraduate Library, and the Karnes Archives and Special Collections Research Center. The Libraries Web site at www.lib.purdue.edu is the Libraries gateway to information services. Libraries faculty and staff provide assistance in person and through www.lib.purdue.edu/askalib; this includes help in gaining access to national and international information. Information about individual libraries can be found under "Libraries and Units" at www.lib.purdue.edu/libraries.

The Libraries offer 2.8 million printed volumes and electronic books, 40,000 electronic and print journals, more than 500 electronic databases, 3.1 million microforms, and access to federal government publications and patents that are received on a depository basis. Local library resources are supplemented by the 4 million items of research materials held by the Center for Research Libraries in Chicago, which includes 7,000 rarely held serial titles. Through Purdue's membership in the center, faculty and graduate students are assured of fast access to this material through the Interlibrary Loan Office in the Humanities, Social Science, and Education (HSSE) Library in Stewart Center.

The library collections and services of the Big Ten libraries, the University of Chicago, Ball State University, and Indiana State University also are available to Purdue students and faculty under cooperative agreements. Individuals who wish to use these facilities are encouraged to contact Circulation Services by e-mail to circservices@purdue.edu or by phone, (765) 494-0369.

The John W. Hicks Undergraduate Library may serve many of a student's library needs, particularly during the first two years at Purdue. Here students will find assistance in locating information needed for papers and speeches along with an extensive collection of reserve books for course assignments. A 24-hour study lounge and the "Undergrounds Coffee Shop" are located in the Hicks Undergraduate Library.

The Digital Learning Collaboratory (DLC) is located in Hicks Undergraduate Library. It is a joint initiative of the Purdue Libraries and Information Technology at Purdue. The DLC supports student learning through access to state-of-the-art hardware and software for creating multimedia projects in individual, group work, and instructional settings. It facilitates the integration of information and technology literacy into the undergraduate curriculum.

Additional Libraries facts and figures can be found within Purdue's Data Digest available at www.purdue.edu/DataDigest.

Study Abroad

The Office of Programs for Study Abroad is dedicated to internationalizing Purdue by helping as many students as possible have overseas experiences that enrich lives, enhance academic experiences, and increase career potential. The office helps students overcome academic, financial, or personal concerns that might prevent them from going abroad, and is especially devoted to removing obstacles for first-time travelers.

Purdue offers more than 200 study abroad and internship programs in dozens of countries, lasting from a week to a year, for all majors. Most programs do not require foreign language skills. Program costs vary, but many are comparable to the cost of studying at Purdue (with the exception of the travel expense). Participants earn Purdue grades and credits, so those who study abroad can graduate in the normal length of time. Most of the financial aid that covers Purdue expenses can also be applied to study abroad, and more financial aid specifically for study abroad has been available in recent years.

Students who have taken part in study abroad often describe their experiences as "life changing," "eye opening," and "the best choice I ever made."

Students should begin their international exploration either online at www.studyabroad.purdue.edu, by calling (765) 494-2383, or by contacting The Office of Programs for Study Abroad; Young Hall, Room 105; 302 Wood Street; West Lafayette, IN 47907-2108.

Graduation Requirements

Scholastic Index Requirements

In general, the scholastic standing and probation standards of all regular students enrolled in engineering programs are the same as those for the University as a whole.

Pass/Not-Pass Option

In order to provide students with the opportunity to broaden their educational foundations with minimal concern for grades earned, an alternate grading system, the pass/not-pass option, is permitted for a limited portion of the student's required graduation hours. The detailed limitations on this option can be different for each degree-granting unit, but the following general rules are some that currently apply:

1. Subject to the regulations of this school, a student can elect this option in any course that does not already appear on his or her academic record and in which he or she is otherwise eligible to enroll for credit with a letter grade. A student cannot elect this option for more than 20 percent of the total credit hours required for his or her graduation.
2. The registrar's class roster includes students who have elected this option.
3. A student enrolled in a course under this option has the same obligations as those enrolled in the course for credit with a letter grade. When the instructor reports final grades in the course, he or she will report that any such student who has earned a grade of "A," "B," or "C," including plus or minus grades, has passed the course and that any other such student has not passed. The registrar will make an appropriate notation on the student's academic record in place of a letter grade but will not use the course in computing grade indexes.
4. In engineering, the pass/not-pass option is not available for required courses in the First-Year Engineering Program, except for ENGR 100.
5. This option is not available to students on probation.
6. This option is available for a maximum of two courses in any one semester, one course during a summer module.
7. Consistent with the policy of the College of Engineering, a student receiving the grade of "pass" in a course taken under the pass/not-pass option cannot take the same course for a letter grade.

These are general or minimum guidelines for those electing this option, but the individual schools and departments of engineering can impose additional restrictions.

General Education Program in Engineering

Humanities and social sciences courses encompass the breadth of human experience and culture, both past and present, including individual behavior, social and political structures, aesthetic

values, modes and dynamics of communication, philosophical and ethical thought, and cognitive processes. Such courses are an integral part of all engineering curricula, which complements technical and professional content by enabling engineering students to appreciate the world in which they live and work and to contribute as both educated members of society and aware, ethical professionals. Humanities and social sciences courses also provide a framework for rational inquiry, critical evaluation, judgment, and decisions when dealing with issues that are nonquantifiable, ambiguous, or controversial. Of equal importance, they offer opportunities for engineering students to develop interests and insights that guide, enrich, and expand their perceptions of the world in which they live.

To these ends, all B.S. students in the College of Engineering are required to complete a general education program of 18 credit hours in approved humanities and social sciences electives. Students are strongly encouraged to develop a coherent general education plan and distribute their general education credits throughout their academic program. The collection of courses used to fulfill this requirement must meet all of the following conditions.

1. Courses must be drawn from those offered by the departments of Agricultural Economics; Child Development and Family Studies; Communication; Economics; English; Foreign Languages and Literatures; History; Interdisciplinary Studies; Philosophy; Political Sciences; Psychological Sciences; Sociology and Anthropology; Speech, Language, and Hearing Sciences; and by the Patti and Rusty Rueff School of Visual and Performing Arts. Any course offered by these programs is allowable, provided it is open to students in the offering program and is not focused primarily on professional training, natural science, or mathematics.
2. In order to ensure sufficient exposure to topics dealing with global, societal, and contemporary issues, at least 9 credit hours must be drawn from courses offered by the departments of Agricultural Economics, Economics, Communication, Foreign Languages and Literatures, History, Interdisciplinary Studies, Philosophy, Political Science, Psychological Sciences, or Sociology and Anthropology.
3. At least 6 of the credit hours must be taken in the same program, and a maximum of 12 credit hours may be taken in any one program.
4. At least 6 of the credit hours must come from courses at the 30000 level or above, or from courses with a required prerequisite in the same program.
5. If a foreign language course is used to satisfy part of the requirements, the student must take at least 6 credit hours of the same language. Credit is not allowed for language courses in the student's native tongue(s), although literature, culture, drama, and related courses are allowed.
6. Credit by examination or granted credit (e.g., advanced placement credit), conditioned solely at the discretion of the awarding program, can be used to satisfy any part of the requirement.
7. No course may be counted more than once toward the requirement, even if the offering program allows it to be repeated for credit.
8. Individual schools may impose requirements in addition to those previously stated but may not require a specific course as part of the general education program.

Abbreviations

The following abbreviations of subject fields are used in the "Plans of Study" section of this catalog. Alphabetization is according to abbreviation.

AAE—Aeronautics and Astronautics
ABE—Agricultural and Biological Engineering
ANTH—Anthropology
ASM—Agricultural Systems Management
BIOL—Biological Sciences
BME—Biomedical Engineering
CE—Civil Engineering
CEM—Construction Engineering and Management
CGT—Computer Graphics Technology
CHE—Chemical Engineering
CHM—Chemistry
COM—Communication
CS—Computer Sciences
ECE—Electrical and Computer Engineering
ECON—Economics
ENE—Engineering Education
ENGL—English
ENGR—First-Year Engineering
FS—Food Science
HS—Health and Safety

HSCI—Health Sciences
IE—Industrial Engineering
MA—Mathematics
ME—Mechanical Engineering
MET—Mechanical Engineering Technology
MGMT—Management
MSE—Materials Engineering
NUCL—Nuclear Engineering
OBHR—Organizational Behavior and Human Resource Management
PE—Physical Education
PES—Physical Education Skills
PHYS—Physics
PSY—Psychology
SOC—Sociology
STAT—Statistics

Plans of Study

The engineering curricula and graduation requirements of each of the engineering schools as presented in this catalog are those that were in effect at the time of printing. Curricula, however, do evolve, reflecting the changing needs of the engineering profession. The student is, therefore, encouraged to obtain the latest curriculum information from his or her academic advisor.

It is important for the student to recognize that the general flexibility of academic curricula is provided in order to make possible allowances for individual differences in background and academic goals. It is the student's responsibility to consult with his or her academic advisor about using this flexibility to design a program to fit particular needs.

The traditional length of a college degree program is four academic years. For this reason, the catalog presents all engineering curricula as four-year programs. Well-qualified students with excellent high school preparation can complete the program in the four-year period — or even less. However, other students may require four and one-half or even five years to complete all requirements. Such students also prove to be successful professional engineers, and the University regards their advancement through the nine or ten semesters as satisfactory academic progress toward an engineering degree. Insufficient high school backgrounds usually are most noticeable during the first and second year of a student's program in engineering. By the time the student reaches the junior year level of work, the course sequence that he or she has used usually meshes so well that high school insufficiencies present no scheduling difficulties such as may have occurred during the first part of his or her engineering program.

In the "Plans of Study" section of this catalog, figures within parentheses, e.g. (3), are credit hours, unless designated otherwise.

First-Year Engineering Program

All beginning engineering students are admitted to the First-Year Engineering Program, housed in the School of Engineering Education. Qualified students are then admitted to the chosen professional school of engineering after satisfactory completion of the First-Year Engineering Program requirements. The First-Year Engineering Program provides a common core of courses in calculus, chemistry, physics, engineering problem solving, and English composition. Students must also complete a first-year general education elective and either a second semester of general chemistry, biology, or computer programming. The objectives of the First-Year Engineering Program are to:

- Prepare students for entry into the engineering schools.
- Enable students to develop the necessary skills and abilities to succeed in the chosen discipline.
- Assist students in becoming acclimated to the Purdue University environment.

Advisors are available year-round to assist and advise students, parents, and University faculty and staff about the curricula, programs, and schools within the College of Engineering. Special programs include:

- Credit by Examination
- EPICS Program
- First-Year Engineering Honor Programs
- University Honors Program
- Global Engineering Program.

Details about the various programs are contained in this publication.

Credit by Examination

Qualified students are able to obtain credit for First-Year Engineering Program requirements by demonstrating mastery of the subject on Advanced Placement, A-Level, College Level

Examination Program, International Baccalaureate, or Purdue University Advanced Credit examinations. Academic advisors can assist students in determining the scores required to obtain credit and the appropriate course placement.

First-Year Engineering Honors Program

The First-Year Engineering Program (FYE) Honors Program is designed to provide academically talented, highly motivated students with a broader, more enriched educational experience during their first year. Most students are admitted to the honors programs based on the following high school metrics: SAT score of 2050 or an ACT score of 32 and top 5% class rank or 3.8 on a 4.0 Purdue-calculated GPA (Math, Science, English grades only). Criteria are reviewed annually and are subject to change.

In addition, if you are a merit scholarship recipient, which includes but is not limited to National Merit Finalist or Scholar, Beering Scholar, Dean's Engineering Scholar, Minority Engineering Program Honors Merit Award, or Women In Engineering Program Honors Merit Award, you are automatically invited. Participation is by invitation only and is completely optional.

The benefits of the honors program include access to courses designed specifically for honors students, access to dedicated honors program advising and staff members, priority registration, and additional honors designations to permanent transcripts. In addition, the honors program offers its students leadership and service learning opportunities, an established academic peer group and honors peer mentor program, participation in an industrial awareness program, and the opportunity to participate in the Engineering Honors Learning Community.

Students in the FYE Honors Program must complete a minimum of one three-credit-hour honors course each semester, meet predetermined GPA requirements at the end of the first and second semesters, participate actively in at least one student organization, and meet all First-Year Engineering Program requirements.

University Honors Program

The University Honors Program (UHP) opened its doors in Fall 2005 with the mission of providing an academically rigorous and educationally enhanced environment to "promote the highest intellectual development of students of superior ability." To that end, the University Honors Program, open each year to approximately 140 entering Purdue University first-year students by invitation only, offers numerous enrichment opportunities both in and out of the classroom. Participating students must maintain a 3.6 GPA and complete 24 credit hours of honors or honors-designated/honors-approved courses.

Honors courses will be designated on official student transcripts. Students who fulfill all requirements of the UHP and their degree program will earn an honors designation on their Purdue diploma.

Students are selected for UHP at the university level. Students can participate in both the University Honors Program and the First-Year Engineering Honors Program concurrently if all eligibility requirements are met.

Learning Community Choices for First-Year College of Engineering Students

The Engineering Learning Communities (LC) support students' transition to Purdue's First-Year Engineering Program. Cohorts of 30 LC students take two to four linked courses and complete a service-learning project during their first semester. This project provides the opportunity for students to work on an engineering project for a real customer, usually a local community organization. This can stretch their views of what engineering is and what engineers do. Outside of class, activities and trips are organized. The other classes that LC students take are not linked, giving them the opportunity to meet people outside of the learning community.

Current Learning Communities options available for First-Year Engineering students include: Engineering for the Planet, Engineering Honors, EPICS, IDEAS, Integrated Science and Engineering, Network, Entrepreneurship and Innovation Learning Community, and Women in Engineering Residential Program.

First-Year Engineering Program Curriculum

In order to fulfill all the requirements for the First-Year Engineering Program, each student must take or obtain credit for the following courses: Calculus I and II, General Chemistry I, Physics I, Engineering Problem Solving and Computer Tools, Science selective (either General Chemistry II, Biology, or Computer Programming), English Composition, and a First-Year General Education elective. (Funda-

mentals of Speech Communication is recommended for most students.) Although not part of the FYE Program curriculum, students interested in majoring in aeronautics and astronautics engineering, civil engineering, construction engineering management, or mechanical engineering are encouraged to take the appropriate computer graphics course.

Required Courses for the FYE Program

Calculus I (4 or 5): MA 16100 or 16500
Calculus II (4 or 5): MA 16200, 16600, 17300, or 18100
Chemistry I (4): CHM 11500, 12300, or 13600
Physics I (4): PHYS 17200 or 17200H
Engineering Problem Solving and Computer Tools (3): ENGR 12600 or 12600H
Engineering Lectures (1): ENGR 10000, 10000H, 10300 or 10400
English Composition (3 or 4): ENGL 10600, 10600I or 10800
Science Selective (3 or 4): CHM 11600, 12400, or 13600; or CS 15900; or ENGR 11700; or BIOL 11000, 11100, 12100, 13100, 19000
First-Year General Education Elective such as COM 11400 (3)
Total Credit Hours 29–33
Optional Computer Graphics Course for AAE and ME majors only (2): CGT 16300
Optional Computer Graphics Course for CE and CEM (2): CGT 16400

Plan of Study for the First-Year Engineering Program

(Minimum — 28 credit hours)

The First-Year Engineering Program is typically completed in two semesters, although students may remain in the First-Year Engineering Program for a maximum of four semesters. Students who have completed the necessary prerequisites may begin coursework for their professional engineering school plan of study while simultaneously completing any remaining First-Year Engineering Program classes. Grades of "C" or better are required in calculus I (MA 16500 or equivalent) and engineering problem solving (ENGR 12600 or equivalent). Students continuing on to general chemistry II need to complete general chemistry I as defined by the ENE faculty. Students who begin their studies of mathematics in precalculus (MA 15900) need a grade of "C" or better to progress to calculus I.

First Semester

(4) **CHM 11500** (General Chemistry)
(4) **ENGL 10600** (First-Year Composition)
(1) **ENGR 10000** (Freshman Engineering Lectures)
(3) **ENGR 12600** (Engineering Problem Solving and Computer Tools)
(4) **MA 16500** (Analytic Geometry and Calculus I)

Second Semester

(2) **CGT 16300** (Introduction to Graphics for Manufacturing) **or**
(2) **CGT 16400** (Graphics for Civil Engineering and Construction)
Science Selective:
BIOL 11000, 11100, 12100, 13100, or
SCI 29000 (3 credit hour minimum)
(4) **CHM 11600** (General Chemistry) **or**
(3) **CS 15900** (Programming Applications for Engineers)
(4) **MA 16600** (Analytic Geometry and Calculus II)
(4) **PHYS 17200** (Modern Mechanics)
(3) First-Year General Education Elective, such as COM 11400 (Fundamentals of Speech Communication)

Note: *This is a typical sequence of courses for the first year. Adjustments are permitted based on a student's high school preparation, college credit, and honors status. Common course substitutions are listed in the "Required Courses for the First-Year Engineering Program" on this page.*

Admission to the College of Engineering

Students are typically admitted to the professional schools within the College of Engineering at the end of the fall and spring semesters. Students must have completed all the requirements of the First-Year Engineering Program in order to be admitted to any of the professional schools. A uniform measure of quality, the Engineering Admissions Index (EAI), is used to ensure that a base level of competency has been achieved by each student in the core FYE Program courses prior to admission to a professional school.

Students who do not have an EAI of 2.0 at the completion of their FYE Program courses will not be admitted to a professional engineering school.

Currently, an EAI of 2.0 is required for guaranteed admission to agricultural, biological, civil, industrial, interdisciplinary, materials, multidisciplinary, and nuclear engineering.

Engineering Admissions Index

The Engineering Admissions Index (EAI) is the grade point average (GPA) of required First-Year Engineering Program classes, with the exception of the first-year general education elective and the engineering lectures course (ENGR 10000/10000H/10300/10400). The EAI is calculated only from required FYE Program courses taken at Purdue University. Courses taken at another college or university and courses for which a student has received credit by examination are not included in the EAI or the GPA.

The following formula is used to calculate both the EAI and the GPA. The sigma ($\sum$) denotes "the sum of": $\sum(xy)/\sum y$, where x = the grade and y = the number of credit hours of the course.

The EAI can be computed online by using the EAI calculator at www.engineering.purdue.edu/ENE/FirstYear/eai_calculator.html.

Admission to Programs with Managed Enrollment

Currently, four engineering schools control enrollment by requiring a higher EAI for guaranteed admission; this enables those schools to maintain a balance between the number of students and the facilities available. As of this printing, aeronautics and astronautics engineering and electrical and computer engineering both have an EAI of 2.5 for guaranteed admission; mechanical engineering and chemical engineering require an EAI of 2.7 for guaranteed admission. Professional schools with managed enrollment have the option of lowering their admission EAI in a given semester to 2.0, if there is space remaining for additional students. Temporary changes in the EAI are not published.

Admission to Programs with Application Processes

Construction engineering and management, and biomedical engineering both have more extensive admittance procedures. Currently, CNE requires an overall GPA of 2.5 and a recommended EAI of 2.5, as well as an interview and an application, which is due annually in January. Biomedical engineering recommends a minimum of 3.0 GPA in the fall semester. An application must be completed by early- to mid-January. Both programs explain their requirements on their Web sites.

Interdisciplinary Engineering

The primary responsibility of Interdisciplinary Engineering (IDE), which is administratively part of the Department of Engineering Education, is to provide a coordinated and controlled educational opportunity for select students whose interests and talents fall at an interface either between engineering disciplines, or between engineering and other disciplines. Both prescribed and open curricula are available, which allows IDE to accommodate highly flexible interdisciplinary programs. These programs are broad, innovative, and challenging, and enable graduates to seek better solutions to a variety of complex socio-economic-technical-humanitarian problems.

Two degrees are offered: Bachelor of Science in Engineering (B.S.E) and Bachelor of Science (B.S.). Virtually the same concentrations of majors is offered for both degrees. The B.S.E degree will be awarded to students who complete the Multidisciplinary Engineering program designed to meet accreditation standards. The B.S. degree is an engineering-related degree with fewer engineering courses and thus more flexibility to take courses that prepare students for professional schools or nontraditional careers. The Multidisciplinary Engineering program is accredited by ABET, Inc., formerly named the Accreditation Board for Engineering and Technology

Concentrations

Every engineering student at Purdue University follows a common first year. Those who decide to enter IDE usually do so toward the end of the second or third semester. Students choose concentrations of the most interest to them and plan their academic programs accordingly; in most instances, the range of available courses enables a student to proceed toward any technically based educational objective. IDE offers many opportunities for an education that is broad and liberal but also technical for students who want to participate in planning their own personalized programs. Interdisciplinary engineer-

ing offers an excellent pre-medicine or pre-law background.

A few examples of typical areas are listed here, but many other possibilities and combinations are available.

- Acoustical engineering
- Applied mathematics engineering
- Engineering management
- Engineering science
- Environmental and ecological engineering
- General engineering
- Integrated engineering
- Pre-professional (law, medicine, etc.) engineering
- Systems engineering
- Theater engineering

Educational Objectives

The objectives of the IDE program are to provide students:

- The opportunity to plan their own programs.
- Flexible alternatives to study engineering plus another field in-depth.
- Opportunities to study engineering disciplines not formally available at Purdue University.
- The opportunity to use engineering as a background to prepare for careers that satisfy their unique interests.

IDE graduates follow diverse career paths. Many obtain entry-level engineering positions; others enroll at professional schools to study law, medicine, and other professions; some go to graduate school in a variety of areas; and a few become entrepreneurs.

IDE welcomes CODO (Change of Degree Objective) students. Students in engineering who meet IDE CODO requirements can usually graduate without requiring additional time if they CODO before or during the first semester of their junior year. Students in other colleges may require extra time because they must complete the First-Year Engineering requirements before they CODO into IDE.

Plans of Study

All students submit plans of study to IDE for approval during the first semester of enrollment in the division.

CODO and transfer students must submit plans of study to IDE before they transfer into the program. All transfer students must receive formal approval of their plans of study by the School of Engineering Education at least one full semester before the semester or summer session in which they intend to graduate.

Registration for Fundamentals of Engineering Examination

IDE seniors in an ABET, Inc. accredited concentration who wish to become registered professional engineers should take the Fundamentals of Engineering examination at the West Lafayette campus during their final semester before graduation.

Counseling Information

Students, prospective students, or high school counselors who want information about IDE should contact Interdisciplinary Engineering, (765) 494-7422.

Graduation Requirements for Bachelor of Science in Engineering (B.S.E)

- Satisfaction of various University-wide graduation requirements: academic, scholastic, residence, fee payments, etc.
- Completion of an appropriate plan of study prepared by the student and approved by the faculty of the Department of Engineering Education and the director of Undergraduate Degree Programs or designated representative(s).
- The B.S.E requires meaningful integration of the required engineering core and area requirements. A minimum of 47 credit hours of engineering coursework beyond the First-Year Engineering Program is required in both engineering core and area requirements. An approved plan of study must be developed during the student's first semester in IDE.

Academic Requirements for Bachelor of Science in Engineering (B.S.E)

Credit Hours Required for Graduation: 124

See the Interdisciplinary Engineering page on the Engineering Web site at www.engineering.purdue.edu/ENE/Undergrad. Contact Interdisciplinary Engineering for details.

Graduation Requirements for Bachelor of Science (B.S.)

- Satisfaction of various University-wide graduation requirements: academic, scholastic, residence, fee payments, etc.

- Completion of an appropriate plan of study prepared by the student and approved by the faculty of the Department of Engineering Education and the director of Undergraduate Programs or designated representative(s).

The plan of study will provide for meaningful integration of both the core and area requirements.

Aeronautics and Astronautics

The School of Aeronautics and Astronautics offers bachelor's, master's, and doctoral degrees in aeronautical and astronautical engineering. Aeronautics covers all aspects of atmospheric flight, and astronautics is concerned with flight in space. The field of aeronautical and astronautical engineering, often collectively called "aerospace," deals with the challenging problems encountered in the design and operation of air and space vehicles.

The objective of the undergraduate aeronautical and astronautical engineering program is to prepare students for careers in aerospace engineering and related disciplines. Through the course of their studies, students shall:

- Acquire the essential technical components of aerospace engineering, including structures and materials, vehicle dynamics, controls, aerodynamics, propulsion, and systems design.
- Develop basic engineering skills: an ability to formulate and solve problems, including computational, experimental, open-ended, and design problems; an ability to work in teams; the ability to communicate their work to others in writing, orally, and graphically; and a habit of professional conduct.
- Have opportunities for research, independent study, cooperative education, study abroad, professional society participation, and similar activities that foster the habit of lifelong learning required for success in the profession.
- Develop an appreciation for the social impact of engineering solutions and, specifically, the role of aerospace technology in today's world.

The sophomore year sets the foundation of basic engineering, including statics, dynamics, elementary structures, electrical circuits, and a broad introduction to the design of both aircraft and spacecraft.

In the junior year, students learn about aerodynamics, propulsion, structures, dynamics, and control systems. Some courses in the third year are available in both aeronautical and astronautical versions, and students choose the area of primary interest.

In the senior year, students choose, in consultation with their academic advisor, two areas of concentration called "major" and "minor" areas. Elective classes can be selected in any of the following fields: fluid mechanics, aerodynamics, propulsion, structures and materials, control systems, dynamics, design, and orbit and flight mechanics.

All students must complete a team-based senior design project, which integrates the technical disciplines and leads to a preliminary design of an aerospace system. Students may elect either aircraft or spacecraft versions of the senior design project.

Students successfully completing the curriculum will be awarded the B.S.AAE degree.

The curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board of Engineering and Technology. More Information about the school can be found at www.engineering.purdue.edu/AAE.

Honors Program

Outstanding students who wish to pursue a course of study specifically tailored to their individual educational goals and career objectives are invited to apply to the School of Aeronautics and Astronautics Honors Program. Exceptional programs can be arranged to augment the regular program to permit more depth, breadth, speed, self-study, and/or research than is possible in the regular curriculum. Students who have an interest in this program should contact the head or associate head of the School of Aeronautics and Astronautics for more details and information.

Study Abroad

Purdue University's Program for Study Abroad Office currently offers more than 200 programs in over 45 countries around the world. The School

Academic Requirements for Bachelor of Science (B.S.)

Credit Hours Required for Graduation: 124

See the Interdisciplinary Engineering page on the Engineering Web site at www.engineering.purdue.edu/ENE/Undergrad. Contact Interdisciplinary Engineering for details.

of Aeronautics and Astronautics has student exchange agreements with Bristol University, U.K; Royal Melbourne Institute of Technology in Melbourne, Australia; University of New South Wales in Sydney, Australia; Technical University of Braunschweig in Germany; Ecole Superieure des Techniques Aeronautiques et de Construction Automobile (ESTACA) in Paris, France; and Osaka University in Japan.

Bachelor of Science Curriculum in Aeronautics and Astronautics

The basic B.S.AAE degree program has a minimum of 129 credit hours, including the First-Year Engineering requirements. The required courses and the major and minor area courses cannot be taken on a pass/not-pass basis. Students must have a 2.0 GPA in the major, as well as overall, to graduate with a B.S.AAE degree. Divided into topical areas, the required curriculum is as follows:

Credit Hours Required for Graduation: 129

Basic Program	***Credit Hours***
The basic B.S.AAE degree program has a minimum of 129 credit hours, including the First-Year Engineering requirements. The required courses and the major and minor area courses cannot be taken on a pass/not-pass basis. Students must have a 2.0 GPA in the major, as well as overall, to graduate with a B.S.AAE degree. Divided into topical areas, the required curriculum is:	
Mathematics	
Calculus: MA 16500, 16600, 26100	**12**
Linear Algebra: MA 26500	**3**
Differential Equations: MA 26600, 30400	**6**
Sciences	
Chemistry: CHM 11500	**4**
Physics: PHYS 17200, 24100	**7**
Communications, Humanities, and Social Sciences	
English Composition	**3**
Communications	**3**
Note: Students must take at least 3 credits of coursework focused on written and/or spoken communications at the 300 level or higher.	
General Education Electives	**18**
Computer Skills	
ENGR 10600	**2**
Programming: CS 15200 or 15600	**2**
Graphics: CGT 16300	**2**
Professional Development: ENGR 10000	**1**
Aeronautics and Astronautics Program	
Structures and Materials: AAE 20400, 20400L, 35200	**7**
Aerodynamics: AAE 33300, 33300L, 33400	**7**
Lab Elective: AAE 35200L or 33400L	**1**
Note: The selected lab should be taken with the corresponding course, if possible.	
Propulsion	
Thermodynamics: ME 20000	**3**
Jet Propulsion AAE 37200 **or** Rocket Propulsion AAE 43900	**3**
Note: Students planning to specialize in aeronautics should take AAE 37200; those aimed at astronautics should take AAE 43900.	
Dynamics and Control	
Statics and Dynamics: AAE 20300, 34000	**6**
Controls: AAE 30100, 36400, 36400L	**7**
Vehicle Dynamics: AAE 42100 or 44000	**3**
Note: Students planning to specialize in aeronautics should take AAE 42100; those aimed at astronautics should take AAE 44000. AAE 36400L is to be taken following AAE 36400.	
Design	
Introduction: AAE 25100	**3**
Spacecraft AAE 45000 **or** Aircraft AAE 45100	**3**
Note: Students planning to specialize in aeronautics should take AAE 45100; those aimed at astronautics should take AAE 45000.	
Major Electives	**9**
Minor Electives	**6**
Note: Major and minor electives are topically related specializations within aerospace engineering. They must be approved by the academic advisor.	
Technical Electives	**6**
Note: Technical electives may be chosen from a broad range of science, engineering, or technology courses, subject to the approval of the academic advisor.	
Note: Students must take at least 3 credits of coursework focused on economics, business, or entrepreneurship — subject to approval by the academic advisor. This may be covered either in the general education or technical electives and, therefore, need not increase the credits to graduate.	

Suggested Plan of Study for Aeronautical and Astronautical Engineering: Aeronautics Concentration

Credit Hours Required for Graduation: 129

Freshman Year, see First-Year Engineering Program.

CGT 16300 is required in the aeronautical and astronautical engineering curriculum.
Students planning to enter AAE are encouraged to take computer programming as the science selective.

Sophomore Year

Third Semester	*Fourth Semester*
(3) **AAE 20300** (Aeromechanics I)	(3) **AAE 20400** (Aeromechanics II)
(0) **AAE 39500** (Undergraduate Seminar)	(1) **AAE 20401** (Aeromechanics II Laboratory)
(4) **MA 26100** (Multivariate Calculus)	(3) **MA 26600** (Ordinary Differential Equations)
(3) **MA 26500** (Linear Algebra)	(3) **ME 20000** (Thermodynamics I)
(3) **PHYS 24100** (Electricity and Optics) **or** **AAE 25100** (Introduction to Aerospace Design)	(3) **PHYS 24100** (Electricity and Optics) **or** **AAE 25100** (Introduction to Aerospace Design)
(3) General education elective	(3) General education elective
(16)	(16)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **AAE 30100** (Signals Analysis in Aerospace)	(3) **AAE 33400** (Aerodynamics)
(3) **AAE 33300** (Fluid Mechanics)	(1) **AAE 33401** (Aerodynamics Laboratory) **or** **AAE 35201** (Structural Analysis I Laboratory)
(1) **AAE 33301** (Fluid Mechanics Laboratory)	(3) **AAE 34000** (Dynamics and Vibrations)
(3) **AAE 35200** (Structural Analysis I)	(3) **AAE 36400** (Control Systems Analysis)
(0) **AAE 39500** (Undergraduate Seminar)	(3) **AAE 37200** (Jet Propulsion Power Plants)
(3) **MA 30400** (Differential Equations and Analysis of Nonlinear Systems for Engineering and the Sciences)	(3) General education elective
(3) General education elective	(16)
(16)	

Senior Year

Seventh Semester	*Eighth Semester*
(1) **AAE 36401** (Control Systems Laboratory)	(3) **AAE 45100** (Aircraft Design)
(0) **AAE 39500** (Undergraduate Seminar)	(9) Major or minor area electives
(3) **AAE 42100** (Flight Dynamics and Control)	(3) Technical elective
(6) Major or minor area electives	(3) General education elective
(3) Technical elective	
(3) General education elective	
(16)	(18)

Suggested Plan of Study for Aeronautical and Astronautical Engineering: Astronautics Concentration

Credit Hours Required for Graduation: 129

Freshman Year, see First-Year Engineering Program.

CGT 16300 is required in the aeronautical and astronautical engineering curriculum.
Students planning to enter AAE are encouraged to take computer programming as the science selective.

Sophomore Year

Third Semester	*Fourth Semester*
(3) **AAE 20300** (Aeromechanics I)	(3) **AAE 20400** (Aeromechanics II)
(0) **AAE 39500** (Undergraduate Seminar)	(1) **AAE 20401** (Aeromechanics II Laboratory)
(4) **MA 26100** (Multivariate Calculus)	(3) **MA 26600** (Ordinary Differential Equations)
(3) **MA 26500** (Linear Algebra)	(3) **ME 20000** (Thermodynamics I)
(3) **PHYS 24100** (Electricity and Optics) **or** **AAE 25100** (Introduction to Aerospace Design)	(3) **PHYS 24100** (Electricity and Optics) **or** **AAE 25100** (Introduction to Aerospace Design)
(3) General education elective	(3) General education elective
(16)	(16)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **AAE 30100** (Signals Analysis in Aerospace)	(3) **AAE 33400** (Aerodynamics)
(3) **AAE 33300** (Fluid Mechanics)	(1) **AAE 33401** (Aerodynamics Laboratory) **or** **AAE 35201** (Structural Analysis I Laboratory)
(1) **AAE 33301** (Fluid Mechanics Laboratory)	(3) **AAE 34000** (Dynamics and Vibrations)
(3) **AAE 35200** (Structural Analysis I)	(3) **AAE 36400** (Control Systems Analysis)
(0) **AAE 39500** (Undergraduate Seminar)	(3) Technical elective
(3) **MA 30400** (Differential Equations and Analysis of Nonlinear Systems for Engineering and the Sciences)	(3) General education elective
(3) General education elective	(16)
(16)	

Senior Year

Seventh Semester	*Eighth Semester*
(1) **AAE 36401** (Control Systems Laboratory)	(3) **AAE 44000** (Spacecraft Attitude Dynamics)
(3) **AAE 43900** (Rocket Propulsion)	(3) **AAE 45000** (Spacecraft Design)
(6) Major or minor area electives	(9) Major or minor area electives
(3) Technical elective	(3) General education elective
(3) General education elective	(18)
(16)	

Options in Aeronautical and Astronautical Engineering

The school offers curriculum options for major and minor areas of study in programs leading to the degrees of B.S.AAE, M.S.AAE, and Ph.D. The techniques developed in these courses are by no means limited to aerospace applications, even though the emphasis is in that area. These options include:

Aerodynamics. This option emphasizes the study of fluid motion around a body moving through atmospheric air at speeds that range from subsonic to hypersonic. Theoretical, computational, and experimental methods are developed to determine forces, moments, and heat transfer that can be applied to the design of aircraft, missiles, and space vehicles. The basic theory and techniques also find application in other areas such as high-

speed ground transportation, hydrofoils, mechanics of blood flow, and noise generation.

Design. The design option involves the study of methods and techniques necessary for the design of aerospace systems and their components. The courses in this option provide opportunities to gain exposure to design methods and to gain experience through design projects. The topics addressed include requirements definition, functional decomposition, concept synthesis, application of design-oriented analysis methods, and optimization. Because aerospace systems are highly interdisciplinary, a systems perspective is encouraged to ensure that students are aware of how design decisions impact numerous features of the aerospace system.

Dynamics and Control. This option involves the study of techniques for aerospace vehicle guidance; systems analysis and control; analysis of flight vehicle trajectories, orbits, and dynamic motion; mission planning; and system optimization methods. This area deals more with the vehicle as a whole and how the subsystems and related technologies are integrated into the optimal design of a vehicle so that the mission requirements are met.

Propulsion. This option involves the study of the basic operation and design of aerospace propulsion devices, including both air-breathing engines and rocket powerplants. The gas dynamics of internal flows, thermodynamics, and combustion processes associated with these devices are discussed in detail. Engine components such as inlets, pumps and/or compressors, combustion chambers, turbines, and nozzles are investigated. Various air-breathing engines such as turbojets, turbofans, ramjets, turboprops, and scramjets are treated. Rocket propulsion systems — including solid rocket motors; liquid rocket engines; hybrid rockets; and nuclear, electric, and advanced nonchemical systems also — are covered.

Structures and Materials. This option emphasizes the study of structural analysis, structural dynamics, structural design, and behavior of aerospace materials. This includes courses that deal with the principles of mechanics and the theoretical, computational, and experimental techniques necessary to ensure the structural integrity of aerospace vehicles. Response to, and failure of, both materials and structures subjected to static and dynamic loads and thermal and corrosive environments are investigated theoretically and observed experimentally.

Agricultural and Biological Engineering

Energy, food, water, and the environment are vital for the well-being of both current and future generations. Agricultural and Biological Engineering (ABE) programs prepare students for careers that address these and other vital concerns. ABE offers two distinct degree programs — Agricultural Engineering and Biological Engineering. The Agricultural Engineering program trains professional engineers for rewarding careers in the Machine Systems Engineering specialization or the Environmental and Natural Resources Engineering specialization. The Biological Engineering program emphasizes the processing and chemistry of biological materials, the development of food, pharmaceuticals, and industrial products, or cellular and biomolecular engineering. Both curricula include a combination of courses in biology, life sciences, and engineering that provide the essential skills needed to design and/or manage biologically based production or processing systems, and machines.

Agricultural engineers with a focus on environmental and natural resources engineering work in industries and organizations focused on effective environmental and natural resource management, sources of clean energy, and maintaining water and air quality.

Agricultural engineers with a focus on machine systems engineering develop machines and processes to support the environmentally friendly production and efficient use of energy, food, and water while promoting health and safety.

Biological engineers work in industries that produce food or pharmaceuticals or use biological or biochemical processes to develop and manufacture new products.

Students in the department have flexibility in planning their professional training to meet particular degree objectives. Both curricula are accredited by the Engineering Accreditation Commission of ABET, Inc., formerly named the Accreditation Board for Engineering and Technology. Additional information is available at www.purdue/edu/ABE.

Educational Objectives

The educational objectives of the Department of Agricultural and Biological Engineering programs are to produce graduates who:

- Effectively practice agricultural engineering in the areas of machine systems and/or environmental and natural resources or effectively practice biological engineering in the areas of design and operation of systems for processing of biological materials to develop products for the food, pharmaceutical, and biochemical industries.
- Have demonstrated proficiency in fundamental engineering skills and technical knowledge as well as in professional and personal skills appropriate for their profession.
- Are prepared for future challenges in either agricultural engineering or biological engineering through the application and discovery of knowledge.
- Learn and grow as individuals, contribute to society, and attain maximum potential through lifelong learning.

To achieve the program educational objectives, the department will:

- Recruit, support, and retain competent faculty and staff.
- Provide facilities and equipment to create an atmosphere conducive to learning and discovery and to the application of knowledge.

Program Outcomes

Program outcomes refer to the important capabilities and skills that a student should possess as a graduate of one of the engineering undergraduate programs in the department. Outcomes for both agricultural engineering (AE) and biological engineering (BE) are divided into two groups: "basic engineering skills" and "professional and personal skills."

Agricultural Engineering (AE) Basic Engineering Skills

Graduates of this program will demonstrate:

- An understanding of the agricultural engineering profession and practice.
- The ability to understand and apply knowledge of mathematics, science, and engineering.
- An understanding of and the ability to identify, formulate, model, and solve problems for engineering systems.
- An ability to design a system, component, or process to meet the desired goal, subject to constraints.
- An ability to design and/or conduct experiments and analyze and interpret data.
- Effective use of appropriate techniques, skills, and state-of-the-art engineering tools necessary for engineering practice.

Biological Engineering (BE) Basic Engineering Skills

Graduates of this program will demonstrate:

- An understanding of the fundamental principles of mathematics and science.
- An understanding of biological and/or food process engineering principles.
- The ability to design and/or conduct experiments to analyze biological and/or food systems and processes.
- An understanding of, and the ability to, identify, formulate, model, and solve problems for biological and/or food process engineering systems.
- An ability to design a system or a process to meet desired needs in the area of biological and/or food process engineering.
- Effective use of appropriate techniques, skills, and state-of-the-art engineering tools necessary for engineering practice.

Professional and Personal Skills (for both AE and BE Programs)

Graduates of these programs will demonstrate:

- An understanding of the global and societal impact of engineering practice, research, discovery, entrepreneurship, and business.
- A knowledge of contemporary issues.
- Appropriate and effective writing, speaking, and listening skills.
- The ability to function on, and contribute effectively to, a multi-disciplinary team.
- The ability to understand and practice ethical responsibility in personal and professional life.
- An appreciation for the value of lifelong learning to maintain "life-balance" and achieve maximum potential.

Career Opportunities

Graduates of these programs will be prepared to develop products and systems ranging from intelligent machines, to techniques for conserving land and water resources and improving their quality, to the creation of healthy foods or

new bio-based materials. The highly interdisciplinary focus enables students to apply basic engineering principles to the design of new and renewable products or processes.

Employment opportunities for Agricultural Engineering graduates include: product engineering, design and test engineering for machinery and manufacturing industries, engineering for consulting firms and government agencies responsible for environmental conservation and quality, facilities design, safety engineering, engineering management, private consulting, teaching in colleges and universities, and research in industry and government.

Biological Engineering graduates are employed in food and/or biologically related industries where their activities include: research and development of new foods or biological and pharmaceutical products; development and operation of manufacturing, packaging and distribution systems for pharmaceutical, food, and bio-based products; design and installation of production processes; and/or plant engineering; distribution and marketing; quality evaluation and control; sanitation and waste disposal; and by-product utilization. There also is a great need for biological and food process engineers as educators, production and processing managers, and food industry executives.

The plans of study lead to either the degree of Bachelor of Science in Agricultural Engineering (B.S.AE.) or Bachelor of Science in Biological Engineering (B.S.BE.). They are administered by the College of Engineering and the College of Agriculture. Beginning students can apply for admission to the College of Engineering and complete the First-Year Engineering Program. An alternative for students with an interest in agricultural or biological engineering is to apply to the Pre-Agricultural and Biological Engineering program in the College of Agriculture.

Dual-degree programs also are available in Biological Engineering/Biochemistry or Biological Engineering/Pharmaceutical Sciences. These programs require an additional year of study and lead to two degrees. The department also offers graduate study leading to the degrees of Master of Science (M.S.) or Doctor of Philosophy (Ph.D.). A five-year dual BS/MS degree is offered in each of the areas for which students can apply at the end of their sophomore year.)

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, three-session co-op, or internship program. International internships also are available through the Global Partners in Apprenticeship Learning (G-PAL) Program within the Office of Professional Practice. 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 on the Professional Practice Program, please visit https://engineering.purdue.edu./ProPractice.

GEARE Program

The Global Engineering Alliance for Research and Education (GEARE) program is a unique and award–winning program that originated in the School of Mechanical Engineering at Purdue. Since 2009, the Office of Professional Practice (OPP) has assumed all GEARE operations and opened up the program to all College of Engineering students and some students in the College of Technology. GEARE is designed to supplement the education of engineers so they are prepared to function immediately in the global workplace. Students in the program participate in an orientation program, including language and culture, one domestic internship, one subsequent international internship at the same company, one semester of study abroad with fully transferable engineering course credits, and a one- to two-semester design team project with design teams that include students from international partner universities working on an industry-inspired project.

Interested students are encouraged to refer to the OPP Web site, https://engineering.purdue.edu/ProPractice.

Honors Program

An honors program is available for students with at least a 3.25 graduate index who desire the flexibility to pursue their interests in more depth. Under the guidance of a professional staff member, an honors student can devise his or her own plan of study which, except for school requirements, may be altered extensively from the regular curricula. Particular attention will be given

to self-study opportunities, design and research projects, and work experience that would reinforce the overall goals of the student. For more detailed information, students should go to the Student Academic Center in ABE room 201.

Study Abroad and International Studies Minor

If the United States is to compete effectively in a global economy, engineers must understand not only the international economic system but also the cultures, languages, and the scientific and engineering capabilities of other nations. The Study Abroad Office provides Purdue students with opportunities to take classes overseas. Those who desire more extensive training can participate in the International Studies Minor Program.

There are more than 200 programs, varying in length from one week to one academic year, available to Purdue students through the Study Abroad Office. These programs allow students to earn academic credit that can be used to fulfill their general education requirements and/or academic course requirements in their major or minor areas of study.

Students who participate in the International Studies Minor Program incorporate a special international component into their undergraduate programs of study. Except for the overseas experiential component of the program, students usually are able to use the elective structure within their major program of study to earn the minor. The Office of International Programs in Agriculture (IPIA) can provide special counsel to ABE students regarding program operations, including the identification and coordination of out-of-country experiences.

More detailed information about international opportunities is available through Purdue's Global Engineering Program (www.engineering.purdue.edu/gep) and the Office of International Programs in Agriculture (www.ippu.purdue.edu).

Minimum Degree Requirements for Agricultural Engineering

Credit Hours Required for Graduation: 131

Courses	*Credit Hours*
Mathematics and Basic Sciences	
Calculus: MA 16500, 16600, 26100, 26200	**16**
Chemistry: CHM 11500, 11600	**8**
Physics: PHYS 17200, 24100	**7**
Biological Sciences	**8**
Agricultural Sciences	
AGRY 25500	**3**
Elective	**3**
Computing	
ENGR 12600, CS 15900	**3**
Students specializing in Machine Systems have the option of taking CS 15900 and an additional hour of free elective instead of CHM 11600.	
Professional Development	
ENGR 10000; ABE 29000, 49000	**3**
Communication	
English Composition: ENGL 10600	**4**
Speech: COM 11400	**3**
Humanities and Social Sciences 18 (General Education)	
Must be chosen in accordance with the approved general education list and with the help of a faculty advisor. Of the 18 credit hours, 3 must be an additional communication elective, and 3 must be economics.	
Six credit hours must be taken to fulfill the College of Agriculture international understanding requirement; these credits may be taken as humanities/social sciences, free elective, or agriculture elective — depending on the chosen courses.	
Core Engineering Courses	
Computations: ABE 20500	**3**
Basic Mechanics of Materials: NUCL 27300, ME 27000 and 27400	**9**
Thermodynamics: ABE 21000	**3**
Physical Properties: ABE 30500	**3**
Soil and Water Conservation: ABE 32500	**4**
Basic Fluid Mechanics/Hydraulics: ME 30900 **or** CE 34000 and 34300	**4**
Machine Design: ABE 33000	**3**
Electronics: ECE 20100	**3**
Hydraulics for Mobile Equipment: ABE 43500	**3**
Numerical Methods/Modeling: ABE 45000	**3**
Capstone Design: ABE 48500	**4**
Technical Electives	**6**
Free Electives	**7**

Suggested Plan of Study for Agricultural Engineering

Credit Hours Required for Graduation: 131

ABE 12000, Introduction to Agricultural and Biological Engineering, is recommended for students interested in agricultural and biological engineering, but it is not required for admission to the program. **ABE 29000**, Sophomore Seminar, also is recommended in the third semester.

Freshman Year, see First-Year Engineering Program.

Sophomore Year

Third Semester	*Fourth Semester*
(3) **ABE 20500** (Engineering Computations for Biological Systems)	(3) **ABE 21000** (Biological Applications of Material and Energy Balances)
(1) **ABE 29000** (Sophomore Seminar)	(4) **MA 26200** (Linear Algebra and Differential Equations)
(4) **MA 26100** (Multivariate Calculus)	(3) **ME 27400** (Basic Mechanics II)
(3) **ME 27000** (Basic Mechanics I)	(3) **NUCL 27300** (Mechanics of Materials)
(3) **PHYS 24100** (Electricity and Optics)	(3) General education elective*
(4) Biological sciences elective	
(18)	(16)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **ABE 30500** (Physical Properties of Biological Materials)	(3) **ABE 33000** (Design of Machine Components)
(4) **ABE 32500** (Soil and Water Resource Engineering)	(3) **ECE 20100** (Linear Circuit Analysis I)
(3) **AGRY 25500** (Soil Science)	(4) Biological sciences elective
(3) **CE 34000** (Hydraulics) **and**	(3) General education elective*
(1) **CE 34300** (Elementary Hydraulics Laboratory) **or** (4) **ME 30900** (Fluid Mechanics)	(3) Elective
(3) General education elective*	
(17)	(16)

Senior Year

Seventh Semester	*Eighth Semester*
(3) **ABE 43500** (Hydraulic Control Systems for Mobile Equipment)	(4) **ABE 48500** (Agricultural Engineering Design)
(3) **ABE 45000** (Finite Element Method in Design and Optimization)	(3) Engineering technical elective
(1) **ABE 49000** (Professional Practice in Agricultural and Biological Engineering)	(6) General education electives*
(3) Agriculture elective	(3) Elective
(3) Engineering technical elective	
(3) General education elective*	
(16)	(16)

** Eighteen credit hours of general education electives must be chosen in accordance with the general education document (available in the Student Academic Center, Room 201, Agricultural and Biological Engineering Building). Of the 18 credit hours, 3 must be economics such as ECON 25100 or 25200, and 3 must be an additional communication elective.*

Minimum Degree Requirements for Biological Engineering

Credit Hours Required for Graduation: 133

Courses	*Credit Hours*
Mathematics and Basic Sciences	
Calculus: MA 16500, 16600, 26100, 26500, 26600	**18**
Chemistry: CHM 11500, 11600, 25700	**12**
Physics: PHYS 17200, 24100	**7**
Biological and Food Sciences	
Biological Sciences: BIOL 22100, 23000, 29500	**8**
BCHM 22100 or FN 20500	**3**
Biological or Food Science electives*	**6**
Engineering Tools and Skills	
ENGR 12600	**3**
Professional Development	
ABE 29000, 49000	**2**
Communication	
English Composition: ENGL 10600	**4**
Speech: COM 11400	**3**
Humanities and Social Sciences	**18**
General Education	
Must be chosen in accordance with the approved general education list and with the help of a faculty advisor. Of the 18 credit hours, 6 must meet College of Agriculture international understanding requirements, 3 must be an additional communication elective, and 3 must be economics.	
Core Engineering Courses	
Thermodynamics: ABE 20100, 20200, 30100, 30300	**12**
Heat, Mass, and Momentum Transfer: CHE 37700, 37800	**6**
Kinetics and Reaction Engineering: ABE 37000	**3**
Sensors and Process Control: ABE 46000	**3**
Transport Processes: ABE 45400	**4**
Unit Operations: ABE 55500	4
Plant Design and Economics: ABE 55600	**4**
Process Engineering: ABE 58000	**3**
Technical Electives*	**9**

** Eighteen credit hours of general education electives must be chosen in accordance with the general education document (available in the Student Academic Center, Room 201, Agricultural and Biological Engineering Building). Of the 18 credit hours, 3 must be economics, such as ECON 25100 or 25200, and 3 must be an additional communication elective.*

Plan of Study for Biological Engineering

Credit Hours Required for Graduation: 133

It is recommended that students take a general education elective in the freshman year.

Freshman Year, see First-Year Engineering Program.

Sophomore Year

Third Semester	*Fourth Semester*
(3) **ABE 20100** (Thermodynamics in Biological Systems I)	(3) **ABE 20200** (Thermodynamics in Biological Systems II)
(1) **ABE 29000** (Sophomore Seminar)	(3) **BCHM 22100** (Analytical Biochemistry) **or FN 20500** (Food Science)
(4) **CHM 25700** (Organic Chemistry)	(3) **MA 26500** (Linear Algebra)
(4) **MA 26100** (Multivariate Calculus)	(3) **MA 26600** (Ordinary Differential Equations)
(3) **PHYS 24100** (Electricity and Optics)	(3) Engineering elective
(3) General education elective*	(3) General education elective*
(18)	(18)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **ABE 30300** (Applications of Physical Chemistry to Biological Processes)	(3) **ABE 37000** (Biological/Microbial Kinetics and Reaction Engineering)
(3) **ABE 31000** (Thermodynamics of Food and Biological Systems)	(4) **ABE 45400** (Transport Processes in Biological and Food Process Systems)
(3) **BIOL 23000** (Biology of the Living Cell)	(4) **BIOL 22100** (Introduction to Microbiology)
(1) **BIOL 29500** (Quantitative Biology of the Living Cell)	(3) **CHE 37800** (Heat and Mass Transfer)
(3) **CHE 37700** (Momentum Transfer)	(3) Engineering elective
(3) General education elective*	
(16)	(17)

Senior Year

Seventh Semester	*Eighth Semester*
(1) **ABE 49000** (Professional Practice in Agricultural and Biological Engineering)	(3) **ABE 46000** (Sensors and Process Control)
(4) **ABE 55500** (Biological and Food Processing Operations)	(4) **ABE 55600** (Food Plant Design and Economics)
(3) Biological science or food science elective†	(3) **ABE 58000** (Process Engineering of Renewable Resources)
(3) Engineering elective†	(3) Biological science or food science elective
(6) General education elective*	(3) General education elective*
(17)	(16)

** Eighteen credit hours of general education electives must be chosen in accordance with the general education document (available in the Student Academic Center, Room 201, Agricultural and Biological Engineering Building). Of the 18 credit hours, 3 must be economics, such as ECON 25100 or 25200, and 3 must be an additional communication elective.*

† See the list of approved restricted electives that appears in the ABE Student Handbook.

Biomedical Engineering

Biomedical engineering combines engineering expertise with medical needs for the enhancement of human health care. It is a branch of engineering in which knowledge and skills are developed and applied to understand and solve problems in biology and medicine.

Purdue University established a new undergraduate program in Biomedical Engineering in 2004, Students can now earn a Bachelor of Science in Biomedical Engineering (B.S.BME) degree from the Weldon School of Biomedical Engineering. The first class of undergraduates received degrees in May 2007. A fully established graduate program in biomedical engineering has been in place since 1998, granting degrees of Master of Science in Biomedical Engineering (M.S.BME) and Doctor of Philosophy (Ph.D.).

Opportunities for B.S.BME graduates will continue to increase over the next 10 years. Positions available in the medical products industry include the design, development, and manufacturing of a wide array of medical devices, computer models to monitor and diagnose disease, biosensors to measure, and the design of biocompatible materials for tissue replacement.

Students who complete the undergraduate program with high scholastic achievement and who are interested in careers in research are encouraged to pursue an advanced degree in biomedical engineering. Students with stronger interest in the clinical aspect of biomedical engineering should consider application to the joint program between the Weldon School of Biomedical Engineering and the Indiana University School of Medicine, which leads to a combined degree (M.D./Ph.D.).

Admission to the undergraduate program is offered only in the spring semester of each year to eligible students in the First-Year Engineering Program. Selective admission is based upon a holistic evaluation of students who will complete the First-Year Engineering Program, utilizing a set of criteria that includes SAT/ACT scores, the Engineering Admissions Index (EAI), and an entrance exam (creative problem solving and critical thinking skills). Please consult with an academic advisor to learn more about this process of evaluation and selection.

Students not selected by these criteria are encouraged to pursue admission to one of the other professional engineering schools through which well-established specialty areas within the field of biomedical engineering continue to be offered. These programs include agricultural and biological engineering, electrical and computer engineering, mechanical engineering, and chemical engineering.

The BME undergraduate curriculum, which begins in the sophomore year, includes an array of courses that teach engineering science, analysis, and design in the context of biological and biomedical problems. Courses incorporate instruction in biomolecules, biomechanics, biological mass transport, cell biology, biostatistics, elective courses, and bioinstrumentation. In addition, BME and other engineering disciplines, life science, general education, and two professional seminars are required before graduation.

An undergraduate internship program provides an opportunity for biomedical engineering students to participate in a practical, supervised engineering experience with industry partners. Sponsoring companies may choose to place interns in a variety of roles, including research, product development, manufacturing, regulatory affairs, and marketing.

A senior design project provides the capstone engineering design experience, which ties together all the previous semesters of coursework on design and analysis into one integrated group project that takes the students from conception through construction and testing to a final presentation.

Further information about the undergraduate program in biomedical engineering, including a plan of study listing required courses and recommended electives, is available through the Weldon School of Biomedical Engineering Web site, www.engineering.purdue.edu/BME/Academics/BMEUndergraduate.Program.

GEARE Program

The Global Engineering Alliance for Research and Education (GEARE) program is a unique and award–winning program that originated in the School of Mechanical Engineering at Purdue. Since 2009, the Office of Professional Practice (OPP) has assumed all GEARE operations and opened up the program to all College of Engineering students and some students in the College of Technology. GEARE is designed to supplement the education of engineers so they are prepared to function immediately in the global workplace.

Students in the program participate in an orientation program, including language and culture, one domestic internship, one subsequent international internship at the same company, one semester of study abroad with fully transferable engineering course credits, and a one- to two-semester design team project with design teams that include students from international partner universities working on an industry-inspired project.

Interested students are encouraged to refer to the OPP Web site, https://engineering.purdue.edu/ProPractice.

Minimum Degree Requirements for Bachelor of Science in Biomedical Engineering (B.S.BME)

Credit Hours Required for Graduation: 130*

Courses	*Credit Hours*
First-Year Engineering Program No more than 8 credit hours of freshman calculus can be applied toward the BME degree. All First-Year Engineering courses must be completed with a "C" or above for entry into the BME undergraduate program.	**30**
Core Biomedical Engineering BME 20100, 20400, 20500, 20600, 30100, 30400, 30600, 39000, 29500, 39500, 49500	**26**
BME Breadth Requirement Core Life Sciences Requirement* BIOL 23000 and two additional life science courses at the 30000-level or above. Core Engineering Requirement: ECE 30100; IE 33000 or STAT 50400; ME 20000, 27000, 30900; and MSE 23000. BME/Engineering Elective: Three (3) additional BME/Engineering courses at the 40000-level or above.† Senior Design Requirement: BME 40500	**41**
Advanced Physics PHYS 24100	**3**
Advanced Math MA 26100, and MA 26600 or 26200	**7**
General Education Electives Course selections must meet the General Education Program requirements. Refer to "General Education Program in Engineering" on page 26-27. Includes an ethics elective to be chosen from either PHIL 27000 or 28000.	**18**
Unrestricted Elective Additional coursework to bring the total to at least 130 hours.	**5**
GPA Requirement: A Graduation Index of 2.0 or better is required to fulfill the B.S.BME degree requirements. A minimum overall GPA of 2.0 is required in the BME major courses to qualify for graduation with a B.S.BME degree.	

** See the most up-to-date requirements on the Weldon School of Biomedical Engineering Web site.*

† These courses must be selected from a list of courses approved by the Weldon School of Biomedical Engineering faculty and maintained by the Undergraduate Advising Office.

Suggested Plan of Study for Biomedical Engineering

Credit Hours Required for Graduation: 130*

Freshman Year, see First-Year Engineering Program.

Sophomore Year

Third Semester	*Fourth Semester*
(3) **BIOL 23000** (Biology of the Living Cell)	(3) **BME 20400** (Biomechanics of Hard and Soft Tissues)
(3) **BME 20100** (Biomolecules: Structure, Function, and Engineering Applications)	(1) **BME 20600** (Biomedical Engineering Laboratory II)
(1) **BME 20500** (Biomedical Engineering Laboratory I)	(3) **MA 26600** (Ordinary Differential Equations)
(4) **MA 26100** (Multivariate Calculus)	(3) **BME 29500** (Physiology for Engineers)
(3) **ME 27000** (Basic Mechanics)	(1) **BME 29500** (Frontiers in BME)
(3) **PHYS 24100** (Electricity and Optics)	(3) **ME 20000** (Thermodynamics I)
	(3) **MSE 23000** (Structure and Properties of Materials)
(17)	(17)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **BME 30100** (Bioelectricity)	(3) **BME 30400** (Bioheat and Mass Transfer)
(2) **BME 30500** (Bioinstrumentation Laboratory)	(1) **BME 30600** (Biotransport Laboratory)
(1) **BME 39000** (Biomedical Engineering Professional Seminar)	(3) **ECE 30100** (Signals and Systems)
(4) **ME 30900** (Fluid Mechanics)	(3) **IE 33000** (Probability and Statistics in Engineering II)
(6) General education elective	(1) **BME 39000** (BME Professional Seminar)
	(3) Ethics elective
	(3) General education elective
(16)	(17)

Senior Year

Seventh Semester	*Eighth Semester*
(3) **BME 59500U** (Nonlinear Dynamics of Biological Systems)	(4) **BME 40500** (Biomedical Engineering Design Project)†
(6) Biomedical engineering/Engineering electives	(3) Biomedical engineering/Engineering elective
(3) Life science elective	(3) Life science elective
(3) Unrestricted elective	(3) General education electives
	(2) Unrestricted elective
(15)	(15)

** See the most up-to-date requirements on the Weldon School of Biomedical Engineering Web site.*

Chemical Engineering

The School of Chemical Engineering offers courses of study leading to the degree of Bachelor of Science in Chemical Engineering (B.S.ChE) and the advanced degrees of Master of Science in Chemical Engineering (M.S.ChE) and Doctor of Philosophy (Ph.D).

At the B.S. level, the objective is to prepare engineering professionals with a strong functional command of chemical engineering fundamentals; experimental, mathematical, computational, and communication skills; and awareness of the scope of the profession, which will enable them to become the engineering leaders of the future.

Chemical engineers rely on their knowledge of mathematics and science — particularly chemistry — to overcome technical problems in industry and society. They use their engineering knowledge to meet challenges in manufacturing of bulk and commodity chemicals; in development and production of pharmaceuticals; in discovery and production of biomaterials and biochemicals; in environmental protection and remediation; in microelectronics manufacturing; in the development and delivery of energy; in law, especially intellectual property law; in education; in publishing; in finance; and in medicine. 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.

Chemical engineers use their technical training every day, but they also must have well-developed communication and teamwork skills to work with many different teams of engineers, scientists, managers, financiers, doctors, lawyers, and government officials.

At the same time, chemical engineering is among the broadest of all majors at the University. Chemical engineers have many interests and skills that are shared by electrical engineers, civil engineers, biomedical engineers, aeronautical engineers, and mechanical engineers. On top of these varied skills, chemical engineers have a strong understanding of chemistry and increasingly, biology. As a result, students in chemical engineering excel in coursework within and outside the chemical engineering major that prepares them to be world leaders in technology areas like energy, the environment, biotechnology and medicine, personal care products, food, and high performance materials.

Students who obtain Bachelor of Science (B.S.) degrees in chemical engineering have many professional options. Most go into industry, where they work in manufacturing environments. In a manufacturing position, chemical engineers will typically work on two or three projects simultaneously, in collaboration with other engineers. They will improve existing manufacturing processes, troubleshoot processes that are running out of specification, or implement process changes that will deliver new or improved products. Chemical engineers are involved in manufacturing high value-added products, which translates into salaries that are usually the highest of any engineering major. Some B.S. chemical engineers go to law school, where they often are drawn to legal issues associated with patents and intellectual property.

Chemical engineering also is one of the most desirable majors for preparation for medical school, and chemical engineers are very successful in the medical profession. Students who go on to receive Master of Science (M.S.) degrees will follow career paths that are very similar to B.S. graduates, with the exception that they often begin their careers with added responsibility due to their advanced training. Students who receive doctoral (Ph.D.) degrees will usually be hired to do research in industry or government labs or to teach and direct research at a university.

To prepare graduates to succeed in graduate school or professional school as well as in industry, the chemical engineering curriculum at Purdue emphasizes a healthy blend of theoretical and applied coursework. A typical course schedule contains basic courses in mathematics, chemistry, physics, and biology, accompanied by specialized courses to give students an advanced understanding of the principles of chemical engineering. It is important to remember that Purdue graduates are in demand by the wide range of companies listed above without having to take specialized coursework to prepare for a given industry sector. As a potential student, this means that the opportunities detailed earlier in this section may be available to you just based on your basic B.S. degree in Chemical Engineering from Purdue.

GPA Requirement

A graduation index of 2.0 or better is required for graduation with a B.S.ChE. In addition, a minimum grade point average (GPA) of 2.0 is required in the core chemical engineering (CHE) courses (sophomore level and higher) to qualify for graduation.

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, three-session co-op, or internship program. International internships also are available through the Global Partners in Apprenticeship Learning (G-PAL) Program within the Office of Professional Practice. 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 on the Professional Practice Program, please visit https://engineering.purdue.edu./ProPractice.

GEARE Program

The Global Engineering Alliance for Research and Education (GEARE) program is a unique and award–winning program that originated in the School of Mechanical Engineering at Purdue. Since 2009, the Office of Professional Practice (OPP) has assumed all GEARE operations and opened up the program to all College of Engineering students and some students in the College of Technology. GEARE is designed to supplement the education of engineers so they are prepared to function immediately in the global workplace. Students in the program participate in an orientation program, including language and culture, one domestic internship, one subsequent international internship at the same company, one semester of study abroad with fully transferable engineering course credits, and a one- to two-semester design team project with design teams that include students from international partner universities working on an industry-inspired project.

Interested students are encouraged to refer to the OPP Web site, https://engineering.purdue.edu/ProPractice.

Preparation for the Graduate Program

Students with a high scholastic index who are interested in the more creative and technical phases of engineering, such as research, development, design, and teaching, are advised to follow a program leading to the degree of M.S.ChE or Ph.D. It is recommended that such students take at least a year of foreign language in their nontechnical elective program. Their technical electives should be chosen from advanced courses in mathematics or statistics, chemical engineering, biology, chemistry, or physics.

Descriptions of chemistry, mathematics, biology, and physics courses listed as electives will be found within the University's online course repository on the Purdue Web site at www.mypurdue.purdue.edu.

Honors Program

An honors option is available for qualified undergraduate students. Among the purposes of this option are encouragement of student interest in graduate study and research/academic careers and special recognition of students attaining high levels of academic achievement.

A two-semester research effort (CHE 49800, 49900) on a project of the student's choice is a major part of the honors program. The honors student selects a research topic in consultation with a chemical engineering faculty member, who then serves as research advisor. The honors research culminates in submission of a written thesis and a public presentation and oral defense of this work.

Formal application to the program should be made in the second semester of the junior year. Complete details are available from the chemical engineering undergraduate office.

The total hours required for graduation under the honors option are the same as the B.S.ChE total, but CHE 54000 must be included as an elective. An honors certificate will be awarded when a student successfully completes the option.

Plan of Study for Chemical Engineering

Credit Hours Required for Graduation: 131

Freshman Year, see First-Year Engineering Program.

Chemistry Sequence. The freshman chemistry requirement for chemical engineering students is eight credits of general chemical and qualitative analysis. These may be earned by taking one of the following sequences: **CHM 11500/11600** (8 credits), or **CHM 12300/12400** (8 credits). The preference within the School of Chemical Engineering is that students take the **CHM 12300/12400** sequence, but **CHM 11500/11600** also will be accepted.

The freshman engineering student who is interested in chemical engineering must fulfill all of the requirements of the First-Year Engineering Program before he or she can enter the School of Chemical Engineering.

Sophomore Year

Third Semester	*Fourth Semester*
(0) **CHE 20000** (Chemical Engineering Seminar)	(4) **CHE 21100** (Chemical Engineering Thermodynamics)
(3) **CHE 20500** (Chemical Engineering Calculations)*	(3) **CHE 32000** (Statistical Modeling)
(3) **CHM 26100** (Organic Chemistry I)	(3) **CHM 26200** (Organic Chemistry II)
(1) **CHM 26300** (Organic Chemistry Laboratory I)	(1) **CHM 26400** (Organic Chemistry Laboratory II)
(4) **MA 26100** (Multivariate Calculus)	(4) **MA 26200** (Linear Algebra and Differential Equations)
(3) **PHYS 24100** (Electricity and Optics)	(3) General education elective
(3) General education elective	(18)
(17)	

Junior Year

Fifth Semester	*Sixth Semester*
(3) **CHE 30600** (Staged Separations)	(0) **CHE 30000** (Chemical Engineering Seminar)
(3) **CHE 37000** (Physical Chemistry)	(3) **CHE 33000** (Principles of Molecular Engineering)
(4) **CHE 37700** (Momentum Transfer)	(4) **CHE 34800** (Chemical Reaction Engineering)
(3) **BIOL 23000** (Biology of the Living Cell)	(4) **CHE 37800** (Heat and Mass Transfer)
(3) **MA 30300** (Differential Equations for Engineering)	(3) Engineering elective
	(3) General education elective
(16)	(17)

Senior Year

Seventh Semester	*Eighth Semester*
(0) **CHE 40000** (Chemical Engineering Seminar)	(3) **CHE 43500** (Chemical Engineering Laboratory II)
(3) **CHE 43400** (Chemical Engineering Laboratory I)	(2) **CHE 45000** (Design and Analysis of Processing Systems)
(3) **CHE 44900** (Design and Cost Analysis)	(3) Chemical engineering elective
(3) **CHE 45600** (Process Dynamics and Control)	(3) Technical elective
(3) Chemical engineering elective	(6) General education electives
(3) General education elective	
(15)	(17)

** A "C" or better must be earned in CHE 20500 to continue to enroll in chemical engineering classes.*

Chemistry/Chemical Engineering Dual-Degree Program

The Department of Chemistry and the School of Chemical Engineering offer a joint five-year program for students. This curriculum leads to both the degree of B.S. in Chemistry and B.S.ChE. Graduates of this program will be certified as fulfilling the recommended requirements of the American Chemical Society. The curriculum in chemical engineering is accredited by the Engineer's Council for Professional Development.

Students wishing to participate in this program should apply accordingly and be admitted to both the First-Year Engineering program and the College of Science.

Plan of Study for Chemistry/Chemical Engineering Dual Degree

Freshman Year

First Semester	*Second Semester*
(4) **CHM 12500** (Introduction to Chemistry I) **or** **CHM 11500** (General Chemistry)	(5) **CHM 12600** (Introduction to Chemistry II) **or** (4) **CHM 11600** (General Chemistry)
(4) **ENGL 10600** (First-Year Composition **or** **ENGL 10800** (Accelerated First-Year Composition)	(1) **ENGR 10000** (Freshman Engineering Lecture)
(3) **CS 15800** (C Programming) **or** (4) **CS 17700** (Programming with Multimedia Objects)	(3) **ENGR 12600** (Introduction to Engineering Problem Solving and Computers)
(5) **MA 16100** (Plane Analytic Geometry and Calculus I) **or MA 16500** (Analytic Geometry and Calculus I)*	(5) **MA 16200** (Plane Analytic geometry and Calculus II) **or** (4) **MA 16600** (Analytic Geometry and Calculus II)*
	(4) **PHYS 17200** (Mechanics)
(16)	(16-18)

Sophomore Year

Third Semester	*Fourth Semester*
(3) **CHE 20500** (Chemical Engineering Calculations)†	(4) **CHE 21100** (Introductory Chemical Engineering Thermodynamics)
(3) **CHM 26100** (Organic Chemistry I)	(3) **CHM 26200** (Organic Chemistry II)
(2) **CHM 26500** (Organic Chemistry Laboratory I)	(2) **CHM 26600** (Organic Chemistry Laboratory II)
(4) **MA 26100** (Multivariate Calculus)	(3) **COM 21700** (Science Writing and Presentation)
(4) **PHYS 27200** (Electricity and Optics)	(4) **MA 26200** (Linear Algebra and Differential Equations)
(16)	(16)

Junior Year

Fifth Semester	*Sixth Semester*
(4) **CHE 37700** (Momentum Transfer)	(3) **CHE 32000** (Statistical Modeling)
(4) **CHM 32100** (Analytical Chemistry)	(3) **CHM 37400** (Physical Chemistry II)
(3) **MA 30300** (Differential Equations for Engineering)	(2) **CHM 37600** (Physical Chemistry Laboratory)
(3) Foreign Language 10100	(3) Foreign Language 10200
(3) Great Issues class	(3) Engineering elective
(17)	(14)

** If MA 16100 and/or 16200 is taken, these courses will be accepted as only 4 credit hours each toward meeting the graduation requirements for chemical engineering.*

† A "C" or better must be earned in CHE 20500 to continue to enroll in chemical engineering courses.

Senior Year

Seventh Semester	*Eighth Semester*
(3) **CHE 30600** (Design of Staged Separation Processes)	(3) **CHE 33000** (Principles of Molecular Engineering)
(4) **CHE 34800** (Chemical Reaction Engineering)	(4) **CHE 37800** (Heat and Mass Transfer)
(4) **CHM 42400** (Analytic Chemistry II)	(4) **CHM 24100** (Introduction to Inorganic Chemistry)
(3) Foreign Language 20100	(1) **CHM 51300** (Literature)
	(3) General education elective
(14)	(15)

Fifth Year

Ninth Semester	*Tenth Semester*
(0) **CHE 40000** (Chemical Engineering Seminar)	(3) **CHE 43500** (Chemical Engineering Laboratory II)
(3) **CHE 43400** (Chemical Engineering Laboratory I)	(2) **CHE 45000** (Design and Analysis of Processing Systems)
(3) **CHE 45600** (Process Dynamics and Control)	(4) **CHM 34200** (Inorganic Chemistry I)
(3) **CHE 4490** (Design and Cost Analysis)	(1) **CHM 49400** (Chemistry Seminar)
(3) **CHM 53300** (Biochemistry)	(3) General education elective
(3) General education elective	
(15)	(13)

Civil Engineering

Civil engineering is a remarkably broad field of study. Students can elect to prepare for professional careers in planning, design, or construction in a variety of areas: architectural engineering, construction engineering, environmental engineering, geomatics (surveying) engineering, geotechnical engineering, hydraulic and hydrologic engineering, civil engineering materials, structural engineering, and transportation and infrastructure systems engineering.

The curriculum accommodates this breadth by providing a fundamental set of required courses complemented by sufficient flexibility to allow students to concentrate portions of their studies in some meaningful combination of the special areas that are of particular interest to them. Students develop plans of study that meet their career objectives with the help of interested faculty advisors.

The goals of the civil engineering program are to provide students who qualify for the program with:

- An outstanding engineering education from a nationally and internationally recognized institution.
- A program of study that accommodates the individual's interests and career goals.
- Teaching and advising by talented faculty who are accessible and available for interaction with students.
- The ability to solve practical engineering problems and communicate the solutions effectively.
- The opportunity to join the vast family of Purdue civil engineering graduates who are playing leading roles in the practice of civil engineering worldwide.
- A solid foundation for those students who wish to pursue graduate studies.
- The ability to engage in lifelong learning.

The educational experience in civil engineering provides students with a solid foundation of technical knowledge; an appreciation of the social, economic, and political implications of civil engineering projects; the ability to make decisions based on these implications as well as on technical, ethical, and humanistic considerations; and finally, the capacity to effectively communicate not only these decisions but ideas in general.

This four-year program leads to a Bachelor of Science in Civil Engineering (B.S.CE) degree. A graduate program leading to master's and doctoral degrees is open to outstanding students who wish to undertake advanced study. For more information on the graduate program, please consult *The Graduate School* catalog. It is also quite common for civil engineering graduates to pursue further study in other professions such as business or law.

The civil engineering profession encompasses a wide range of projects: buildings and bridges; tunnels, dams, and levees; harbors, waterways, and irrigation facilities; water supply systems; contaminant flows, waste treatment facilities, and air and geoenvironmental remediation; airports, highways, railroads, and intelligent transportation systems; pipelines, and power lines — the infrastructure of the world. These often-monumental projects, coupled with the changing needs of our civilization and the need for sustainable development, provide unlimited challenges and opportunities. In meeting these challenges, civil engineers use a variety of advanced technologies, including high-performance computing, geographic information systems, imaging, and automation.

Employment opportunities for civil engineering graduates interested in traditional civil engineering projects include engineering consulting firms; construction firms; industrial firms; federal, state, and municipal agencies; and the military. Additionally, however, civil engineering graduates often become involved in organizations with activities that are far removed from traditional civil engineering endeavors, such as the aerospace industry, research laboratories, the automotive industry, software developers, and management consultants.

The undergraduate program in civil engineering is accredited by the Engineering Accreditation Commission of ABET, Inc., formerly named the Accreditation Board for Engineering and Technology.

While studying for the bachelor's degree in civil engineering, a student may elect to obtain a minor in any of a number of disciplines within the University. For example, a minor in management typically requires one additional semester of study beyond that required for the B.S.CE degree.

Opportunities for study abroad are available in cooperation with the University's Program for Study Abroad Office. Students who have an interest in the study abroad program should contact the Undergraduate Office in the School of Civil Engineering.

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, three-session co-op, or internship program. International internships also are available through the Global Partners in Apprenticeship Learning (G-PAL) Program within the Office of Professional Practice. 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 on the Professional Practice Program, please visit https://engineering.purdue.edu./ProPractice.

GEARE Program

The Global Engineering Alliance for Research and Education (GEARE) program is a unique and award–winning program that originated in the School of Mechanical Engineering at Purdue. Since 2009, the Office of Professional Practice (OPP) has assumed all GEARE operations and opened up the program to all College of Engineering students and some students in the College of Technology. GEARE is designed to supplement the education of engineers so they are prepared to function immediately in the global workplace. Students in the program participate in an orientation program, including language and culture, one domestic internship, one subsequent international internship at the same company, one semester of study abroad with fully transferable engineering course credits, and a one- to two-semester design team project with design teams that include students from international partner universities working on an industry-inspired project.

Interested students are encouraged to refer to the OPP Web site, https://engineering.purdue.edu/ProPractice.

Honors Program

An honors program is available for qualified undergraduate students. Among the purposes of this program are special recognition of students attaining high levels of academic achievement and encouragement of student interest in graduate study and research/academic careers. An individual's honors program of study will be designed in cooperation with the faculty to provide more depth, breadth, self-study, and/or research experience than the regular program of study. Successful completion of the honors program will be recognized at graduation.

Detailed information about the honors program can be found on the School of Civil Engineering Web site. Students who have an interest in the honors program should contact the Undergraduate Office in the School of Civil Engineering.

Land Surveying Minor

The Land Surveying (LS) minor is available to any student at Purdue who has met the corequisites and/or prerequisites for courses in the LS course sequence. The LS minor consists of 10 courses (31 credits) plus a summer internship.

When the minor is combined with the B.S.CE degree program, the minor will likely add two to five 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, this will be submitted to a curriculum committee, which will approve the sequence. When the student has successfully completed the sequence of courses and has earned at least a 2.0 grade point average over the entire sequence, that student will be granted a minor in LS.

Core Course Policy

Students in the School of Civil Engineering must satisfy a core course policy to graduate. A core course is defined as any course required for graduation with a Bachelor of Science in Civil Engineering degree that is not required by the First-Year Engineering (FYE) program. The policy is as follows:

- A student must earn a grade of "C-" or better in all core courses.

- A student must earn a grade of "C-" or better in a core course in order to use the course as a prerequisite.
- A student shall be dismissed from the School of Civil Engineering after three attempts to complete a core course where each attempt resulted in a grade of "D+," "D," "D-," "E," "F," or "WF." A grade of "W" does not count toward the three attempts. Re-entry will be solely at the discretion of the Civil Engineering Undergraduate Committee and will be reviewed on a case-by-case basis. The Undergraduate Committee has the prerogative to set the requirements, if any, for re-entry.

Technical electives and general education electives are not subject to this policy. Also, the science selective from the FYE program is not subject to this policy.

English Requirement

Students in the School of Civil Engineering must receive a grade of "C-" or better in a first course in English composition to graduate.

Minimum Degree Requirements for Civil Engineering

Credit Hours Required for Graduation: 133*

Courses	*Credit Hours*
Mathematics and Physical Sciences	
Calculus: MA 16500, 16600, 26100, 26500, 26600	**18**
Statistics: STAT 51100	**3**
Chemistry: CHM 11500	**4**
Physics: PHYS 17200, 24100	**7**
Science Selective	**3–4**
Engineering Design	
ENGR 10000, 12600, CGT 16400	**6**
First-Year (or other) Electives	**0-2**
Communication and General Education	
English Composition: ENGL 10600 or 10800	**3–4**
Speech: COM 11400	**3**
Technical Communication: CE 39900	**3**
Humanities and Social Sciences: Courses must be chosen in accordance with the School of Civil Engineering's general education policies and with the help of a faculty advisor.	**18**
Core Engineering Courses	
Geomatics: CE 20300	**4**
Basic Mechanics/Materials: CE 23100, 27000, 29700, 29800, 33100, 34000, 34300	**20**
Seminar: CE 29000	0
Thermodynamics: ME 20000	**3**
Systems Design: CE 39800	**3**
Final Design Project: CE 49800. This course must be taken during the student's final semester.	**3**
Technical Electives	**30**
Courses are selected with the help of a faculty advisor to accommodate the student's professional goals and to provide the student with sufficient design background. At least 21 of these credits must be CE-designated courses.	

** Pending curriculum revisions may change the credit hours required for graduation. See the most recent requirements on the School of Civil Engineering Web site at www.ce.purdue.edu.*

Plan of Study for Civil Engineering

Credit Hours Required for Graduation: 133

Freshman Year, see First-Year Engineering Program.

Communications. COM 11400 is a required course in the civil engineering curriculum and should be taken in the freshman year. **Graphics. CGT 16400** is a required course in the civil engineering curriculum and should be taken in the freshman year. **Science Selective. CHM 11600** is the recommended course and should be taken in the freshman year.

Sophomore Year

Third Semester	*Fourth Semester*
(4) **CE 20300** (Principles and Practices of Geomatics)	(3) **CE 23100** (Engineering Materials I)
(0) **CE 29000** (Civil Engineering Seminar)	(4) **CE 27000** (Introductory Structural Mechanics)
(3) **CE 29700** (Basic Mechanics I: Statics)	(3) **CE 29800** (Basic Mechanics II: Dynamics)
(4) **MA 26100** (Multivariate Calculus)	(3) **MA 26500** (Linear Algebra)
(3) **PHYS 24100** (Electricity and Optics)	(3) General education elective*
(3) General education elective*	
(17)	(16)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **CE 33100** (Engineering Materials II)	(3) **CE 39800** (Introduction to Civil Engineering Systems Design)
(3) **CE 34000** (Hydraulics)	(3) **CE 39900** (Oral and Written Communications for Civil Engineers)
(1) **CE 34300** (Elementary Hydraulics Laboratory)	(3) **STAT 51100** (Statistical Methods)
(3) **MA 26600** (Ordinary Differential Equations)	(3) General education elective*
(3) General education elective*	(6) Electives†
(3) Elective†	
(16)	(18)

Senior Year

Seventh Semester	*Eighth Semester*
(3) **ME 20000** (Thermodynamics I)	(3) **CE 49800** (Civil Engineering Design Project)
(3) General education elective*	(3) General education elective*
(12) Electives†	(9) Electives†
(18)	(15)

** Eighteen credit hours of general education electives are chosen in accordance with the general education requirements of the College of Engineering and the following departmental requirements:*

1. *The program must contain at least 6 credit hours in the humanities.*
2. *The program must contain at least 6 credit hours in social sciences It is strongly recommended that ECON 25100 be included in the program in social sciences.*
3. *All general education courses must be taken for a grade.*

† Thirty credit hours of electives are chosen in accordance with the following requirements:

1. *The elective course program shall be consistent with career objectives. For instance, one can elect to concentrate on a major in a specialized area with an integrated sequence of courses or can choose a general program in civil engineering by taking courses in several areas.*
2. *At least 12 credit hours must be chosen from an approved list of introductory civil engineering courses to provide breadth of study.*
3. *At least 9 credit hours must be chosen from an approved list of design-intensive civil engineering courses.*
4. *At least 21 credit hours must be CE designated courses that must include two integrated sequences with a minimum of six credit hours in each.*
5. *The remaining credit hours required must be selected in support of the career objectives of the student. See an advisor for current policies.*

Construction Engineering

The Division of Construction Engineering and Management (CEM) offers a degree program that prepares the graduate for practice as an engineering professional in the diverse construction industry. Coursework covers the basic physical sciences, engineering sciences, engineering principles of design, construction planning, business and management, humanities, and social sciences in a curriculum tailored to address globally relevant issues as well as to meet the requirements for an accredited Bachelor of Science in Construction Engineering (B.S.CNE) degree.

Construction engineers provide engineering management services that include the planning and direction of projects to construct facilities and infrastructure that serve the needs of society and business. Employing the classic construction resources elements of materials, machines, workforce, money, and information — and with respect for the natural environment and the needs of the end user — the construction professional ensures that construction of designed facilities is completed in a safe manner within schedule and budgetary constraints and according to quality standards. The optimal planning and control of construction processes is the construction engineer's unique expertise.

Requirements in the construction engineering and management industry for professional engineers and managers are increasing. Increased competitiveness, advancing use of technology, global competition, and the growing complexity of management challenges have created new opportunities for well-prepared graduates. The educational objectives of the B.S.CNE degree program are to graduate students who are prepared:

- To obtain leadership positions within their industry organizations
- To contribute to the advancement of the profession through participation in education, mentoring, and research
- To pursue professional advancement through registration, certification, etc.
- To continue their education through life-long learning opportunities, graduate studies, and/or self study
- To engage in global/societal advancement through use of their professional talents to serve the communities in which they reside and by engaging in the dialogue surrounding the societal impact of engineering decisions

The Purdue Construction Engineering program stresses study and experience in engineering as well as the management and human relations aspects of the profession. Graduates from the Purdue program, which was established in 1976, have moved into positions of significant responsibility in a variety of construction endeavors throughout the country.

The construction engineering undergraduate degree program is accredited by the Engineering Accreditation Commission of ABET, Inc. (formerly named the Accreditation Board for Engineering and Technology).

Internship Program with Industry

A unique feature of this program is the requirement for three 12-week internship periods, during which the student works as a paid employee of a construction contractor or related construction organization. Through these internships, graduates gain valuable practical experience and learning to complement their classroom work and enhance their qualifications to enter professional practice in construction.

The Division of Construction Engineering and Management internship director facilitates the internship and monitors the intern's progress through a succession of field assignments, typically progressing from field operations and construction office operation to project management work.

The student is selected for the program through an application and an interview, generally during the second semester of his or her first year. Selection depends upon the applicant's proven academic ability, aptitude for the construction field, potential for successful performance in intern assignments, and the availability of sponsor firms.

Preparation for Graduate Education

The construction engineering curriculum prepares undergraduates for graduate-level study in construction and civil engineering. Students with interests in advanced education and research in this and related fields pursue M.S.CE, M.S.E., and Ph.D. degrees at Purdue and other leading universities.

Minimum Grade Requirements

A minimum 2.5 EAI (GPA based on required First-Year Engineering courses) is required for admission to the construction engineering degree program. Furthermore, students in the program must obtain a grade of (1) "C" or better in a first course in English composition, and (2) of "C-" or better in all courses required beyond the First-Year Engineering curriculum.

Plan of Study for Construction Engineering and Management

Credit Hours Required for Graduation: 134

Freshman Year, see First-Year Engineering Program.

Summer Session

(0) **CEM 19100** (Construction Internship I)

Sophomore Year

Third Semester	*Fourth Semester*
(4) **CE 20300** (Fundamentals of Surveying)	(3) **CE 22100** (Construction Plans and Estimates)
(3) **CE 22000** (Construction Management)	(4) **CE 27000** (Instructory Structural Mechanics)
(3) **CE 29700** (Basic Mechanics I: Statics)	(3) **CE 33300** (Civil Engineering Materials)
(2) **CGT 16400** (Graphics for Civil Engineers and Construction)	(0) **CEM 29000** (Construction Seminar)
(4) **MA 26100** (Multivariate Calculus	(3) **MA 26500** (Linear Algebra)
(16)	(3) **PHYS 24100** (Electricity and Optics)†
	(16)

Summer Session

(0) **CEM 29100** (Construction Internship II)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **CE 29800** (Basic Mechanics II: Dynamics)	(3) **ME 20000** (Thermodynamics I)
(3) **CE 32100** (Construction Planning and Scheduling)	(3) **MGMT 20000** (Introductory Accounting)
(3) **CE 39900** (Oral and Written Communications for Civil Engineers)	(9) Technical electives*†
(3) **MA 26600** (Ordinary Differential Equations)	(3) General education elective
(3) **STAT 51100** (Statistical Methods)	
(3) General education elective*	
(18)	(18)

Summer Session

(0) **CEM 39100** (Construction Internship III)

Senior Year

Seventh Semester	*Eighth Semester*
(3) **CE 52100** (Construction Business Management)	(3) **CE 52400** (Legal Aspects in Engineering Practice)
(3) **CEM 42500** (Construction Practice Project)	(6) Technical electives*†
(7) Technical electives†	(6) General education electives
(6) General education electives*	(15)
(19)	

** Eighteen credit hours of general education electives are chosen in accordance with the general education requirements of the College of Engineering.*

† Technical electives vary depending on the specialty area of interest and career objectives. A list of acceptable technical electives is available from the Division of Construction Engineering and Management.

Specialty Areas of Emphasis

The student may choose elective courses that emphasize building, highway and heavy, mechanical, or electrical aspects of construction. A current plan of study and information about the B.S.CNE degree program can be found at https://engineering.purdue.edu/CEM.

Minor in Construction Engineering

Starting in 2010–11, an undergraduate engineering student can obtain a minor in construction engineering. Course and professional experience requirements can be found at https://engineering.purdue.edu/CEM.

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. There are two degree programs offered by the school: the Bachelor of Science in Electrical Engineering (B.S.EE) and the Bachelor of Science in Computer Engineering (B.S.CmpE).

Engineers in both programs must have a strong background in mathematics and physics, a broad base in the humanities and social sciences, and a command of the English language to provide the breadth essential for optimum professional growth. The curricula for both the B.S.EE and B.S.CmpE degrees are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

Graduates from the School of Electrical and Computer Engineering are sought by all major industries. Graduates hold many important 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.

Mission of the School

The Purdue School of Electrical and Computer Engineering enriches society and advances engineering in three crucial ways: by educating electrical and computer engineering students from Indiana, the country, and the world so that they have the knowledge, ability, and skills to innovate, excel, and lead in their professions; by contributing to the benefit of humanity through the discovery of fundamental knowledge, the solution of current technological problems, and the development of new applications; and finally, by sharing knowledge and expertise through meaningful engagement within and outside the Purdue community.

B.S.EE and B.S.CmpE Program Educational Objectives

The primary objective of the B.S.EE and B.S.CmpE degree programs is to prepare graduates who will be successful in their chosen career paths. Specifically, graduates of these programs will be capable of achieving:

Success in post-undergraduate studies as measured by:
- satisfaction with decision to further their education
- advanced degrees earned
- professional visibility
- international activities

and/or

Success in their chosen profession as measured by:
- career satisfaction
- promotions/raises
- professional visibility
- entrepreneurial activities
- international activities

Contributing to the graduates' ability to succeed are the following attributes that the B.S.EE and

B.S.CmpE degree programs are designed to instill in its graduates:

- Strong foundation in the core electrical/computer engineering fundamentals
- Foundation in mathematics and the basic sciences.
- Knowledge of relevant technologies.
- Problem solving and design capability.
- Creativity and enthusiasm for life-long learning.
- Engineering professionalism.
- Appreciation for the impact of technology in a global context.

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, three-session co-op, or internship program. International internships also are available through the Global Partners in Apprenticeship Learning (G-PAL) Program within the Office of Professional Practice. 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 on the Professional Practice Program, please visit https://engineering.purdue.edu./ProPractice.

GEARE Program

The Global Engineering Alliance for Research and Education (GEARE) program is a unique and award–winning program that originated in the School of Mechanical Engineering at Purdue. Since 2009, the Office of Professional Practice (OPP) has assumed all GEARE operations and opened up the program to all College of Engineering students and some students in the College of Technology. GEARE is designed to supplement the education of engineers so they are prepared to function immediately in the global workplace. Students in the program participate in an orientation program, including language and culture, one domestic internship, one subsequent international internship at the same company, one semester of study abroad with fully transferable engineering course credits, and a one- to two-semester design team project with design teams that include students from international partner universities working on an industry-inspired project.

Interested students are encouraged to refer to the OPP Web site, https://engineering.purdue.edu/ProPractice.

Electrical Engineering

The School of Electrical and Computer Engineering has created the opportunity for the undergraduate student to design his or her own program of study in preparation for a professional career in engineering. Through individual counseling, students receive assistance with designing programs to meet the academic requirements of their personal career objectives within their desired areas of specialization. Engineering design is a fundamental requirement for every program. This is integrated throughout the student's plan of study by design components of required courses and culminates in a meaningful major engineering design experience consistent with practice requirements of the discipline.

Minimum Degree Requirements for Bachelor of Science in Electrical Engineering (B.S.EE)

The Bachelor of Science in Electrical Engineering degree requires a total of 124 credit hours and a minimum Graduation Index of 2.0. Students must qualify for admission into the School of Electrical and Computer Engineering by satisfactory completion of the First-Year Engineering Program. All courses required by the First-Year Engineering Program may be used towards satisfaction of the B.S.EE degree requirements.

More detailed information on Electrical and Computer Engineering course offerings and degree requirements is available at www.purdue.edu/ECE/InfoFor/CurrentStudents.

Credit Hours Required for Graduation: 124

Courses	*Credit Hours*
ECE Requirements:	**47**
EE Core Curriculum: ECE 20100, 20200, 20700, 20800, 25500, 27000, 30100, 30200, 31100.	24
ECE Seminars: ECE 20000, 40000	1
Advanced EE Selective: Choose three (3) of the following: ECE 30500, 32100, 36200, 38200, 43800, 44000. Only one of ECE 43800 and 44000 can be used as an Advanced EE Selective ECE 36200, 43800, and 44000 also contribute to the ECE laboratory requirement described below.	9–11
Senior Design Requirement: An ECE-approved senior design course or sequence. A prerequisite for all senior design courses is completion of the EE Core Curriculum.	3–4
ECE Electives: Choose additional ECE courses to bring total ECE credit hours to at least 47 including three (3) laboratory courses and/or ECE courses with laboratory components in addition to those required as part of the EE Core Curriculum.	7–10
Major Area GPA: A cumulative GPA of 2.0 or higher in the ECE courses taken to satisfy the ECE Requirements is required to qualify for graduation with the B.S.EE degree.	
General Engineering:	**7**
Introduction to Engineering: ENGR 10000, 12600	4
Engineering Science Elective: Choose one course from the approved list.	3
Mathematics:	**18–19**
Choose one of the math options below. If MA 16100 and/or MA 16200 (or their equivalents) are taken in place of MA 16500 and/or MA 16600, only 4 of the 5 credit hours for each course may be applied to degree requirements.	
Option 1: MA 16500, 16600, 26100, 26500, 26600.	18
Option 2: MA 16500, 16600, 26100, 26200, and one of: MA 30300, 30400, 35100, 38500, 41000, 42500, or CS 31400.	19
Science:	**18–19**
Computer Science: CS 15900 or ENGR 11700.	3
Chemistry: CHM 11500.	4
Physics: PHYS 17200, 27200	8
Liberal Arts:	**24–25**
Communication Skills: ENGL 10600 or 10800, COM 11400.	6–7
General Education Electives: See General Education Program.	18
Complementary Electives:	**7–9**
Additional courses to bring the total to at least 124 credit hours. These courses should be selected to complement the student's academic program	

Electrical Engineering (B.S.EE)

Sample Plan of Study for Electrical Engineering

Credit Hours Required for Graduation: 124

Freshman Year

First Semester	*Second Semester*
(4) **CHM 11500** (General Chemistry)	(4) **CHM 11600** (General Chemistry)
(4) **ENGL 10600** (First-Year Composition)	(3) **COM 11400** (Fundamentals of Speech Communication)
(1) **ENGR 10000** (Freshman Engineering Lectures)	(3) **CS 15900** (Programming Applications for Engineers)
(3) **ENGR 12600** (Engineering Problem Solving and Computer Tools)	(4) **MA 16600** (Analytic Geometry and Calculus II)
(4) **MA 16500** (Analytic Geometry and Calculus I)	(4) **PHYS 17200** (Modern Mechanics)
(16)	(18)

Sophomore Year

Third Semester	*Fourth Semester*
(0) **ECE 20000** (Electrical and Computer Engineering Seminar)	(3) **ECE 20200** (Linear Circuit Analysis II)
(3) **ECE 20100** (Linear Circuit Analysis I)	(1) **ECE 20800** (Electronic Devices and Design Laboratory)
(1) **ECE 20700** (Electronic Measurement Techniques)	(3) **ECE 25500** (Introduction to Electronic Analysis and Design)
(4) **MA 26100** (Multivariate Calculus)	(4) **ECE 27000** (Introduction to Digital System Design)
(4) **PHYS 27200** (Electric and Magnetic Interactions)	(3) **MA 26600** (Ordinary Differential Equations)
(3) General education elective	(3) General education elective
(15)	(17)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **ECE 30100** (Signals and Systems)	(3) **ECE 30200** (Probabilistic Methods in Electrical and Computer Engineering)
(3) **MA 26500** (Linear Algebra) **or** advanced math elective	(3) **ECE 31100** (Electric and Magnetic Fields)
(4) ECE electives	(4) ECE electives
(3) Engineering science elective	(3) Complementary elective
(3) General education elective	(3) General education elective
(16)	(16)

Senior Year

Seventh Semester	*Eighth Semester*
(1) **ECE 40000** (Electrical and Computer Engineering Undergraduate Seminar)	(3) EE senior design requirement
(8) ECE electives	(3) ECE electives
(2) Complementary elective	(3) Complementary elective
(3) General education elective	(3) General education elective
(14)	(12)

Computer Engineering

The Bachelor of Science in Computer Engineering (B.S.CmpE) degree curriculum offers an in-depth education in both the hardware and software aspects of modern computer systems. The program builds on a strong foundation in electrical engineering, including traditional analog and digital circuits, electronic circuits, and systems. A strong laboratory component supports the theoretical aspects of the coursework. Students gain valuable digital hardware design experience as well as an understanding of computer programming throughout the sophomore year. During the junior year, the traditional theoretical courses in system theory, discrete mathematics, and data structures are supplemented with opportunities to experiment with microprocessor systems, design simple VLSI chips, and learn software tools. Most of the senior year courses focus on translating the hardware and software knowledge gained during the previous years into practical computer systems applications.

Minimum Degree Requirements for Bachelor of Science in Computer Engineering (B.S.CmpE)

The Bachelor of Science in Computer Engineering degree requires a total of 125 credit hours and a minimum Graduation Index of 2.0. Students must qualify for admission into the School of Electrical and Computer Engineering by satisfactory completion of the First-Year Engineering Program. All courses required by the First-Year Engineering Program may be used towards satisfaction of the B.S.CmpE degree requirements.

More detailed information on Electrical and Computer Engineering course offerings and degree requirements is available at www.purdue.edu/ECE/InfoFor/CurrentStudents.

Credit Hours Required for Graduation: 125

Courses	*Credit Hours*
ECE Requirements:	**49**
CmpE Core Curriculum: ECE 20100, 20200, 20700, 20800, 25500, 26400, 27000, 30100, 30200, 33700, 36200, 36400, 36800.	33
ECE Seminars: ECE 20000, 40000	1
Advanced CmpE Elective: ECE 43700 and either ECE 46900 or ECE 46800	8
Senior Design Requirement: An ECE-approved senior design course or sequence. A prerequisite for all senior design courses is completion of the CmpE Core Curriculum.	3–4
CmpE Electives: Choose additional approved courses to bring total ECE credit hours to at least 49.	3–4
Major Area GPA: A cumulative GPA of 2.0 or higher in the ECE courses taken to satisfy the ECE requirements is required to qualify for graduation with the B.S.CmpE degree.	
General Engineering:	**7**
Introduction to Engineering: ENGR 10000, 12600	4
Engineering Science Elective: Choose one course from the approved list.	3
Mathematics:	**21–22**
Choose one of the math options below. If MA 16100 and/or MA 16200 (or their equivalents) are taken in place of MA 16500 and/or MA 16600, only 4 of the 5 credit hours for each course may be applied to degree requirements.	
Option 1: MA 16500, 16600, 26100, 26500, 26600, ECE 36900	21
Option 2: MA 16500, 16600, 26100, 26200, ECE 36900 and one of: MA 30300, 30400, 35100, 38500, 41000, 42500, or CS 31400.	22
Science:	**18-19**
Computer Science: CS 15900 or ENGR 11700.	3
Chemistry: CHM 11500, 11600.	8
Physics: PHYS 17200, 27200	8
Science Selective: Choose from approved list	3-4
Liberal Arts:	**24–25**
Communication Skills: ENGL 10600 or 10800, COM 11400.	6–7
General Education Electives: See General Education Program.	18
Complementary Electives:	**3–5**
Additional courses to bring the total to at least 124 credit hours. These courses should be selected to complement the student's academic program.	

Plan of Study for Computer Engineering

Credit Hours Required for Graduation: 125

Freshman Year

First Semester	*Second Semester*
(4) **CHM 11500** (General Chemistry)	(4) **CHM 11600** (General Chemistry)
(4) **ENGL 10600** (First-Year Composition)	(3) **COM 11400** (Fundamentals of Speech Communication)
(1) **ENGR 10000** (Freshman Engineering Lectures)	(3) **CS 15900** (Programming Applications for Engineers)
(3) **ENGR 12600** (Engineering Problem Solving and Computer Tools)	(4) **MA 16600** (Analytic Geometry and Calculus II)
(4) **MA 16500** (Analytic Geometry and Calculus I)	(4) **PHYS 17200** (Modern Mechanics)
(16)	(18)

Sophomore Year

Third Semester	*Fourth Semester*
(0) **ECE 20000** (Electrical and Computer Engineering Seminar)	(3) **ECE 20200** (Linear Circuit Analysis II)
(3) **ECE 20100** (Linear Circuit Analysis I)	(1) **ECE 20800** (Electronic Devices and Design Laboratory)
(1) **ECE 20700** (Electronic Measurement Techniques)	(3) **ECE 25500** (Introduction to Electronic Analysis and Design)
(2) **ECE 26400** (Advanced C Programming)	(4) **ECE 27000** (Introduction to Digital System Design)
(4) **MA 26100** (Multivariate Calculus)	(1) **ECE 36400** (Software Engineering Tools Laboratory)
(4) **PHYS 27200** (Electricity and Optics)	(3) **MA 26600** (Ordinary Differential Equations)
(3) General education elective	
(17)	(15)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **ECE 30100** (Signals and Systems)	(3) **ECE 30200** (Probabilistic Methods in Electrical and Computer Engineering)
(4) **ECE 36200** (Microprocessor Systems and Interfacing)	(2) **ECE 33700** (ASIC Design Laboratory)
(3) **ECE 36800** (Data Structures)	(4) Computer engineering elective
(3) **ECE 36900** (Discrete Mathematics for Computer Engineering)	(3) Engineering science elective
(3) General education elective	(3) General education elective
(16)	(15)

Senior Year

Seventh Semester	*Eighth Semester*
(4) **ECE 43700** (Computer Design and Prototyping)	(1) **ECE 40000** (Electrical and Computer Engineering Undergraduate Seminar)
(3) **MA 26500** (Linear Algebra)	(4) **ECE 46900** (Operating Systems Engineering)
(3) Computer engineering senior design requirement	(4) Complementary elective
(6) General education electives	(3) General education elective
(16)	(12)

Industrial Engineering

Industrial engineering is a broad professional discipline concerned with the analysis and design of systems and procedures for organizing the basic resources of production — people, information, materials, and equipment — to achieve specific objectives. An industrial engineer draws upon knowledge of mathematics, the physical and engineering sciences, and the management and behavioral sciences to function as a problem-solver, innovator, designer, coordinator, and system integrator. Industrial engineers practice in all phases of manufacturing industries, service industries, and governmental agencies.

The complexity of modern industrial and service organizations and the emphasis on increased effectiveness, efficiency, and productivity have led to a growing need for industrial engineering analysis and design and 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. Although industrial engineering is a comparatively new professional area, having developed during the last four decades, it is already one of the nation's largest and most rapidly growing engineering professions.

The industrial engineering program prepares men and women for careers in all phases of industrial engineering and enables them to perform other managerial and technical 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.

The School of Industrial Engineering offers educational programs leading to the degree of Bachelor of Science in Industrial Engineering (B.S.IE). The two undergraduate programs of study — the regular industrial engineering curriculum and the honors curriculum — provide students with a broad scientific and engineering base and contain a sequence of courses in mathematics, physics, chemistry, and the engineering sciences. These courses are accompanied by industrial engineering courses covering the areas of manufacturing process and facilities design, engineering statistics, engineering cost analysis, work analysis and design, operations research, process control, production system design, computer utilization and information systems, and systems analysis and design.

During the junior and senior years, 15 semester hours of elective courses enable the student to study in the following areas of specialization: human factors engineering, manufacturing systems engineering, operations research and systems engineering, production and management systems engineering, and other areas of concentration. In addition, 18 hours of elective courses in the social sciences and humanities are included.

The undergraduate program in industrial engineering is accredited by the Engineering Accreditation Commission of ABET Inc., formerly named the Accreditation Board for Engineering and Technology.

Educational Objectives

The industrial engineering program is designed to achieve the following detailed objectives that are consistent with the mission of Purdue University and the College of Engineering:

- **Graduates should be prepared to take the lead in recognizing engineering problems in their organizations and designing solutions.** Prominent in this area are skills in developing (possibly several) useful analytical formulations to gain insights into ill-structured problems and characterize the best solution obtainable within the limits of the available time, data, and economic resources. However, developing an elegant solution is not sufficient; the engineer also should have a clear idea of issues related to the implementability of the proposed solution, make modifications required for acceptance of a proposal, and be capable of guiding a project through the implementation process.
- **Graduates should be capable of identifying the best contemporary tools for the problem, applying them, and interpreting their results to gain insight into industrial engineering problems and propose effective solutions.** Graduates should be sufficiently well-trained in basic science and engineering to be able to read technical literature and become familiar with different tools that are available (computer software and modeling approaches/formalisms such as mathematical programming, simulation etc.) to the point that they can identify when each tool is appropriate to use with a clear

understanding of underlying assumptions and limitations; collect and analyze the data required for the selected approach, including understanding of the effects of missing and inaccurate data, and where appropriate, conducting experiments; interpret the results of the analysis in the context of the problem at hand; and use the analysis as an effective base for assessing the implementability of the proposed solution.

- **Graduates should be capable of operating effectively in today's dynamic, heterogeneous organizations.** The accelerating rate of technological change is leading to organizations becoming global, culturally diverse, and increasingly dynamic and goal-oriented in organizational structure. Often the basic organizational unit is the cross-functional team deployed to achieve a specific, tactical objective in a short period of time. This increasing lack of permanence in organization places new stresses on engineers' ability to rapidly achieve an effective level of professional collaboration with people of diverse skill sets and cultural backgrounds. Performance in this environment requires the ability to communicate effectively with technical and non-technical people at very different levels of the organization, the ability to rapidly establish working relationships and become familiar with new application domains, and the assumption of several different roles with the same people over time — perhaps even at the same time in different contexts. Effective problem definition, task breakdown, and delegation are particularly important.
- **Graduates should have the basic skills required to maintain their professional knowledge over the duration of their career.** Graduates should be able to take responsibility for their own learning, including identifying weak areas in their background and seeking out resources to remedy them. The ability to do this in a time-effective manner is essential in today's fast-paced engineering organizations. This results in many graduates pursuing a variety of advanced or professional degrees subsequent to their completion of the undergraduate industrial engineering program. Hence, students should graduate with a solid base of skills and knowledge upon which these further studies can build. Examples are knowledge of computer skills for problem solving, and basic literacy in science and engineering.
- **Graduates should be prepared to contribute as ethical and responsible members of society.** Engineering graduates should be as well prepared as any other citizens to contribute as members of society. Still, the increasing importance of technology to our economic well-being and its pervasive presence in all aspects of our daily lives places a special burden on the engineering community to be cognizant of the social impacts of their actions. Furthermore, engineering practitioners are increasingly being called upon to address problems with broad social and ethical consequences. Students should be familiar with these issues and be prepared to address them with integrity and empathy for all stockholders involved.

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, three-session co-op, or internship program. International internships also are available through the Global Partners in Apprenticeship Learning (G-PAL) Program within the Office of Professional Practice. 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 on the Professional Practice Program, please visit https://engineering.purdue.edu./ProPractice.

GEARE Program

The Global Engineering Alliance for Research and Education (GEARE) program is a unique and award–winning program that originated in the School of Mechanical Engineering at Purdue. Since 2009, the Office of Professional Practice (OPP) has assumed all GEARE operations and opened up the program to all College of Engineering students and some students in the College of Technology. GEARE is designed to supplement the education of engineers so they are prepared to function immediately in the global workplace. Students in the program participate in an orientation program, including language and culture, one domestic internship, one subsequent international internship at the same company, one semester of study abroad with fully transferable engineering course credits, and a one- to two-semester design team project with design teams

that include students from international partner universities working on an industry-inspired project.

Interested students are encouraged to refer to the OPP Web site, https://engineering.purdue.edu/ProPractice.

Honors Program

A special honors program is available for students who have demonstrated exceptional academic ability and want to conduct meaningful independent research or solve a unique design project. To enter and remain in the honors program, a student must maintain at least a 3.0 graduation index.

The program is usually initiated at the start of the second semester of the junior year by registering for IE 30000 (Honors Program Seminar). The course is designed to assist students with the identification of a suitable research or design project topic under the direction of an industrial engineering faculty member. After satisfactory completion of two consecutive semesters of IE 49900 for 3 credit hours per semester, submission of an acceptable written report, obtaining the recommendation of the course instructor, and being approved by the school head, participation in the honors program is noted on the student's post-graduation transcript. The 6 credit hours of IE 49900 can be used as part of the 9 hours of unspecified technical electives during the senior year. At least one of the technical electives must be a 50000 dual-level industrial engineering course.

Minors

The School of Industrial Engineering recognizes minors granted by other academic units such as electrical engineering, mechanical engineering, liberal arts, management, modern languages, and various branches of science. Example plans of study for more than 40 different minors are on file in the Industrial Engineering Undergraduate Office.

Students interested in earning a minor that will be recorded on their transcript must file an approved plan of study by the beginning of the senior year. The plan of study must be approved by the academic unit granting the minor and by the School of Industrial Engineering. Courses selected for the minor cannot substantially duplicate material in the student's industrial engineering plan of study. Some courses may be used in both plans of study; for example, a course could be a general education elective in the industrial engineering plan of study and a required course for a minor in a given area.

Minors typically require 15 to 18 credit hours of work from a restricted list of courses.

Pass/Not-Pass Option

The pass/not-pass option is allowed only in the general education program. Technical electives must be taken for a grade. This option provides an opportunity for students to broaden their educational experience by taking advanced courses with minimal concern for grades earned due to the lack of necessary prerequisite material. Introductory courses should be taken for a grade. Physical education service courses, unless required for ROTC, should be taken with the pass/not-pass option. The general rules stated under the graduation requirements for engineering are in effect for all industrial engineering students.

Preparation for Graduate Study

The School of Industrial Engineering also offers graduate work leading to the degrees of Master of Science (M.S.), Master of Science in Industrial Engineering (M.S.IE), and Doctor of Philosophy (Ph.D.). The regular undergraduate curriculum and the honors program provide strong foundations for graduate study, and students who complete either of the programs with appropriate academic records are encouraged to pursue graduate work. Approximately one-third of the recent graduates have done advanced studies in engineering, business, law, or medicine within five years after graduation.

Curriculum in Industrial Engineering

Industrial engineering is a diversified discipline, with students preparing for careers in a variety of areas within the general field. The curriculum provides flexibility in course selection so students can specialize in a given major option. Academic advisors in each area provide assistance in selection of appropriate elective courses.

Minimum Degree Requirements for Industrial Engineering

Credit Hours Required for Graduation: 123

Courses	*Credit Hours*
First-Year Engineering Program	**29**
Mathematics and Physics MA 26100, 26500, 26600; PHYS 24100	**13**
General Education Electives	**18**
Required Engineering Courses ECE 20100; IE 23000, 33000, 33200, 33500, 33600, 34300, 37000, 38300, 38600, 43100, 47400, 48600; ME 20000, 27000; NUCL 27300	**48**
Technical Electives	**15**

Plan of Study for Industrial Engineering

Credit Hours Required for Graduation: 123

Freshman Year, see First-Year Engineering Program.

Sophomore Year

Third Semester	*Fourth Semester*
(0) **IE 20000** (Industrial Engineering Seminar)	(3) **IE 33000** (Probability and Statistics in Engineering II)
(3) **IE 23000** (Probability and Statistics in Engineering I)	(3) **MA 26500** (Linear Algebra)
(3) **IE 34300** (Engineering Economics)	(3) **NUCL 27300** (Mechanics of Materials)
(4) **MA 26100** (Multivariate Calculus)	(3) **PHYS 24100** (Electricity and Optics)
(3) **ME 27000** (Basic Mechanics I)	(3) General education elective
(3) General education elective	
(16)	(15)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **ECE 20100** (Linear Circuit Analysis I)	(3) **IE 33600** (Operations Research — Stochastic Models)
(3) **IE 33200** (Computing in Industrial Engineering)	(3) **IE 38300** (Integrated Production Systems I)
(3) **IE 33500** (Operations Research — Optimization)	(3) **IE 38600** (Work Analysis and Design I)
(3) **IE 37000** (Manufacturing Processes I)	(3) **ME 20000** (Thermodynamics I)
(3) **MA 26600** (Ordinary Differential Equations)	(3) General education elective
(3) General education elective	
(18)	(15)

Senior Year

Seventh Semester	*Eighth Semester*
(3) **IE 47400** (Industrial Control Systems)	(3) **IE 43100** (Industrial Engineering Design)
(3) **IE 48600** (Work Analysis and Design II)	(9) Technical electives*
(6) Technical electives*	(3) General education electives
(3) General education elective	
(15)	(15)

** The 15 credit hours of technical electives are chosen from a list of courses approved by the School of Industrial Engineering faculty and must include two out of the three following courses: IE 47000 (Manufacturing Processes II), IE 48400 (Integrated Production Systems II), or an approved 3-credit-hour industrial engineering course.*

Options in Industrial Engineering

The school offers the following five options:

General Industrial Engineering. This option is intended for the student who wants to specialize in a given area other than the four options that follow, or the student who wants to develop a broader background in the general area of industrial engineering. The 15 hours of technical electives should be selected with the approval of the academic advisor and should include at least one two-course sequence in one of the technical options. At least six hours of these electives must be in industrial engineering.

Human Factors Engineering. Human factors engineering is concerned with the systematic application of knowledge about the human sensory, perceptual, mental, and psychomotor characteristics in the engineering design of facilities to enhance the operational use of equipment and facilities and to improve the quality of working life.

Suggested electives in this option are IE 53300, 55600, 55800, 55900, and 57700; PSY 27200, and 33300 or 47500; OBHR 33000; and SOC 31600. At least 6 credit hours of technical electives must be in industrial engineering.

Manufacturing Systems Engineering. In this option, a student learns through study and experimentation about the planning, analysis, and design of manufacturing methods, processes, and systems, including consideration of equipment, controls, services, managerial concerns, and new technology such as computer-aided design/computer-aided manufacturing (CAD/CAM), robotics, and computer control.

Suggested electives in this option are IE 47000, 48400, 57000, 57200, 57400, and 57500. Additional electives are IE 53000, 53200, 53300, 54800, 55800, 57900, 58200, and 58300; ME 27400; and MSE 23000. At least 6 credit hours of technical electives must be in industrial engineering.

Operations Research and Systems Engineering. In this option, students study principles and develop techniques for quantitative evaluation of problems. The problems involve allocation of limited resources in organized systems using theory and methods of statistics, mathematical modeling, and optimization.

Students selecting this option should strive to obtain a sound foundation in mathematics. Suggested courses are CS 41400; MA 34100, 35300, 36200 or 41000, 38500, 45300, 51000, and 51100; and STAT 51600 and 51700. Some suggested electives in industrial engineering are IE 53500, 53600, 53700, 53800, 53900, 58000, and 58100. At least 6 credit hours of technical electives must be in industrial engineering.

Production and Management Systems Engineering. This option focuses on the methods and theoretical foundations for analysis, design, installation, and maintenance of operational and management systems or subsystems involved in the production and distribution of goods and services. Planning, scheduling, allocation, and control for productivity improvement and effective utilization of resources (people, materials, money, and machines) are emphasized.

Suggested electives in this option are IE 47000, 48400, 53000, 57500, 57900, 58000, 58100, 58200, and 58300. Other electives are IE 53200, 53300, 54500, 54600, and 56600; MGMT 20000, 20100, 32300, and 45500; OBHR 30000, PSY 47500; and SOC 31600 and 41600. Students pursuing a minor in management can select MGMT 32400, 35000, 35100, 35400, and 42500, and OBHR 33000 and 42800. At least 6 credit hours of technical electives must be in industrial engineering.

Materials Engineering

Materials have been central to the growth, prosperity, security, and quality of life of humans since the beginning of recorded history. In everyday life, we are constantly reminded that we live in a world that is both dependent upon, and limited by, materials. Everything we see and use is made of materials derived from the earth: cars, airplanes, computers, refrigerators, microwave ovens, TVs, dishes, silverware, athletic equipment of all types, and even biomedical devices such as replacement joints and limbs. Materials influence our lives each time we buy or use a new product.

No engineer can make anything without materials, so materials engineers are at the forefront of every cutting-edge engineering development. They achieve new levels of understanding of materials and the controls in materials processing to achieve the performance outcomes desired.

The intellectual core and definition of the field stem from a realization concerning the application of all materials. Whenever a material is being created, developed, or produced, the properties or phenomena the material exhibits are of central concern. Experience shows that the properties and phenomena associated with a material are intimately related to its composition and structure at all levels, including which atoms are present and how the atoms are arranged in the material, and that this structure is the result of synthesis and processing. The final materials must perform a given task and must do so in an economical and societally acceptable manner. It is these elements' properties, structure and composition, synthesis and processing, and performance, and the strong interrelationship among them that define the field of materials science and engineering.

Materials scientists and 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.

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 the materials classes: ceramics, metals, polymers, etc. The senior year, consisting of electives primarily, allows students the opportunity to focus their program toward personal goals in the field.

In addition to the undergraduate program in materials science and engineering that leads to the Bachelor of Science in Materials Science Engineering (B.S.MSE), the school offers graduate programs for the Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees. The undergraduate curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

For current information about plans of study, please see the Web site at www.engineering.purdue.edu/MSE.

Undergraduate MSE Program Goals

The School of Materials Engineering at Purdue University will provide an education that optimally serves the school's constituencies: the students and their parents, the MSE faculty, other programs at Purdue, alumni, employers, graduate programs, and throughout the state of Indiana.

Program Educational Objectives

The School of Materials Engineering will produce graduates who:

1. Exhibit an understanding of the scientific principles and engineering practices that cut across all classes of materials.
2. Contribute their materials engineering expertise effectively as members of interdisciplinary teams.
3. Participate in groups and societies that enhance their profession and their community.
4. Adapt to a changing technical landscape through application of their knowledge base.
5. Possess the communication and teamwork skills to facilitate career development both in technical and nontechnical areas.

Program Outcomes

Graduates of the School of Materials Engineering will have:

1. An ability to apply knowledge of mathematics, science, and engineering to problems in materials engineering.
2. An ability to design and conduct experiments, as well as to develop engineering judgment through the analysis and interpretation of data.
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environ-

mental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. An ability to function on multi-disciplinary teams to solve engineering problems.
5. An ability to identify, formulate, and solve engineering problems, particularly in the context of materials selection and design.
6. An understanding of professional and ethical responsibility.
7. An ability to exhibit effective oral and written communication skills.
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
9. A recognition of the need for, and an ability to engage in, life-long learning.
10. A knowledge of contemporary issues, particularly as they relate to materials engineering.
11. An ability to use the techniques, skills, and experimental, computational, and data analysis tools necessary for materials engineering practice.

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, three-session co-op, or internship program.

Minimum Degree Requirements for Materials Engineering

Credit Hours Required for Graduation: 128

Courses	*Credit Hours*
Mathematics and Physical Sciences	
Calculus: MA 16500, 16600, 26100, 26500, 26600	**18**
Chemistry: CHM 11500, 11600, 25700,	**15**
Physics: PHYS 15200 or 17200, 24100, 25200	**8**
Communication and General Education	
English Composition: Communications: COM 11400 or approved communications elective	**3**
General Education Electives and social science elective courses selected with MSE faculty guidance in accordance with the general education requirements of the College of Engineering.	**18**
Seminars	
ENGR 10000, MSE 39000	**1**
First-Year Electives	**2**
Core Engineering Courses	
Computing: ENGR 12600	**3**
MSE Core: 23000, 23500, 25000, 26000, 27000, 33000, 33500, 34000, 36700, 37000, 38200, 43000, 44000, 44500. Integrated MSE courses, including yearlong, industry-sponsored senior design projects, on the structure, properties, processing, and performance of engineering materials.	**33**
Technical Electives A plan of study is designed with the help of a faculty advisor to meet each individual student's professional goals. At least 12 of the 18 credits must be materials-specific courses; the remaining 6 credits may be selected from an approved list of courses, including other academic disciplines.	**18**

Plan of Study for Materials Science and Engineering (B.S.MSE)

Credit Hours Required for Graduation: 128

Freshman Year, see First-Year Engineering Program.

Sophomore Year*

Third Semester	*Fourth Semester*
(4) **MA 26100** (Multivariate Calculus)	(3) **MA 26600** (Ordinary Differential Equations)
(3) **MA 26500** (Linear Algebra)	(3) **MSE 25000** (Physical Properties in Engineering Systems)
(3) **MSE 23000** (Structure and Properties of Materials)	(3) **MSE 26000** (Thermodynamics of Materials)
(3) **MSE 23500** (Materials Properties Laboratory)	(3) **MSE 27000** (Atomistic Materials Science)
(0) **MSE 39000** (Materials Engineering Seminar)	(0) **MSE 39000** (Materials Engineering Seminar)
(3) **PHYS 24100** (Electricity and Optics)	(1) **PHYS 25200** (Electricity and Optics Laboratory)
	(3) General education elective†
(16)	(16)

Junior Year

Fifth Semester	*Sixth Semester*
(4) **CHM 25700** (Organic Chemistry)	(3) **MSE 33000** (Processing and Properties of Materials)
(3) **MSE 33500** (Materials Characterization Laboratory)	(3) **MSE 36700** (Materials Processing Laboratory)
(3) **MSE 34000** (Transport Phenomena)	(3) **MSE 38200** (Mechanical Response of Materials)
(3) **MSE 37000** (Electricity, Optics, and Magnetic Properties of Materials)	(0) **MSE 39000** (Materials Engineering Seminar)
(0) **MSE 39000** (Materials Engineering Seminar)	(3) Technical elective‡
(3) General education elective†	(3) General education elective†
(16)	(15)

Senior Year

Seventh Semester	*Eighth Semester*
(0) **MSE 39000** (Materials Engineering Seminar)	(0) **MSE 39000** (Materials Engineering Seminar)
(3) **MSE 43000** (Materials Processing and Design I)	(3) **MSE 44000** (Materials Processing and Design II)
(3) **MSE 44500** (Materials Engineering Systems Analysis and Design)	(9) Technical electives‡
(6) Technical electives‡	(6) General education electives*
(3) General education elective*	
(15)	(18)

* *Students entering the School of Materials Engineering should have completed the sequence of CHM 11500 and 11600 or the sequence of CHM 12300 and 12400.*

† *Eighteen credit hours of general education electives are chosen in accordance with the general education requirements of the Schools of Engineering.*

‡ *Eighteen credit hours of technical electives must be selected from lists of courses approved by the faculty of the School of Materials Engineering. At least 12 of the 18 hours are to be selected from an approved list of materials courses. Up to 6 hours can be chosen from a separate list of courses, which includes other support areas.*

Note: Of the courses used to satisfy the minimum graduation requirements, the pass/not-pass option may be applied only to general education elective courses.

Mechanical Engineering

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, automotive, biotechnology, chemical, computers and electronics, construction, consumer products, energy, engineering consulting, and thermal systems, among others. 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, and patent lawyers.

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, 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, helping others 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 summarized below.

Knowledge Areas

The program should provide students with a solid technical foundation for their careers. This foundation should include:
- Science and math.
- Engineering fundamentals.
- Analytical skills.
- Experimental skills.
- Open-ended design and problem-solving skills
- Multidisciplinarity within and beyond engineering.
- Integration of analytical, problem-solving, and design skills.

Abilities

The program should prepare students to be effective engineers in the professional workplace. To this end, students should develop the following abilities:
- Leadership.
- Teamwork.
- Communication.
- Decision-making.
- Recognize and manage change.
- Work effectively in diverse and multicultural environments.
- Work effectively in the global engineering profession.
- Synthesize engineering, business, and societal perspectives.

Qualities

The program should assist students in fostering a number of other important qualities that will help lead them to a successful career and become a responsible and productive member of society. These qualities include:

- Innovation.
- Strong work ethic.
- Ethically responsible in a global, social, intellectual, and technological context.
- Adaptable in a changing environment.
- Entrepreneurial and intrapreneurial.
- Curious and persistent continuous learners.

To achieve these 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 English composition and communications.

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 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 speech and composition 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, and learn the basics of Web publishing. 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 corporate sponsors of their selected design projects.

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.

The curriculum in mechanical engineering is accredited by the Engineering Accreditation Commission of ABET, Inc., formerly named the Accreditation Board for Engineering and Technology. Visit the School of Mechanical Engineering Web site at www.purdue.edu/ME/Undergrad for more current information about the undergraduate programs in ME.

Scholarships

The School of Mechanical Engineering sponsors a broad array of need-based and merit-based scholarships. Eligible candidates — incoming sophomores through senior mechanical engi-

neering 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 $2.5 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.

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, three-session co-op, or internship program. International internships also are available through the Global Partners in Apprenticeship Learning (G-PAL) Program within the Office of Professional Practice. 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 on the Professional Practice Program, please visit https://engineering.purdue.edu./ProPractice.

GEARE Program

The Global Engineering Alliance for Research and Education (GEARE) program is a unique and award–winning program that originated in the School of Mechanical Engineering at Purdue. Since 2009, the Office of Professional Practice (OPP) has assumed all GEARE operations and opened up the program to all College of Engineering students and some students in the College of Technology. GEARE is designed to supplement the education of engineers so they are prepared to function immediately in the global workplace. Students in the program participate in an orientation program, including language and culture, one domestic internship, one subsequent international internship at the same company, one semester of study abroad with fully transferable engineering course credits, and a one- to two-semester design team project with design teams that include students from international partner universities working on an industry-inspired project.

Interested students are encouraged to refer to the OPP Web site, https://engineering.purdue.edu/ProPractice.

Honors Program

An honors program is available for outstanding mechanical engineering undergraduate students. The honors program is a mechanism for:

1. Participating in small enrollment, targeted courses.
2. Participating in a directed project in their area of interest.
3. Stimulating interest in graduate study and research/academic careers.
4. Developing a community of honors scholars.
5. Allowing for special recognition of high levels of academic achievement.

The ME Honors program utilizes the normal technical, general education, and free elective requirements for the B.S.ME degree in a way that is consistent with its designation as an honors program. Admission to the ME Honors program is automatic for any student in good standing in the First-Year Engineering Honors program. Students not in the First-Year Engineering Honors program can apply for admission into the ME Honors program by completing an honors application and meeting the required cumulative GPA for admission.

Completion of the ME 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 ME Honors program can be found on the ME Web site. Questions about the program should be directed to Professor Charles M. Krousgrill.

Study Abroad

Purdue University's Program for Study Abroad Office currently offers more than 200 programs in over 45 countries around the world. The School of Mechanical Engineering has student exchange agreements with the University of Adelaide in Adelaide, Australia; Royal Melbourne Institute of Technology in Melbourne, Australia; University of New South Wales in Sydney, Australia; University of Western Australia in Perth, Australia; Technical University of Denmark in Lundtofte, Denmark; University of Grenoble in Grenoble, France; University of Hannover in Hannover, Germany; University of Karlsruhe, in Karlsruhe, Germany; Tohoku University in Sendai, Japan; ITESM in Monterrey, Mexico; University of Canterbury in Christchurch, New Zealand; National University of Singapore in Singapore; and Royal Institute of Technology in Stockholm, Sweden.

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 register to take the FE exam at the West Lafayette campus in their final fall or spring semester before graduation. Announcements appear early in the semester. To aid seniors in their preparation for the exam, the student chapter of the American Society of Mechanical Engineers (ASME) sells EIT Review Manuals, and the student chapter of the American Society of Civil Engineers (ASCE) organizes faculty-taught review sessions on key topics covered on the FE exam. 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 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 at www.purdue.edu/ME. Questions about the FE exam or the process to become a registered professional engineer should be directed to Professor James D. Jones in the School of Mechanical Engineering.

ME Minor Program

A minor in mechanical engineering is available to any non-ME student in the College of Engineering as well as to any students in industrial management. The mechanical engineering minor involves completing 15 credits of core requirements and 7 credits from one of three elective options. To be awarded the ME minor, all 22 required credits must be completed with a grade of "C" or better. Details of the specific course requirements and approval forms can be found at: www.purdue.edu/ME/Download/MEminor.doc.

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/MBA Program to high-achieving students, Each year a significant number of engineering graduates pursue MBAs at U.S. business schools. The MBA 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 MBAs 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/MBA 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 MBA 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.

For more details about the B.S.ME/MBA Program, go to www.krannert.purdue.edu/programs/masters/degree_programs/bsmeMBA.asp.

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 upon completion.

The B.S.ME/M.S.ME program is a mechanism for:

1. Providing a seamless transition from the B.S.ME to the M.S.ME program.
2. Participating in a directed project in their area of interest.
3. Stimulating interest in graduate study and research/academic careers.
4. 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 technical 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/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 at https://engineering.purdue.edu/ME/Academics/Graduate/combinedBSMS.html. Questions about this information should be directed to Professor Anil Bajaj.

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 the 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, and medicine. Questions about graduate study should be directed to the Mechanical Engineering Graduate Office in the Mechanical Engineering Building, Room 111; megrad@ecn.purdue.edu/me/academics/graduate/index.html; or (765) 494-5730.

Minimum Degree Requirements for Mechanical Engineering (B.S.ME)

Credit Hours Required for Graduation: 128

Courses	*Credit Hours*
Mathematics and Sciences	
Calculus: MA 16500, 16600, 26100, 26200, 30300	**19**
Chemistry: CHM 11500	**4**
Physics: PHYS 17200, 24100	**7**
Science Selective	**3–4**
Communication, Humanities, and Social Sciences	
English Composition: ENGL 10800	**3**
Speech: COM 11400	**3**
Professionalism, Ethics, Technical Communication: ME 29000	**1**
General Education Electives (Must be chosen in accordance with the approved general education list and with the help of a faculty advisor.)	**18**
Mechanical Sciences	
Basic Mechanics: ME 27000, 27400	**6**
Materials: ME 32300; MSE 23000	**6**
Design	
Design: ME 26300, 35200, 46300	**10**
Thermal Fluid Sciences	
Thermodynamics: ME 20000	**3**
Fluid Mechanics: ME 30900	**4**
Heat Transfer: ME 31500	**4**
Information Technologies	
Electrical Engineering: ECE 20100, 20700	**4**
Systems, Measurements, and Controls: ME 36500, 37500	**6**
Freshman Requirements	
ENGR 10000, 10600; CGT 16300	**6**
Restricted Electives	
ME 30000, 45200, 47500 (2 of 3)	**6**
Technical Electives	
Can be taken from an extensive list of physical sciences, mathematics, and engineering courses and select management courses as approved by an academic advisor.	**12**
Free Electives	
Chosen from the general education elective or technical groups, or a course approved by an academic advisor.	**3**
GPA Requirement	
A graduation index of 2.0 or better is required for graduation with a B.S.ME degree. In addition, a minimum grade point average (GPA) of 2.0 is required in the core index (all sophomore-level and higher required technical courses — including the restricted electives) and the non-core index (all required courses except the core courses) to qualify for graduation.	

Plan of Study for Mechanical Engineering

Credit Hours Required for Graduation: 128

Freshman Year, see First-Year Engineering Program.

Graphics. CGT 16300 is a required course in the mechanical engineering curriculum and should be taken in the freshman year.

Sophomore Year

Third Semester	*Fourth Semester*
(4) **MA 26100** (Multivariate Calculus)	(3) **ECE 20100** (Linear Circuit Analysis I)
(3) **ME 20000** (Thermodynamics I)	(1) **ECE 20700** (Electronic Measurement Techniques)
(3) **ME 27000** (Basic Mechanics I)	(4) **MA 26200** (Linear Algebra and Differential Equations)
(1) **ME 29000** (Mechanical Engineering Professional Seminar)	(3) **ME 26300** (Introduction to Mechanical Engineering Design)
(3) **PHYS 24100** (Electricity and Optics)	(3) **ME 27400** (Basic Mechanics II)
(3) Economics elective*	(3) World affairs and cultures elective*
(17)	(17)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **MA 30300** (Differential and Partial Differential Equations for Engineering and the Sciences)	(4) **ME 35200** (Machine Design I)
(4) **ME 30900** (Fluid Mechanics)	(3) **ME 37500** (System Modeling and Analysis)
(3) **ME 32300** (Mechanics of Materials)	(3) **MSE 23000** (Structure and Properties of Materials)
(3) **ME 36500** (Systems and Measurements)	(3) General education elective*
(3) General education elective*	(3) Professional elective*
(16)	(16)

Senior Year

Seventh Semester	*Eighth Semester*
(4) **ME 31500** (Heat and Mass Transfer)	(3) **ME 46300** (Engineering Design)
(3) Free elective*	(3) General education elective*
(3) General education elective*	(6) Professional electives*
(3) Professional elective*	(3) Restricted electives*
(3) Restricted elective*	
(16)	(15)

** The 39 credit hours of electives must be chosen in accordance with the following conditions:*

1. *Eighteen credit hours of general education electives (including the economics elective and the world affairs and cultures elective) chosen in accordance with the general education document, which is available at www.purdue.edu/ME/Academics/Undergraduate/GenEds.html.*
2. *Six credit hours of restricted electives are to include two of the following three courses: ME 30000, 45200, 47500.*
3. *Twelve credit hours of professional electives in engineering, mathematics, natural sciences, ME 49700 projects, or select management courses chosen in accordance with the professional elective rules, which are available at www.purdue.edu/ME/Academics/Undergraduate/METechElects.html.*
4. *Three credit hours of free electives can be chosen from items 1 through 3 above, or, with prior approval of the student's faculty advisor, from other areas.*

Notes: a. The pass/not-pass option may not be used for any courses required for graduation except for ENGR 10000.

b. Deviations from the stated curriculum must be approved by the Curriculum Committee of the School of Mechanical Engineering.

Nuclear Engineering

Nuclear engineering encompasses all areas of the research, development, and application of nuclear energy. Nuclear energy is a prime source of power in the world, and its wise utilization will produce many benefits. Unlike fossil fuels, nuclear power does not contribute to acid rain or greenhouse gases that produce global warming.

The application of nuclear energy requires engineers with a broad educational background that covers specialized areas such as nuclear physics, nuclear medicine, and radiation science as well as general areas of engineering useful in any energy field, such as electricity production, production of synthetic fuels, national security, hydrogen, nuclear propulsion, and materials processing.

The four-year undergraduate program leading to a Bachelor of Science in Nuclear Engineering (B.S.NE) degree provides a well-grounded education that will lead to opportunities in any field of engineering.

Educational Objectives

The undergraduate education in the School of Nuclear Engineering has the following goals and objectives:

- **Provide the B.S. graduate with the technical capabilities required for successful performance as a nuclear engineer.** Nuclear engineers are challenged by a wide variety of problems related to consumer and industrial power, space exploration, water supply, food supply, environment and pollution, health, and transportation, among others. Therefore, the technical capabilities required of the nuclear engineer are highly varied. The School of Nuclear Engineering's program of education will provide:
  - A fundamental knowledge of the traditional and evolving areas in nuclear engineering and requisite subject areas.
  - The ability to mathematically model and analyze data.
  - The ability to use computers as tools in solving engineering problems.
  - A working knowledge of radiation measurements and statistical analysis.
  - An ability to solve open-ended design problems systematically.
- **Prepare graduates to be effective engineers in the workplace.** In addition to technical skills, the modern engineer must be able to communicate effectively, perform efficiently as a member of interdisciplinary project teams, and display excellent interpersonal skills in order to fulfill expectations of most industrial employers. Graduates should have the ability to:
  - Effectively communicate technical information orally and in writing.
  - Function efficiently as an individual, on a team, and with peers.
  - Address difficult, complex problems and adapt to new situations.
  - Work with a diverse, interdisciplinary workforce.
- **Instill in students a sense of responsibility to their profession, their community, and society at large.** The undergraduate program should go beyond the purely technical preparation to assist students in developing their sense of responsibility to the broader environments in which they must live and function. Upon completion of their program, graduates should have developed a commitment and sensitivity to these broader professional and social needs. They also should have developed:
  - A commitment to professional and ethical behavior in every endeavor.
  - The motivation and the ability for lifelong learning inside and outside of a formal educational setting.
  - A strong work ethic.
  - An appreciation of the impact of engineering solutions within a global and societal context.
  - A sensitivity to world affairs and cultures.
  - A commitment to public safety and understanding of nuclear processes.

In order to meet these objectives, the School of Nuclear Engineering has developed a curriculum with a broad base in the humanities and basic sciences upon which to build a nuclear engineering career. The required courses provide a strong foundation in basic sciences, including physics, mathematics, computer science, and chemistry. Engineering science courses include mechanics, materials, electric circuit analysis, thermodynamics, fluid mechanics, and heat and mass transfer. These form the foundation of any engineering program related to nuclear processes and applications.

Specialized courses in reactor physics and engineering build on this foundation. In addition, each student develops an area of specialty through the careful selection of 15 hours of technical electives. These areas may include

such diverse nuclear specialties as reactor engineering, nuclear materials, reactor physics, controlled thermonuclear fusion, reactor safety, energy systems, security, nuclear medicine, instrumentation, controls, and reactor simulation. New areas include computational methods, hydrogen generation, fuel cells, and space exploration. Additionally, nuclear engineering students may select electives that prepare them for careers in medical diagnostics and treatments, nuclear waste management, plasma processing, and related software development.

To prepare nuclear engineering students to meet their educational goals, they will complement their technical preparation with general education electives consisting of 18 credit hours of courses that provide an integrated and well-rounded program in the humanities and social sciences.

Graduate programs leading to the degrees of Master of Science in Nuclear Engineering (M.S.NE), Master of Science (M.S.), and Doctor of Philosophy (Ph.D.) are offered for qualified students seeking advanced degrees. The M.S.NE normally is obtained by students with a B.S. in engineering.

Financial aid with remitted tuition for graduate students includes teaching and research assistantships as well as traineeships and fellowships.

Information about the M.S.NE and Ph.D. programs can be found at www.engineering.purdue.edu/NE/Academics/Graduate or by contacting the School of Nuclear Engineering.

Areas for graduate research and study include nuclear reactor theory and analysis, fuel management, reactor thermal-hydraulics and safety, fusion plasma engineering and technology, design of advanced nuclear systems, radiation effects, energy materials, radioactive waste, artificial intelligence, nuclear medicine techniques, advanced reactor fuels, direct energy conversion, energy storage, and global warming.

A coordinated undergraduate/graduate program leading to an M.S.NE degree is available. Under this program, undergraduate students can apply for admission to the Graduate School at the beginning of their final semester. Qualified and interested students may start planning their graduate program with their undergraduate counselors at the beginning of the junior year.

Although one objective of the nuclear engineering program is to help students develop in specialized areas, the primary goal is to prepare them for a professional career. As a result, students are encouraged to develop a broad background in engineering and science and an awareness of social, economic, and environmental issues. Thus equipped, they will be capable of continued professional growth in the constantly changing technological world.

The curriculum in nuclear engineering is accredited by the Engineering Accreditation Commission of ABET, Inc., formerly named the Accreditation Board for Engineering and Technology. Further information about the undergraduate program in nuclear engineering is available through the School of Nuclear Engineering Web site at www.engineering.purdue.edu/NE/Academics/Undergraduate.

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, three-session co-op, or internship program. International internships also are available through the Global Partners in Apprenticeship Learning (G-PAL) Program within the Office of Professional Practice. 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 on the Professional Practice Program, please visit https://engineering.purdue.edu./ProPractice.

GEARE Program

The Global Engineering Alliance for Research and Education (GEARE) program is a unique and award–winning program that originated in the School of Mechanical Engineering at Purdue. Since 2009, the Office of Professional Practice (OPP) has assumed all GEARE operations and opened up the program to all College of Engineering students and some students in the College of Technology. GEARE is designed to supplement the education of engineers so they are prepared to function immediately in the global workplace. Students in the program participate in an orientation program, including language and culture, one domestic internship, one subsequent international

internship at the same company, one semester of study abroad with fully transferable engineering course credits, and a one- to two-semester design team project with design teams that include students from international partner universities working on an industry-inspired project.

Interested students are encouraged to refer to the OPP Web site, https://engineering.purdue.edu/ProPractice.

Minor Program

A minor in nuclear engineering is available to any student who completes a total of 12 credits, consisting of two core courses NUCL 20000 and 30000, each of 3 credits, plus an additional 6 credits in one area of specialization. Available areas of specialization include reactor physics, nuclear power systems, nuclear fusion, direct energy conversion, neural fuzzy approaches, reactor thermal-hydraulics, nuclear materials, and radioactive waste management. Contact the Student Services Office in the School of Nuclear Engineering for additional information.

Scholarships

Nuclear engineering students are eligible for a broad array of aid-based and merit-based scholarships. In addition to these, several assistantships and scholarships are available for students seeking research experience. Interested candidates (incoming freshman through senior nuclear engineering students) are invited to submit applications for consideration. Contact the Nuclear Engineering Student Services Office (NUCL) for more information.

Curriculum in Nuclear Engineering

Graduation requirements for the degree of B.S.NE are:

- Satisfaction of various University-wide graduation requirements (academic, scholastic, residence, fee payments, etc.).
- Completion of an appropriate plan of study prepared by the student and his or her academic counselor and approved by the Undergraduate Committee and the head of the School of Nuclear Engineering or a designated representative.

Minimum Degree Requirements for Nuclear Engineering

Credit Hours Required for Graduation: 131

Courses	*Credit Hours*
Freshman Year, see First-Year Engineering Program	**31**
Mathematics	**11***
Physics	**3†**
General Education Electives	**18**
Engineering Core	**53‡**
Technical Electives	**15§**

All elective courses are to be selected with the aid of the student's counselor to best fulfill the objectives of the individual student's program. General education electives must be chosen from the list of courses approved by the College of Engineering (available in the Nuclear Engineering Student Services Office). A maximum of 12 credit hours may be taken in any one department, a minimum of 6 credit hours must be taken in at least one department in each of the two categories of humanities and social sciences. At least 6 of the credit hours must come from courses at the 30000 level or above, or from courses with a required prerequisite in the same department.

Technical electives are to be selected from the colleges of Science and Engineering, and the School of Health Sciences, but exceptions will be considered on their merit by the undergraduate committee.

Following are sample plans of study in a few technical areas. Students, with the help of their advisors, may create plans of study in any relevant technical discipline.

** The recommended courses to satisfy the mathematics requirement involve MA 26100, 26500, 26600 (or equivalent), and three elective hours.*

† This requirement involves PHYS 24100 (or equivalent).

‡ The recommended courses to satisfy the engineering core are NUCL 20000, 20500, 27300, 29800, 30000, 30500, 31000, 32000, 35000, 35100, 35500, 39800, 40200, 44900, 45000, 49800, 51000, 52000; EE 20100; ME 20000, 27000, and 27400; MSE 23500; or their equivalent. The substitution of a maximum of 6 credit hours of courses approved by the undergraduate committee will be permitted to meet special needs.

§ After satisfactory completion of four semesters of advanced ROTC, 6 of these credits can be substituted for technical electives.

Suggested Plan of Study for Energy Materials and Radioactive Waste Management

Credit Hours Required for Graduation: 131

Freshman Year, see First-Year Engineering Program.

Sophomore Year

Third Semester	*Fourth Semester*
(4) **MA 26100** (Multivariate Calculus)	(3) **MA 26500** (Linear Algebra)
(3) **ME 20000** (Thermodynamics I)	(3) **ME 27400** (Basic Mechanics II)
(3) **ME 27000** (Basic Mechanics I)	(2) **NUCL 20500** (Nuclear Engineering Undergraduate Laboratory I)
(3) **NUCL 20000** (Introduction to Nuclear Engineering)	(3) **NUCL 27300** (Mechanics of Materials)
(0) **NUCL 29800** (Sophomore Seminar)	(0) **NUCL 29800** (Sophomore Seminar)
(3) General education elective	(3) **PHYS 24100** (Electricity and Optics)
	(3) General education elective
(16)	(17)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **MA 26600** (Ordinary Differential Equations)	(3) **MSE 24000** (Processing and Properties of Materials)
(3) **MSE 23500** (Materials Properties Laboratory)	(3) **NUCL 31000** (Introduction to Neutron Physics)
(3) **MSE 35000** (Thermodynamics of Materials)*	(3) **NUCL 35100** (Nuclear Thermal-Hydraulics II)
(3) **NUCL 30000** (Nuclear Structure and Radiation Interactions)	(3) **NUCL 35500** (Nuclear Thermohydraulics Laboratory)
(3) **NUCL 32000** (Introduction to Materials for Nuclear Applications)	(0) **NUCL 39800** (Junior Seminar)
(3) **NUCL 35000** (Nuclear Thermal-Hydraulics I)	(3) **NUCL 52000** (Radiation Effects and Reactor Materials)*
(0) **NUCL 39800** (Junior Seminar)	(3) General education elective
(18)	(18)

Senior Year

Seventh Semester	*Eighth Semester*
(3) **MSE 33500** (Materials Characterization Laboratory)†	(3) **ECE 20100** (Linear Circuit Analysis I)
(2) **NUCL 30500** (Nuclear Engineering Undergraduate Laboratory II)	(3) **NUCL 45000** (Design in Nuclear Engineering)
(3) **NUCL 40200** (Engineering of Nuclear Power Systems)	(0) **NUCL 49800** (Senior Seminar)
(1) **NUCL 44900** (Senior Design Proposal)	(3) Mathematics elective‡
(0) **NUCL 49800** (Senior Seminar)	(3) Technical elective*
(6) Technical electives*	(6) General education electives
(3) General education elective	
(18)	(18)

** Fifteen credit hours of technical electives are required and should be selected with the help of your academic advisor. Recommended electives for the energy materials option include AAE 55300; MSE 33500, 34000, 35000, 36700, 37000, 38200, 50200, 50800, 53100, 55500, 55600, 55700, 55900, 56000, 57500, and 57600; NUCL 50300, 51000, and 52000 (NUCL 50300 is required for radioactive waste management). Either NUCL 51000 or 52000 must be included in the engineering core. Other courses to meet specific objectives also can be selected.*

† One materials lab course beyond MSE 23500 is required.

‡ The mathematics elective is usually selected from MA 30400 or 36200.

Suggested Plan of Study for Nuclear Fusion

Credit Hours Required for Graduation: 131

Freshman Year, see First-Year Engineering Program.

Sophomore Year

Third Semester	*Fourth Semester*
(4) **MA 26100** (Multivariate Calculus)	(3) **MA 26500** (Linear Algebra)
(3) **ME 20000** (Thermodynamics I)	(3) **ME 27400** (Basic Mechanics II)
(3) **ME 27000** (Basic Mechanics I)	(2) **NUCL 20500** (Nuclear Engineering Undergraduate Laboratory I)
(3) **NUCL 20000** (Introduction to Nuclear Engineering)	(3) **NUCL 27300** (Mechanics of Materials)
(0) **NUCL 29800** (Sophomore Seminar)	(0) **NUCL 29800** (Sophomore Seminar)
(3) General education elective	(4) **PHYS 26100** (Electricity and Optics)
	(3) General education elective
(16)	(18)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **MA 26600** (Ordinary Differential Equations)	(3) **NUCL 31000** (Introduction to Neutron Physics)
(3) **MSE 23500** (Materials Properties Laboratory)	(3) **NUCL 35100** (Nuclear Thermal-Hydraulics II)
(3) **NUCL 30000** (Nuclear Structure and Radiation Interactions)	(3) **NUCL 35500** (Nuclear Thermohydraulics Laboratory)
(3) **NUCL 32000** (Introduction to Materials for Nuclear Applications)	(0) **NUCL 39800** (Junior Seminar)
(3) **NUCL 35000** (Nuclear Thermal-Hydraulics I)	(3) **NUCL 46000** (Introduction to Controlled Thermonuclear Fusion)*
(0) **NUCL 39800** (Junior Seminar)	(3) **PHYS 33000** (Intermediate Electricity and Magnetism)*
(3) General education elective	(3) Mathematics elective†
(18)	(18)

Senior Year

Seventh Semester	*Eighth Semester*
(3) **MA 51100** (Boundary Value Problems of Differential Equations)*	(3) **ECE 20100** (Linear Circuit Analysis I)
(2) **NUCL 30500** (Nuclear Engineering Undergraduate Laboratory II)	(3) **NUCL 45000** (Design in Nuclear Engineering)
(3) **NUCL 40200** (Engineering of Nuclear Power Systems)	(0) **NUCL 49800** (Senior Seminar)
(1) **NUCL 44900** (Senior Design Proposal)	(3) **NUCL 56300** (Direct Energy Conversion)*
(0) **NUCL 49800** (Senior Seminar)	(6) General education electives
(3) **NUCL 51000** (Nuclear Reactor Theory I)*	
(3) **NUCL 56000** (Introduction to Fusion Technology)*	
(3) General education elective	
(18)	(15)

** Fifteen credit hours of technical electives are required and should be selected with the help of your academic advisor. Recommended electives for nuclear fusion include NUCL 46000, 51000, 52000, 56000, 56300, and 57000; and PHYS 33000. Either NUCL 51000 or 52000 must be included in the engineering core. Other courses to meet specific objectives also can be selected.*

† The mathematics elective is usually MA 51000.

Suggested Plan of Study for Nuclear Power Engineering

Credit Hours Required for Graduation: 131

Freshman Year, see First-Year Engineering Program.

Sophomore Year

Third Semester	*Fourth Semester*
(4) **MA 26100** (Multivariate Calculus)	(3) **MA 26500** (Linear Algebra)
(3) **ME 20000** (Thermodynamics I)	(3) **ME 27400** (Basic Mechanics II)
(3) **ME 27000** (Basic Mechanics I)	(2) **NUCL 20500** (Nuclear Engineering Undergraduate Laboratory I)
(3) **NUCL 20000** (Introduction to Nuclear Engineering)	(3) **NUCL 27300** (Mechanics of Materials)
(0) **NUCL 29800** (Sophomore Seminar)	(0) **NUCL 29800** (Sophomore Seminar)
(3) General education elective	(3) **PHYS 24100** (Electricity and Optics)
	(3) General education elective
(16)	(17)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **MA 26600** (Ordinary Differential Equations)	(3) **ECE 20100** (Linear Circuit Analysis I)
(3) **MSE 23500** (Materials Properties Laboratory)	(3) **NUCL 31000** (Introduction to Neutron Physics)
(3) **NUCL 30000** (Nuclear Structure and Radiation Interactions)	(3) **NUCL 35100** (Nuclear Thermal-Hydraulics II)
(3) **NUCL 32000** (Introduction to Materials for Nuclear Applications)	(3) **NUCL 35500** (Nuclear Thermohydraulics Laboratory)
(3) **NUCL 35000** (Nuclear Thermal-Hydraulics I)	(0) **NUCL 39800** (Junior Seminar)
(0) **NUCL 39800** (Junior Seminar)	(3) **NUCL 52000** (Radiation Effects and Reactor Materials)*
(3) General education elective	(3) General education elective
(18)	(18)

Senior Year

Seventh Semester	*Eighth Semester*
(2) **NUCL 30500** (Nuclear Engineering Undergraduate Laboratory II)	(3) **NUCL 45000** (Design in Nuclear Engineering)
(3) **NUCL 40200** (Engineering of Nuclear Power Systems)	(0) **NUCL 49800** (Senior Seminar)
(1) **NUCL 44900** (Senior Design Proposal)	(3) Mathematics elective†
(0) **NUCL 49800** (Senior Seminar)	(6) Technical electives*
(3) **NUCL 51000** (Nuclear Reactor Theory I)*	(3) General education elective
(6) Technical electives*	
(3) General education elective	
(18)	(15)

** Fifteen credit hours of technical electives are required and should be selected with the help of your academic advisor. Recommended electives for nuclear power engineering include HSCI 43800 and 52600; IE 577; ME 43000 and 43300; and NUCL 46000, 47000. 50300, 51000, 51100, 51200, 52000, 54400, 55100, 55200, 56000, 56300, 57000, and 57500. Either NUCL 51000 or 52000 must be included in the engineering core. Other courses to meet specific objectives also can be selected.*

† The mathematics elective usually is selected from MA 30400 or 36200.

Information about Courses

Official Purdue University course information is available on the Web at www.courses.purdue.edu. Click on the "Search by term" link at the top of the page.

The Official Purdue University Course Repository is maintained by the Office of the Registrar and is updated instantaneously. It contains a multitude of information, including course descriptions and requisites for retired, current, and future courses offered at the West Lafayette campus as well as at Purdue Calumet, Purdue North Central, Indiana University-Purdue University Fort Wayne, Indiana University-Purdue University Indianapolis, and the College of Technology locations around the state.

The course information available online is organized by term, subject area, and course number, which enables you to tailor your search. You also may want to consult your academic advisor if you have questions about the courses required for your plan of study.

College of Engineering Administration and Faculty

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Melba Crawford, *Ph.D.,* Interim Associate Dean for Research

Audeen W. Fentiman, *Ph.D.,* Associate Dean for Graduate Education and Interdisciplinary Programs

Michael T. Harris, *Ph.D.,* Associate Dean for Undergraduate Education

Klod Kokini, *Ph.D.,* Associate Dean for Academic Affairs

Teri Reed-Rhoads, *Ph.D.,* Assistant Dean for Undergraduate Education

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Interdisciplinary Engineering

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Adjunct Associate Professor: D. L. Filmer, *Ph.D.*

Adjunct Assistant Professors: I. Hrbud, *Ph.D.;* J. J. Rusek, *Ph.D.*

Courtesy Appointments: B. S. Caldwell, *Ph.D. (IE);* J. P. Gore, *Ph.D. (ME);* P. K. Imbrie, *Ph.D. (ENE);* N. L. Key, *Ph.D. (ME);* S. F. Son, *Ph.D. (ME).*

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