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West Lafayette, Indiana 47907

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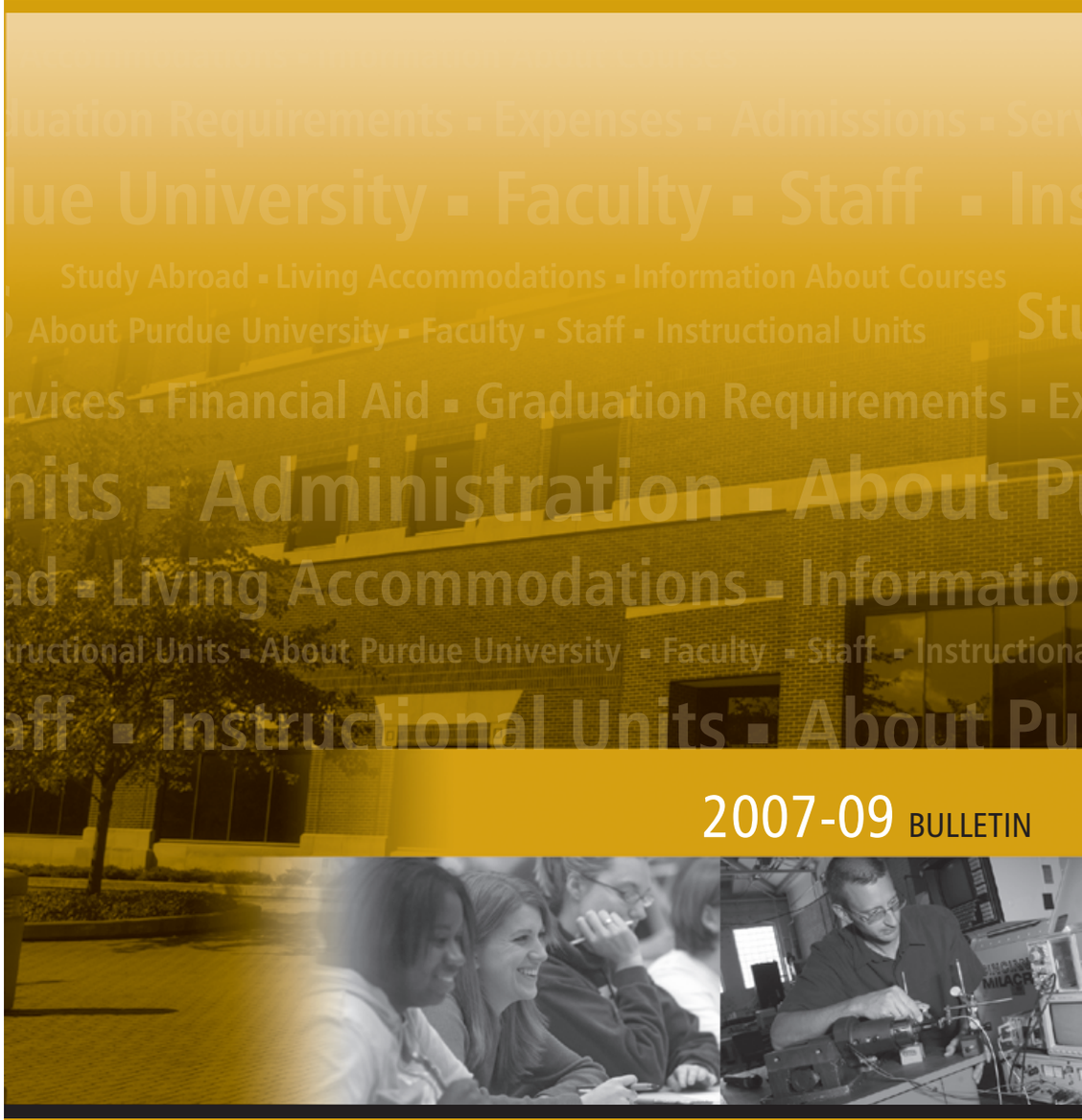

2007-09 BULLETIN

College of Engineering Catalog

Purdue University Publications

Bulletins are issued by each of the divisions listed below and are available for free. Forward requests to Purdue Marketing Communications, pmc@pmc.purdue.edu; telephone (765) 494-2034. The mailing address is: Purdue Marketing Communications; Purdue University; South Campus Courts, Building D; 507 Harrison Street; West Lafayette, IN 47907-2025. Please write legibly and include your zip code.

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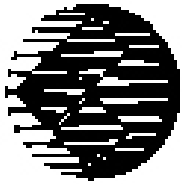

College of Engineering

2007 – 09
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Contents

About Purdue University

Serving people was Purdue University's founding principle as the Indiana link in the nationwide chain of land-grant colleges and universities. Purdue, which opened its doors on September 16, 1874, with a student body of 39 and a staff of six, has grown into a world-class educational system of 69,600 students and about 18,400 faculty and staff members across Indiana. The West Lafayette campus comprises 39,200 students and nearly 15,000 faculty and staff members.

Purdue graduates have been to the moon, to the highest levels of business and government, and to Sweden to receive the Nobel Prize. The roster of about 384,000 living alumni includes noted CEOs, agriculturalists, scientists, teachers, engineers, pharmacists, journalists, veterinarians, and athletes who have made notable contributions to our society.

Purdue has been a vital resource to the people of Indiana, the nation, and the world — from its land-grant foundation to its status today as a prominent land-, sea-, and space-grant university that champions its missions of learning, discovery, and engagement.

Making higher education available to the people was the plan in 1862 when President Lincoln signed the Morrill Act. That act gave public lands to any state that would use proceeds from the sale of the land to support a college that would teach agriculture and the mechanic arts.

Three years after passage of the land-grant act, the Indiana General Assembly voted to take advantage of the provisions. Competition among various areas of the state culminated in 1869 when the assembly accepted $150,000 from Lafayette civic leader John Purdue, $50,000 from Tippecanoe County, and 100 acres of land from local citizens. In appreciation, the institution was named Purdue University and was established in West Lafayette. The University officially opened for classes September 16, 1874.

Purdue quickly established prominence in agriculture and engineering, answering the immediate needs of the people. And it has since built solid reputations in veterinary medicine, technology, a range of sciences, pharmacy, nursing, management, liberal arts, health sciences, education, and consumer and family sciences.

The physical growth of campus also has been dramatic. Originally the campus consisted of three buildings rising out of Indiana farmland. Today the main campus encompasses 160 major buildings. Nearly $600 million worth of new construction and renovation is under way or scheduled to occur at Purdue in West Lafayette during the first seven years of the new millennium.

The Purdue system has expanded to include Purdue campuses at Fort Wayne, Hammond, and Westville, and degree programs at Indiana University-Purdue University Indianapolis and Indiana University-Purdue University Columbus. Purdue's College of Technology exists in 10 Indiana communities in addition to the West Lafayette campus.

The mission of answering the people's needs goes beyond educating productive graduate and undergraduate students. Purdue is a highly respected research institution, with research and sponsored program expenditures of over $407.2 million in the 2005–06 fiscal year on the West Lafayette campus. In addition, the University offers its expertise to the state of Indiana in numerous ways, as well as to business and industry, retailers, and teachers.

Purdue's impact in Indiana is evident daily through its spectrum of learning, discovery, and engagement. The University has an annual impact of more than $2.9 billion on Indiana's economy. Purdue's march toward preeminence has solid footing in the development of Discovery Park, where the University's talent and ideas are pacesetters in interdisciplinary world-leading nanotechnology and biosciences research and discovery.

Outreach programs include the Purdue University Cooperative Extension Service, with sites in each of Indiana's 92 counties serving as a gateway to lifelong learning. The Office for Continuing Education and Conferences serves tens of thousands of adult learners annually through Purdue courses for personal and professional development offered on campus, off campus, and by distance education.

Purdue is also a cultural and recreational hub for people in northwestern Indiana. The Edward C. Elliott Hall of Music, one of the largest proscenium theaters in the world, houses 6,025 spectators for music, dance, theatre, and pop entertainment. Boilermaker fans crowd Ross-Ade Stadium, Mackey Arena, and the Intercollegiate Athletic Facility for Big Ten Conference football, basketball, and volleyball.

Purdue University ranks among the 25 largest universities in the United States. Its position of leadership and influence in teaching and research stems in large part from its worldwide acclaim in engineering, science, and technology, but its preeminence is bolstered by an exciting array of academic disciplines. On the West Lafayette campus, there are 370 majors/specializations to choose from within the following colleges and schools:

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 scientists, engineers, business representatives, producers, information specialists, and resource managers for professional careers in the world's food and natural resource systems. See www.agriculture.purdue.edu/oap.

College of Consumer and Family Sciences

The college, one of the largest and highest ranking 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, nutrition, health and fitness, tourism, 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 our 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 are also 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 programs. Students launch their careers with a common first-year program in the Department of Engineering Education. Once they have completed that program, they choose from undergraduate curricula in aeronautics and astronautics, agricultural and biological, biomedical, chemical, civil, computer, construction engineering and management, electrical, food process, industrial, interdisciplinary, land surveying and geomatics, materials, mechanical, or nuclear engineering. Every school and department offers graduate degree programs. See www.engineering.purdue.edu.

School of Health Sciences

The school offers a variety of health-related study areas, including medical technology, medical physics, health physics, industrial hygiene, and related environmental and general health science programs. It also administers the prepharmacy, premedical, predental, and pre-allied health programs, including occupational and physical therapy and dental hygiene. Students completing the programs and gaining experience in the field may qualify for professional certification. 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 11 departments: audiology and speech sciences; communication; English; foreign languages and literatures; health and kinesiology; history; philosophy; political science; psychological sciences; sociology and anthropology; and visual and performing arts. Students can prepare themselves in more than 50 majors, including 11 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.) and for entry into graduate studies. 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.N. 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 advanced practice nurses. The Doctor of Nursing Practice (D.N.P.) delivers a curriculum from post-baccalaureate to the practice doctorate degree, with an emphasis on care of rural, underserved populations. 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 two prepharmacy years can be taken either at Purdue's School of Pharmacy or at another institution. 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 interdisciplinary science programs prepare students for immediate careers or advanced study. Premedical, predental, and preveterinary options; a cooperative education 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 22 specializations in the College of Technology prepare students to meet the technological needs of business, industry, and government. Technology students begin taking courses in their major as early as the freshman year. Courses and other opportunities allow students to experience a variety of hands-on, real-world applications. The college awards associate, bachelor's, and graduate degrees. See www.purdue.edu/technology.

School of Veterinary Medicine

This professional school, which graduated its first class in 1963, has assumed a leading position nationally and internationally in veterinary education. The school is one of only 28 in the United States that grant the Doctor of Veterinary Medicine 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 the only such program in the state of Indiana and one of only two AVMA programs administered by a school of veterinary medicine. See www.vet.purdue.edu/admissions.

The Graduate School

All programs of graduate study and research leading to advanced degrees are under the Graduate School's jurisdiction. Programs of study lead to the degrees of Doctor of Philosophy, Doctor of Audiology, Doctor of Nursing Practice, Educational Specialist, Master of Arts, Master of Arts in Teaching, Master of Fine Arts, Master of Business Administration, Master of Science, and Master of Science in various professional fields. More than 70 robust programs with research- and practice-oriented curricula are available in options that include the sciences, arts, engineering, agriculture, management, and humanities as well as exciting interdisciplinary programs. The Graduate School also offers several graduate-level, academic credit certificate programs. See 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 6,262 undergraduate students and 2,219 graduate students. The Department of Engineering Education is the entry point for all new students, who receive initial advising and academic counseling with staff in that department. 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 and biological engineering, biomedical engineering, chemical engineering, civil engineering, computer engineering, electrical engineering, food process 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 bulletin.

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 Department 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 and Management. The School of Civil Engineering administers a program leading to the degree of Bachelor of Science in Land Surveying Engineering (B.S.LSE). The B.S. degree in the Interdisciplinary Engineering program is not accredited as an engineering program. All other Purdue University Schools of Engineering undergraduate educational programs, with the exception of the plans of study leading to the B.S.E degree in the Interdisciplinary Engineering program and the Biomedical Engineering program, which are too new to be eligible, are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; telephone: (410) 347-7700.

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 provide the people of the state of Indiana, the nation, and the world the engineering components of the land-grant university missions of excellence in learning, discovery, and engagement. Graduates of engineering programs are expected to acquire knowledge, develop the abilities to assess what they learn, and learn to apply it effectively. They must be able to read and think critically and to communicate — both orally and in writing — with clarity and precision. Developing competence in quantitative and scientific reasoning is equally necessary. They also must become aware of the cultural, social, political, and economic forces and the technologies that shape our world. In their area of specialization, students are expected to achieve depth of understanding of both the essential content and principal modes of inquiry and to become familiar with the ethical issues facing their chosen fields. A Purdue education should prepare them for a lifetime of continual learning.

Students are encouraged to take the Fundamentals of Engineering (FE) exam during the last semester in residence. This exam is the first step toward professional engineering registration.

Engineering Professional Practice Programs

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 cooperative education 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. Cooperative education students get a broader view of a host organization through rotations in a variety of departments. Cooperative Education programs typically utilize year-round alternating sessions of work and academic study.

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.

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 a residence hall
- A seminar for first-year students
- A mentoring program
- 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. SWE and WIEP 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.

Two key organizations share in the MEP commitment to diversity. The National Society of Black Engineers (NSBE) was founded at Purdue in 1975. The White House awarded NSBE the 2003 Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring. Today more than 20,000 precollege and collegiate students, and alumni are members of NSBE.

Purdue also has a chapter of the Society of Hispanic Professional Engineers (SHPE). The University's SHPE has received the outstanding chapter award for the region.

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 struc-

tures 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.

A National Aeronautics and Space Administration or NASA-funded Institute for Nanoelectronics and Computing (INaC) and a National Science Foundation or NSF-funded network for computational nanotechnology (nCn) promote multidisciplinary research that forms the backbone 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.

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 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

All inquiries about admissions (whether you are entering from high school, transferring from another institution, or re-entering after being out of school) should be addressed to: Office of Admissions; Purdue University; Schleman Hall; 475 Stadium Mall Drive; West Lafayette, IN 47907-2050; admissions@purdue.edu; (765) 494-1776.

Your first inquiry concerning admission should include (1) the amount of education you have completed; (2) your plans for further education, indicating your area of interest; and (3) the approximate date of your entrance to Purdue.

When you are entering directly from high school, the Office of Admissions suggests that you file your application for admission early in your senior year. Transfer students should apply as early as possible.

Campus Visits

A visit to the campus and an interview with an admissions counselor will help you determine which educational programs at Purdue are in keeping with your educational background and your future career interests. Such a campus visit is especially appropriate during your junior year in high school.

The Office of Admissions is open each weekday from 8 a.m. to 5 p.m. No appointment is necessary; however, if you would like a tour

of the campus, contact the Office of Admissions before your visit.

Students interested in Purdue have a variety of opportunities to visit the campus. Some programs, such as Fall Preview Days and Introducing Purdue, offer more formal agendas that include admissions presentations, school and program sessions, and campus tours. Prospective students and their families also can make individual visits; the Office of Admissions offers multiple visit sessions on a daily basis, Monday through Friday, including walking tours of campus. Students planning a visit to campus should first contact the Office of Admissions or visit the Admissions Web site — www.purdue.edu/Admissions/Undergrad — for further information.

Core 40 — Indiana Students

Purdue University applauds the state's efforts to strengthen Indiana's high school students' academic preparation and encourages all students to complete the Core 40 requirements. In addition to considering high school courses, Purdue will continue to use other factors such as grade point average, class rank, trends in achievement, honors courses, and test scores when reviewing applications for admissions. We will evaluate applicants on an individual basis and in relation to their requested majors. Program limitations also will continue to be a factor in admission to certain majors.

Admissions Criteria

Your admission as a new student into the College of Engineering at Purdue is determined by a holistic review that evaluates rank in class, test scores, ability to be successful, grade average in college preparatory subjects, grades in courses related to the degree objective, trends in achievement, completion of minimum high school subject matter expectations, the strength of the college preparatory program, personal attributes, and information provided by your high school counselor. All applicants who have not completed a full year of college work are required to provide SAT or ACT scores (including the writing sections of these tests). Students are encouraged to take either the SAT or the ACT in the spring of their junior year.

First-Year Engineering Program admission is limited and selective. Only the most qualified applicants will be offered admission.

Required and Recommended Preparation

It is highly recommended that while in high school you take the maximum amount of college preparatory mathematics, laboratory sciences, and English offered. If choices are possible, those courses highly dependent upon knowledge and reasoning should take precedence over courses in which the emphasis is on manual skill. Applicants to the College of Engineering should review the following high school subject matter charts:

Subjects	Minimum Semester Expectations
English	8
Academic math*	6
Laboratory science†	6
Foreign language	4

* *Includes algebra, geometry, trigonometry, calculus, etc.*

† *Includes biology, chemistry, physics, earth/space science, physiology/anatomy, etc.*

Subjects	Additional Semesters Recommended
Computer skills	2
Additional mathematics, foreign language, lab science, or social studies	4

A student who has not completed the recommended preparation will usually require more than four years to complete the requirements for the bachelor's degree.

Because this catalog is used for two to three years, you should refer to www.purdue.edu/Admissions/Undergrad for the most current and accurate information about admission to the College of Engineering.

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.

Advance Deposit on Fees

If you are a new student admitted for the fall semester, you must make a nonrefundable advance deposit of $100. This deposit is to reserve a place for you on the new student roster. Students admitted on or before April 10 must submit the deposit by May 1. Those admitted after April 10 must submit the deposit within three weeks (21 days) after the date of the offer of admission.

If you receive an offer of admission but fail to make the required deposit of $100 within the time allotted, you automatically forfeit your right to a place on the new student roster.

The $100 advance deposit will be applied to your first semester fees and is not associated with your University housing application or contract.

Early Enrollment for Superior Students

If you are a high school student with a highly superior scholastic record during the first three years of high school, you may qualify for admission to Purdue without high school graduation.

The regular entrance requirements are supplemented by certain objective measurements of your qualification to advance to the university level. In this way, the University tries to recognize and provide for individual rates of learning and achievement.

As a nongraduate of high school, you will be considered for admission if you (1) have earned 12 or more credits toward graduation; (2) have a highly superior school record; (3) are strongly recommended by your principal; (4) have the approval of your parents for college entrance without high school graduation; (5) qualify by your performance on prescribed admissions tests; and (6) are approved by the University Admissions Committee.

Purdue cannot guarantee high school diplomas under this arrangement, but it cooperates with whatever arrangement the state or local school system may have for awarding a high school diploma to a successful participant in this plan.

Admission with Advanced Standing

On the basis of your CEEB Advanced Placement Examination, Purdue advanced credit examination, or high school record, you, as a first-year student, may receive advanced credit and/or advanced placement.

Transfer Students

If you are transferring from another college or university, you must comply with the following procedures:

1. Submit an official undergraduate application for admission.
2. Forward official transcripts of work done at institutions previously attended (both high school and college). A separate transcript must be provided by each institution, regardless of whether credit is requested.
3. To be assured of consideration for admission, your completed application should be received as early as possible. Some engineering programs may be closed to transfer students.
4. Transfer students who meet the high school subject matter requirements for Engineering and have completed all of the First-Year Engineering Program requirements in calculus, chemistry, physics, computer science, English composition, and speech or humanities should apply directly to the professional school and must meet minimum grade point averages, which vary by program. Specific information regarding minimum grade point averages and college-level subject matter requirements is available from the Office of Admissions.
5. Transfer students may be considered for the First-Year Engineering Program under the following circumstances: the student has a grade point average of 3.0 or higher and the student has completed at least 14 semester credit hours, including a minimum of 8 of the First-Year Engineering requirements in calculus, chemistry, and physics.

Because this catalog is used for two to three years, you should refer to www.purdue.edu/Admissions/Undergrad for the most current and accurate information about admission to the College of Engineering.

Transfer (or Advanced) Credit

Credit for courses at Purdue University will be given for work of equivalent character and amount successfully completed at another accredited college. Advanced standing will be determined on the basis of these credits.

Advanced credit will be regarded as provisional and may be withdrawn by the director of admissions upon recommendation of the head of the department concerned if dependent work is not satisfactorily completed.

Purdue University is a supporter of and a participant in the Indiana Core Transfer Library (CTL), a growing list of courses that will transfer from one public Indiana institution to another. As the Core Transfer Library is developed, information will be available at www.che.state.in.us.

When credit earned at another college or university is transferred to Purdue and accepted toward advanced standing, the credit is converted into terms of Purdue courses and applied to the program of study. It remains for you, the student, to complete the program, and your schedule of courses each term will be adjusted accordingly. It does not follow that your classification at Purdue or the time necessary for completion of the required work for a degree will be in line with what was expected at the previous institution. Grades are not transferred; only credits in courses are recorded.

Students participating in college-credit courses taught concurrently for high school and college credit during the regular school day by local high school teachers must validate the credit by submitting satisfactory results on the College Board Advanced Placement Examination or the Purdue advanced credit examination, as determined by the subject department. The determination of use of transfer credit in part or in full to satisfy graduation requirements is the responsibility of the school head or his or her designated representative, in accordance with the regulations of the University faculty.

All credentials are submitted with the understanding that they become the property of Purdue University.

Early Registration — Day on Campus

The Student Access, Transition and Success Programs (SATS) and the Office of Admissions invite you to campus for one day of early registration during the summer before your first semester as a new student. This day is set aside for you to meet with your academic counselor and to select your first-semester classes. The University then will proceed with the registration process and mail you a fee statement and your class schedule.

Student Orientation and Support Programs

Student Access, Transition and Success Programs (SATS) is responsible for the coordination of initiatives that help students prepare for, transition into, and succeed 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 for new, beginning students and includes a variety of activities designed to help them 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 the students at the appropriate times.

SATS programs include Day on Campus, Learning Communities, Orientation Programs (such as Boiler Gold Rush and Welcome Programs), Parent and Family Programs, the Purdue Opportunity Awards program, the Purdue HelpDesk, 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 G77; 128 Memorial Mall Drive; West Lafayette, IN 47907.

Nondegree Students

If you are an adult living near one of Purdue's campuses and you want to take a course at the University without seeking a degree or following a regular plan of study, you can apply for admission as a nondegree student. You must show that you have the background and course prerequisites necessary for the course or courses in which you are interested. The Office of Admissions will advise you on admissions procedures.

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.

Time of Entrance

Purdue University offers instruction during two semesters and summer session. You can begin most programs of study with any semester or during the summer. The semesters start in August and January, and the summer modules begin in May, June, and July. Students may begin the following programs only at the times stated: flight, nursing, and the Undergraduate Studies Program, fall; the specific veterinary technology program you are interested in will determine when you may begin your studies.

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.

The Purdue Statewide Academic System

Admission to Another Purdue Campus

Purdue's educational system provides students access to a full complement of the University's faculty, resources, and academic programs. Whether you're enrolled at Calumet, Fort Wayne, North Central, or West Lafayette, you can pursue a degree from Purdue University and fulfill your career aspirations.

As one of the nation's top research institutions, Purdue is recognized around the world for the quality of its programs and its graduates. When you pursue your goals at a Purdue campus, you'll earn your share of that reputation. You'll enjoy all the challenges as well as the benefits and rewards associated with a preeminent university. Purdue University's quality is available across the state, and the primary goal of each campus is to help each student excel through discovery, learning, and engagement.

For information about what is offered at each Purdue University campus, use the following contact list.

Calumet	www.calumet.purdue.edu adms@calumet.purdue.edu
Fort Wayne	www.ipfw.edu ASK@ipfw.edu
North Central	www.pnc.edu admissions@pnc.edu
West Lafayette	www.purdue.edu admissions@purdue.edu

There also are Purdue programs at Indiana University-Purdue University Indianapolis. Go to www.iupui.edu for more information.

Admission to the College of Technology — Statewide

The College of Technology resides in 10 Indiana communities in addition to the West Lafayette campus. A unique partnership of education, business, industry, and government, these community-based locations feature quality curriculum requirements, faculty who are as highly qualified as their West Lafayette campus peers, low student-to-faculty ratios, and the opportunity to earn a degree from Purdue University.

Technology programs at all locations emphasize hands-on, real-world applications to engineering principles. Students learn marketable skills to meet the defined needs of Indiana business and industry. Purdue Technology graduates are well prepared for immediate employment and enjoy one of the University's highest job-placement rates and some of the highest starting salaries for undergraduate majors.

In addition to academics, these College of Technology locations offer opportunities to get involved in on-campus and community activities. They also provide a full range of student services to ensure a rewarding college experience and future success.

The College of Technology Web site is www.purdue.edu/technology. For information about what is offered at each location, contact the Office of Admissions on the West Lafayette campus at admissions@purdue.edu or the location that interests you. The following list provides contact information for each location.

West Lafayette
Niaz Latif
(765) 494-1101
latif@purdue.edu

Anderson
319 Cottage Avenue
Anderson, IN 46012-3404
Phone: (765) 641-4551
E-mail: techanderson@purdue.edu

Columbus
4555 Central Avenue, Suite 1200
Columbus, IN 47203-1892
Phone: (812) 314-8526
E-mail: techcolumbus@purdue.edu

Greensburg
422 East Central Avenue, Suite 2
Greensburg, IN 47240-1834
Phone: (812) 622-8686

Indianapolis
2175 South Hoffman Road
Indianapolis, IN 46241-3650
Phone: (317) 484-1824
E-mail: techindianapolis@purdue.edu

Kokomo
2300 South Washington Street
Kokomo, IN 46904-9003
Phone: (765) 455-9339
E-mail: techkokomo@purdue.edu

Lafayette
5500 State Road 38 East, AD 2900
Lafayette, IN 47903-9405
Phone: (765) 496-6886
E-mail: techlafayette@purdue.edu

Muncie
Ball State University AT 223
Muncie, IN 47306-0256
Phone: (765) 285-5554

New Albany
4201 Grant Line Road
New Albany, IN 47150-2158
Phone: (812) 941-2353
E-mail: technewalbany@purdue.edu

Richmond
Indiana University
2325 Chester Boulevard
Richmond, IN 47374-1220
Phone: (765) 973-8228
E-mail: techrichmond@purdue.edu

South Bend
1733 Northside Boulevard
South Bend, IN 46634-7111
Phone: (574) 520-4180
E-mail: techsouthbend@purdue.edu

Readmission

Students who are dropped from Purdue University for academic deficiency must be out of the University for at least one semester (not including summer session) and must apply for readmission through the Office of the Dean of Students. There are deadlines for submitting an application with a $100 fee and for removing all encumbrances. A student may strengthen his or her application by submitting evidence of successful coursework from another institution. Information about the readmission process is available from the Office of the Dean of Students; Schleman Hall; 475 Stadium Mall Drive; West Lafayette, IN 47907-2050; (765) 494-1747.

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 disabled or Vietnam era 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 Vietnam era veterans through its affirmative action program.

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 you are enrolled in, etc. Basic minimum costs for the two-semester 2006–07 school year on the West Lafayette campus are shown in the table below. 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.

Beginning in the Fall 2006 Semester, students who enroll for a new degree-seeking program will be assessed a repair and rehabilitation fee. (The fee is retroactive for students who were enrolled as new degree-seeking students in Summer 2006.) This 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.

2006–07 Estimated Costs West Lafayette Campus (Fall and Spring Semesters)

Items	Indiana Resident	Nonresident
Tuition/Fees	$6,846* †	$21,016* †
Room/Board	7,140	7,140
Books/Supplies	990	990
Travel	270	420
Miscellaneous	1,650	1,650
Total	**$16,896**	**$31,216**

** First-time students enrolled at the West Lafayette campus beginning in the Fall 2002 Semester and thereafter pay these fees. Undergraduate, graduate, and professional students who were enrolled as degree-seeking students in the Spring 2002 Semester on the West Lafayette campus may be eligible for a lower fee. To maintain eligibility for a lower fee, students must be continuously enrolled (Fall and Spring semesters); eligible students will pay a lower fee until the date of attainment of one degree or until the Fall 2007 Semester, whichever comes first. Beginning in the Fall 2006 Semester, students who enroll for a new degree-seeking program will be assessed a campus repair and rehabilitation fee. That fee, as approved by the Board of Trustees, is also retroactive for students who enrolled as new degree-seeking students in Summer 2006.*

† 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, $600; Management, $936; 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 $50 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, or 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

Purdue University recognizes that not all students and their parents can afford to finance a college education entirely from their income and assets. To ensure that all students have an opportunity to obtain a college education regardless of their financial circumstances, the University, through the Division of Financial Aid, administers a four-fold 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. Information regarding the GED is available through any public high school or any state department of education/public instruction.

Most types of aid are based upon financial need and satisfactory academic progress. To be considered for all types of financial aid, you must submit a Free Application for Federal Student Aid (FAFSA). This form should be submitted online at www.fafsa.ed.gov or can be obtained from the Division of Financial Aid; Schleman Hall of Student Services, Room 305; 475 Stadium Mall Drive; West Lafayette, IN 47907-2050.

You should apply early for Purdue University financial aid. Eligible FAFSAs postmarked by March 1 will receive preference in the awarding of aid.

You are welcome to visit the campus to discuss not only family budgeting in order to meet college expenses, but also the types of available aid and the application procedure.

Walk-in counselors are available from 9 a.m. to 5 p.m. on Monday, Tuesday, Wednesday, and Friday, and from 1 to 5 p.m. on Thursday. Phone counselors are available from 8 a.m. to 5 p.m. Monday through Friday at (765) 494-0998. Computer access to your aid status is available at www.ssinfo.purdue.edu.

Scholarships Awarded by Engineering

The College of Engineering awards scholarships based upon merit or merit and need. Unless the student or their family do not plan to receive financial aid, need-based scholarships, or apply for student or parent loans to pay for their education, all incoming students should fill out the Preliminary Financial Aid (PFA) and the Free Application for Federal Student Aid (FAFSA) applications. All continuing students who want to apply for financial aid, need-based scholarships, or loans should fill out 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 automatically considered for all 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 PFAE sheet that is to be filled out the same time as the Purdue application. Scholarship selection begins in January. These scholarships are extremely competitive. 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 his or her 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 paperwork that needs to be filed due to federal tax laws, and they 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, because their money cannot be distributed to them until the 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 engineering scholarship administrator.

Resident Assistants

University Residences has a plan whereby graduate and undergraduate students who are at least 21 years of age by the end of their first semester of employment with University Residences 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.

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, or religion. 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 14 University Residences, a fraternity or sorority house, cooperative housing, or in a privately operated facility within the local community.

Apply for housing as soon as possible — whether or not you've made a final decision about enrolling at Purdue. University Residences begins accepting applications from admitted students in September for the following academic year.

Housing assignments generally are made in the order in which applications and $75 housing deposits are received, after housing assignments are made for certain groups such as Learning Communities and National Merit Finalists. Therefore, you should apply for housing as soon as possible to improve your chance of assign-

ment to a residence of your higher preference. You will have the opportunity to indicate your housing preferences and a specific roommate request at the time you receive your housing contract mailing.

Apply online at www.housing.purdue.edu to expedite your application. If you don't have Internet access, use the paper application included with the housing brochure in your initial admission packet. With your application, you will be required to submit a $75 deposit. If you do decide to live on campus, this deposit will be credited to your first housing bill; if you do not, the deposit is refundable per the schedule below.

March 1 is the preferential housing application deadline. Because the University does not guarantee on-campus housing, it is important that students meet this deadline, although applying earlier is recommended. Students who apply for housing after the March 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 for housing by March 1 receive a housing contract mailing by April 1, which will be due to be returned by mid-April. When you receive your housing contract mailing, you will be prompted 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, each of you must rank your residence preferences the same and request each other as a roommate.

New students who notify University Residences in writing of their choice to cancel their housing application will receive a refund of the housing deposit as follows:

Fall semester or summer session, cancellation received:

- Before May 1, $75 refund
- Between May 1 and May 31, $25 refund
- On or after June 1, no refund

Spring semester, cancellation received:

- Before December 1, $25 refund
- On or after December 1, no refund

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 11,100 single undergraduate men and women.

The all-male residences include Cary Quadrangle, providing accommodations for 1,166 students, and Tarkington and Wiley Halls, each providing space for about 700 students.

Six University Residences — Owen, McCutcheon, Harrison, Shreve, Earhart, and Hillenbrand halls — 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, Shealy, Wood, Warren, and Vawter halls comprise the all-women's residences and are referred to as Windsor Halls. Windsor Halls provide accommodations for 595 students.

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

As a student, you may choose from three plans consisting of 10, 15, or 20 meal swipes a week, as suits your lifestyle. University Residences offers students who are sophomore 3 and above the Black Meal Plan, consisting of a block of 210 meals, and the Gold Meal Plan, consisting of 300 meals. With these plans, 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 each University Residences hall. If you bring a personal computer, you may use the Residences' optional Ethernet connections or data-over-voice service to access the University computing network directly from your room.

Room and board rates in 2006–07 vary from $5,528 to $8,624, depending on your chosen meal plan option, residence, and room size.

Approximately 700 spaces in Hawkins Hall are reserved for assignment to older undergraduate students. Hawkins Hall residents are not required to purchase a meal plan. Accommodations in Hawkins Hall are on a room-only basis. The cost for a room in 2006–07 ranges from

$320 to $585 a month depending on the type of room selected; that includes local telephone service with voice mail and call waiting.

More than 1,000 spaces for single undergraduate students are available in Hilltop Apartments. The apartments house two, three, or four 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 non-board option. The room and board rate for 2006–07 in the apartments ranges from $6,172 to $9,466 a year.

(Rates quoted are subject to change as approved by the Board of Trustees and undoubtedly will be somewhat higher during the 2007–08 period of this publication.)

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

Accommodations for Married Students/Families

At Purdue Village, there are 1,000 University Residences-operated apartments located within a one-mile walking distance of the main campus. The apartments are unfurnished and equipped with a stove and refrigerator. There are one-bedroom and two-bedroom apartments, with the two-bedroom apartments having washers and dryers.

One-bedroom apartment costs range from $520 to $535 a month. Two-bedroom units range from $640 to $655 a month. Your rent payment covers all utilities, including local telephone service and Boiler TV (cable). These rates are effective during the 2006–07 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.

For more information on Purdue Village, visit www.housing.purdue.edu, call (800) 440-2140, or fax (800) 440-2141.

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; Schleman Hall, Room 250; 475 Stadium Mall Drive; West Lafayette, IN 47907-2050; or call (765) 494-1231. Students are expected to complete and return application information by February 1 or earlier for membership the following fall semester.

Additional information is available at www.purduecooperatives.org.

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.purdue.edu/greek.

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 Adaptive Programs division 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/adpro. 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 Center for Career Opportunities (CCO) will assist you with your career decision-making and job search processes. Career counseling by appointment and resume reviews on a drop-in basis are available to students who visit the CCO at Stewart Center, Room 194, between 8 a.m. and 5 p.m. Monday through Friday. A wide variety of other career development and job search resources are found at https://www.cco.purdue.edu/student/CCOExpress.shtml.

Purdue University students and graduates interested in having their resume referred to prospective employers and participating in interviews with employers for internships and post-graduate employment are encouraged to register with CCO Express at the address given in the previous paragraph. Based on the number of employers recruiting at the Center for Career Opportunities, the interviewing program ranks among the three or four largest within university career centers in the United States each year.

For Further Information

General Information. The *General Information* bulletin will give you further details about admission, fees, expenses, financial aid, registration, living accommodations, student activities, student services, requirements for graduation, transfer students, ROTC, and other areas of student interest.

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, or request copies from Purdue Marketing Communications; 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.

Alcohol Policy. Purdue students are subject to Indiana law, which prohibits consumption or possession of alcoholic beverages by anyone under 21 years of age. The University does not permit alcohol to be brought onto Purdue property, with certain exceptions, by any person regardless of age. Fraternity and sorority houses and student cooperative housing units are considered off-campus housing and are permitted to have alcoholic beverages, but they must observe specific University guidelines and state law.

The University does not have the responsibility or the authority to control off-campus student drinking, but it does attempt to give students the opportunity to make informed and mature decisions about alcohol use. A variety of educational and counseling programs are offered to help students deal with all aspects of alcohol and drug use, from peer pressure to dependency.

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.

Intellectual Property. All students are subject to the University policy on intellectual property, Executive Memorandum B-10, which can be found at www.purdue.edu/policies/pages/teach_res_outreach/b_10.html.

Information Technology

Information Technology at Purdue, which is known by the acronym "ITaP" (pronounced EYE-tap), is responsible for centralized computing and telecommunications services for faculty, staff, and students on the West Lafayette campus.

Computing services range from the very visible computing laboratories located in more than 60 locations throughout campus, to the unseen but essential enterprise applications that facilitate the business of the University. The ITaP staff members install, maintain, operate, and repair computer equipment, and provide services including career accounts, e-mail, calendaring, directories, and database administration.

In addition to the instructional computer laboratories, services for students include:

1. The WebCT course management system.
2. The Purdue Mobile Learning Initiative, which enables students to purchase laptop computers with on-campus technical support and repair.
3. The Digital Learning Collaboratory, a center for creating multimedia content including digital portfolios, Web pages, and digital video. The center is operated jointly with the Purdue University Libraries.
4. The Adaptive Programs lab for those with special needs.
5. Web-based access to many software applications, Software Remote. (In 2006, *EdTech: Focus on Higher Education* magazine gave Software Remote an IT innovation award.)
6. Free anti-virus software and computer security resources through SecurePurdue.
7. Significant discounts on commonly used software programs, such as Microsoft Office and Macromedia Studio.

Purdue is one of the few universities to offer high-performance computing capability to undergraduates, too. A Linux-based computer cluster in the Digital Learning Collaboratory is available for students to perform animation rendering, modeling, and other computational intensive assignments.

Also supporting research at Purdue is the Envision Center for Data Perceptualization, which is one of the largest scientific visualization facilities found at any university. The Envision Center utilizes a blend of computer science, engineering, perception, technology, and art to process and display information through the use of computer graphics. Students can use the facility to take visualization-related courses or to take collaborative courses with students from other universities.

Telecommunications services provided by ITaP range from basic phone services for campus offices and residences to wireless connectivity in areas throughout the campus. ITaP supports the infrastructure that links campus buildings by optical fiber and provides commodity Internet to residences and offices. ITaP also manages Purdue's participation in several research networks, including the Internet 2, the TeraGrid, and the Northwest Indiana Computational Grid.

To help University personnel stay up to date on the rapidly changing information technology field, courses and one-on-one consulting are available on every aspect of computing and telecommunications.

For additional information, please consult www.itap.purdue.edu or call (765) 494-4000. The address for the ITaP Customer Service Center is Stewart Center, Room G068; 128 Memorial Mall; West Lafayette, IN 47907-2034.

Engineering Computer Network

The Engineering Computer Network (ECN) consists of a network of workstations, file servers, and compute servers that compliment and expand ITaP instructional and research computers. This equipment is distributed throughout the several buildings of the College of Engineering, providing convenient access for students, faculty, and staff. The ECN systems are connected to the rest of campus and to other large computing networks via high-speed links.

Libraries

The collections and services of the Purdue University Libraries are an important resource for your educational experience.

The University Libraries system on the West Lafayette campus includes 13 subject-oriented libraries and the Hicks Undergraduate Library. The Libraries provide a print collection of nearly 2,500,000 volumes and more than 3,100,000 microforms of older scholarly materials in addition to many current scientific and technical reports. Approximately 21,000 serial titles are received, including periodicals and serial publications of societies, institutions, and the federal and state governments. Federal government publications and patents are received on a depository basis. The Libraries also offer more than 7,000 electronic information sources. The Libraries Web site at www.lib.purdue.edu is the gateway to information and services.

Local library resources are supplemented by the four million items of research materials held by the Center for Research Libraries in Chicago, including 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 in the HSSE Library.

The Digital Learning Collaboratory (DLC) is located in the 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.

Librarians and a knowledgeable reference staff are readily available to assist students with their information retrieval needs.

Siegesmund Engineering Library

The Siegesmund Engineering Library is the principal library resource for students in the College of Engineering. Located in the A.A. Potter Engineering Center, the collections include over 392,000 volumes, 1,700 journals, and an extensive collection of microfiche, printed technical reports, and standards related to most areas of engineering. The library is an officially designated depository for United States patents and trademarks, with holdings back to 1790. Numerous electronic resources also support study and research in these fields. Librarians and reference staff assist users in retrieving information in all formats.

Goss Library

Of special interest is the William Freeman Myrick Goss Library of the History of Engineering, established in 1928 when Purdue received the personal library of Professor William Goss, dean of engineering at the University from 1879 to 1907. Edna D. Goss, his widow, established an endowment for the library that now contains more than 5,000 historical and rare volumes, with particular emphasis on railroad engineering.

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. They are spelled out in the "Registration" section of the *General Information* bulletin.

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" 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 Visual and Performing Arts. Any course offered by these departments is allowable, provided it is open to students in the offering department 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 department, and a maximum of 12 credit hours may be taken in any one department.
4. At least 6 of the credit hours must come from courses at the 300-level or above, or from courses with a required prerequisite in the same department.
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 department, 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 department 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.

CHM—Chemistry
A&AE—Aeronautics and Astronautics
ABE—Agricultural and Biological Engineering
ANTH—Anthropology
ASM—Agricultural Systems Management
BIOL—Biological Sciences
BME—Biomedical Engineering
C E—Civil Engineering
CEM—Construction Engineering and Management
CGT—Computer Graphics Technology
CHE—Chemical Engineering
CHM—Chemistry
COM—Communication
C S—Computer Sciences
ECE—Electrical and Computer Engineering
ECON—Economics
ENE—Engineering Education
ENGL—English
ENGR—First-Year Engineering
FS—Food Science
H&S—Health and Safety
HSCI—Health Sciences
I E—Industrial Engineering
L S—Land Surveying
MA—Mathematics
M E—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 Department of Engineering Education. Qualified students are then admitted to the schools 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 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 schools of engineering.
- 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:

Office of Professional Practice: Cooperative Education and Internships

The College of Engineering has several alternative work schedule programs designed to give students a choice in total length of full-time work experience. Opportunities range from an alternating-session traditional cooperative education with nearly two years of work time to a low-commitment summer internship. Visit the Web site: www.ecn.purdue.edu/ProPractice.

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.

Day on Campus

All beginning fall semsester students are encouraged to visit campus during Day on Campus, a summer orientation program that occurs in June and early July. On that day, students attend orientation events and register for their fall courses.

First-Year Engineering Honors Program

The First-Year Engineering Program (FYE) Honors Program is designed to provide academically talented and highly motivated students a broader and more enriched educational experience during their first year. Most students are admitted to the honors program based on a combination of SAT/ACT test scores and class rank (or recalculated core high school GPA). Students must have a combined math and verbal score of 1360 on the SATs (or an equivalent ACT) and be in the upper 10 percent of their high school class (or have a 3.8 out of 4.0 recalculated core GPA from math, science, and English grades only). In addition, National Merit Finalists, Beering Scholars, Minority Engineering Program Honors Merit Award Recipients, and Women in Engineering Program Honors Merit Award recipients 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, participation in an industrial awareness program, additional honors designations to permanent transcripts, priority registration, and assigned academic advising. In addition, the honors program offers its students leadership and service learning opportunities, an established academic peer group, an honors peer mentor program, the potential for international/global experience, and the opportunity to participate in the Engineering Honors Learning Community.

Students in the FYE Honors Program must complete a minimum of seven credit hours of honors courses or advanced courses 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 Communities

The Engineering Learning Communities (LC) support students' transition to Purdue's First-Year Engineering Program. Cohorts of 30 LC students take two or three 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 Network; IDEAS, which has a multicultural theme; and Engineering Honors, open only to students in the FYE Honors Program.

Minority Engineering Program

Although the program is open to all students, the mission of the Minority Engineering Program (MEP) is to engage in activities designed to increase and improve the enrollment, retention, and successful graduation of engineers from African American, Native American, Latino/Hispanic American, and other historically under-represented groups. MEP accomplishes its mission through motivation, recruitment, and retention. MEP has been the key to Purdue successfully graduating more than 1,300

engineering students of color to date. More information is available at www.engineering.purdue.edu/MEP.

Women in Engineering Program

The Women in Engineering Program (WIEP) at Purdue University is dedicated to enriching the profession of engineering through the full participation of women. WIEP develops and directs activities that provide encouragement for girls and young women to study engineering, shares information about careers and companies, and fosters an environment conducive to the successful completion of their studies. WIEP also maintains strong relationships with alumnae, friends, and companies who generously support the program. More information is available at www.engineering.purdue.edu/WIEP.

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, engineering lectures, science selective (either general chemistry II or computer programming), English composition, and a first-year general education elective. (Fundamentals 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, land surveying and geomatics engineering, or mechanical engineering are encouraged to take the appropriate computer graphics course.

Students who began their post-secondary college education prior to Summer 2006 are required to complete general chemistry II, computer programming, and Fundamentals of Speech Communication.

Required Courses for the FYE Program

Calculus I (4 or 5): MA 161 or 165
Calculus II (4 or 5): MA 162, 166, 173, or 181
Chemistry I (4): CHM 115, 123, or 136
Physics I (4): PHYS 172 or 172H
Engineering Problem Solving and Computer Tools (3): ENGR 126 or 126H
Engineering Lectures (1): ENGR 100, 100H, 103 or 104
English Composition (3 or 4): ENGL 106, 106I or 108
Science Selective (3 or 4): CHM 116, 124, or 136; or C S 159; or ENGR 117
First-Year General Education Elective (3) such as COM 114
Total Credit Hours **29–33**

Optional Computer Graphics Course for AAE and ME majors only (2): CGT 163
Optional Computer Graphics Course for CE, CEM, and LGSE majors only (2): CGT 164

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 up to five 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 165 or equivalent) and engineering problem solving (ENGR 126 or equivalent). Students continuing on to general chemistry II need to complete general chemistry I with a satisfactory grade, as defined by the ENE faculty. Students who begin their studies of mathematics in precalculus (MA 159) need a grade of "C" or better to progress to calculus I.

First Semester

(4) **CHM 115** (General Chemistry)
(4) **ENGL 106** (First-Year Composition)
(1) **ENGR 100** (Freshman Engineering Lectures)
(3) **ENGR 126** (Engineering Problem Solving and Computer Tools)
(4) **MA 165** (Analytic Geometry and Calculus I)

Second Semester

(2) **CGT 163** (Introduction to Graphics for Manufacturing) **or**
(2) **CGT 164** (Graphics for Civil Engineering and Construction)
Science Selective:
(4) **CHM 116** (General Chemistry) **or**
(3) **C S 159** (Programming Applications for Engineers)

(4) **MA 166** (Analytic Geometry and Calculus II)
(4) **PHYS 172** (Modern Mechanics)
(3) First-Year General Education Elective, such as COM 114 (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" above.*

Admission to the College of Engineering

Students are 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 and biological, chemical, civil, industrial, interdisciplinary, land surveying and geomatics, 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 100/100H/103/104). 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 (A = 4, B = 3, C = 2, D = 1 and F = 0) 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

Three 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 requires 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, CEM 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 in the engineering lecture courses.

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 range of majors is offered for both degrees. The B.S.E degree

will be awarded to students who complete the 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 them for professional schools or nontraditional careers. IDE programs are not currently accredited by the Accreditation Board for Engineering and Technology (ABET): however, IDE's B.S.E program was designed to meet ABET requirements and will be visited in 2007.

Major Areas of Study

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 areas 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 engineering 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
- Basic engineering
- Engineering management
- Engineering science
- Innovative design engineering
- Multi-disciplinary engineering
- Power 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.

Plans of Study

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

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 Department 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 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., as described in the Purdue University *General Information* bulletin.
- 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 requirements are still being developed. The plan of study provides for 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., as described in the Purdue University *General Information* bulletin.
- 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.

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.

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.

Professional Practice Program with Industry

A five-year professional practice program, which provides industrial experience related to engineering with eligible companies, is offered to a limited number of qualified students. Students normally are selected at the end of the

first semester of the freshman year and begin the professional practice program in the sophomore year. Alternating semesters, including summers, are spent in industry and at the University.

Students also may spend one or more semesters working in industry, yet retain full-time-student status by registration for "professional internship." This mechanism requires only departmental approval. See www.ecn.purdue.edu/ProPractice.

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 40 countries around the world. The School 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 program of study in this catalog applies to students who entered the school before Fall 2006. Students entering after that date should refer to the Web site at www.engineering.purdue.edu/AAE/Students/Ugrad. The basic B.S.AAE degree program has a minimum of 131 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 165, 166, 261	**12**
Linear Algebra: MA 265	**3**
Differential Equations: MA 266, 304	**6**
Sciences	
Chemistry: CHM 115	**4**
Physics: PHYS 172, 241	**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 in addition to the required first-year composition course.	
General Education Electives	**18**
Computer Skills	
ENGR 106	**2**
Programming: C S 152 or 156	**2**
Graphics: CGT 163	**2**
Professional Development: ENGR 100	**1**
Aeronautics and Astronautics Program	
Structures and Materials: A&AE 204, 204L, 352	**7**
Aerodynamics: A&AE 333, 333L, 334	**7**
Lab Elective: A&AE 352L or 334L	**1**
Note: The selected lab should be taken with the corresponding course, if possible.	
Propulsion	
Thermodynamics: M E 200	**3**
Jet Propulsion A&AE 372 **or** Rocket Propulsion A&AE 439	**3**
Note: Students planning to specialize in aeronautics should take A&AE 372; those aimed at astronautics should take A&AE 439.	
Dynamics and Control	
Statics and Dynamics: A&AE 203, 340	**6**
Controls: A&AE 301, 364, 364L	**7**
Vehicle Dynamics: A&AE 421 or 440	**3**
Note: Students planning to specialize in aeronautics should take A&AE 421; those aimed at astronautics should take A&AE 440. A&AE 364L is to be taken following A&AE 364.	

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Design

Introduction: A&AE 251 **3**

Spacecraft A&AE 450 **or**
Aircraft A&AE 451 **3**

Note: Students planning to specialize in aeronautics should take A&AE 451; those aimed at astronautics should take A&AE 450.

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: 131

Freshman Year, see First-Year Engineering Program.

CGT 163 is required in the aeronautical and astronautical engineering curriculum.
Students planning to enter A&AE are encouraged to take computer programming as the science selective.

Sophomore Year

Third Semester	*Fourth Semester*
(3) **A&AE 203** (Aeromechanics I)	(3) **A&AE 204** (Aeromechanics II)
(0) **A&AE 395** (Undergraduate Seminar)	(1) **A&AE 204L** (Aeromechanics II Laboratory)
(4) **MA 261** (Multivariate Calculus)	(3) **PHYS 241** (Electricity and Optics) **or** **A&AE 251** (Introduction to Aerospace Design)
(3) **MA 265** (Linear Algebra)	(3) **MA 266** (Ordinary Differential Equations)
(3) **PHYS 241** (Electricity and Optics) **or** **A&AE 251** (Introduction to Aerospace Design)	(3) **ME 200** (Thermodynamics I)
(3) General education elective	(3) General education elective
(16)	(16)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **A&AE 301** (Signals Analysis in Aerospace)	(3) **A&AE 334** (Aerodynamics)
(3) **A&AE 333** (Fluid Mechanics)	(1) **A&AE 334L** (Aerodynamics Laboratory) **or** **A&AE 352L** (Structural Analysis I Laboratory)
(1) **A&AE 333L** (Fluid Mechanics Laboratory)	(3) **A&AE 340** (Dynamics and Vibrations)
(3) **A&AE 352** (Structural Analysis I)	(3) **A&AE 364** (Control Systems Analysis)
(3) **MA 304** (Differential Equations and Analysis of Nonlinear Systems for Engineering and the Sciences)	(3) **A&AE 372** (Jet Propulsion Power Plants)
(0) **A&AE 395** (Undergraduate Seminar)	(3) General education elective
(3) General education elective	
(16)	(16)

Senior Year

Seventh Semester	*Eighth Semester*
(1) **A&AE 364L** (Control Systems Laboratory)	(3) **A&AE 451** (Aircraft Design)
(0) **A&AE 395** (Undergraduate Seminar)	(3) General education elective
(3) **A&AE 421** (Flight Dynamics and Control)	(9) Major or minor area electives
(6) Major or minor area electives	(3) Technical 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: 131

Freshman Year, see First-Year Engineering Program.

CGT 163 is required in the aeronautical and astronautical engineering curriculum.
Students planning to enter A&AE are encouraged to take computer programming as the science selective.

Sophomore Year

Third Semester	*Fourth Semester*
(3) **A&AE 203** (Aeromechanics I)	(3) **A&AE 204** (Aeromechanics II)
(0) **A&AE 395** (Undergraduate Seminar)	(1) **A&AE 204L** (Aeromechanics II Laboratory)
(4) **MA 261** (Multivariate Calculus)	(3) **MA 266** (Ordinary Differential Equations)
(3) **MA 265** (Linear Algebra)	(3) **ME 200** (Thermodynamics I)
(3) **PHYS 241** (Electricity and Optics) **or** **A&AE 251** (Introduction to Aerospace Design)	(3) **PHYS 241** (Electricity and Optics) **or** **A&AE 251** (Introduction to Aerospace Design)
(3) General education elective	(3) General education elective
(16)	(16)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **A&AE 301** (Signals Analysis in Aerospace)	(3) **A&AE 334** (Aerodynamics)
(3) **A&AE 333** (Fluid Mechanics)	(1) **A&AE 334L** (Aerodynamics Laboratory) **or** **A&AE 352L** (Structural Analysis I Laboratory)
(1) **A&AE 333L** (Fluid Mechanics Laboratory)	(3) **A&AE 340** (Dynamics and Vibrations)
(3) **A&AE 352** (Structural Analysis I)	(3) **A&AE 364** (Control Systems Analysis)
(0) **A&AE 395** (Undergraduate Seminar)	(3) General education elective
(3) **MA 304** (Differential Equations and Analysis of Nonlinear Systems for Engineering and the Sciences)	(3) Technical elective
(3) General education elective	
(16)	(16)

Senior Year

Seventh Semester	*Eighth Semester*
(1) **A&AE 364L** (Control Systems Laboratory)	(3) **A&AE 440** (Spacecraft Attitude Dynamics)
(3) **A&AE 439** (Rocket Propulsion)	(3) **A&AE 450** (Spacecraft Design)
(3) General education elective	(3) General education elective
(6) Major or minor area electives	(9) Major or minor area electives
(3) Technical elective	
(16)	(18)

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 non-chemical 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

Agricultural and Biological Engineering (ABE) programs prepare students for careers in industries and organizations with products or missions related to agricultural, biological, and food materials and processes. These encompass environmental and natural resources issues, food safety and quality, biotechnology, workers' health and safety, water and air quality, alternative energy sources, and development of machine systems for food and fiber production and processing.

ABE offers two distinct curricula — in agricultural and biological engineering and in biological food process engineering. The agricultural and biological engineering program develops professional engineers for successful careers working with biological materials and production agriculture and its natural resource base. This program offers two areas of specialization: machine systems engineering as well as environmental and natural resources engineering. The biological food process engineering program emphasizes the processing and chemistry of biological materials for food and industrial products. Both curricula combine courses in the biological and life sciences with the engineering foundation essential to design and/or manage biological production and processing systems.

A high degree of flexibility for planning a student's professional training to meet particular degree objectives is provided. Both curricula are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. Additional information is available at www.purdue.edu/ABE.

Educational Objectives

The educational objectives of the agricultural and biological engineering programs are to produce graduates who:

- Effectively practice agricultural and biological engineering in the areas of machine systems, environmental and natural resources, and food processing.
- Have demonstrated proficiency in basic engineering skills and technical knowledge as well as in professional and personal skills appropriate for their profession.
- Are prepared for future challenges in food agricultural and 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 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 and biological engineering (ABE) and biological and food process engineering (BFPE) are divided into two groups: basic engineering skills and professional and personal skills.

ABE Basic Engineering Skills

Graduates of this program will demonstrate:

- An understanding of the agricultural and biological 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.
- The ability to design a system, component, or process to meet the desired goal, subject to constraints.
- The 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.

BFPE Basic Engineering Skills

Graduates of this program will demonstrate:

- An understanding of the fundamental principles of mathematics and science.
- An understanding of food process engineering principles.
- The ability to design and/or conduct experiments to analyze food systems and processes.
- An understanding of and the ability to identify, formulate, model, and solve problems for food process engineering systems.
- An ability to design a system or a process to meet desired needs in the area of 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 ABE and BFPE Programs)

Graduates of these programs will demonstrate:

- An understanding of the global and societal impact of engineering practice research and discovery.
- 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 systems and products ranging from intelligent machines, to techniques for improving the quality of land and water resources, to the creation of low-fat healthy foods. The highly interdisciplinary focus will enable students to apply basic engineering principles to the design of new products or processes.

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

Employment opportunities for biological and food process engineers are available in nearly every phase of food processing: research and development, process design, plant engineering, distribution and marketing, quality evaluation and control, sanitation and waste disposal, and by-product development and utilization. There is also a great need for biological and food process engineers as educators, production and processing managers, and food industry executives.

The following plans of study lead to the degree of Bachelor of Science in Agricultural and Biological Engineering (B.S.ABE) and are administered by the College of Engineering and the College of Agriculture. Beginning students should apply for admission to the College of Engineering and complete the First-Year Engineering Program. For qualified agricultural students who develop an interest in agricultural and biological engineering during their freshman year, an alternate course sequence in the College of Agriculture is available. Dual-degree programs also are available in biological and food process engineering/biochemistry or biological and food process engineering/pharmaceutical sciences. These programs require an additional year of study leading to two degrees. The department also offers graduate study leading to the degrees of Master of Science (M.S.) and Doctor of Philosophy (Ph.D.).

Professional Practice Program with Industry

Students achieving above a 3.0 graduation index after completion of their freshman-year courses are eligible for the Professional Practice Program in Engineering that leads to the degree over a five-year period. In this program, the freshman and senior years are spent on campus, and the three intervening years are spent intermittently on campus and on a job with a company or agency related to agricultural and biological engineering or biological and food process engineering. Interested students should contact the faculty coordinator for the Department of Agricultural and Biological Engineering during the second semester of the freshman year. See www.ecn.purdue.edu/ProPractice.

Honors Program

An honors program is available for superior students who want special counseling in an area of their interest. 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.

Admission into the honors program is based on a written application submitted to the agricultural and biological engineering faculty for approval. The application should include a brief statement of the overall goals of the student and the objectives and content of his or her proposed program. To enter and remain in the honors program, a student must maintain at least a 3.25 graduation index and must show an acceptable rate of progress toward meeting his or her program objectives. Successful completion of the honors program will be recognized by the awarding of an honors certificate at graduation.

International Studies Minor

Increasing globalization of knowledge and the world economy has created a situation in which competition is global. It has become apparent that if the United States is to compete effectively on a global scale, we must train a new generation of young engineers who have the knowledge, skills, attitudes, and aspirations to understand not only the new international economic system but also its cultures, languages, and scientific output. One important way to accomplish this goal is by providing opportunities for engineering undergraduates to experience part of their education outside the United States or to participate in the International Studies minor program.

The International Studies minor provides the opportunity for students to 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.

To qualify for this minor, students normally will be expected to focus on a specific geographical region and complete the following requirements:

- Individuals must demonstrate proficiency in a second language by completing or establishing credit by examination in the fourth course in a language (202 level language course) and by completing a conversation course in the language, if offered. Also, language proficiency may be demonstrated by successfully passing the Foreign Service Institute examination at Level 2 in both reading and speaking.
- Students must complete a minimum of 15 semester credits of courses with a principal international focus in the areas of culture (anthropology, art, literature, philosophy, or sociology), political science, history, or economics. A minimum of six credits of this coursework must be focused on the geographic region of choice.
- Individuals must participate in a cooperative work, internship, study abroad, or cultural exchange experience of eight weeks or more in the selected geographic region.
- Students must submit a summary paper and make an oral presentation documenting the integration of the various learning and experiential activities that were undertaken in the international stay.

The Office of International Programs in Agriculture (IPIA) will provide special counsel to students regarding program operations, including the identification and coordination of out-of-country experiences.

Minimum Degree Requirements for Agricultural and Biological Engineering

Credit Hours Required for Graduation: 131

Courses	*Credit Hours*
Mathematics and Basic Sciences	
Calculus: MA 165, 166, 261, 262	**16**
Chemistry: CHM 115, 116	**8**
Physics: PHYS 172, 241	**7**
Biological Sciences	**8**
Agricultural Sciences	
AGRY 255	**3**
Elective	**3**
Computing	
ENGR 126, C S 156	**3**
Professional Development	
ENGR 100; ABE 290, 490	**3**
Communication	
English Composition: ENGL 106	**4**
Speech: COM 114	**3**
Humanities and Social Sciences (General Education)	**18**
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.	
Core Engineering Courses	
Computations: ABE 205	**3**
Basic Mechanics of Materials: NUCL 273, M E 270 and 274	**9**
Thermodynamics: ABE 210	**3**
Physical Properties: ABE 305	**3**
Soil and Water Conservation: ABE 325	**4**
Basic Fluid Mechanics/Hydraulics: M E 309 **or** C E 340 and 343	**4**
Machine Design: ABE 330	**3**
Electronics: ECE 201	**3**
Hydraulics for Mobile Equipment: ABE 435	**3**
Numerical Methods/Modeling: ABE 450	**3**
Capstone Design: ABE 485	**4**
Technical Electives	**6**
Free Electives	**7**
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.	

Suggested Plan of Study for Agricultural and Biological Engineering

Credit Hours Required for Graduation: 131

A technical graphics course is required in the agricultural and biological engineering curriculum and should be taken in the freshman year. ASM 211 is recommended.

ABE 120, 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 290, Sophomore Seminar, also is recommended in the third semester.

Freshman Year, see First-Year Engineering Program.

Sophomore Year

Third Semester	*Fourth Semester*
(3) **ABE 205** (Engineering Computations for Biological Systems)	(3) **ABE 210** (Biological Applications of Material and Energy Balances)
(1) **ABE 290** (Sophomore Seminar)	(4) **MA 262** (Linear Algebra and Differential Equations)
(4) **MA 261** (Multivariate Calculus)	(3) **M E 274** (Basic Mechanics II)
(3) **M E 270** (Basic Mechanics I)	(3) **NUCL 273** (Mechanics of Materials)
(3) **PHYS 241** (Electricity and Optics)	(3) General education elective*
(4) Biological sciences elective	
(18)	(16)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **ABE 305** (Physical Properties of Biological Materials)	(3) **ABE 330** (Design of Machine Components)
(4) **ABE 325** (Soil and Water Resource Engineering)	(3) **ECE 201** (Linear Circuit Analysis I)
(3) **AGRY 255** (Soil Science)	(4) Biological sciences elective
(3) **C E 340** (Hydraulics) **and**	(3) General education elective*
(1) **C E 343** (Elementary Hydraulics Laboratory) **or** (4) **M E 309** (Fluid Mechanics)	(3) Elective
(3) General education elective*	
(17)	(16)

Senior Year

Seventh Semester	*Eighth Semester*
(3) **ABE 435** (Hydraulic Control Systems for Mobile Equipment)	(4) **ABE 485** (Agricultural Engineering Design)
(3) **ABE 450** (Finite Element Method in Design and Optimization)	(3) Engineering technical elective
(1) **ABE 490** (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 (ECON 251 or 252) and 3 must be an additional communication elective.*

Minimum Degree Requirements for Biological and Food Process Engineering

Credit Hours Required for Graduation: 133

Courses	*Credit Hours*
Mathematics and Basic Sciences	
Calculus: MA 165, 166, 261, 265, 266	**18**
Chemistry: CHM 115, 116, 257	**12**
Physics: PHYS 172, 241	**7**
Biological and Food Sciences	
Biological Sciences: BIOL 221, 295E, 295F	**8**
BCHM 221 or F&N 205	**3**
Biological or Food Science electives*	**6**
Computing	
ENGR 126, C S 156	**3**
Professional Development	
ENGR 100; ABE 290, 490	**3**
Communication	
English Composition: ENGL 106	**4**
Speech: COM 114	**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 201, 202, 301, 303	**12**
Heat, Mass, and Momentum Transfer: CHE 377, 378	**6**
Kinetics and Reaction Engineering: ABE 370	**3**
Sensors and Process Control: ABE 460	**3**
Transport Processes: ABE 454	**4**
Unit Operations: ABE 555	
Plant Design and Economics: ABE 556	**4**
Process Engineering: ABE 580	**4**
Technical Electives*	**9**

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

Plan of Study for Biological and Food Process 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 201** (Thermodynamics in Biological Systems I)	(3) **ABE 202** (Thermodynamics in Biological Systems II)
(1) **ABE 290** (Sophomore Seminar)	(3) **BCHM 221** (Analytical Biochemistry) **or F&N 205** (Food Science)
(4) **CHM 257** (Organic Chemistry)	(3) **MA 265** (Linear Algebra)
(4) **MA 261** (Multivariate Calculus)	(3) **MA 266** (Ordinary Differential Equations)
(3) **PHYS 241** (Electricity and Optics)	(3) Engineering elective
(3) General education elective*	(3) General education elective*
(18)	(18)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **ABE 303** (Applications of Physical Chemistry to Biological Processes)	(3) **ABE 370** (Biological/Microbial Kinetics and Reaction Engineering)
(3) **ABE 310** (Thermodynamics of Food and Biological Systems)	(4) **ABE 454** (Transport Processes in Biological and Food Process Systems)
(3) **BIOL 295E** (Biology of the Living Cell)	(4) **BIOL 221** (Introduction to Microbiology)
(1) **BIOL 295F** (Quantitative Biology of the Living Cell)	(3) **CHE 378** (Heat and Mass Transfer)
(3) **CHE 377** (Momentum Transfer)	(3) Engineering elective
(3) General education elective*	
(16)	(17)

Senior Year

Seventh Semester	*Eighth Semester*
(1) **ABE 490** (Professional Practice in Agricultural and Biological Engineering)	(3) **ABE 460** (Sensors and Process Control)
(4) **ABE 555** (Biological and Food Processing Operations)	(4) **ABE 556** (Food Plant Design and Economics)
(3) Biological science or food science elective†	(3) **ABE 580** (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 (ECON 251 or 252), 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 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 biomedical engineering undergraduate program in 2004, and 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 will complete their 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. 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 and instruments such as artificial joints, artificial kidneys, and cardiac defibrillators; the creation of computer models to monitor and diagnose disease; the building of sensors to measure blood chemistry; and the design of biocompatible materials.

Students who graduate from the undergraduate program with high scholastic achievement and who are interested in careers in research or teaching 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 Purdue University 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 professional engineering programs 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 professional undergraduate curriculum, which begins in the sophomore year, includes an array of courses that teach engineering science, analysis, and design in the context of biology and biomedical problems. Courses incorporate instruction in biomolecules, biomechanics, biodynamic systems, biological mass transport, cell biology, biostatistics and informatics, and bioinstrumentation. In addition, there are BME and engineering electives, life science electives, general education electives, and professional seminar 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, engineering.purdue.edu/BME/Academics/Undergraduate.

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

Credit Hours Required for Graduation: 132*

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.	**31**
Core Biomedical Engineering BME 201, 204, 205, 206, 301, 304, 305, 306, 390	**18**
BME Breadth Requirement Core Life Sciences Requirement* BIOL 230 and three additional life science courses at the 300-level or above. Core Engineering Requirement: BME 595U; ECE 301; I E 330 or STAT 503; M E 200, 270, 309; and MSE 230. BME/Engineering Elective: Three (3) additional BME/Engineering courses at the 400-level or above.† Senior Design Requirement: BME 405 Other Requirement: C S 478	**50**
Advanced Physics PHYS 241	**3**
Advanced Math MA 261, and MA 266 or 262	**7**
General Education Electives Course selections must meet the General Education Program requirements. Refer to "General Education Program in Engineering" on page 27. Includes an ethics elective to be chosen from either PHIL 270 or 280.	**18**
Unrestricted Elective Additional coursework to bring the total to at least 132 hours.	**3**

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 major-area (BME) courses to qualify for graduation with a B.S.BME degree.

** See the most up-to-date requirements on the 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: 132*

Freshman Year, see First-Year Engineering Program.

Sophomore Year

Third Semester	*Fourth Semester*
(3) **BIOL 230** (Biology of the Living Cell)	(3) **BME 204** (Biomechanics of Hard and Soft Tissues)
(3) **BME 201** (Biomolecules: Structure, Function, and Engineering Applications)	(1) **BME 206** (Biomedical Engineering Laboratory II)
(1) **BME 205** (Biomedical Engineering Laboratory I)	(3) **MA 266** (Ordinary Differential Equations)
(4) **MA 261** (Multivariate Calculus)	(3) **M E 200** (Thermodynamics I)
(3) **M E 270** (Basic Mechanics)	(3) **MSE 230** (Structure and Properties of Materials)
(3) **PHYS 241** (Electricity and Optics)	(3) General education elective
(17)	(16)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **BME 301** (Bioelectricity)	(3) **BME 304** (Bioheat and Mass Transfer)
(2) **BME 305** (Bioinstrumentation Laboratory)	(1) **BME 306** (Biotransport Laboratory)
(1) **BME 390** (Biomedical Engineering Professional Seminar)	(3) **ECE 301** (Signals and Systems)
(4) **M E 309** (Fluid Mechanics)	(3) **I E 330** (Probability and Statistics in Engineering II)
(3) General education elective	(3) Ethics elective
(3) Life science elective	(3) General education elective
(16)	(16)

Senior Year

Seventh Semester	*Eighth Semester*
(3) **BME 595U** (Nonlinear Dynamics of Biological Systems)	(4) **BME 405** (Biomedical Engineering Design Project)†
(3) **C S 478** (Introduction to Bioinformatics)	(3) Biomedical engineering/Engineering elective
(6) Biomedical engineering/Engineering electives	(6) General education electives
(3) Life science elective	(3) Life science elective
(3) Unrestricted elective	
(18)	(16)

** See the most up-to-date requirements on the Web site.*
† BME 405 can be taken in the fall or the spring semester of the senior year.

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.

In a period of rapid technological change, the main tools that will sustain the chemical engineering professional over a career are a firm foundation in the fundamentals, the necessary skills to generate focused technical information through effective experiments, the commitment to lifelong learning, and the ability to communicate requirements and results. The curriculum and instructional processes are fine-tuned and continuously improved to ensure that the fundamentals and supporting skills are indeed assimilated by students. The curriculum also instills awareness of the breadth of the chemical engineering profession and of the impact of engineering solutions in the global and societal context.

Chemical engineering includes all phases of technical activity in which knowledge of chemistry — along with other basic sciences such as mathematics, physics, biology, and computer sciences — is used to attack and solve the problems of society. These problems include energy, health, environment, food, clothing, shelter, and materials. For example, the chemical-processing industries are under technical and managerial control of the chemical engineer. These industries supply society with a vast array of products, including chemicals, plastics, pharmaceuticals, foods, textiles, fuels, and industrial gases. The chemical engineer also serves society in improving the environment by reducing and eliminating pollution and applying the biosciences in biochemical and biomedical engineering.

The chemical engineering curriculum builds on the basic sciences and other branches of engineering to accomplish these objectives. Courses in English, communication, and general education electives furnish a broad background in humanities, human behavior, and contemporary issues. Elective programs developed by the student with his or her faculty advisor can create options in such areas as applied chemistry, biochemical engineering, biomedical engineering, chemical reaction engineering, chemical processing, computer-aided design, energy and natural resources processing, environmental engineering, food processing, materials science, pharmaceutical engineering, prelaw, premedicine, process control, production and sales, and systems engineering.

The spectrum of activity of the chemical engineer, because of his or her unique background, is one of the broadest in the science-technical field. Chemical engineers find employment in all phases of technical operations. Traditionally, more of the graduates in chemical engineering have obtained M.S. and Ph.D. degrees than those in almost any other engineering field. It is advantageous for those interested in the more advanced work in research, development, and college teaching to obtain a graduate degree. The chemical engineering degree frequently is used as a stepping-stone to other professions such as law, medicine, or teaching.

The curriculum in chemical engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. Please visit the chemical engineering Web site at https://engineering.purdue.edu/Che/Academics/Undergraduate/index.html for more current information about plans of study.

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

A limited number of qualified students can enter a cooperative work-study plan that leads to the degree of B.S.ChE over a five-year program. The first (freshman) and the fifth year of the program will be spent as a full-time student on the Purdue University campus. Half of the second, third, and fourth years will be spent on the campus, and the other half will be spent on a job in the chemical industry with a selected cooperating company. Two students often share one job so that one is working while the other is on campus.

Students must have a scholastic average in the upper half of the freshman class if they wish to enter the cooperative program. Those

interested in the program should contact the faculty coordinator for the School of Chemical Engineering during the second semester of the freshman year.

After finishing the program, the student will receive a regular engineering degree and a certificate indicating completion of the cooperative program with industry. See www.ecn.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 online course repository on the Purdue Web site at www.courses.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 498, 499) 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 normal B.S.ChE total, but CHE 540 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 115/116** (8 credits), or **CHM 123/124** (8 credits). The preference within the School of Chemical Engineering is students take the **CHM 123/124** sequence, but **CHM 115/116** will also 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 200** (Chemical Engineering Seminar)	(3) **CHE 211** (Introductory Chemical Engineering Thermodynamics)
(3) **CHE 205** (Chemical Engineering Calculations)*	(3) **CHE 320** (Statistical Modeling and Quality Enhancement)
(3) **CHM 261** (Organic Chemistry)	(3) **CHM 262** (Organic Chemistry)
(1) **CHM 263** (Organic Chemistry Laboratory)	(1) **CHM 264** (Organic Chemistry Laboratory)
(4) **MA 261** (Multivariate Calculus)	(3) **MA 262** (Linear Algebra and Differential Equations)
(3) **PHYS 241** (Electricity and Optics)	(3) General education elective
(17)	(17)

** A "C" or better must be earned in CHE 205 to continue to enroll in chemical engineering classes.*

Junior Year

Fifth Semester	*Sixth Semester*
(3) **BIOL 295E** (Biology of the Living Cell) **or** equivalent	(0) **CHE 300** (Chemical Engineering Seminar)
(3) **CHE 306** (Design of Staged Separation Processes)	(3) **CHE 330** (Principles of Molecular Engineering)
(3) **CHE 377** (Momentum Transfer)	(3) **CHE 348** (Chemical Reaction Engineering)
(2) **CHM 376** (Physical Chemistry Laboratory)	(3) **CHE 378** (Heat and Mass Transfer)
(3) **CHM 370** (Topics in Physical Chemistry)	(3) **I E 343** (Engineering Economics)
(3) **MA 303** (Differential Equations and Partial Differential Equations for Engineering and the Sciences)	(3) Engineering elective
	(3) General education elective
(17)	(18)

Senior Year

Seventh Semester	*Eighth Semester*
(0) **CHE 400** (Professional Guidance)	(3) **CHE 435** (Chemical Engineering Laboratory II)
(3) **CHE 434** (Chemical Engineering Laboratory I)	(3) **CHE 450** (Design and Analysis of Processing Systems)
(3) **CHE 456** (Process Dynamics and Control)	(3) CHE elective
(3) CHE elective	(6) General education electives
(3) General education elective	(1) Free elective
(3) Technical elective	
(15)	(16)

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: environmental engineering; hydraulic engineering; structural engineering; transportation engineering; geotechnical engineering; geomatics (surveying) engineering, geodesy and photogrammetry; construction engineering and management; civil engineering materials; 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 CE 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* bulletin. 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 the Accreditation Board for Engineering and Technology.

A four-year degree program in land surveying and geomatics engineering also is offered by the School of Civil Engineering and is described later in this publication. Students can elect to obtain degrees in both civil engineering and land surveying engineering. This dual-degree option is a five-year program.

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

The professional practice program enables qualified students to obtain experience related to civil engineering with selected employers while completing the requirements for the undergraduate degree. Students are typically selected at the end of the first semester of the freshman year based on academic standing, expressed interest in the professional practice experience opportunity, and availability of positions. The School of Civil Engineering also assists students in finding summer internships related to civil engineering. Students interested in these formal and informal employment programs should contact the school's director of industrial relations.

A student who wishes to participate should file an application with the professional practice coordinator for civil engineering after completing the first semester of the freshman year. On the basis of the first semester's scholastic index, qualified students are selected for the program on a tentative basis. After completing the year of work with the required index and being accepted as a cooperative employee by a University-approved employer, a student formally enters the program. The student's completion of the program is recognized by the awarding of an appropriate certificate along with the regular civil engineering diploma at the time of graduation.

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.

English Requirement

Undergraduate students with a C E or LSGE classification must receive a grade of "C" or better in (1) a first course in English composition and (2) C E 399 to graduate.

Minimum Degree Requirements for Civil Engineering

Credit Hours Required for Graduation: 133*

Courses	*Credit Hours*
Mathematics and Physical Sciences	
Calculus: MA 165, 166, 261, 265, 266	**18**
Statistics: STAT 511	**3**
Chemistry: CHM 115	**4**
Physics: PHYS 172, 241	**7**
Science Selective	**3–4**
Computing	
ENGR 126, CGT 164	**5**
Seminars	
ENGR 100, C E 290	**1**
First-Year (or other) Electives	**0–2**
Communication and General Education	
English Composition: ENGL 106 or 108	**3–4**
Speech: COM 114	**3**
Technical Communication: C E 399	**3**
Humanities and Social Sciences: Courses must be chosen in accordance with the approved general education list and with the help of a faculty advisor.	**18**
Core Engineering Courses	
Surveying: C E 203	**4**
Basic Mechanics/Materials: C E 231, 270, 297, 298, 331, 340, 343	**20**
Thermodynamics: M E 200	**3**
Economics, Systems Design: C E 398	**3**
Final Design Project: C E 498. 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 C E 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 114 is a required course in the civil engineering curriculum and should be taken in the freshman year.
Graphics. CGT 164 is a required course in the civil engineering curriculum and should be taken in the freshman year.

Science Selective. CHM 116 is the recommended course and should be taken in the freshman year.

Sophomore Year

Third Semester	*Fourth Semester*
(4) **C E 203** (Principles and Practices of Geomatics)	(3) **C E 231** (Engineering Materials I)
(0) **C E 290** (Civil Engineering Seminar)	(4) **C E 270** (Introductory Structural Mechanics)
(3) **C E 297** (Basic Mechanics I: Statics)	(3) **C E 298** (Basic Mechanics II: Dynamics)
(4) **MA 261** (Multivariate Calculus)	(3) **MA 265** (Linear Algebra)
(3) **PHYS 241** (Electricity and Optics)	(3) General education elective*
(3) General education elective*	
(17)	(16)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **C E 331** (Engineering Materials II)	(3) **STAT 511** (Statistical Methods)
(3) **C E 340** (Hydraulics)	(3) **C E 398** (Introduction to Civil Engineering Systems Design)
(1) **C E 343** (Elementary Hydraulics Laboratory)	(3) **C E 399** (Oral and Written Communications for Civil Engineers)
(3) **MA 266** (Ordinary Differential Equations)	(3) General education elective*
(3) General education elective*	(6) Electives†
(3) Elective†	
(16)	(18)

Senior Year

Seventh Semester	*Eighth Semester*
(3) **M E 200** (Thermodynamics I)	(3) **C E 498** (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 (visual and performing arts, English literature, foreign languages and literatures, history, or philosophy).*
2. *The program must contain at least 6 credit hours in social sciences (audiology and speech sciences, communication, economics, political science, psychology, or sociology and anthropology). It is strongly recommended that ECON 251 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 C E 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. After satisfactory completion of four semesters of advanced ROTC, a maximum of 6 credit hours can be included.*

Land Surveying and Geomatics Engineering

Land surveying and geomatics engineering requires aptitude for applied mathematics, precise measurement using field and laboratory instruments, discriminating investigation and analysis of field evidence, and prudent professional judgment. Geomatics engineering graduates obtain professional employment in the areas of land surveying, engineering project surveying, geodetic surveying, photogrammetry and digital mapping, and geographic information system (GIS) design and management.

The goals of the land surveying and geomatics engineering program are to provide students who qualify for the program with:

- An outstanding engineering-based education in land surveying and geomatics 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 surveying and geomatics engineering problems and communicate the solutions effectively.
- The opportunity to join the family of Purdue land surveying and geomatics engineering graduates who are playing leading roles in the practice of land surveying and geomatics 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 land surveying and geomatics engineering provides students with a solid foundation of technical knowledge; an appreciation of the social, economic, and political implications of surveying and civil engineering projects; the ability to make decisions based on these implications as well as technical, ethical, and humanistic considerations; and finally, the capacity to effectively communicate with other professionals and the public. Graduates of the program will join the large and growing family of Purdue land surveying and geomatics engineering graduates who are providing leadership in the practice of surveying and mapping worldwide.

The undergraduate program is built upon a core foundation of coursework in engineering and surveying principles. Most students in the program prepare for professional licensure by taking the Fundamentals of Surveying Examination during their last semester.

Graduates of the program are prepared for entry-level positions in any of the major areas of geomatics engineering. These positions lead to increasing levels of responsibility for the design and management of many types of projects. Following are descriptions of the prominent specialties within the field of geomatics engineering:

The **land surveyor** works with engineers, lawyers, architects, urban planners, local government officials, and directly with the public. The land surveyor is involved in both field and office activities. The land surveyor establishes property boundaries and prepares written land descriptions, applying principles of boundary law and field measurement analysis. Since these services are offered to the public, the land surveyor must be licensed as a professional surveyor. The land surveyor often is involved in land development and design. As part of the design team, he or she applies principles of surveying and civil engineering to planning, design, and field layout of streets, storm and sanitary sewer extensions, and property boundaries. Hence, land surveying requires knowledge in applied science and mathematics, engineering, surveying, planning, and property law.

The **survey engineer** performs all surveys required to design, construct, and maintain an engineering project. The survey engineer provides topographic surveys for project design, accurate horizontal and vertical control surveys for mapping and construction layout, and precise surveys to monitor movement and performance of the completed structure. Surveying for engineering and mapping requires ties to local, national, and international geodetic control networks. The satellite-based global positioning system (GPS) is used extensively to establish new control points and connections to existing geodetic reference points. Graduates will be prepared to design surveying systems to meet specific requirements of engineering, mapping, and boundary survey projects.

The **photogrammetric engineer** makes use of aerial photography and imagery acquired by commercial high-resolution mapping and remote sensing satellites to prepare maps and data for a variety of applications. These applications include engineering design and topographic maps, land use and planning maps, and digital maps and attribute data in a computer-based geographic information system for display and spatial analysis. Graduates will be prepared to use imagery

from airborne and space-based sensors to solve surveying and engineering problems.

The **geographic information systems specialist** integrates land measurements and related land information into a computer-based digital mapping and analysis system. The surveying graduate is prepared to assume a leadership role in the implementation and management of these land information systems. To use our land and resources properly, it is necessary for land records to include not only ownership boundaries, planimetric information, and topographic data, but also information such as soil type, zoning, environmental, and demographic data. Gathering such data is an interdisciplinary effort in which the surveyor is an integral member of the professional team. Collecting, storing, and making land information available utilizes electronic total station field instrumentation, satellite geodesy, digital photogrammetic mapping, and extensive computer mapping and data base management.

The School of Civil Engineering administers the land surveying and geomatics engineering curriculum. The degree is a Bachelor of Science in Land Surveying and Geomatics Engineering (B.S.LSGE). The degree program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

A unique five-year dual degree option also is offered in which a student can obtain two bachelor's degrees with majors in land surveying and geomatics engineering and in civil engineering. Dual-degree graduates will be prepared to take both the Fundamentals of Surveying Examination and the Fundamentals of Engineering Examination during the fifth year.

Students in the land surveying and geomatics engineering program are eligible to participate in the study abroad, honors, and professional practice experience programs offered through the School of Civil Engineering.

Minimum Degree Requirements for Land Surveying and Geomatics Engineering

Credit Hours Required for Graduation: 136*

Courses	*Credit Hours*
Mathematics and Physical Sciences	
Calculus: MA 165, 166, 261, 265, 266	**18**
Chemistry: CHM 115	**4**
Physics: PHYS 172, 241	**7**
Science Selective	**3–4**
Statistics: STAT 511	**3**
Computing	
ENGR 126, CGT 164	**5**
Seminars	
ENGR 100	**1**
First-Year (or other) Electives	**0–2**
Communication and General Education	
English Composition: ENGL 106 or 108	**3–4**
Speech: COM 114	**3**
Technical Communication: C E 399	**3**
Humanities and Social Sciences: Courses must be chosen in accordance with the approved general education list and with the help of a faculty advisor.	**18**
Core Engineering Courses	
Surveying: C E 203, 303	**7**
Basic Mechanics/Materials: C E 273, 297, 333, 340, 344	**13**
Engineering Economics: C E 398	**3**
Transportation: C E 361	**3**
Geomatics: C E 306, 403, 506, 510, 511	**15**
Land Surveying: L S 300, 301, 400, 401	**13**
Final Design Project: L S 409 This course must be taken during the student's last spring semester.	**3**
Technical Electives Courses are selected with the help of a faculty advisor to accommodate the student's professional goals. At least 6 of these credits must be selected from a designated list of approved elective courses.	**9**

** See the most recent requirements on the School of Civil Engineering Web site at www.ce.purdue.edu.*

Plan of Study for Land Surveying and Geomatics Engineering

Credit Hours Required for Graduation: 136*

Freshman Year, see First-Year Engineering Program.

Communications. COM 114 is a required course in the land surveying and geomatics engineering curriculum and should be taken in the freshman year.

Graphics. CGT 164 is a required course in the land surveying and geomatics engineering curriculum and should be taken in the freshman year.

Science Selective. C S 158 is the recommended course and should be taken in the freshman year.

Sophomore Year

Third Semester	*Fourth Semester*
(4) **C E 203** (Principles and Practices of Geomatics)	(3) **C E 273** (Mechanics of Materials)
(3) **C E 297** (Basic Mechanics I: Statics)	(3) **C E 303** (Engineering Surveying)
(4) **MA 261** (Multivariate Calculus)	(3) **C E 333** (Civil Engineering Materials)
(3) **PHYS 241** (Electricity and Optics)	(3) **MA 265** (Linear Algebra)
(3) General education elective*	(6) General education elective*
(17)	(18)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **C E 306** (Analysis of Survey Observations)	(3) **C E 340** (Hydraulics)
(3) **C E 361** (Transportation Engineering)	(1) **C E 344** (Drainage Design Laboratory)
(3) **L S 300** (Land Survey Systems)	(3) **C E 398** (Introduction to Civil Engineering Systems Design)
(3) **MA 266** (Ordinary Differential Equations)	(3) **C E 399** (Oral and Written Communications for Civil Engineers)
(3) **STAT 511** (Statistical Methods)	(3) **C E 403** (Principles of Photogrammetry and Remote Sensing)
(3) General education elective*	(3) **L S 301** (Property Surveys and Descriptions)
(18)	(16)

Summer Session

(4) **L S 400** (Summer Geomatics Engineering Design Project)

Senior Year

Seventh Semester	*Eighth Semester*
(3) **C E 506** (Data Adjustment I)	(3) **C E 511** (GPS Surveying)
(3) **C E 510** (Map Projections and Geometric Geodesy)	(3) **L S 409** (Subdivision Planning and Design)
(3) **L S 401** (Legal Aspects of Surveying)	(3) Technical elective†
(6) Technical elective†	(6) General education electives*
(15)	(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 (visual and performing arts, English literature, foreign languages and literatures, history, or philosophy).*
2. *The program must contain at least 6 credit hours in social sciences (audiology and speech sciences, communication, economics, political science, psychology, or sociology and anthropology). It is strongly recommended that ECON 251 be included in the program in social sciences.*
3. *All general education courses must be taken for a grade.*

† A minimum of two of the technical electives must be selected from a list of courses approved by the Land Surveying and Geomatics Engineering faculty.

Construction Engineering and Management

The construction engineering and management program prepares the graduate for practice as an engineering professional and manager in the diverse construction industry. Coursework covers the basic sciences, engineering sciences, engineering design, construction planning, business and management subjects, and humanities and social sciences in a curriculum tailored to the needs of United States construction firms as well as to meet the requirements for an accredited Bachelor of Science in Construction Engineering (B.S.CNE) degree.

The construction engineer and manager directs the building of facilities and infrastructure that serve the needs of society and business. Employing the classic construction elements of materials, machines, workforce, money, and information — and with respect for the natural environment and the needs of the customer — the construction professional ensures that quality construction of designed facilities is completed according to schedules and within budgets.

The goals of the Bachelor of Science in Construction Engineering (B.S.CNE) program are:

- To prepare graduates to serve the United States construction industry as engineering professionals and managers.
- To provide graduates with a solid foundation in the engineering sciences and in management topics related to construction.
- To provide students with a program of study that matches their career goals, and with the ability to solve practical engineering problems and communicate the solutions effectively.
- To provide a solid foundation for those students who wish to pursue graduate studies.

Requirements in the United States construction 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 Purdue construction engineering and management program stresses study and experience in the engineering aspects as well as the management and people 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.

In addition to concentration on the core engineering and science disciplines, the student undergoes continual learning in the areas of verbal and written communications, team performance, and leadership. In the final four semesters, the student chooses an area of emphasis from among building, highway and heavy, mechanical, or electrical construction.

The undergraduate program in construction engineering and management is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

A current plan of study and information about the B.S.CNE degree program can be found at www.purdue.edu/CEM.

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 arranges for the internship sponsors and monitors the intern's progress through a succession of field assignments, typically progressing from field operations and construction office operations 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 and management curriculum prepares graduates for graduate-level study in construction and civil engineering. Students with interests in advanced education and research in this and related fields pursue the M.S.CE, M.S.E, and Ph.D. degrees at Purdue and other leading universities.

English Requirement

Undergraduate CEM students must receive a grade of "C" or better in (1) a first course in English composition, (2) C E 399, and (3) the C E 425 Senior Design capstone course to graduate.

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 191** (Construction Internship I)

Sophomore Year

Third Semester	*Fourth Semester*
(4) **C E 203** (Fundamentals of Surveying)	(3) **C E 221** (Construction Plans and Estimates)
(3) **C E 220** (Construction Management)	(4) **C E 270** (Instructory Structural Mechanics)
(3) **C E 297** (Basic Mechanics I: Statics)	(3) **C E 333** (Civil Engineering Materials)
(2) **CGT 164** (Graphics for Civil Engineers and Construction)	(0) **CEM 290** (Construction Seminar)
	(3) **MA 265** (Linear Algebra)
(4) **MA 261** (Multivariate Calculus	(3) **PHYS 241** (Electricity and Optics)†
(16)	(16)

Summer Session

(0) **CEM 291** (Construction Internship II)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **CE 298** (Basic Mechanics II: Dynamics)	(3) **M E 200** (Thermodynamics I)
(3) **CE 321** (Construction Planning and Scheduling)	(3) **MGMT 200** (Introductory Accounting)
(3) **CE 399** (Oral and Written Communications for Civil Engineers)	(3) General education elective
	(10) Technical electives*†
(3) **MA 266** (Ordinary Differential Equations)	
(3) **STAT 511** (Statistical Methods)	
(3) General education elective*	
(18)	(18)

Summer Session

(0) **CEM 391** (Construction Internship III)

Senior Year

Seventh Semester	*Eighth Semester*
(3) **C E 425** (Construction Practice Project)	(3) **C E 524** (Legal Aspects in Engineering Practice)
(3) **C E 521** (Construction Business Management)	(6) General education electives
(6) General education electives*	(6) Technical electives*†
(7) Technical electives†	
(19)	(15)

** 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

Candidates for the Bachelor of Science in Construction Engineering degree are to select technical electives within the specialty areas of emphasis according to the following guidelines:

Building/Heavy Highway Construction Specialty
(3) **C E 340** (Hydraulics)
(1) **C E 344** (Drainage Design Laboratory)
(3) **C E 371** (Structural Analysis I)
(3) **C E 383** (Geotechnical Engineering I)
(4) **C E 473** (Theory of Reinforced Concrete)
Plus at least 6 credits from the current approved technical electives list available from the Division of Construction Engineering and Management.

Electrical Construction Specialty
(3) **ECE 201** (Linear Circuit Analysis I)
(3) **ECE 207** (Electronic Measurement Techniques)
(3) **ECE 432** (Elements of Power System Engineering)
Plus at least 12 credits from the current approved technical electives list available from the Division of Construction Engineering and Management.

Mechanical Construction Specialty
(3) **ECE 201** (Linear Circuit Analysis I)
(4) **M E 309** (Fluid Mechanics)
Plus at least 12 credits from the current approved technical electives list available from the Division of Construction Engineering and Management.

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:

1. A Strong Foundation in the Core Electrical/Computer Engineering Fundamentals — The B.S.EE curriculum provides all students with the fundamental knowledge and abilities necessary for specialization in all areas of electrical/computer engineering.
2. A Firm Foundation in Mathematics and the Basic Sciences — A firm foundation in mathematics and the basic sciences is necessary for the understanding, application, and development of engineering principles.
3. Knowledge of Relevant Technologies —The student needs to be well informed about current technologies important to electrical/computer engineering, as well as likely future technological advances.
4. Problem Solving and Design Capability — The student needs to develop skills for devising and evaluating solutions to both closed-end (single solution) and open-ended (multiple solution) problems. This includes the design of components, systems, and experiments.
5. Creativity and Enthusiasm for Life-Long Learning — The program will foster an environment that encourages creativity and an excitement-driven outlook among its students and faculty.
6. Schooling in Professional Attributes — Professional attributes include communication skills, the art of self-learning, teamwork, and ethics.
7. Breadth of Knowledge — In addition to a breadth of knowledge within electrical engineering, the well-rounded student must have an appreciation for other disciplines, both technical and non-technical, in order to deal with the impact of technology in a global and societal context.

Professional Practice Program

A professional practice program is offered that enables a limited number of qualified students pursuing either degree to obtain paid industrial experience related to engineering with selected companies while completing the requirements for their degree. After completing the freshman curriculum, and after acceptance as a professional practice program employee by a University-approved employer, qualified students may formally enter the program. After satisfactorily completing the program and their degree, the student receives a certificate indicating completion of the professional practice program.

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 201, 202, 207, 208, 255, 270, 301, 302, 311.	24
ECE Seminars: ECE 200, 400	1
Advanced EE Selective: Choose three (3) of the following: ECE 305, 321, 362, 382, 438, 440. Only one of ECE 438 and 440 can be used as an Advanced EE Selective ECE 362, 438, and 440 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 100, 126	4
Engineering Science Elective: Choose one course from the approved list.	3
Mathematics:	**18–19**
Choose one of the Math options below. If MA 161 and/or MA 162 (or their equivalents) are taken in place of MA 165 and/or MA 166, only 4 of the 5 credit hours for each course may be applied to degree requirements.	
Option 1: MA 165, 166, 261, 265, 266.	18
Option 2: MA 165, 166, 261, 262, and one of: MA 303, 304, 351, 385, 410, 425, or C. S 314.	19
Science:	**19**
Computer Science: C. S. 159 or ENGR 117.	3
Chemistry: CHM 155, 116.	8
Physics: PHYS 172, 261	8
Liberal Arts:	**24–25**
Communication Skills: ENGL 106 or 108, COM 114.	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 115** (General Chemistry)	(4) **CHM 116** (General Chemistry)
(4) **ENGL 106** (First-Year Composition)	(3) **COM 114** (Fundamentals of Speech Communication)
(1) **ENGR 100** (Freshman Engineering Lectures)	(3) **C S 159** (Programming Applications for Engineers)
(3) **ENGR 126** (Engineering Problem Solving and Computer Tools)	(4) **MA 166** (Analytic Geometry and Calculus II)
(4) **MA 165** (Analytic Geometry and Calculus I)	(4) **PHYS 172** (Modern Mechanics)
(16)	(18)

Sophomore Year

Third Semester	*Fourth Semester*
(0) **ECE 200** (Electrical and Computer Engineering Seminar)	(3) **ECE 202** (Linear Circuit Analysis II)
(3) **ECE 201** (Linear Circuit Analysis I)	(1) **ECE 208** (Electronic Devices and Design Laboratory)
(1) **ECE 207** (Electronic Measurement Techniques)	(3) **ECE 255** (Introduction to Electronic Analysis and Design)
(4) **MA 261** (Multivariate Calculus)	(4) **ECE 270** (Introduction to Digital System Design)
(4) **PHYS 272** (Electric and Magnetic Interactions)	(3) **MA 266** (Ordinary Differential Equations)
(3) General education elective	(3) General education elective
(15)	(17-18)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **ECE 301** (Signals and Systems)	(3) **ECE 302** (Probabilistic Methods in Electrical and Computer Engineering)
(3) **MA 265** (Linear Algebra) **or** Advanced math elective	(3) **ECE 311** (Electric and Magnetic Fields)
(4) ECE elective(s)	(4) ECE elective(s)
(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 400** (Electrical and Computer Engineering Undergraduate Seminar)	(3) E E senior design requirement
(8) ECE electives	(3) ECE elective(s)
(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 201, 202, 207, 208, 255, 264, 270, 301, 302, 337, 362, 368.	33
ECE Seminars: ECE 200, 400	1
Advanced CmpE Elective: ECE 437 and either ECE 469 or ECE 495S	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 100, 126	4
Engineering Science Elective: Choose one course from the approved list.	3
Mathematics:	**21–22**
Choose one of the math options below. If MA 161 and/or MA 162 (or their equivalents) are taken in place of MA 165 and/or MA 166, only 4 of the 5 credit hours for each course may be applied to degree requirements.	
Option 1: MA 165, 166, 261, 265, 266, ECE 369	21
Option 2: MA 165, 166, 261, 262, ECE 369 and one of: MA 303, 304, 351, 385, 410, 425, or C S 314.	22
Science:	**19**
Computer Science: C S 159 or ENGR 117.	3
Chemistry: CHM 155, 116.	8
Physics: PHYS 172, 261	8
Liberal Arts:	**24–25**
Communication Skills: ENGL 106 or 108, COM 114.	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 115** (General Chemistry)	(4) **CHM 116** (General Chemistry)
(4) **ENGL 106** (First-Year Composition)	(3) **COM 114** (Fundamentals of Speech Communication)
(1) **ENGR 100** (Freshman Engineering Lectures)	(3) **C S 159** (Programming Applications for Engineers)
(3) **ENGR 126** (Engineering Problem Solving and Computer Tools)	(4) **MA 166** (Analytic Geometry and Calculus II)
(4) **MA 165** (Analytic Geometry and Calculus I)	(4) **PHYS 172** (Modern Mechanics)
(16)	(18)

Sophomore Year

Third Semester	*Fourth Semester*
(0) **ECE 200** (Electrical and Computer Engineering Seminar)	(3) **ECE 202** (Linear Circuit Analysis II)
(3) **ECE 201** (Linear Circuit Analysis I)	(1) **ECE 208** (Electronic Devices and Design Laboratory)
(1) **ECE 207** (Electronic Measurement Techniques)	(3) **ECE 255** (Introduction to Electronic Analysis and Design)
(2) **ECE 264** (Advanced C Programming)	(4) **ECE 270** (Introduction to Digital System Design)
(4) **MA 261** (Multivariate Calculus)	(1) **ECE 364** (Software Engineering Tools Laboratory)
(4) **PHYS 261** (Electricity and Optics)	(3) **MA 266** (Ordinary Differential Equations) **or** (4) **MA 262** (Linear Algebra and Differential Equations)
(3) General education elective	
(17)	(15-16)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **ECE 301** (Signals and Systems)	(3) **ECE 302** (Probabilistic Methods in Electrical and Computer Engineering)
(4) **ECE 362** (Microprocessor Systems and Interfacing)	(2) **ECE 495D** (ASIC Design Laboratory)
(3) **ECE 368** (Data Structures)	(3) **MA 265** (Linear Algebra) **or** Advanced math elective
(3) **ECE 369** (Discrete Mathematics for Computer Engineering)	(3) Computer engineering elective
(3) General education elective	(3) Engineering science elective
	(3) General education elective
(16)	(16)

Senior Year

Seventh Semester	*Eighth Semester*
(4) **ECE 437** (Computer Design and Prototyping)	(1) **ECE 400** (Electrical and Computer Engineering Undergraduate Seminar)
(3) Computer engineering senior design requirement	(3) **ECE 468** (Introduction to Compilers and Translation Engineering) **or** (4) **ECE 469** (Operating Systems Engineering)
(3) Computer engineering elective	(6) General education electives
(3) General education elective	(3) Unrestricted elective
(3) Unrestricted elective	
(16)	(13-14)

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 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 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

A five-year professional practice program is offered that gives a limited number of qualified students a chance to obtain industrial engineering experience with selected employers while completing the requirements for the undergraduate degree. Students are selected at the end of the First-Year Engineering Program and begin the professional practice program during the sophomore year. Alternate periods, including summers, are spent in industry or at the University. To qualify for the program, students are required to have a scholastic index that places them in the upper half of the First-Year Engineering Program class. Usually, this corresponds to an index of 3.0 or better on a 4.0 scale.

A student wishing to participate should file an application with the professional practice coordinator for industrial engineering after completion of the first semester of the First-Year Engineering Program. On the basis of the first semester's scholastic index, qualified students will be selected for the program on a tentative basis.

After completing the first year's work, with the required index and after being accepted as a professional practice employee by a University-approved employer, a student can formally enter the program. In order to continue in the program in good standing, the student must maintain a minimum graduation index of 2.8 on a 4.0 scale.

All professional practice program students are encouraged to participate in a special seminar (I E 495) for academic credit while pursuing studies at the West Lafayette campus. When finished with the program, the student receives the regular engineering degree and a certificate indicating completion of the professional practice program with industry.

Internship Program

Internship positions, which are also professional practice programs, are available during the fall, spring, and summer sessions; they provide an opportunity to explore different areas of specialization within the industrial engineering profession. This work experience assists in the selection of technical electives during the senior year and is beneficial when interviewing for full-time employment upon graduation. The internship program is less structured than the cooperative education program but still provides valuable firsthand information of the type of entry-level positions that are most suitable for a given individual student. Participants have full-time student status while registered for the professional internship course I E 496. See www.ecn.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 I E 300 (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 I E 499 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 I E 499 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 graduate-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, must 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.

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*
Freshman Engineering Program	**29**
Mathematics and Physics MA 261, 265, 266; PHYS 241	**13**
General Education Electives	**18**
Required Engineering Courses ECE 201; I E 230, 330, 332, 335, 336, 343, 370, 383, 386, 431, 474, 486; ME 200, 270; NUCL 273	**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) **I E 200** (Industrial Engineering Seminar)	(3) **I E 330** (Probability and Statistics in Engineering II)
(3) **I E 230** (Probability and Statistics in Engineering I)	(3) **MA 265** (Linear Algebra)
(3) **I E 343** (Engineering Economics)	(3) **NUCL 273** (Mechanics of Materials)
(4) **MA 261** (Multivariate Calculus)	(3) **PHYS 241** (Electricity and Optics)
(3) **ME 270** (Basic Mechanics I)	(3) General education elective
(3) General education elective	
(16)	(15)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **ECE 201** (Linear Circuit Analysis I)	(3) **I E 336** (Operations Research — Stochastic Models)
(3) **I E 332** (Computing in Industrial Engineering)	(3) **I E 383** (Integrated Production Systems I)
(3) **I E 335** (Operations Research — Optimization)	(3) **I E 386** (Work Analysis and Design I)
(3) **I E 370** (Manufacturing Processes I)	(3) **M E 200** (Thermodynamics I)
(3) **MA 266** (Ordinary Differential Equations)	(3) General education elective
(3) General education elective	
(18)	(15)

Senior Year

Seventh Semester	*Eighth Semester*
(3) **I E 474** (Industrial Control Systems)	(3) **I E 431** (Industrial Engineering Design)
(3) **I E 486** (Work Analysis and Design II)	(3) General education elective
(3) General education elective	(9) Technical electives*
(6) Technical electives*	
(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 either I E 470 (Manufacturing Processes II) or I E 484 (Integrated Production Systems II), both courses, or one additional 3 credit hour approved elective course in industrial engineering.*

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 I E 533, 556, 558, 559, and 577; PSY 272, 310, 314, and 333 or 475; OBHR 330; and SOC 316. 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 I E 470, 484, 570, 572, 574, and 575. Additional electives are I E 530, 532, 533, 548, 558, 579, 582, and 583; M E 274; and MSE 230. 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 C S 414; MA 341, 353, 362 or 410, 385, 453, 510, and 511; and STAT 516 and 517. Some suggested electives in industrial engineering are I E 535, 536, 537, 538, 539, 580, and 581. 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 I E 470, 484, 530, 575, 579, 580, 581, 582, and 583. Other electives are I E 532, 533, 545, 546, and 566; MGMT 200, 201, 323, and 455; OBHR 300, PSY 475 and 476; and SOC 316 and 416. Students pursuing a minor in management can select MGMT 324, 350, 351, 354, and 425, and OBHR 330 and 428. 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.

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.

An honors program offers opportunities for outstanding students who have a broad-based achievement record. The program provides recognition of a broad-based achievement by the student that includes non-academic performance and provides a special opportunity to individualize the academic program.

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 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, environmental, 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

A five-year professsional practice cooperative education program is offered that enables a limited number of students to obtain industrial employment related to engineering with selected industries while completing the requirements for an engineering degree. Successful graduates will receive the regular engineering degree and a certificate indicating completion of the professional practice program with industry. See www.ecn.purdue.edu/ProPractice for details.

Minimum Degree Requirements for Materials Engineering

Credit Hours Required for Graduation: 128

Courses	*Credit Hours*
Mathematics and Physical Sciences	
Calculus: MA 165, 166, 261, 265, 266	**18**
Chemistry: CHM 115, 116, 257, 373	**15**
Physics: PHYS 152 or 172, 241, 252	**8**
Communication and General Education	
English Composition: Communications: COM 114 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 100, MSE 390	**1**
First-Year Electives	**2**
Core Engineering Courses	
Computing: ENGR 126	**3**
Basic Mechanics: ME 270, NUCL 273	**6**
MSE Core: 230, 235, 240, 335, 340, 350, 367, 370, 382, 430, 440. 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) **CHM 257** (Organic Chemistry)	(3) **MA 265** (Linear Algebra)
(4) **MA 261** (Multivariate Calculus)	(3) **MA 266** (Ordinary Differential Equations)
(3) **M E 270** (Basic Mechanics I)	(3) **MSE 240** (Processing and Properties of Materials)
(3) **MSE 230** (Structure and Properties of Materials)	(0) **MSE 390** (Materials Engineering Seminar)
(3) **MSE 235** (Materials Properties Laboratory)	(3) **PHYS 241** (Electricity and Optics)
(0) **MSE 390** (Materials Engineering Seminar)	(1) **PHYS 252** (Electricity and Optics Laboratory)
	(3) General education elective†
(17)	(16)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **CHM 373** (Physical Chemistry)	(3) **MSE 350** (Thermodynamics of Materials)
(3) **MSE 335** (Materials Characterization Laboratory)	(3) **MSE 367** (Materials Processing Laboratory)
(3) **MSE 340** (Transport Phenomena)	(3) **MSE 382** (Mechanical Response of Materials)
(3) **MSE 370** (Electrical, Optical, and Magnetic Properties of Materials)	(0) **MSE 390** (Materials Engineering Seminar)
(0) **MSE 390** (Materials Engineering Seminar)	(3) Technical elective‡
(3) **NUCL 273** (Mechanics of Materials)	(3) General education elective†
(3) General education elective†	
(18)	(15)

Senior Year

Seventh Semester	*Eighth Semester*
(0) **MSE 390** (Materials Engineering Seminar)	(0) **MSE 390** (Materials Engineering Seminar)
(3) **MSE 430** (Materials Processing and Design I)	(3) **MSE 440** (Materials Processing and Design II)
(9) Technical electives‡	(6) Technical electives‡
(3) General education elective†	(6) General education electives†
(15)	(15)

** Students entering the School of Materials Engineering should have completed the sequence of CHM 115 and 116 or CHM 123 and 124.*

† Eighteen credit hours of general education electives are chosen in accordance with the general education requirements of the College 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-specific" courses. Up to 6 hours can be chosen from a separate list of courses, which includes other support areas.

Note: 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 –

- Being prepared for, and 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.

Traits

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

- Innovative ability.
- Strong work ethic.

- Globally, socially, ethically, intellectually, and technologically responsible.
- Adaptable in a changing environment.
- Entrepreneurial and intrapreneurial.
- Curious and persistent lifelong learner.

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 technical electives in engineering, mathematics, natural sciences, select management courses, or individualized project courses (M E 497).

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 (M E 290), 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 M E 263, 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 (M E 463), 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 technical 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 the Accreditation Board for Engineering and Technology (ABET). 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 aid-based and merit-based scholarships. Eligible candidates — incoming sophomores through senior mechanical engineering students — are invited in mid-spring to submit applications for consideration. To qualify, students are required to have a scholastic index of 2.8 or better on a 4.0 scale. More than 200 scholarships are awarded each year. Awards range from $1,000 to $5,000 and total over $300,000.

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 Programs

Professional work experience is an essential component of a Purdue undergraduate engineering education. Approximately 90 percent of the Purdue mechanical engineering students graduate with three to 18 months of meaningful work experience. Students are strongly encouraged to take advantage of these opportunities.

To aid in securing professional work assignments, the school sponsors an Office for Industrial Experience to help students identify and apply for professional work experience. The office offers two complementary programs — the Cooperative Education Program and the Internship Program. Approximately 25 percent of the Purdue mechanical engineering students participate in the co-op program, and 65 percent participate in the internship program.

Cooperative Program with Industry. The co-op program is a four-year or five-year program in which students spend alternate semesters (including summers) working and studying while progressing toward their degrees. Students integrate University studies with up to 18 months of practical engineering experience with approved industries, government organizations, or consulting firms. The sequence of three to five work sessions with a single employer provides the student with a well-planned work experience with increased project responsibilities as they progress through their educational program.

Students are invited to apply for the co-op program at the end of the first semester of their freshman year. To qualify for the program, students are required to have a scholastic index of 2.8 or better on a 4.0 scale. Applicants then interview with University-approved co-op employers on a competitive basis. Applicants participate in the program upon successful completion of the freshman engineering requirements. Once in the co-op program, students must maintain a minimum graduation index of 2.8 on a 4.0 scale to be in good standing. At completion, students receive a certificate for their participation in the Cooperative Engineering Education Program along with their regular engineering degree.

Internship Program with Industry. The internship program is a complementary program that works with companies from virtually every industrial sector to offer summer and/or semester internships to mechanical engineering students desiring three-month to seven-month work assignments. Students may intern for the same organization multiple times, thereby providing more depth in their experience, or for several different organizations, thereby providing a broader range of industrial work experience.

There is no scholastic index requirement to be eligible for the internship program. However, stronger academic performance often helps in securing internship positions. Interested students are encouraged to contact the Office for Industrial Experience for information about internship opportunities.

Professional work experience offers several advantages to students, including:

- Receiving an engineering degree and acquiring 3 to 18 months of relevant professional experience, which makes academic work more meaningful and develops professional engineering and management skills.
- Discovering the area of mechanical engineering in which they might like to work, helping students choose their engineering courses more wisely.
- Earning much or all of their college expenses. Most students earn from $2,600 to $3,200 a month on average while in the co-op or internship program.
- Enhancing the graduates' competitiveness and career prospects in the job market.

Honors Option

An honors option is available for outstanding mechanical engineering undergraduate students. The honors option 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 mechanical engineering honors option utilizes the normal technical and free elective requirements for the B.S.ME degree in a way that is consistent with its designation as an honors option. Details of the honors option admission and program requirements can be found on the Web at www.purdue.edu/ME/Undergrad/HonorsOption.whtml.

Global Engineering Programs

The School of Mechanical Engineering offers the Global Engineering Alliance for Research and Education (GEARE) Program as well a traditional study abroad program. The school also supports students in seeking out international academic and internship programs like IAESTE (International Association for the Exchange of Students for Experience). A brief description of these programs are provided below. Details about these programs can be found on the Web at www.purdue.edu/ME/International.

Global Engineering Alliance for Research and Education (GEARE) Program

The GEARE Program is the flagship program that offers students an eight-month intensive international experience in engineering. This experience includes two internships with a global partner: one in the United States and one overseas. This experience also involves a semester abroad at the partner university. During the semester abroad, your studies are coordinated with a real-world multi-cultural design project that takes place both on the overseas campus and at Purdue. You spend one semester abroad studying at a partner university (and working on the global design project) and one semester at Purdue with the partner students (completing the global design project). Current GEARE partners include: the University of Karlsruhe in Karlsruhe, Germany; Shanghai Jiao Tong University in Shanghai, China; the Indian Institute of Technology Bombay in Bombay, India; and ITESM in Monterrey, Mexico.

Study Abroad

Purdue University's Program for Study Abroad Office currently offers more than 200 programs in over 40 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, 60 to 80 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 homepage at www.purdue.edu/ME. Questions about the FE exam or the process to become a registered professional engineer should be directed to Professor D. H. W. van Gelder in the School of Civil Engineering.

ME Minor Program

A minor in mechanical engineering (ME minor code = 280) is available to any non-ME student as well as 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/M.B.A. Program to high achieving students. Each year a significant number of engineering graduates pursue M.B.A.s at U.S. business schools. The M.B.A. is seen as a complement

to the engineer's technical education, providing an understanding of the business context within which many technical decisions are made. Many employers also have a strong preference for hiring M.B.A.s with engineering backgrounds, particularly in the manufacturing and technology sectors, sectors in which Krannert and the College of Engineering enjoy many longstanding relationships with leading employers. The B.S.ME/M.B.A. combined degree offering will provide top B.S.ME students an efficient and cost-effective path for developing management knowledge as well as the highly valued credential of an M.B.A. degree. It will also open new job opportunities for the program graduates that expedite their progression to high-level management positions.

Basic admission requirements include:

1. Maintaining a 3.5 graduation GPA.
2. Securing at least one session of internship and/or co-op work experience prior to the senior year.
3. Securing advanced credit (preferably math) or willingness to accelerate your ME program by taking summer courses.
4. Completing an application and successfully interviewing for a position with the Management faculty.

For more details about the B.S.ME/M.B.A. Program go to http://www.krannert.purdue.edu/programs/masters/degree_programs/bsmeMBA.asp.

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.

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

Credit Hours Required for Graduation: 128

Courses	*Credit Hours*
Mathematics and Sciences	
Calculus: MA 165, 166, 261, 262, 303	**19**
Chemistry: CHM 115	**4**
Physics: PHYS 172, 241	**7**
Science Selective	**3–4**
Communication, Humanities, and Social Sciences	
English Composition: ENGL 108	**3**
Speech: COM 114	**3**
Professionalism, Ethics, Technical Communication: M E 290	**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: M E 270, 274	**6**
Materials: M E 323; MSE 230	**6**
Design	
Design: M E 263, 352, 463	**10**
Thermal Fluid Sciences	
Thermodynamics: M E 200	**3**
Fluid Mechanics: M E 309	**4**
Heat Transfer: M E 315	**4**
Information Technologies	
Electrical Engineering: ECE 201, 207	**4**
Systems, Measurements, and Controls: M E 365, 375	**6**
Freshman Requirements	
ENGR 100, 106; CGT 163	**6**
Restricted Electives	
M E 300, 452, 475 (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 163 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 261** (Multivariate Calculus)	(3) **ECE 201** (Linear Circuit Analysis I)
(3) **M E 200** (Thermodynamics I)	(1) **ECE 207** (Electronic Measurement Techniques)
(3) **M E 270** (Basic Mechanics I)	(4) **MA 262** (Linear Algebra and Differential Equations)
(1) **M E 290** (Mechanical Engineering Professional Seminar)	(3) **M E 263** (Introduction to Mechanical Engineering Design)
(3) **PHYS 241** (Electricity and Optics)	(3) **M E 274** (Basic Mechanics II)
(3) Economics elective*	(3) World affairs and cultures elective*
(17)	(17)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **MA 303** (Differential and Partial Differential Equations for Engineering and the Sciences)	(4) **M E 352** (Machine Design I)
(4) **M E 309** (Fluid Mechanics)	(3) **M E 375** (System Modeling and Analysis)
(3) **M E 323** (Mechanics of Materials)	(3) **MSE 230** (Structure and Properties of Materials)
(3) **M E 365** (Systems and Measurements)	(3) General education elective*
(3) General education elective*	(3) Technical elective*
(16)	(16)

Senior Year

Seventh Semester	*Eighth Semester*
(4) **M E 315** (Heat and Mass Transfer)	(3) **M E 463** (Engineering Design)
(1) General education elective*	(3) General education elective*
(3) Restricted elective*	(3) Restricted electives*
(4) Technical elective*	(6) Technical electives*
(2) Free 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/Undergrad/GenEds.whtml.*
2. *Six credit hours of restricted electives are to include two of the following three courses: M E 300, 452, 475.*
3. *Twelve credit hours of technical electives in engineering, mathematics, natural sciences, M E 497 projects, or select management courses chosen in accordance with the technical elective rules, which are available at www.purdue.edu/METechElects.whtml.*
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 100.

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 engi-

neering, 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 the Accreditation Board for Engineering and Technology (ABET). 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

The Office of Professional Practice offers a variety of work schedules that allow students to participate in experiences ranging from traditional cooperative education to low-commitment summer internships. For students in nuclear engineering, a five-year cooperative education program is offered that enables students to obtain paid engineering experience while obtaining their B.S.NE degree. Nuclear engineering students usually find cooperative employment in the areas of electric utilities, architectural and engineering firms, equipment suppliers, national laboratories, and government regulatory agencies.

In the cooperative education program, students integrate their University studies with practical engineering experience through well-planned and varied work assignments. This is accomplished by spending alternate semesters, including summers, during the second, third, and fourth years of the program, at work or at the University.

Interested students should contact the faculty coordinator in the School of Nuclear Engineering during the first semester of their freshman year. On the basis of the scholastic index, qualified students will be selected for the program on a tentative basis. The student will then be allowed to interview with a University-approved employer. If hired, the student can formally enter the program. When finished, the student receives the regular engineering degree along with a certificate indicating the completion of the professional practice program with industry.

Internship Program

The School of Nuclear Engineering also coordinates summer intern employment. The intern program enables students to choose among various employers in succeeding years, but it lacks the sustained career development opportunities possible under the cooperative program. See www.ecn.purdue.edu/ProPractice.

Minor Program

A minor in nuclear engineering is available to any student who completes a total of 12 credits, consisting of common core courses NUCL 200 and 300, 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 Student Services Office in nuclear engineering (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.) as described in the University's *General Information* bulletin.
- 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 300 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 261, 265, 266 (or equivalent), and three elective hours.*

† *This requirement involves PHYS 241 (or equivalent).*

‡ *The recommended courses to satisfy the engineering core are NUCL 200, 205, 273, 298, 300, 305, 310, 320, 350, 351, 355, 398, 402, 449, 450, 498, 510, 520; E E 201; M E 200, 270, and 274; MSE 235; 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 261** (Multivariate Calculus)	(3) **MA 265** (Linear Algebra)
(3) **M E 200** (Thermodynamics I)	(3) **M E 274** (Basic Mechanics II)
(3) **M E 270** (Basic Mechanics I)	(2) **NUCL 205** (Nuclear Engineering Undergraduate Laboratory I)
(3) **NUCL 200** (Introduction to Nuclear Engineering)	(3) **NUCL 273** (Mechanics of Materials)
(0) **NUCL 298** (Sophomore Seminar)	(0) **NUCL 298** (Sophomore Seminar)
(3) General education elective	(3) **PHYS 241** (Electricity and Optics)
	(3) General education elective
(16)	(17)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **MA 266** (Ordinary Differential Equations)	(3) **MSE 240** (Processing and Properties of Materials)
(3) **MSE 235** (Materials Properties Laboratory)	(3) **NUCL 310** (Introduction to Neutron Physics)
(3) **MSE 350** (Thermodynamics of Materials)*	(3) **NUCL 351** (Nuclear Thermal-Hydraulics II)
(3) **NUCL 300** (Nuclear Structure and Radiation Interactions)	(3) **NUCL 355** (Nuclear Thermohydraulics Laboratory)
(3) **NUCL 320** (Introduction to Materials for Nuclear Applications)	(0) **NUCL 398** (Junior Seminar)
(3) **NUCL 350** (Nuclear Thermal-Hydraulics I)	(3) **NUCL 520** (Radiation Effects and Reactor Materials)*
(0) **NUCL 398** (Junior Seminar)	(3) General education elective
(18)	(18)

Senior Year

Seventh Semester	*Eighth Semester*
(3) **MSE 335** (Materials Characterization Laboratory) †	(3) **ECE 201** (Linear Circuit Analysis I)
(2) **NUCL 305** (Nuclear Engineering Undergraduate Laboratory II)	(3) **NUCL 450** (Design in Nuclear Engineering)
(3) **NUCL 402** (Engineering of Nuclear Power Systems)	(0) **NUCL 498** (Senior Seminar)
(1) **NUCL 449** (Senior Design Proposal)	(6) General education electives
(0) **NUCL 498** (Senior Seminar)	(3) Mathematics elective‡
(3) General education elective	(3) Technical elective*
(6) Technical electives*	
(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 A&AE 553; MSE 335, 340, 350, 367, 370, 382, 502, 508, 531, 555, 556, 557, 559, 560, 575, and 576; NUCL 503, 510, and 520 (NUCL 503 is required for radioactive waste management). Either NUCL 510 or 520 must be included in the engineering core. Other courses to meet specific objectives also can be selected.*

† One materials lab course beyond MSE 235 is required.

‡ The mathematics elective is usually selected from MA 304, or 362.

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 261** (Multivariate Calculus)	(3) **MA 265** (Linear Algebra)
(3) **M E 200** (Thermodynamics I)	(3) **M E 274** (Basic Mechanics II)
(3) **M E 270** (Basic Mechanics I)	(2) **NUCL 205** (Nuclear Engineering Undergraduate Laboratory I)
(3) **NUCL 200** (Introduction to Nuclear Engineering)	(3) **NUCL 273** (Mechanics of Materials)
(0) **NUCL 298** (Sophomore Seminar)	(0) **NUCL 298** (Sophomore Seminar)
(3) General education elective	(4) **PHYS 261** (Electricity and Optics)
	(3) General education elective
(16)	(18)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **MA 266** (Ordinary Differential Equations)	(3) **NUCL 310** (Introduction to Neutron Physics)
(3) **MSE 235** (Materials Properties Laboratory)	(3) **NUCL 351** (Nuclear Thermal-Hydraulics II)
(3) **NUCL 300** (Nuclear Structure and Radiation Interactions)	(3) **NUCL 355** (Nuclear Thermohydraulics Laboratory)
(3) **NUCL 320** (Introduction to Materials for Nuclear Applications)	(0) **NUCL 398** (Junior Seminar)
(3) **NUCL 350** (Nuclear Thermal-Hydraulics I)	(3) **NUCL 460** (Introduction to Controlled Thermonuclear Fusion)*
(0) **NUCL 398** (Junior Seminar)	(3) **PHYS 330** (Intermediate Electricity and Magnetism)*
(3) General education elective	(3) Mathematics elective†
(18)	(18)

Senior Year

Seventh Semester	*Eighth Semester*
(3) **MA 511** (Boundary Value Problems of Differential Equations)*	(3) **ECE 201** (Linear Circuit Analysis I)
(2) **NUCL 305** (Nuclear Engineering Undergraduate Laboratory II)	(3) **NUCL 450** (Design in Nuclear Engineering)
(3) **NUCL 402** (Engineering of Nuclear Power Systems)	(0) **NUCL 498** (Senior Seminar)
(1) **NUCL 449** (Senior Design Proposal)	(3) **NUCL 563** (Direct Energy Conversion)*
(0) **NUCL 498** (Senior Seminar)	(6) General education electives
(3) **NUCL 510** (Nuclear Reactor Theory I)*	
(3) **NUCL 560** (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 460, 510, 520, 560, 563, and 570; and PHYS 330. Either NUCL 510 or 520 must be included in the engineering core. Other courses to meet specific objectives also can be selected.*

† The mathematics elective is usually MA 510.

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 261** (Multivariate Calculus)	(3) **MA 265** (Linear Algebra)
(3) **M E 200** (Thermodynamics I)	(3) **M E 274** (Basic Mechanics II)
(3) **M E 270** (Basic Mechanics I)	(2) **NUCL 205** (Nuclear Engineering Undergraduate Laboratory I)
(3) **NUCL 200** (Introduction to Nuclear Engineering)	(3) **NUCL 273** (Mechanics of Materials)
(0) **NUCL 298** (Sophomore Seminar)	(0) **NUCL 298** (Sophomore Seminar)
(3) General education elective	(3) **PHYS 241** (Electricity and Optics)
	(3) General education elective
(16)	(17)

Junior Year

Fifth Semester	*Sixth Semester*
(3) **MA 266** (Ordinary Differential Equations)	(3) **ECE 201** (Linear Circuit Analysis I)
(3) **MSE 235** (Materials Properties Laboratory)	(3) **NUCL 310** (Introduction to Neutron Physics)
(3) **NUCL 300** (Nuclear Structure and Radiation Interactions)	(3) **NUCL 351** (Nuclear Thermal-Hydraulics II)
(3) **NUCL 320** (Introduction to Materials for Nuclear Applications)	(3) **NUCL 355** (Nuclear Thermohydraulics Laboratory)
(3) **NUCL 350** (Nuclear Thermal-Hydraulics I)	(0) **NUCL 398** (Junior Seminar)
(0) **NUCL 398** (Junior Seminar)	(3) **NUCL 520** (Radiation Effects and Reactor Materials)*
(3) General education elective	(3) General education elective
(18)	(18)

Senior Year

Seventh Semester	*Eighth Semester*
(2) **NUCL 305** (Nuclear Engineering Undergraduate Laboratory II)	(3) **NUCL 450** (Design in Nuclear Engineering)
(3) **NUCL 402** (Engineering of Nuclear Power Systems)	(0) **NUCL 498** (Senior Seminar)
(1) **NUCL 449** (Senior Design Proposal)	(3) General education elective
(0) **NUCL 498** (Senior Seminar)	(3) Mathematics elective†
(3) **NUCL 510** (Nuclear Reactor Theory I)*	(6) Technical electives*
(3) General education elective	
(6) Technical electives*	
(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 438 and 526; I E 577; M E 430 and 433; and NUCL 460, 470. 503, 510, 511, 512, 520, 544, 551, 552, 560, 563, 570, and 575. Either NUCL 510 or 520 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 304, or 362.

Information about Courses

Official Purdue University course information is available on the Web at www.courses.purdue.edu. Click on the "Course Information — All Campuses" 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 campus, program, and subject area, 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

Leah H. Jamieson, *Ph.D.,* John A. Edwardson Dean of Engineering and Ransburg Distinguished Professor of Electrical and Computer Engineering

Vincent F. Bralts, *Ph.D.,* Associate Dean for Resource Planning and Management

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

Jay P. Gore, *Ph.D.,* Associate Dean for Research and Entrepreneurship

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

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

Melba Crawford, *Ph.D.,* Assistant Dean for Interdisciplinary Research

Edgar J. Martinez, *Ph.D.,* Assistant Dean for Research and Entrepreneurship

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

Heads of Instructional Departments

M. Katherine Banks, *Ph.D.,* Head of the School of Civil Engineering

M. Katherine Banks, *Ph.D.,* Interim Head of the Division of Construction Engineering and Management

Vincent F. Bralts, *Ph.D.,* Interim Head of the School of Nuclear Engineering

Bernard A. Engel, *Ph.D.,* Head of the Department of Agricultural and Biological Engineering

Thomas N. Farris, *Ph.D.,* Head of the School of Aeronautics and Astronautics

Kamyar Haghighi, *Ph.D.,* Head of the Department of Engineering Education

E. Daniel Hirleman, *Ph.D.,* Head of the School of Mechanical Engineering

Inez Hua, *Ph.D.,* Interim Head of Ecological and Environmental Engineering

Alexander H. King, *D.Phil.,* Head of the School of Materials Engineering

Nagabhushana Prabhu, *Ph.D.,* Head of the School of Industrial Engineering

Mark J. T. Smith, *Ph.D.,* Head of the School of Electrical and Computer Engineering

Arvind Varma, *Ph.D.,* Head of the School of Chemical Engineering

George. R. Wodicka, *Ph.D.,* Head of Biomedical Engineering

Engineering Education

K. Haghighi, Head of the Department

Professors: K. Haghighi, *Ph.D.;* K. A. Smith, *Ph.D.;* P. C. Wankat, *Ph.D.*

Professors Emeriti: T. A. Boyle, *Ph.D.;* W. K. LeBold, *Ph.D.;* R. W. McDowell, *M.S.IE;* C. P. Smith, *M.S.*

Associate Professors: H. A. Diefes-Dux, *Ph.D.;* P. K. Imbrie, *Ph.D.;* R. E. Montgomery, *Ph.D.;* W. C. Oakes, *Ph.D.;* M. W. Ohland, *Ph.D.;* T. R. Rhoads, *Ph.D.*

Assistant Professors: R. S. Adams, *Ph.D.;* S. P. Brophy, *Ph.D.;* M. F. Cox, *Ph.D.;* D. Evangelou, *Ph.D.;* R. A. Streveler, *Ph.D.*

Academic Advisors: B. A. Burnett, *M.S.;* K. E. Deckard, *M.Ed.;* L.A. Haughland, *S.M., M.Ed.;* B. K. Jennings, *M.Ed.;* C. R. Pekny, *B.S.E.;* J. T. Pukrup, *M.A.;* S. K. Woods, *Ph.D.*

Interdisciplinary Engineering

P. C. Wankat, Program Director

Professor: P. C. Wankat, *Ph.D.*

Aeronautics and Astronautics

T. N. Farris, Head of the School

M. H. Williams, Associate Head of the School

Professors: W. W. Chen, *Ph.D.;* S. H. Collicott, *Ph.D.;* M. J. Corless, *Ph.D.;* J. F. Doyle, *Ph.D.;* T. N. Farris, *Ph.D.;* A. E. Frazho, *Ph.D.;* A. F. Grandt Jr., *Ph.D., Raisbeck Engineering Distinguished Professor of Engineering and Technology Integration;* S. D. Heister, *Ph.D.;* K. C. Howell, *Ph.D., Hsu Lo Professor of Aeronautical and Astronautical Engineering;* M. C. Jischke, *Ph.D.;* J. M. Longuski, *Ph.D.;* A. S. Lyrintzis, *Ph.D.;* C. L. Merkle, *Ph.D., Reilly Professor of Engineering;* R. B. Pipes, *John L. Bray Distinguished Professor of Engineering;* M. A. Rotea, *Ph.D.;* S. P. Schneider, *Ph.D.;* J. P. Sullivan, *Ph.D.;* C. T. Sun, *Ph.D., Neil A. Armstrong Distinguished Professor of Aeronautical and Astronautical Engineering;* T. A. Weisshaar, *Ph.D.;* M. H. Williams, *Ph.D.*

Professors Emeriti: L. T. Cargnino, *M.S.Ed.;* J. W. Drake, *D.B.A.;* W. A. Gustafson, *Ph.D.;* C. P. Kentzer, *Ph.D.;* F. J. Marshall, *Sc.Engr.D.;* J. R. Osborn, *Ph.D.;* G. M. Palmer Jr., *Aero.E.;*

Associate Professors: D. Andrisani II, *Ph.D.;* G. A. Blaisdell, *Ph.D.;* W. A. Crossley, *Ph.D.;* J. L. Garrison, *Ph.D.*

Assistant Professors: A. A. Alexeenko, *Ph.D.;* W. E. Anderson, *Ph.D.;* D. A. DeLaurentis, *Ph.D.;* I. Hrbud, *Ph.D;* I. Hwang, *Ph.D;* P. K. Imbrie, *Ph.D.*

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

Adjunct Assistant Professor: J. J. Rusek, *Ph.D.*

Agricultural and Biological Engineering

B.A. Engel, Head of the Department

Professors: V. F. Braltz, *Ph.D.;* O. H. Campanella, *Ph.D.;* B. A. Engel, *Ph.D.;* K. Haghighi, *Ph.D.;* L. F. Huggins, *Ph.D;* M. Ivantysynova, *Ph.D.;* G. W. Krutz, *Ph.D.;* M. R. Ladisch, *Ph.D., Distinguished Professor of Biomedical Engineering and Distinguished Professor of Agricultural and Biological Engineering;* R. H. Mohtar, *Ph.D.;* G. Narsimhan, *Ph.D.;* M. R, Okos, *Ph.D.;* R. L. Stroshine, *Ph.D.;* B. Y. Tao, *Ph.D.*

Professors Emeriti: J. R. Barrett, *M.S.;* A. C. Dale, *Ph.D.;* H. G. Gibson, *M.S.;* C. N. Hinkle, *Ph.D.;* E. J. Monke, *Ph.D.;* R. M. Pearl, *Ph.D.;* G. T. Tsao, *Ph.D.*

Associate Professor: N. J. Carroll, *Ph.D.*

Assistant Professors: K. A. Cherkauer, *Ph.D.;* H. A. Diefes-Dux, *Ph.D.;* K. E. Ileleji, *Ph.D.;* J. Irudayaraj, *Ph.D.;* C. Lu, *Ph.D.;* J. Lumkes, *Ph.D.;* N. S. Mosier, *Ph.D.;* J. L. Rickus, *Ph.D.*

Adjunct Professor: D. Flanagan, *Ph.D.*

Adjunct Assistant Professors: H. Sumali, *Ph.D.;* E. A. Warnemeunde, *Ph.D.*

Biomedical Engineering

G. R. Wodicka, Head of Biomedical Engineering

Professors: R. Bashir, *Ph.D.;* E. J. Berbari, *Ph.D.;* R. B. Borgens, *Ph.D.*, *Mari Hulman George Professor of Applied Neuroscience in the School of Veterinary Medicine and Director, Institute for Applied Neurology, Center for Paralysis Research;* C. A. Bouman, *PhD.;* D. Burr, *Ph.D., Professor and Chairman of Anatomy;* E. J. Delp, *Ph.D., Silicon Valley Professor in Electrical and Computer Engineering;* P. Guo, *Ph.D., Director of the Laboratory of Gene Therapy;* R. E. Hannemann, *M.D., Visiting Professor of Biomedical Engineering;* G. Kassab, *Ph.D.;* K. Kokini, *Ph.D., Associate Dean for Academic Affairs, College of Engineering;* M. R. Ladisch, *Ph.D., Distinguished Professor of Biomedical Engineering and Distinguished Professor of Agricultural and Biological Engineering;* J. F. Leary, *Ph.D., SVM Professor of Nanomedicine;* K. L. March, *Ph.D., M.D., Cryptic Masons Medical Research Foundation Professor;* J. A. Nyenhuis, *Ph.D.;* S. O'Connor, *M.D.;* K. Park, *Ph.D., Showalter Distinguished Professor of Biomedical Engineering;* J. P. Robinson, *Ph.D.;* V. Shalaev, *Ph.D., Robert and Anne Burnett Professor of Electrical and Computer Engineering;* C. H. Turner, *Ph.D.;* G. R. Wodicka, *Ph.D.*

Professor Emeriti: L. A. Geddes, *Ph.D., D.Sc., Showalter Distinguished Professor Emeritus of Biomedical Engineering*

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Assistant Professors: E. L. Bartlett, *Ph.D.;* J. X. Cheng, *Ph.D.;* T-M. G. Chu, *Ph.D., D.D.S.;* M. G. Heinz, *Ph.D.;* J. S. Hovis, *Ph.D.;* P. Irazoqui, *Ph.D.;* A. Ivanisevic, *Ph.D.;* E. Morris, *Ph.D.;* E. Nauman, *Ph.D.;* K. Otto, *Ph.D.;* J. L. Rickus, *Ph.D.;* A. E. Rundell, *Ph.D.;* C. Savran, *Ph.D.;* G. Schmidt, *Ph.D.;* B. Seal, *Ph.D.;* L. Stanciu, *Ph.D.*

Chemical Engineering

A. Varma, Head of the School

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Associate Professors: D. S. Corti, *Ph.D.;* G. U. Lee, *Ph.D.;* J. A. Morgan, *Ph.D.;* K. T. Thomson, *Ph.D.*

Assistant Professors: C. D. Baertsch, *Ph.D.;* H. W. Hillhouse, *Ph.D.;* Y-Y. Won, *Ph.D.*

Civil Engineering

M. K. Banks, Head of the School

D. M. Bullock, Assistant Head for Graduate Programs

G. D. Jeong, Assistant Head for Facilities and Operations

S. D. Johnson, Assistant Head for Undergraduate Programs

Professors: D. M. Abraham, *Ph.D.;* M. K. Banks, *Ph.D.;* E. R. Blatchley III, *Ph.D.;* M. D. Bowman, *Ph.D.;* D. M. Bullock, *Ph.D.;* M. Crawford, *Ph.D.;* V. P. Drnevich, *Ph.D.;* J. D. Fricker, *Ph.D.;* S. R. Govindaraju, *Ph.D.;* R. B. Jacko, *Ph.D.;* C. T. Jafvert, *Ph.D.;* M. E. Kreger, *Ph.D.;* F. L. Mannering, *Ph.D.;* E. M. Mikhail, *Ph.D.;* J. Olek, *Ph.D.;* S. Peeta, *Ph.D.;* J. A. Ramirez, *Ph.D.;* P. S. C. Rao, *Ph.D., Lee A. Reith Distinguished Professorship in Environmental Engineering;* R. Salgado, *Ph.D.;* K. C. Sinha, *Ph.D., Olson Distinguished Professor of Civil Engineering*; M. A. Sozen, *Ph.D., Kettelhut Distinguished Professor of Civil Engineering*

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Associate Professors: J. S. Bethel, *Ph.D.;* A. Bobet, *Ph.D.;* P. L. Bourdeau, *Dr. EngrSc;* L. M. Chang, *Ph.D.;* P. P. Dunston, *Ph.D.;* R. J. Frosch, *Ph.D.;* J. E. Haddock, *Ph.D.;* M. Hastak, *Ph.D.;* I. Hua, *Ph.D.;* G. D. Jeong, *Ph.D.;* S. D. Johnson, *Ph.D.;* D. A. Lyn, *Ph.D.;* L. F. Nies, *Ph.D.;* J. Shan, *Ph.D.;* C. D. Sutton, *Ph.D.;* A. P. Tarko, *Ph.D.;* B. H. W. van Gelder, *Ph.D.;* W. J. Weiss, *Ph.D.*

Assistant Professors: R. J. Connor, *Ph.D.;* A. Irfanoglu, *Ph.D.;* S. Labi, *Ph.D.;* J. Liu, *Ph.D.;* H. Ochoa-Acuna, *Ph.D.;* M. Prezzi, *Ph.D.;* S. Pujol, *Ph.D.;* M. C. Santagata, *Ph.D.;* T. P. Seager, *Ph.D.;* M. S. Sepulveda, *Ph.D.;* J. V. Sinfield, *Ph.D.;* B. Tao, *Ph.D.;* A. H. Varma, *Ph.D.*

Joint Transportation Research Program: K. C. Sinha, *Ph.D.*, Director

Highway Extension and Research Project for Indiana Counties and Cities: T. C. Martin, *M.Sc.E.,* Program Manager

Indiana Clean Manufacturing Technology and Safe Materials Institute: L. A. Corson, *Ph.D.*, Director

North Central SUPERPAVE Center: J. Olek, *Ph.D.*, Director

Institute for Safe, Quiet, Durable Highways: V. P. Drnevich, *Ph.D.*, and R. J. Bernhard, *Ph.D.*, Co-Directors

Center for the Advancement of Transportation Safety: R. C. Zahnke, *M.B.A.,* Director

Construction Engineering and Management

M. K. Banks, Interim Head of the Division

Professor: D. M. Abraham, *Ph.D.*

Associate Professors: L. M. Chang, *Ph.D.; P.S. Dunston, Ph.D.;* M. Hastak, *Ph.D.*

Assistant Professors: T. P. Seager, *Ph.D.;* J.V. Sinfield, *Ph.D.*

Director of Internships: B. J. Hubbard, *Ph.D.*

Electrical and Computer Engineering

M. J. T. Smith, Head of the School

V. Balakrishnan, Associate Head of the School

J. A. Nyenhuis, Associate Head of the School

Professors: M. A. Alam, *Ph.D.;* J. P. Allebach, *Ph.D.*, *Michael J. and Katherine R. Birck Professor of Electrical and Computer Engineering;* V. Balakrishnan, *Ph.D.;* R. Bashir, *Ph.D.;* M. R. Bell, *Ph.D.;* E. Bertino, *Ph.D.;* C. A. Bouman, *Ph.D.;* C.-L. Chen, *Ph.D.;* J. A. Cooper, *Ph.D.*, *Charles William Harrison Professor of Electrical and Computer Engineering;* E. J. Coyle, *Ph.D.;* S. Datta, *Ph.D., Thomas Duncan Distinguished Professor of Electrical and Computer Engineering;* R. A. DeCarlo, *Ph.D.;* E. J. Delp, *Ph.D.*, *Silicon Valley Professor of Electrical and Computer Engineering;* P. C. Doerschuk, *Ph.D.;* D. S. Ebert, *Ph.D.;* R. Eigenmann, *Ph.D.;* D. S. Elliott, *Ph.D.;* O. K. Ersoy, *Ph.D.;* E. S. Furgason, *Ph.D.;* S. B. Gelfand, *PhD.;* A. Ghafoor, *Ph.D.;* M. P. Harper, *Ph.D.;* L. H. Jamieson, *Ph.D.*, *Ransburg Distinguished Professor of Electrical and Computer Engineering;* D. B. Janes, *Ph.D.;* A. C. Kak, *Ph.D.;* G. Klimeck, *Ph.D.;* P. C. Krause, *Ph.D.;* C.-S. G. Lee, *Ph.D.;* J. S. Lehnert, *Ph.D.;* M. S. Lundstrom, *Ph.D.*, *Don and Carol Scifres Distinguished Professor in Electrical and Computer Engineering;* M. R. Melloch, *Ph.D.;* D. G. Meyer, *Ph.D.;* G. W. Neudeck, *Ph.D.;* J. A. Nyenhuis, *Ph.D.;* C.-M. Ong, *Ph.D.;* R. F. Pierret, *Ph.D.;* I. Pomeranz, *Ph.D.;* K. Roy, *Ph.D., Roscoe H. George Professor of Electrical and Computer Engineering;* T. D. Sands, *Ph.D., Basil S. Turner Professor of Electrical and Computer Engineering;* R. J. Schwartz, *Sc.D.;* V. Shalaev, *Ph.D., Robert and Anne Burnett Professor of Electrical and Computer Engineering;* N. B. Shroff, *Ph.D.;* M. J. T. Smith, *Ph.D.*, *Michael J. and Katherine R. Birck Professor of Electrical and Computer Engineering;* E. H. Spafford, *Ph.D.;* S. D. Sudhoff, *Ph.D.;* P. H. Swain, *Ph.D.;* O. Wasynczuk, *Ph.D.;* K. J. Webb, *Ph.D.;* A. M. Weiner, *Sc.D., Scifres Family Distinguished Professor in Electrical and Computer Engineering;* G. R. Wodicka, *Ph.D.; J. M. Woodall Distinguished Professor of Electrical and Computer Engineering;* S. H. Zak, *Ph.D.;* M. D. Zoltowski, *Ph.D.*

Professors Emeriti: G. R. Cooper, *Ph.D.;* F. J. Friedlaender, *Ph.D.;* K. Fukunaga, *Ph.D.;* L. A. Geddes, *Ph.D.*, *Showalter Distinguished Professor Emeritus of Bioengineering;* R. L. Gunshor, *Ph.D.*, *Thomas Duncan Distinguished Professor Emeritus of Electrical and Computer Engineering;* A. J. Koivo, *Ph.D.;* D. A. Landgrebe, *Ph.D.;* P.-M. Lin, *Ph.D.;* J. C. Lindenlaub, *Ph.D.;* L. L. Ogborn, *Ph.D.;* A. L. Shelley, *Ph.D.;* L. F. Silva, *Ph.D.;* H. W. Thompson, *Ph.D.*

Associate Professors: M. A. Capano, *Ph.D.;* R. L. Givan, *Ph.D.;* J. L. Gray, *Ph.D.;* C.-K. Koh, *Ph.D.;* J. V. Krogmeier, *Ph.D.;* S. P. Midkiff, *Ph.D.;* S. D. Pekarek, *Ph.D.;* I. Pollak, *Ph.D.;* J. M. Siskind, *Ph.D.;* T. M. Talavage, *Ph.D.;* H. Z. Tan, *Ph.D.;* T. N. Vijaykumar, *Ph.D.;* P. Ye, *Ph.D.;* B. Ziaie, *Ph.D.*

Assistant Professors: S. Bagchi, *Ph.D.;* M. Boutin, *Ph.D.;* W. J. Chappell, *Ph.D.;* J. V. Clark, *Ph.D.;* M. L. Comer, *Ph.D.;* J. Hu, *Ph.D.;* Y. C. Hu, *Ph.D.;* D. Jiao, *Ph.D.;* B. Jung, *Ph.D.;* G. Lebanon, *Ph.D.;* X. Lin, *Ph.D.;* D. J. Love, *Ph.D.;* Y.-H. Lu, *Ph.D.;* S. Mohammadi, *Ph.D.;* V. S. Pai, *Ph.D.;* D. Peroulis, *Ph.D.;* M. Qi, *Ph.D.;* V. Raghunathan, *Ph.D.:* S. G. Rao, *Ph.D.;* M. S. Thottethodi, *Ph.D.;* C.-C. Wang, *Ph.D.*

Industrial Engineering

N. Prabhu, Head of the School

S. Chandrasekar, Associate Head of the School

J. M. A. Tanchoco, Associate Head of the School

Professors: J. W. Barany, *Ph.D.;* S. Chandrasekar, *Ph.D.;* T. C. Chang, *Ph.D.;* C. R. Liu, *Ph.D.;* T. L. Morin, *Ph.D.;* S. Y. Nof, *Ph.D.;* N. Prabhu, *Ph.D.;* R. L. Rardin, *Ph.D.;* G. Salvendy, *Ph.D.;* B. W. Schmeiser, *Ph.D.;* J. M. A. Tanchoco, *Ph.D.;* R. M. Uzsoy, *Ph.D.;* Y. Yih, *Ph.D.*

Professors Emeriti: W. D. Compton, *Ph.D., Lillian M. Gilbreth Distinguished Professor Emeritus of Industrial Engineering;* J. I. ElGomayel, *Ph.D.;* J. H. Greene, *Ph.D.;* F. F. Leimkuhler, *Dr. Engr.;* C. L. Moodie, *Ph.D.;* C. C. Petersen, *Ph.D.;* J. J. Solberg, *Ph.D., Ransburg Professor Emeritus of Manufacturing;* F. T. Sparrow, *Ph.D.;* A. L Sweet, *Ph.D.;* J .J. Talavage, *Ph.D.*

Associate Professors: B. S. Caldwell, *Ph.D.;* V. G. Duffy, *Ph.D.;* M. A. Lawley, *Ph.D.;* M. R. Lehto, *Ph.D.*

Assistant Professors: S. J. Landry, *Ph.D.*; M. Muthuraman, *Ph.D.;* L. Ozsen, *Ph.D.;* J. P. Richard, *Ph.D.;* H. Wan, *Ph.D.*

Materials Engineering

A. H. King, Head of the School

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Professors Emeriti: R. E. Grace, *Ph.D.;* G. L. Liedl, *Ph.D.;* J. F. Radavich, *Ph.D.;* G. M. Vest, *Ph.D.*

Associate Professors: D. R. Johnson, *Ph.D.;* M. J. M. Krane, *Ph.D.;* E. B. Slamovich, *Ph.D.;* R. H. Spitzer, *Ph.D.;* E. A. Stack, *Ph.D.;* R. W. Trice, *Ph.D.*

Assistant Professors: E. Garcia, *Ph.D.;* L. Stanciu, *Ph.D.;* A. Strachan, *Ph.D.;* J. P. Youngblood, *Ph.D.*

Courtesy Appointments: R. C. Andres, *Ph.D.;* S. Chandrasekar, *Ph.D.;* K. Kokini, *Ph.D.;* D. H. R. Sarma, *Ph.D.;* Y. Y. Won, *Ph.D.*

Mechanical Engineering

E. D. Hirleman, Head of the School

A. K. Bajaj, Associate Head of the School

J. D. Jones, Associate Head of the School

K. H. Hawks, Assistant Head of the School

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