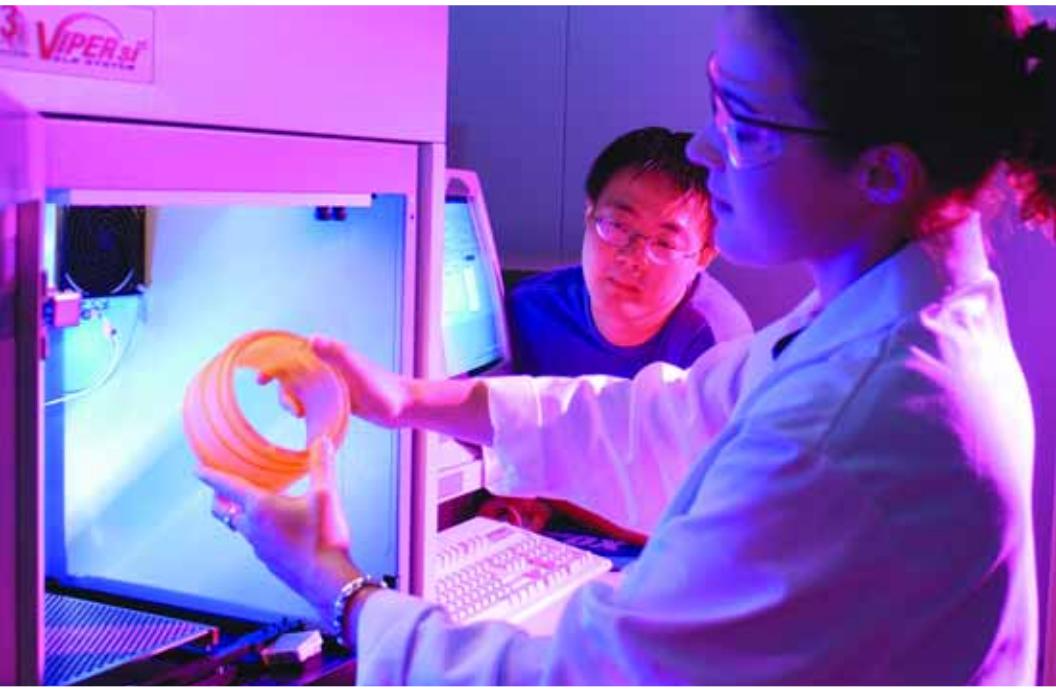
ENGINEERING AT ILLINOIS



2005 Guide to the Engineering Majors

COLLEGE OF ENGINEERING
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
www.engr.uiuc.edu

2005 Guide to the Engineering Majors

Contents

Introduction

You know you like math and science, and you just love tinkering with things—so naturally you decide to go into engineering. The only problem is deciding which field of engineering you want to study. What exactly does a civil engineer do? And how is this different from what a mechanical engineer does? This guide introduces you to the different engineering majors available at the University of Illinois at Urbana-Champaign. If you have questions, visit the departmental websites, and don't feel bashful at all about going to the departmental offices to speak with someone.

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Aerospace Engineering

What is Aerospace Engineering?
Aerospace engineering covers a wide realm of engineering disciplines that culminate in the research and design of air and space vehicles.

What do aerospace engineers do?
Aerospace engineers design, analyze, model, simulate, and test aircraft, spacecraft, satellites, missiles, and rockets, as well as their associated components. Engineers may also be engaged in such research fields as rocketry, aircraft safety, robotics, and the development of new aerospace materials.

Aerospace Engineering at UIUC
The first two years of the Aerospace Engineering (AE) undergraduate program consist primarily of the engineering core curriculum, including classes such as calculus, physics, engineering graphics, thermodynamics, and mechanics. Introductory classes in AE are also taken, including a freshman seminar taught by a faculty member. This course provides an overview of the department and a substantive introduction to aerospace design.

During the junior and senior years, four major fields of study are covered:

- Aerodynamics and Propulsion. This field examines the movement of vehicles and how such movement is affected by different media. A related research topic is the development of electric propulsion systems for spacecraft.
- Dynamics and Control. This field examines how a system's performance can be improved by using information about its current state. A current research topic is the design of alternative control methods for future tailless stealth aircraft.
- Structural Dynamics and Mechanics. This field is concerned with the performance of materials and structures in air and space. A major area of research is the development of lightweight composite materials.
- Design. This field focuses on system engineering, conceptual design, and technical communication skills. Students are split into teams, which work to design either an aircraft or space vehicle. Students often interact with engineers in industry or NASA on these projects. Design teams may also submit their work to national competitions.

A large number of hours are also left open for students to explore other technical areas within AE or other departments. A total of 134 hours are required for graduation.

Career Opportunities

A wide variety of employment opportunities are available to students with a bachelor of science degree in AE. Aerospace corporations, such as Boeing and Lockheed Martin, hire AE students for their knowledge in vehicle design. Auto manufacturers, such as General Motors and Ford, often seek aerospace engineers to improve automobile aerodynamics. AE students may also find positions in the robotics industry, where experience with dynamics and control is valuable. In addition, there exists the possibility of employment in government-supported research units such as NASA. A good number of students also go on to receive their master's or doctoral degrees while conducting research with a leader in their chosen field. Current areas of research include solid rocketry, electric propulsion, race car wing aerodynamics, aircraft icing and safety, computational fluid dynamics, and finite element analysis, to name a few.

Students may also participate in summer intern ships or cooperative education programs within aerospace corporations or NASA. Such experience is of great value when seeking permanent employment after graduation.

Why Aerospace Engineering?

Almost everyone is familiar with some aspect of aerospace engineering, such as the space program or commercial and military aircraft. In addition to these, the field contains a wide variety of opportunities in both research and design. The undergraduate program in Aerospace Engineering at UIUC is one of the best in the nation. By completing a course of study through this program, a student is well prepared to engage in a most challenging and rewarding career.

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Agricultural and Biological Engineering

What is Agricultural Engineering?

Agricultural engineering integrates the biological and physical sciences to provide a foundation for engineering applications in agriculture, food systems, natural resources, the environment, and related biological systems.

What do agricultural engineers do?

Agricultural engineers are involved with food and bioprocess engineering, off-road equipment, bioenvironmental engineering of plant and animal facilities, water quality, and the design of systems for the use and protection of soil and water resources. Important design constraints are related to economics, conservation of materials and energy, safety, and environmental quality.

Agricultural Engineering at UIUC

All graduates obtain a four-year ABET-accredited bachelor of science degree from the College of Engineering and, in an optional five-year program, may receive a second bachelor of science degree from the College of Agriculture. By choice of electives, a student may direct his or her program toward specialization in:

- Power and Machinery
- Soil and Water
- Structures and Environment
- Electric Power and Processing
- Food and Bioprocess Engineering

The curriculum requires 128 hours for graduation, except for the specialization in food and bioprocess engineering, which requires 132 hours for graduation.

Career Opportunities

Graduates of this department are in high demand, and most graduating seniors are employed before the end of their final semester. Graduates are employed by industry, consulting firms, and government for research, education, and manufacturing. Some major employers include the EPA, federal government, Morton Buildings, and Aerovent. Although most students enter industry after graduation, many opportunities are available for students interested in research and further specialization. The Agricultural and Biological Engineering Department at UIUC provides tremendous support for undergraduate students who are interested in enrolling in the graduate program.

Students can also participate in the Cooperative Education program, which gives them a chance to gain valuable industrial experience. By alternating terms on campus with work sessions in industry, students are able to obtain a bachelor of science degree and two years of experience at the end of five calendar years.

Why Agricultural Engineering?

The Agricultural and Biological Engineering Department at the University of Illinois at Urbana-Champaign is world renowned, and departmental advisors ensure that the Accreditation Board for Engineering and Technology requirements are met for any chosen specialization. As an agricultural engineering major at UIUC, you will benefit from a challenging and stimulating program directed at producing the country's best engineers.

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Bioengineering

What is Bioengineering?
Bioengineering combines the analytical and experimental methods of the engineering profession with the biological and medical sciences to achieve a more detailed understanding of biological phenomena and to develop new techniques and devices.

What do bioengineers do?
Bioengineers deal with a wide variety of problems. Students with bioengineering degrees may work as biomedical engineers with medical practitioners to develop new medical techniques, medical devices, and instrumentation for manufacturing companies. Clinical engineers work in hospitals and clinics to maintain and improve the vast amount of technological support required in modern medicine. With advanced degrees in the various fields of bioengineering, some graduates perform basic research related to biology and medicine in the research laboratories of educational and governmental institutions or in the medical industries.

Bioengineering at UIUC
The curriculum requires 132 hours for graduation and is divided into four components. The largest component, basic sciences, dominates the first two years of study. It includes mathematics, physics, and chemistry through biochemistry, and is capped with upper-level life science classes. The bioengineering component begins in the sophomore year and is a quantitative approach employing engineering analysis and design to problems drawn from the life sciences. The third component is the concentration track in which each student develops depth in one area of bioengineering:

- Biosignals, Systems, Control, and Modeling Electronics
- Imaging
- Cellular and Molecular Microengineering
- Computational Biology
- Biomaterials
- Biomechanics
- Biomolecular Engineering
- Cell and Tissue Engineering
- Premedical

The fourth component comprises the general education and free elective coursework that gives balance to a student's education.

Career Opportunities

Students completing the undergraduate curriculum in bioengineering will be prepared for professional careers in businesses related to medical diagnostics, prosthetic devices and implants, the pharmaceutical industry, and consulting in health-related fields. Bioengineering positions are found in industry, commerce, education, and government. Some students may choose to continue their formal education at a graduate school of their choice.

Why Bioengineering?

We are entering the era of bioengineering and biotechnology, building on the tremendous advances in all engineering fields plus the genetic revolution. Almost all observers expect an explosion of bioengineering activity, devices, understanding, and breakthroughs to dominate society during the working careers of students entering college today. The new Bioengineering Department at the University of Illinois unites the fields of engineering, biology, and medical science.

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Chemical and Biomolecular Engineering

What is Chemical Engineering?
Chemical engineering combines the study of chemistry with the disciplines of engineering, physics, and computer science to solve problems. The mission of the Department of Chemical and Biomolecular Engineering is to provide a broad-based education in chemical engineering and related fields for highly qualified undergraduates; to accomplish, in conjunction with a program of graduate education, research recognized by peers as among the most significant in the world; and to serve society through chemical engineering leadership in matters of national policy, education, standards, and professionalism.

What do chemical engineers do?
Chemical engineers make use of our basic natural resources, such as petroleum, natural gas, minerals, and various agricultural products, and convert them to products ranging from computer chips to corn syrups. Some problems that chemical engineers are currently working on include improving the efficiency of petroleum refining, producing cheaper fertilizers and pesticides, and improving the process for the fabrication of semiconductor chips.

Chemical Engineering at UIUC
The American Chemical Society ranks the Chemical and Biomolecular Engineering Department at UIUC among the best in the country. Such excellence is possible because of the high quality and activity of the faculty.

The chemical engineering curriculum is arranged in a flexible manner to accommodate various specific areas of chemical engineering or interdisciplinary areas. Areas that a student can choose to emphasize include environmental engineering, bioengineering, and computer science. Research opportunities are also available to undergraduates in the program. Hence, early planning with an advisor from the department will be advantageous to the student. Upon completion of the program, graduates receive a bachelor of science degree accredited by the Accreditation Board for Engineering Technology.

Students entering without adequate preparation in mathematics and chemistry may find it difficult to complete the chemical engineering curriculum in four years. The department offers an introductory course to the chemical engineering profession (CH E 161) every spring semester for those who are undecided in their major. This class covers the history and scope of chemical engineering endeavors as well as the decisions and criteria for process development and plant design.

The curriculum requires 129 hours for graduation, including 16 hours of approved social sciences and humanities courses for a well-rounded undergraduate education. Also, the department requires all students in the curriculum to maintain a 2.5 general average to be accepted by the department as juniors and seniors.

Career Opportunities

Graduates of this department are soughtafter, and many companies often interview students on campus for intern ships, cooperative programs, and employment. Examples of such companies include Abbott Laboratories, Amoco, Dupont, Exxon, IBM, Intel, and Proctor and Gamble. Areas of employment by industry and consulting firms include research, manufacturing, and process control. More information can be obtained from the placement office in the School of Chemical Science, located at 107 Noyes Lab.

Why Chemical Engineering?

The Chemical Engineering department at the University of Illinois offers a challenging, diverse, and well-rounded curriculum to all undergraduates. Although the department comes under the College of Liberal Arts and Sciences, it maintains close ties with the College of Engineering. The department offers a comprehensive graduate program for M.S. and Ph.D. degrees on the UIUC campus. In addition, it is developing a joint M.S. degree with the National University of Singapore. This will allow graduate students to study and carry research out at both university campuses. The department also offers a special joint degree with the Food Science and Human Nutrition Department in the College of Agricultural, Consumer and Environmental Sciences. This program allows students to receive a B.S. in ChemE and a nonthesis M.S. in Food Science in five years, and it is an excellent opportunity to get a heads-up on one of the largest manufacturing industries in the United States.

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Civil and Environmental Engineering

What is Civil Engineering?
Civil Engineering involves the planning, design, and construction of many of the developments, large and small, that make modern life possible. This work involves finding solutions to many problems faced by society while staying within the limits of available resources, such as materials, space, and money.

What do civil engineers do?
Some of the many facilities that civil engineers are responsible for include bridges, buildings, tunnels, highways, offshore structures, transit systems, dams, airports, irrigation systems, water treatment and distribution facilities, and wastewater collection and treatment facilities.

Civil Engineering at UIUC
The Civil and Environmental Engineering Department is consistently ranked by *U.S. News and World Report* as one of the top programs in the country and attracts the best students and faculty members. A curriculum in civil and environmental engineering encompasses a wide variety of subjects. An undergraduate in this program will receive training in all these areas, while choosing one for primary emphasis.

- Construction. This field involves the planning, coordination, and supervision of the building of facilities. A career in construction engineering requires courses in structures, foundations, buildings, bridges, and transportation facilities.
- Environmental. This field involves finding solutions to problems such as air and water pollution and the disposal of solid waste and hazardous by-products of industry and agriculture. This work is done by designing and building facilities to purify and alter such substances while enforcing state and federal pollution control regulations.
- Geotechnical. This field involves the selection, design, and supervision of foundation construction. This expertise is also needed in siting, designing, and constructing dikes, dams, and underground facilities.
- Hydrosystems. This field involves planning, designing, constructing, and operating facilities for the control and use of water and structures in the marine environment. They provide systems of freshwater supplies and are involved in projects that require underwater work and ocean mining.
- Materials. This field involves developing innovative materials to fit the needs of society. Students in this discipline will take courses in mechanics and materials and will study the properties of concrete, steel, wood, and other common materials.
- Structures: This field involves designing structural projects and supervising their construction. Structural engineers design a variety of systems, ranging from buildings and bridges, to power plants, dams, offshore oil platforms, transmission line towers, and aircraft and space structures.

- Transportation. This field involves the design of transportation systems such as highways, railways, and airports. Transportation engineers are also responsible for rehabilitating and maintaining existing facilities and planning transportation systems to handle international, interregional, and intracity commodity and passenger flow.

All these disciplines require an intense study of physics, math, chemistry, and mechanics, along with some economics and related courses.

Career Opportunities

Our graduates have been involved in many civil engineering projects of great magnitude. From the Golden Gate Bridge, to the Sears Tower, to the English Channel Tunnel, this department's alumni have had a hand in shaping the world in which we live and move. Students find employment in firms such as Commonwealth Edison, the Illinois Department of Transportation, and Boeing. A number of students also continue for graduate study.

Why Civil Engineering?

With so many fields of interest, a civil engineering degree offers students a variety of options before and after graduation. Students are prepared for a challenging career made necessary by the growing demands of society. It allows one to work indoors, outdoors, individually, and in teams, to provide for the needs of society, and to improve modern life.

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Computer Science

What is Computer Science?
Computer Science is the study of the theory, design, and applications of digital computers and information-processing techniques.

What do computer scientists do?
We have seen computers transformed from large-scale computation machines, active only in high-end businesses, to the PCs found in many homes and schools. They have changed the way we live our lives and carry out our daily functions in nearly every imaginable way. Computers are becoming more and more important every day. What does this mean? It means we need people who know how to use them. We need people who can apply current technology and also improve upon it. Today's largest and fastest growing companies are looking for people who can do just that.

Computer Science at UIUC
The Department of Computer Science at UIUC has led the revolution that has redefined the meaning of computing for the last fifty years and will continue to do so for the next fifty years. UIUC students and faculty members have designed and built the world's fastest computers, created the user interfaces that made the World Wide Web and distributed collaboration possible, invented compilation techniques for automatic program parallelization, co-founded the field of computer arithmetic, and explored the operating system and processor architecture models that underlie modern computer systems.

The Computer Science Department provides students with the skills necessary to join the work force in any aspect of the computing industry. The initial stages of the program resemble that of most engineering curriculums and consist mostly of fundamental math and physics classes, which provide a solid foundation for any engineer. These first two years also include fundamental computer science courses, giving the student a broad understanding of the many areas covered in the curriculum. The main areas of study are:

- Software Architecture Foundations
- Numerical Analysis
- Hardware
- Artificial Intelligence

A student will also choose an area other than computer science and complete an application sequence in that field. This sequence is chosen from one of the many fields in which computers are used. The student will learn how computers can be applied to perform otherwise impossible tasks and offer exposure to other engineering fields.

Career Opportunities

After obtaining a degree in computer science, an overwhelming number of opportunities present themselves. Companies come to campus from all over the world to hire our students. These companies include Microsoft, Hewlett Packard, Netscape, Motorola, and IBM. Students are also well prepared for graduate study.

Why Computer Science?

The field of computing is rapidly changing, creating opportunities that require a base of both theoretical and practical skills. Graduates of computer science at UIUC possess the skills necessary to succeed in this dynamic, consumer-driven industry.

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Electrical and Computer Engineering

What is Electrical and Computer Engineering?
Electrical and Computer Engineering (ECE) integrates aspects of physics, biology, medicine, materials science, computer science, and engineering to generate and transmit electromagnetic fields and electricity for use in communications, biotechnology applications, and electronic circuits.

What do electrical and computer engineers do?
Electrical and computer engineers work in numerous and widely varying areas, including the generation and regulation of electric power supplied to the home, the manipulation of signals for communication purposes, the design of computer systems, and the design of specialized circuits for equipment ranging from household appliances to military aircraft. In addition, many graduates extend their knowledge in areas such as medicine and law.

Electrical and Computer Engineering at UIUC
The first two years of study are used to complete basic core classes in math, physics, computer science, and engineering. This course work includes a four-hour lab and lecture course for freshman which, without sacrificing substance, gives students hands-on design experience in electrical and computer engineering. For the remainder of their undergraduate studies, students choose advanced courses in one or more specialty areas.

Computer Engineering Specialties
• Artificial Intelligence. This field involves the design of intelligent systems for applications such as robotics. Major topics in this area include language understanding, knowledge acquisition, reasoning, computer vision, and pattern recognition.
• Computer Systems. This field involves the design and analysis of computers, including the topics of VLSI systems, computer architecture, computer networks, and integrated circuits.
• Systems and Computation. This field involves the integration of both hardware and software into a coherent system for effective application of computers.

Electrical Engineering Specialties
- Power and Energy Systems. This field involves the study of how electrical power is generated and delivered to the home, the North American power grid, generators and motors, and new power electronics applications.
- Physical and Quantum Electronics. This field involves transistors, lasers, light-emitting-diodes, and the development of electronic devices smaller than the cells in the body.
- Circuits. This field involves the design with transistor amplifiers, especially very large scale integrated (VLSI) circuits for both analog and digital applications.

- Analog and Digital Signal Processing. This field involves processing information, such as digitized pictures and sound.
- Bioengineering and Acoustics. This field involves the application of ECE to areas of biology and medicine, with emphasis on ultrasonic, biomedical instrumentation, and medical imaging.
- Electromagnetics and Optics. This field involves the design of antennas for radio and microwave communication, optics, wave scattering and propagation, and microwave solid-state devices.
- Communications. This field involves applied mathematics and engineering in support of satellite and wireless communications for cellular phones, telephones, navigation, and radar.
- Control Systems. This field involves the use of feedback to achieve better control in a wide range of engineering applications, including missiles, robotics, bioengineering, and electronic circuits.
- Space Science and Remote Sensing. This field involves gaining a better understanding of the atmosphere and the earth using electromagnetic signals.

Career Opportunities

Many diverse opportunities await electrical and computer engineers after graduation. Many graduates work for high tech companies such as Intel, Motorola, Microsoft, General Electric, Boeing, IBM, Ameritech, and Illinois Power. Students also find themselves well prepared to pursue graduate degrees.

Why Electrical and Computer Engineering?

The Department of Electrical and Computer Engineering at UIUC is world renown for its excellence in research and education. The department is consistently ranked in the top three or four programs nationally and usually first among public institutions. We strongly encourage you to contact us on the Web. Our "Undergraduate Study" page includes a number of features aimed at high school students, including information on careers and undergraduate life.

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Engineering Mechanics

What is Engineering Mechanics?

Mechanics pervades modern research and development problems. Current work in the field of engineering mechanics includes fluid flow, materials, vibrations and oscillations, fracture, turbulence, applied mathematics, elasticity and plasticity, large-scale computer simulations, acoustics, nonlinear dynamics and chaos, biomechanics, geophysical processes, combustion and detonation, microelectromechanical systems, space technology and exploration, energy development, and electronic packaging.

What do students with an engineering mechanics degree do?

Engineering mechanics is the basis of all the mechanical sciences: civil engineering, materials science and engineering, mechanical engineering, aeronautical and aerospace engineering. Students go on to pursue careers in research and development in all those fields.

Engineering Mechanics at UIUC

Engineering Mechanics (EM) is a fully accredited engineering program. It is a rigorous curriculum in the science of mechanics with an emphasis on physics and applied mathematics. Design experiences and computer applications are emphasized throughout. Students spend the first two years taking a set of core classes that emphasize a broad education covering the basic areas of science and engineering that are fundamental to all branches of engineering.

In addition to the classes required by the core curriculum, engineering mechanics allows students to specialize in one of several secondary fields. The secondary field is chosen in consultation with a faculty advisor and consists of 12 hours of course work in technical courses in mechanics and closely related subjects. During their junior and senior years, EM students specialize in one of the following areas of engineering mechanics:

- Solid Mechanics
- Fluid Mechanics
- Experimental Mechanics
- Computational Mechanics
- Mechanics of Materials

Career Opportunities

Engineering mechanics provides excellent preparation for graduate study in mechanics and related areas. About half of all graduates enter graduate school immediately. Students not continuing full time in graduate school generally take project-management positions in industry, involving applications, design, testing, quality assurance, and customer support. The fundamental training in mechanics serves them well in both small and large corporations. Some recent larger companies that have hired bachelor's degree engineering mechanics students include IBM, Boeing, Raytheon, and Caterpillar.

Why Engineering Mechanics?

The question you have now is this: Is engineering mechanics for you? Ask yourself these questions: Do you do well in and enjoy math and physics? Are you interested in how things work? Do you like tinkering with mechanical things? If you answer "yes" to these questions, then engineering mechanics may be for you.

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Engineering Physics

What is Engineering Physics?
Physics is the study of the complex and basic interactions of matter, energy, space, and time. Engineering physics combines basic engineering classes with fundamental physics and mathematics courses.

What do engineering physicists do?
There are, generally speaking, two categories into which physicists fall. Experimental physicists consider potentially interesting, unknown aspects of physical systems and then prepare experiments to study the behavior of these systems under controlled conditions. Theoretical physicists attempt to find the mathematical relationships that characterize the behavior of physical systems, guided by experimental results.

Engineering Physics at UIUC
Engineering physics is made up of these main subcategories:

- Nuclear and Elementary Particle Physics. This field involves the study of atoms, the nuclei of atoms, and elementary particles.
- Condensed Matter Physics. This field involves the study of the behavior of atoms when they combine to form liquids and solids, including the study of magnetism and superconductivity.
- Biomolecular Physics. This field involves the study of the physical processes of biological systems.
- Astrophysics. This field involves the study of the properties of astronomical objects such as stars, black holes, and planets.

Additionally, students in engineering physics may pursue an applied physics option in one of the following areas:

- Applied Nuclear Physics
- Bioengineering
- Fluids and Plasmas
- Optical Physics and Lasers
- Physical Electronics
- System Analysis and Control Theory

Career Opportunities

Both private industry and the government employ physicists to do research and engineering. The electronics industry is the largest employer of physicists, but the petroleum, chemical, aerospace, instrument, and machinery industries hire numerous graduates also. Private consulting and research firms, engineering and architectural service industries, and commercial laboratories have a need for engineering physicists too. The federal government employs many physicists in its defense, standards, and aeronautics divisions, as well as in national laboratories. Additionally, the broad, thorough training provided in the undergraduate program prepares students to continue on to graduate school to conduct research and instruct the next generation of physicists.

Why Engineering Physics?

The Physics Department at the UIUC is one of the largest departments in the country. Our undergraduate, graduate, and research programs are ranked among the top ten in the world. The hallmark of physics is its technical breadth, and our graduates have the skills to succeed in graduate school or in their choice of industries.

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General Engineering

What is General Engineering?
General Engineering is a unique curriculum that spans many disciplines of engineering. In response to the demand for well-rounded engineers, the General Engineering program was developed to educate students to become strong leaders and decision makers with practical engineering abilities.

What do students with a general engineering degree do?
General engineers fill positions ranging from administrators to project designers, supervisors, and group leaders in research or production. They serve also as sales engineers, technical service representatives, directors of public relations units, and in other posts of leadership requiring both technical knowledge and the ability to deal with people effectively.

General Engineering at UIUC
General engineering students at UIUC take solid classes in basic sciences, engineering sciences, and engineering design. They focus primarily in mechanics and structures, control systems, and decision making from an interdisciplinary engineering perspective. However, a General Engineering student also specializes in a particular field of study—the secondary field that can be chosen from a preapproved list or customized around a student's own particular interests and career goals. In the past several years, students have specialized in secondary fields including robotics, industrial design, pre-medicine, cinematography, and even Japanese.

Students in the general engineering program build leadership and learn business principles and practical engineering skills both inside and outside the classroom. Classes specifically designed to meet these objectives, as well as several other seminars and programs, are an integral part of a General Engineering education. One particular program, Teamwork for a Quality Education, or TQE, organizes groups of freshmen, sophomores, juniors, seniors, grad students, and faculty to accomplish the simple goal of obtaining the highest quality education for each member of the team. Peer tutoring, community service, and technical projects are all a part of the overall plan to achieve this goal.

The capstone senior design project exposes students to real engineering problem solving within industry. Groups of General Engineering students are linked with a particular company to solve a "real" engineering problem. For the duration of the project, the student-directed team collaborates with the company to cooperatively engineer solutions to a particular industry-related problem or situation. At the end of the project, the students have gained valuable practical experience while the companies have often saved millions of dollars from the students' ideas. The senior design projects completed in the past 26 years have won more national Lincoln Arc Welding Awards (including the prestigious Best of Program in 1995) than any other university in the country.

Career Opportunities

After a general engineering student graduates from UIUC, the opportunities for employment or graduate study are virtually endless. Many general engineers find jobs in consulting, computer-aided design/manufacturing (CAD/CAM), production, plant layout, quality control, and other industrial applications. Many of our graduates enter into management tracks after graduation. Some nontraditional careers for general engineers include business, patent law, medicine, and a multitude of various technically related fields.

Why General Engineering?

With a degree in general engineering from a department that is second to none, the leadership and practical engineering skills acquired within the General Engineering Department at UIUC will lead to any career path you choose.

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Industrial Engineering

What is Industrial Engineering?

Efficiency, productivity, competitive, and cutting edge—these are some of the words that best describe industrial engineering. It is the improvement of manufacturing and other processes to maximize productivity and profit.

What do industrial engineers do?

Industrial engineers can be found in a wide variety of fields, often playing unique yet crucial roles. They can be found not only in manufacturing and industrial settings but also in hospitals, government agencies, and financial institutions.

Industrial Engineering at UIUC

For industrial engineering (IE) students, the first couple of years of school will be spent mastering fundamental math, chemistry, and physics requirements, just like other engineering students. The IE course work sets in around the third year, when students take the following topics:

- Operations Research. This field involves everything from plant or factory layout using computer simulation to production planning and control. Some topics that fall under this heading are managing inventory or material flow and project or production scheduling.
- Quality Control. This field involves improving processes and quality through statistics and probability. In any competitive market, improving quality and efficiency is vital to survival.
- Human Factors. This field involves designing workplaces that maximize safety and health issues, which is sometimes called ergonomics. This area can also deal with workplace psychology and cognitive processes.

The Department of Mechanical and Industrial Engineering at UIUC is committed to providing its students with the best education money can buy. Undergraduates can often get involved in the department's research programs. Included in these programs are the Manufacturing Research Center, the Machine Tool Agile Manufacturing Research Institute, and the Center for Machine-Tool Systems Research.

Career Opportunities

Most UIUC industrial engineering seniors are employed before graduation. Industrial engineers have taken jobs with such companies as General Motors, Accenture, and Caterpillar, to name a few. Graduates with an industrial engineering degree often find they can work in several departments of a company, including quality engineering, manufacturing, production, and management.

Why Industrial Engineering?

The opportunities awaiting a UIUC industrial engineering graduate are virtually limitless. However, one should not count on strolling leisurely through this program. There are reasons for UIUC's fantastic reputation in industrial engineering. Its students must prove themselves through hundreds of hours of studying and problem solving. The payoff comes with the challenging and high-paying careers that wait on the other end.

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Materials Science and Engineering

What is Materials Science and Engineering?

Materials science and engineering involves the study of the structures, properties, composition, synthesis, and performance of materials.

What do materials scientists and engineers do?

A materials scientist or engineer works with materials to improve them or to create new materials. They also help to determine what materials are used in a product based upon given requirements and how to produce these materials efficiently. Basically, materials scientists and engineers work to improve materials and the products made from those materials.

Materials Science and Engineering at UIUC

The first two years of study are spent in a core engineering curriculum. This core program includes courses in physics, chemistry, calculus, statics, drafting, and computer programming. Students may take an introductory seminar class their freshman year and an introduction to materials engineering course their sophomore year. In the junior year, students will take the basic materials properties courses, such as materials thermodynamics and materials synthesis. The senior year is spent studying in an area of specialization. Currently, 128 credit hours are required for graduation.

There are four main areas of study in the MatSE curriculum:

- Metals
- Ceramic
- Electronic Materials
- Polymers

Two other interrelated areas include composites and biomaterials.

Career Opportunities

Materials science and engineering graduates have a variety of options open to them. After graduation, they can find jobs with many different companies or national laboratories. Some of these companies include Intel, 3M, Motorola, Du Pont, Owens Corning, National Steel, Abbott Labs, and Ford Motor Company, just to name a few. Some graduates also choose to go to graduate school to obtain M.S. or Ph.D. degrees. Other graduates enter medical or law school to obtain an advanced degree, or they may attend business school to obtain an MBA degree.

Why Materials Science and Engineering?

For the past several years, the Materials Science and Engineering Department at UIUC has been ranked among the top three materials programs in the nation. If you are concerned about large class sizes, then you may like our undergraduate classes, with an average size of around 22 students. Several student organizations on campus plan a variety of events throughout the year. The materials department also has its own job placement office, which helps students find jobs after graduation, as well as summer jobs or co-op positions while still in school.

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Mechanical Engineering

What is Mechanical Engineering?

Mechanical engineering applies a number of mathematical and science-related courses to design components, machines, and systems involving the conversion and usage of mechanical energy.

What do mechanical engineers do?

Mechanical engineers can be found in almost every part of industry, ranging from the appliance and automotive industries to the aerospace and defense industries. They can work to answer such questions as how to make a plane's wings withstand more stress or how to make a refrigerator run on less energy while maintaining an even temperature. They attempt to find solutions for such questions as how to make a car run efficiently on solar power and what materials should be used to make screws that will last over time and that will be less expensive to manufacture.

Mechanical Engineering at UIUC

Aside from the general courses all undergraduate engineering students take, such as physics, chemistry, and mathematics, the mechanical undergraduate curriculum includes in-depth studies concerning the usage of energy, general design principles, and the opportunities to apply these learned principles to modern, real-life problems.

Students can also become active members in several different mechanical and general engineering clubs that invite engineers to their meetings to talk about leading technical companies and their personal work experiences. Some clubs compete against other universities across the country in building small cars and other exciting engineered creations. Mechanical engineering students can also participate in the university's cooperative program, which allows students to gain real-life work experience in almost any industry they choose.

The Department of Mechanical and Industrial Engineering at UIUC is committed to providing its students with the best education money can buy. Undergraduates can often get involved in the department's research programs. Included in these programs are the Manufacturing Research Center, the Machine Tool Agile Manufacturing Research Institute, the Air Conditioning and Refrigeration Center, and the Center for Machine-Tool Systems Research.

Career Opportunities

Most UIUC mechanical engineering seniors are employed before graduation. Mechanical engineers have graduated to take jobs with such companies as General Electric, Motorola, and Caterpillar, to name a few. Graduates with a mechanical degree often find they can work in one of several departments of a company, including design, manufacturing, research, test equipment, and management.

Why Mechanical Engineering?

The opportunities awaiting a UIUC mechanical engineering graduate are virtually limitless. However, one should not count on strolling leisurely through this program. There are reasons for UIUC's fantastic reputation in mechanical engineering. Its students must prove themselves through hundreds of hours of studying and problem solving. The payoff comes with the challenging and high-paying careers that wait on the other end.

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Nuclear, Plasma, and Radiological Engineering (NPRE)

What is NPRE?
Nuclear, plasma, and radiological engineering is a branch of engineering primarily related to the development and use of nuclear energy and radiation sources for a wide variety of applications in energy production, in materials processing and science, and for biomedical and industrial use. This discipline includes the continued safe and reliable applications of fission reactors as central electric power plant thermal sources and the use of radiation sources in areas such as materials, biological systems, medical treatment, radiation instrumentation, environmental systems, and activation analysis.

What do NPRE engineers do?
NPRE engineers study nuclear power and the radiological applications that have emerged in the last half of this century to play a central role in the quality of life and the security we currently enjoy. Applications of nuclear technology will continue to play an important and pivotal role as the needs for electricity expand and new, important uses of radiation are found and developed in the United States and around the world.

Nuclear, Plasma, and Radiological Engineering at UIUC
The curriculum in NPRE provides a solid base from which to pursue careers in a variety of fields that develop and employ nuclear, plasma, and radiological applications. All of these areas, listed below, are heavily dependent on advanced computers and computational techniques.

- Nuclear Power. This field involves the study of nuclear fission power, which accounts for more than 20% of the total electricity generated nationally and continues to be a major component of the nuclear engineering profession. A new generation of nuclear fission power plants is being constructed and deployed around the world, particularly in the Pacific Rim. Nuclear energy is increasingly chosen to provide a safe, nonpolluting source of electricity for many developed and developing nations.
- Nuclear Safety and Reliability. This field, which involves the understanding and development of safety and control capabilities for new and existing nuclear systems, is a significant line of interest as nuclear plant availability increases and more modern techniques for monitoring and regulating nuclear plants become available.
- Environmental Applications of Nuclear Technology. This field involves waste packaging, transport, and storage, which are currently a major focus of the nuclear industry. Lesser known, but equally important, are the uses of neutron activation analysis and other radiological techniques to identify trace levels of impurities and pollutants in the environment and to monitor changes in soil, ground water, and air contaminants. Similar nuclear sensing techniques are employed for oil and mineral exploration and other nonintrusive surveying applications.

- Nuclear Fusion. This field involves the development of nuclear fusion, which is strongly research-oriented. The design and construction of experimental fusion machines, which present a considerable engineering challenge, will provide the basis for the eventual commercialization of fusion as a reliable and plentiful energy source.
- Plasma Engineering and Applications. This field involves the study of plasmas which, while important for nuclear fusion, find a wide variety of applications for materials processing, waste processing, diagnostic techniques, and as sources of light.
- Radiological Engineering and Applications. This field involves the study of radiation for use in a variety of biological, medical, and processing applications. These applications include imaging, diagnostics, and therapy in a number of medical fields and similar applications for materials and for process monitoring and control.
- Instrumentation and Process Control. This field involves the development and application of diagnostic techniques that are central to many industrial, commercial, and health applications. Because radiation often provides a useful source of diagnostic or nondestructive interrogation, its use is central to the development of novel process and control instrumentation.

Career Opportunities

Nuclear engineers find employment in a wide range of companies from Illinois Power to Proctor and Gamble. The curriculum also prepares its graduates to continue formal education at the graduate level.

Why Nuclear Engineering?

The NPR engineering curriculum emphasizes engineering design, the development of communication skills, computer skills, and team work to prepare students to meet the challenges of the discipline and the many opportunities it embodies. Graduates of this department are well prepared to meet the challenges of supplying energy for our future.

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Explore www.engr.uiuc.edu For Your Links to Engineering at Illinois

Students
The College of Engineering website compiles links to admissions, financial aid, housing, registration, timetables, and other college and university resources under Students. (Choose either Prospective Students or Current Students.) Also explore this area of the website to find out about the many activities, clubs, societies, and organizations that provide leadership and professional development to engineering students. If you have questions, please use the Q & A services:

Ask a Dean! Dean Keith Hjelmstad and other advising deans in the Office of Academic Programs answer your questions about applications, transfer credits, financial aid, and other concerns.

Ask a student! Engineering Council members answer your questions about student organizations, activities, and campus life.

Visitors and K-12
Explore these areas of the website for links to campus maps as well as general information about campus and the surrounding communities. Find out about campus tours, mentoring programs, and the students who visit high schools to talk about Engineering at Illinois. Check back often for updates on Engineering Open House, summer camps, and other annual campus events.

A Guide to the Engineering Majors *is sponsored by Engineering Council. Engineering Council (EC) is the students' voice in the College of Engineering. An executive board oversees 13 committees and more than 50 professional and honorary engineering societies. EC holds events that allow students to develop leadership skills, encourages personal and societal achievement, and builds a sense of community among engineering students. EC also sponsors a number of programs that showcase the skills of UIUC engineering students to the campus, the local community, and the general public.*

COLLEGE OF ENGINEERING

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN