Not all engineering programs are equal.

We know from experience that the core curriculum, research opportunities, and service activities offered at the University are some of the things that make Notre Dame engineering unique. Academically, our goal is to help undergraduates examine their options and explore the possibilities open to them as engineers. World-class faculty and cutting-edge research facilities also help prepare students to be leaders in their fields. As a Catholic university, we believe in a values-based approach to all education, including engineering. At Notre Dame, you will find a top-tier university committed to educating technology leaders who approach their work with a focus on ethics.
Other things that make Notre Dame engineering unique include:

- State-of-the-art engineering facilities in the Stinson-Remick Hall of Engineering
- A strong liberal arts core, focusing on oral and written communications
- Courses taught by regular faculty, not graduate assistants
- A one-of-a-kind first-year engineering program
- The opportunity to take a year or more to select a major
- A student/faculty ratio of less than 8 to 1
- Hands-on research opportunities for undergraduates
- A two-course engineering-business practices sequence
- A choice of international study programs
- Numerous opportunities for community service
- Opportunities to pursue a dual degree in liberal arts, science, or business
- Ninety-nine percent of students completing an engineering degree in four years
- Strong success in internship and full-time career placement
- Placement in the best graduate schools in the country
As a first-year engineering student you have the same opportunities that all Notre Dame students have to find the major that’s right for you, while also taking a set of required courses to give you a strong foundation for further engineering studies, including the EG10111/10112 course sequence.

EG10111/10112 introduces basic engineering principles. The courses are taught in sections of 25-30 students, so that all students benefit from the attention of a regular faculty member. Student assistants are a vital part of the classes, helping answer technical questions and easing the adjustment from high school to college.

The EG10111/10112 sequence is designed to help first-year students understand and work as engineers so that they might make an informed choice about their future. Working on a series of projects throughout the year, students learn to predict increasingly complex system behavior, arriving at design decisions based on sound engineering principles and practice.

The engineering program at Notre Dame is one of the most flexible you'll find. It lets you tailor your educational experience and your degree ... from your first year of studies through your senior design project. Academic minors and concentrations, internships, international study experiences, service opportunities, and cutting-edge programs have been designed to help you excel, whether you choose to continue your studies in graduate school or enter industry.

**First Year of Studies — Engineering**

A typical first-year in the College of Engineering includes the following courses:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall Semester</strong></td>
<td>University Seminar or Writing &amp; Rhetoric</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>General Chemistry — Fundamental Principles</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Arts &amp; Letters Core Course</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Introduction to Engineering Systems I (EG10111)</td>
<td>3</td>
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<tr>
<td></td>
<td>Physical Education</td>
<td>–</td>
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<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>17</strong></td>
</tr>
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<table>
<thead>
<tr>
<th><strong>Spring Semester</strong></th>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>University Seminar or Writing &amp; Rhetoric</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Calculus II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>General Chemistry — Biological Processes</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>General Physics I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Introduction to Engineering Systems II (EG10112)</td>
<td>3</td>
<td></td>
</tr>
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<td><strong>Total</strong></td>
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</tbody>
</table>
A unique blend of computer workstations, library resources, and laboratory space, the McCourney Engineering Learning Center in Stinson-Remick Hall of Engineering enhances Notre Dame’s undergraduate engineering experience. The center’s more than 10,100 sq. ft. offers plenty of room for students to work individually or in teams on a variety of discipline-specific and multidisciplinary projects, creating and testing mathematical models via advanced computer simulations, and designing and fabricating prototype systems and processes. As they interact with faculty and student assistants, undergraduates discover the limitless opportunities available within the field of engineering.

www.nd.edu/~englearn

Entering the University, you will be assigned an adviser from the First Year of Studies program, but College of Engineering faculty, academic advisers, and engineering peer mentors (juniors and seniors who help with study sessions, research tips, and even social events planned specifically for engineering students) are also available to help you in your studies. They will work with you to help you determine your major and the courses you will need to take to achieve your goals.

Numerous technical electives and other programs help you to personalize your course of study and your experience. As an engineering student at Notre Dame you will be part of an exciting community, that will help you to learn and grow so that you can participate in the global community after you graduate.

Although initially designed to support the first-year engineering curriculum, the Engineering Learning Center has become a vital tool for student exploration, experimentation, and other hands-on experiences at all levels. Most of the departments within the college have created courses that promote interactive learning, using the center’s features to support students as they analyze, design, build, test, and communicate their findings, ultimately preparing them to function successfully as engineers in today’s multidisciplinary environment.
Bioengineering Options

Because each traditional engineering major plays a role in the research and development of bioengineering technology, bioengineering at Notre Dame does not reside in a single department. This approach to bioengineering allows students to develop an exceptionally strong skill set in a traditional engineering major, while learning how to apply the theories of that field to a specific area of bioengineering.

Students may also choose to minor or pursue a degree concentration in bioengineering. Specialty areas within this field focus on chemical or mechanical engineering principles and include biomechanics, the study of motion and devices in the body; biomaterials, which studies living tissue as well as synthetic materials for use in implants; and bioinstrumentation, the development of electronics and measurement devices for diagnostic and treatment applications. With four of the five largest orthopedics companies in the world within a one-hour drive from Notre Dame, students have a fantastic opportunity to interact with orthopedics professionals on campus or at these facilities as part of their research.

Fundamental Principles in Biological Processes, required for all engineering students, gives undergraduates an introduction to the everyday functions of cells and how they are related to chemical reactions. A fast-paced course, some students have used it as a stepping stone to the wide range of bioengineering research opportunities offered throughout the College of Engineering, particularly first-year students who would not normally have the opportunity to participate in hands-on research until the end of the sophomore year.

Although not currently working on a research project, Michelle Fuhrman applied the knowledge she gained in the course to her work as a student assistant in the Introduction to Engineering course sequence. "Developing an understanding of how intricate biological processes are is as important from an engineering perspective as it is from a scientific one," she says. "Only when engineers understand the interactive nature of the processes can they begin to design the ‘machines’ that can analyze and affect patient health — such as the differentiating factors from a blood sample or the correct patient dosage or concentration of medicine to administer, as well as novel ways in which to deliver the medicine."
Through technical electives and research opportunities, engineering students are able to tailor their educational experience to earn a certificate in materials science. This is important because society is constantly looking for new and better materials to meet its needs. These new materials must be stronger, lighter, more flexible, more corrosion-resistant, and less expensive than the old ones. They must meet the requirements of new and emerging technologies. These new materials — like the wood and stone of years ago — will be the building blocks of tomorrow, impacting industries such as aerospace, automotive, biomaterials, chemical, electronics, energy, metals, and telecommunications.

Materials Options

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Many Notre Dame undergraduates are already participating in high-profile materials research. They are working with nationally known faculty in aerospace and mechanical engineering, electrical engineering, and chemical and biomolecular engineering to develop novel materials for fuel cells, a new generation of semiconductors, biocatalytic membranes, tissue engineering, medical diagnostic devices, and pollution prevention and remediation.

Electrical engineering, computer science, or computer engineering majors may concentrate on bioinformatics or biometrics. Often called computational biology, bioinformatics employs algorithms and mathematical methods to model and analyze biological behavior. It uses computers to mimic the movements and “thought patterns” of simple life forms in order to better understand, interpret, and predict real-life actions. Bioinformatics includes imaging technologies, which aid in medical diagnoses and treatment plans, as well as vision identification, sometimes called biometrics. In fact, students in the Department of Computer Science and Engineering have developed one of the largest databases of faces, for identification purposes, in the United States.

Chemical and civil engineers work collaboratively with biologists, chemists, and physicists in the field of bioremediation. Understanding the geological controls on natural environments and habitats, as well as the impact of human activities upon those environments, is a focus of several research facilities in the college.
Notre Dame and the College of Engineering encourage students to participate in international study programs. These study-abroad experiences, which are available during your junior year and summer breaks, develop leadership skills and build respect and understanding for different cultures.

Selected and carefully developed so that they mesh with the on-campus engineering curricula, these programs allow you as an engineering student to spend time abroad yet still graduate in four years. Different courses are offered in each program location, so it is important to work with your academic advisers in the college to select the international study experience that will best fit your chosen engineering discipline.

Semester-long study-abroad programs available for you as an engineering student include London, England; Perth, Australia; Puebla, Mexico; Cairo, Egypt; and Santiago, Chile. Engineering students may also choose to study in Dublin, Ireland, for an entire academic year or for a semester.

Some students prefer summer study-abroad programs. Six-week summer programs are available in Beijing, China; London, England; Rome, Italy; and Alcoy, Spain.

All of the programs will introduce you to the culture of a country as you interact with local residents, explore historical sites, and tour engineering facilities. Some programs do require students to be fluent in a language other than English.

工程学专业的国际项目

工程学专业的国际项目不仅提供丰富的文化体验，还提供了建立合作伙伴关系和与来自其他文化的学生和教师合作的机会。这为南丁格尔工程学学生提供了一种实习式体验。例如，中国夏季工程计划将学生与航空航天和机械工程、电气工程或计算机科学与工程的中国学生配对，他们在京师大学进行实地工作，解决由国际公司提出的实际问题。项目可能包括设计一种测量肋状圆柱滚子轴承的新方法和设备，或通过减少20%的汽车乘客座椅重量同时保持安全标准来解决这个问题。对于任何国际项目，掌握一国语言的基础是有帮助的，但对参加此项目的学生来说至关重要的是一般的工程原理知识。此工程计划包括自下而上的和自上而下的工程视角，以便找到解决方案。项目结束时将举行正式的高管和导师的会议。
Business Options

While a handful of universities — particularly those with business schools — offer business management training for engineering undergraduates, the Integrated Engineering and Business Practices Program at Notre Dame is one of the few programs in the country that integrates business courses into the engineering curriculum.

The College of Engineering’s business practices program is a two-course sequence designed to help engineering students develop an understanding of the dynamics of corporate operations. Students learn how to read a financial report and study business planning cycles as they review corporations and their financial processes. They examine managerial styles and organizational climates and discuss hiring trends in human resources.

In addition to classroom instruction, the courses feature guest speakers who are professional engineers and managers, teleconferences with industry executives, business simulation programs, case studies, and required student presentations.

An engineering degree, particularly when paired with a keen understanding of business processes, is very marketable and can be applied in a variety of careers. Engineers comprise 20 percent of all Fortune 500 CEOs — more than any other single undergraduate degree. Three presidents, several governors, senators, and congressional representatives have had engineering backgrounds.

Undergraduates who choose to develop additional business-related skills in accountancy and finance, and who want to deepen their understanding of the detailed economic issues that drive businesses and consumers, can opt for the Minor in Engineering Corporate Practice (MECP). The MECP is a college-wide minor that builds on the courses in the Integrated Engineering and Business Practices Program.

Students with a stellar academic record and a keen interest in business development could also enter the Engineering/M.B.A. program, which is offered jointly with the Mendoza College of Business. Students may apply for the program in their junior year and will spend their fourth and fifth years at the University finishing both the engineering undergraduate degree and the master’s of business administration. This joint program allows a student to complete both degrees in five years, rather than the six years traditionally necessary to obtain these degrees if pursued separately.

www.engineering.nd.edu/engbiz/
In addition to academic programs, the College of Engineering offers other programs specifically designed to meet the needs of all of its students.

**Women’s Engineering Program**
The purpose of the Women’s Engineering Program is to address the unique needs of women students and the different experiences they bring into the Notre Dame engineering community. Through a supportive community within the College, our women develop the leadership and academic skills key to success. Students are also encouraged to participate in the nationally recognized award-winning collegiate section of the Society of Women Engineers.

**Minority Engineering Program**
The College of Engineering is committed to maintaining an environment where students of diverse backgrounds are a vital part of the engineering community. The Minority Engineering Program aims to develop strong leadership skills for college life and beyond, and encourages students to participate in Notre Dame sections of the National Society of Black Engineers and the Society of Hispanic Engineers and Scientists.

**Joint Engineering Council**
The Joint Engineering Council serves as an umbrella organization for all of the engineering professional and honor societies at Notre Dame. It represents the engineering student body, sponsoring academic and career events, such as Engineer’s Week and Industry Day, community outreach programs, and social events.
Service Opportunities

Developments in communication, medicine, and a host of other industries rely on the expertise, creativity, and commitment of engineers to build a better world.

As a Catholic university, Notre Dame stresses the academic aspects of campus life, but it also encourages its students to live their faith through service to those in need. The College of Engineering offers a number of opportunities for students to gain valuable life experience as engineers while also serving humanity. Projects range from ongoing community events to international humanitarian efforts.

A number of student organizations also engage in service through activities on a smaller scale, such as annual blood drives or Thanksgiving food drives.

www.nd.edu/~engopp

In 2008 Notre Dame Students Empowering through Engineering Development (NDSEED) began like most seeds do — small (six civil engineering undergraduates) but filled with hope and a passion for service. Students participating in NDSEED, many of whom are engineers, use what they are learning in the classroom to help build necessary structures in remote communities around the world. Since its inception, working with Bridges to Prosperity and other organizations, as well as students across campus from a variety of disciplines, NDSEED students have built bridges in Honduras, Guatemala, and Nicaragua. These structures now provide safe crossings during the rainy seasons for villagers previously stranded for weeks at a time without life’s basic necessities.

www.nd.edu/~engopp

Community Service Opportunity: Online Data Management System

Computer science and engineering students have been working with the St. Joseph County Chapter of the American Red Cross to design and deploy an online data management system that would enable the local chapter to be more effective and efficient in serving the community when responding to disasters and emergencies. The students have been developing databases that help identify and track resources (food, blankets, temporary shelter, clothing, and medications) along with geographical data to simplify the complex task of matching needs to resources for quicker response times to people in need. They are also developing an Android application that could be used by citizens or by Red Cross trained volunteers to photograph and describe damage to buildings in the community after a disaster. This documentation could then be uploaded to a web site for access by Red Cross staff.

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The College of Engineering offers eight degree programs across five departments. Each program challenges you to think like an engineer, working individually and in teams, just like you will be expected to do after you graduate. There are also plenty of opportunities for undergraduate research in each department on a variety of projects.

Aerospace and Mechanical Engineering

The Department of Aerospace and Mechanical Engineering offers two degree programs: aerospace engineering and mechanical engineering. Both tracks prepare students for careers in industry, government, or research laboratories. Many of our students also continue on to graduate school.

The aerospace engineering program educates students interested in the design, manufacturing, and operation of aircraft and space vehicles. It emphasizes basic aerospace disciplines such as aerodynamics, fluid mechanics, propulsion, orbital mechanics, and solid and structural mechanics. But it also integrates broader disciplines such as design, experimental methods, and systems analysis.

Your first years as an aerospace engineering major will be spent learning the fundamentals. In your junior and senior years, you may choose a more technical specialization in areas such as design and manufacturing, thermal and fluid sciences, bioengineering, solid mechanics, materials, control and mechanical systems, or computational engineering.

Every student undertakes a senior design project, which focuses on the overall performance of an aerospace system. Projects are judged by faculty members in the department and a panel of industry experts.

Aerospace graduates leave Notre Dame having become familiar with multiple fields and types of professional practices, understanding the work aerospace engineers perform and the kinds of problems they solve.

Students entering mechanical engineering also follow a well-rounded program in mechanical sciences. The curriculum emphasizes modeling or simulating discrete and continuous aerospace mechanical systems; understanding common sensor types; acquiring digital data from a range of transducers; problem-solving using a mix of analytical, numerical and experimental results; programming in several computer languages; and strengthening oral and written communication skills.

After your sophomore year as a mechanical engineering student, you may choose from a variety of electives designed to enhance your degree. Technical elective courses cover aerospace design and manufacturing, thermal and fluid sciences, bioengineering, solid mechanics, materials, control and mechanical systems, and computational engineering.
Your senior design project will focus on the design and development of a mechanical system or product enhanced by embedded sensors and computers. Many students also submit their projects to undergraduate design competitions.

Mechanical engineering graduates leave Notre Dame understanding the work mechanical engineers perform, especially with regard to mechanical systems and designs enabled by embedded computing.

Students in the Department of Aerospace and Mechanical Engineering may further refine their curricula concentrations in any of a number of key research areas within the college, such as:

- Aerospace Engineering (Mechanical Engineers Only)
- Bioengineering
- Design and Manufacturing
- Computational Engineering
- Control and Mechanical Systems
- Materials
- Solid Mechanics
- Thermal and Fluid Sciences

All seniors take a senior design course. Aerospace engineering students are required to design, build, and test a remote-controlled aircraft. The course is divided into three parts of approximately four weeks each. The first stage of the course involves the concept or “paper” design of the vehicle. During this period students must take into account the challenge: to design a remote-controlled aircraft which can carry a specified payload, take-off on grass in no more than 300 ft., and return and land safely. In addition, all planes must feature a fixed main wing; house an electric motor powered by a battery power pack; and include an internal cargo which consists of a “sport” propeller, an onboard microprocessor, and a digital radio control system with up to seven channels.

Once students have completed the initial concept, they generate a full set of plans on CAD systems in the department’s design laboratories. Although they can purchase some of the materials, they are required to manufacture many of their own parts.

The final “test,” of course, is whether or not the vehicle can fly. Each aircraft must pass a flight test that consists of maintaining velocity at a constant attitude and achieving a change in altitude through a minimum of a 100 ft. climb. During each flight information from the microprocessor is transmitted to a laptop computer located on the ground. Flight performance is analyzed using the data collected. All of it figures into the final grade for the course.
The goal of the Department of Chemical and Bio-
“focused on innovation and application of wireless
technologies” molecular Engineering is to provide an
educational program that combines a strong funda-
mental focus in chemical engineering with a broader
perspective brought in by courses in the humanities
and the sciences. Students come to appreciate the tech-
nological aspects of chemical engineering, as well as the
complex scientific, social, and moral issues that affect
the practice of chemical engineering.

Emphasizing the fundamentals better prepares students
for careers in chemical engineering in areas such as
consumer products, petroleum, food processing,
computer chip manufacturing, advanced drug-delivery
systems, environmental contamination remediation,
and the sustainability of energy sources and other
raw materials necessary for life in a modern society.

Chemical engineering undergraduates at all levels par-
ticipate in research activities with faculty and graduate
students. They explore in-depth areas such as environ-
mentally benign solvents, biomaterials, microfluidic
devices, catalysis, fuel cells, and drug-delivery systems.

As a junior or senior, you may choose elective courses
that provide specialized training in materials, environ-
mental chemical engineering, or biomolecular engi-
neering. The department also offers a pre-med track
for those planning to attend medical school.
One of the many reasons researchers around the world are focusing on energy is the fact that it is vital to dynamic societies and healthy economies. However, the most compelling reason to reassess energy use may be the link between global climate change and the burning of fossil fuels. Faculty and student researchers in the College of Engineering are studying cost-effective ways to produce clean, safe, and renewable energy. One of the projects on which they are focusing involves clean coal technologies using ionic liquids.

Although there is enough coal globally to last several hundred years, burning coal in conventional coal-fired power plants causes the formation and emission of particulates, as well as oxides of nitrogen, sulfur, and carbon. Notre Dame research teams are developing more energy-efficient processes to perform gas separations using ionic liquids, which are non-volatile and do not contribute to air pollution. In fact, Notre Dame is a pioneer in the use of ionic liquids for these types of applications.

Because no single solution will meet the energy challenge, University researchers are also pursuing projects to develop and improve energy efficiency, safe nuclear waste storage, and renewable energy sources, including solar, wind, and biomass technologies. Undergraduate research opportunities are available in all of these areas.
Notre Dame’s civil and environmental engineering and earth sciences programs offer a well-rounded curriculum that focuses on the basic principles of science and engineering while preparing students for a variety of careers ranging from construction, industry, and national laboratories to consulting and leadership in academia.

As with the other programs in the College of Engineering, a strong foundation is laid during the first two years. As a junior or senior, each student selects an area of specialty, such as civil engineering, environmental earth sciences, or environmental engineering.

Throughout the program undergraduates develop knowledge, skills, vision, and an ethical decision-making framework that allows them to become leaders in the design, construction, and protection of civil infrastructures. They also receive a foundation...
in the physical sciences that emphasizes the processes which occur near or at the surface of the earth and the impact of human activity on such processes. They are able to explore the geochemical, mineralogical, and hydrological properties of the earth’s crust and develop an understanding of the interplay between natural processes — such as mineral-rock-water-bacteria interactions — with anthropogenic issues — such as the transport of toxic heavy metals and the safe disposal of nuclear waste.

The combination of classroom, laboratory, seminars and field trips expose students to the realities and professionals in their field so that they are able to serve society from helping provide and protect the most basic needs of clean water and shelter to the advanced energy needs and transportation systems that sustain a thriving economy and a high standard of living.

Students in the Department of Civil & Environmental Engineering & Earth Sciences may further refine their curricula with concentrations in key research areas, such as:

- Environment (Civil Engineering Majors Only)
- Hydraulics and Structures (Civil Engineering Majors Only)
Focusing on the application of computers to real problems, especially with regard to the design, development, and use of software, the computer science program builds upon a foundation of basic science, mathematics, and engineering courses. Students study current computer software and hardware technology while they learn about the key properties of algorithms (the mathematical statements of problem solutions), and how to design and implement algorithms to efficiently solve programs. Students also explore the theoretical foundations of computer engineering, software and hardware systems, computer applications, and the social and ethical implications of computing technology.

Using modern software development tools and techniques, computer science students develop the ability to engineer large, efficient, portable, and scalable pieces of software that implement algorithms in ways that are helpful to end users. They learn to function independently and on multidisciplinary teams and are well prepared for continued change in future computing technology, including understanding the effects of computer technology on society.

The computer engineering program focuses on understanding both the fundamental nature of the electronic

Facilities Include
Computer Vision Research Laboratory
Cooperative Computing Laboratory
Data, Inference, Analysis, and Learning Laboratory
Embedded System Design Group
Laboratory for Computational Life Sciences
Nanomagnet Logic Research Group
Notre Dame Bioinformatics Laboratory
Robotics, Health & Communication Laboratory

BIOMETRICS:
IRIS, EAR, GAIT, AND FACE RECOGNITION TECHNOLOGIES
Fingerprinting is one of the oldest and most reliable forms of biometrics – the use of physical or biological characteristics to identify people with or without their knowledge. The security impact of biometrics technologies is obvious.

A leader in biometrics research, Notre Dame’s efforts have been supported by the National Science Foundation, Central Intelligence Agency, Intelligence Advanced Research Projects Activity, Federal Bureau of Investigation, and the Department of Justice. One of the most recent projects at the University focusing on biometrics involves iris recognition technologies. Iris recognition uses near infrared illumination and special camera technology to create digital images of the intricate structure of the iris, the textured part of the eye that surrounds the pupil. These types of images are used, for example, in security applications such as frequent traveler programs to clear immigration services.

Originally thought to be an “unchanging” physical marker, results obtained by faculty, graduate students, and undergraduate researchers at Notre Dame have shown that pupil dilation affects images of the iris. The team’s findings have led to changes in the international standard for iris template data, so that it now includes a value for estimated pupil dilation.

The Notre Dame team has also studied how the accuracy of iris matching changes over time, between the time the initial image is captured (and stored in a database) and when it is called up to match a “fresh” image. The group’s work identified a noticeable degradation in the matching quality of the same iris after four years, suggesting that iris scans, like facial photographs, should be re-taken at set intervals.

In addition to the iris, the Notre Dame group is pursuing face, gait, and ear recognition technologies.

Early in the program computer engineering students learn to use modern design tools and techniques to develop, analyze, and prototype digital computing systems. The senior design experience gives students the opportunity to analyze a problem, identify a potential solution, place the solution in the context of existing work, implement a prototype of the solution, test and assess the prototype, and document and present the work.

Students in the Department of Computer Science and Engineering may specialize in a variety of concentrations with multiple course requirements including:

- Bioinformatics and Computational Biology
- Cloud Computing
- Information Technology Leadership
- Media Computing
Electrical Engineering

Notre Dame’s electrical engineering program provides students with a solid foundation in the analysis and design of electronic circuits, systems, and devices. As an electrical engineering student, you will be immersed in the technology at the heart of the information revolution that has transformed our modern world — enabling everything from cell phones and video games to medical information processing and next-generation integrated circuit (IC) chips.

The electrical engineering curriculum includes required and elective courses in the pure and applied “focused on innovation and application of wireless technologies” sciences, as well as in the fundamental principles of electrical engineering. During your first and second years in the program, you build a breadth of understanding and lay the foundation for specialized study. Then, as a junior or senior, you may select from a wide array of elective courses focusing on such diverse technologies as nanotechnology, wireless communication systems, microelectronics and IC fabrication, signal and image processing, photonics, control systems, and “green” energy processing.

As a graduate of the electrical engineering program, opportunities are available to you in virtually every industry. Our students have gone on to take important roles in such diverse fields as national security, entertainment, telecommunications, finance, aerospace, power generation, chemical processing, and construction. Every industry that requires “high tech” informa-

Centers and Institutes
- Center for Applied Mathematics
- Center for Low Energy Systems Technology
- Center for Nano Science and Technology
- Wireless Institute

Facilities Include
- Controls Systems Research Laboratory
- Device Simulation Laboratory
- High-speed Circuits and Devices Laboratory
- Laboratory for Image and Signal Analysis
- Nanoelectronics Laboratory
- Nanofabrication Facility
- Nano-optics Laboratory
- Optoelectronics Laboratory
- Photonics Laboratory
Through key courses in the College of Engineering and the John J. Reilly Center for Science, Technology, and Values, undergraduates are able to work directly with internationally known faculty while they study the societal implications (and technical ramifications) of nanotechnology. The students gain hands-on experience in a field that holds incredible potential for the next generation of materials and devices.

Funding from the University’s Strategic Academic Planning Committee and the National Science Foundation supports undergraduate researchers during the academic year, as well as during intensive summer research programs. These students are able to work in several of the facilities and centers of the University, including Stinson-Remick Hall. This building features a 10,000-sq.-ft. clean room and shielded area, to help with low noise measurements. Temperature and humidity controlled, the clean room also provides a cleanliness level of ISO 5 (class 100) with extremely low electromagnetic (<0.1 mG), acoustic (<60dBA), and vibration levels (VC-D) to support the fabrication of nanostructures. This type of facility is comparable to those found in industry, which helps provide students, undergraduates as well as graduate students, with technical knowledge and practical experience that will help them succeed.

Students in the Department of Electrical Engineering are able to focus their efforts through a number of concentrations with multiple course requirements including:

- Biosystems
- Communications
- Energy
- Multimedia
- Semiconductors and Nanotechnology

www.ee.nd.edu

If additional study is in your future, you should know that many of our undergraduates go on to study at the world’s finest graduate schools, including Princeton University, Massachusetts Institute of Technology, University of California at Berkeley, and Cornell University. Many also opt to go on to law or medical school.

www.ee.nd.edu
Minors and Options

To develop additional depth and breadth to their education, the College currently offers students several minors:

Students who intend to work in industry may benefit from the engineering corporate practice minor, which is open to seniors and develops skills in the areas of business operations, accountancy and finance. The interdisciplinary minor comprises the two-course Integrated Engineering and Business Practices sequence offered by the College of Engineering, an economics class taught by the College of Arts & Letters, and accountancy and finance introductory courses in the Mendoza College of Business.

Students interested in bioengineering may take a six-course sequence where they learn how to use the tools of engineering analysis with the fundamentals of the engineering and life sciences. The sequence enlivens the understanding of living organisms, medical treatments, and biochemical pathways and provides quantitative predictions and insight towards the design of medical and biological devices and processes. This minor consists of three foundational courses in bioengineering, cell biology, and more advanced courses in the biology field, along with three courses specializing in areas such as biomaterials, biomechanics, biotransport/microdevices, tissue engineering and biomaterials, molecular and cellular bioengineering, bioinformatics, biomedical imaging and treatment, and environmental bioactivity and remediation.

The energy engineering minor, consists of a five-course sequence that deepens a students understanding of the various aspects of energy from an engineering perspective, including courses that address energy systems, combustion, gas turbines, electrochemical energy and storage, energy and climate, fuel cells, alternative energy devices and materials, electric machinery and power systems, and electric and hybrid vehicles.

Engineering students interested in an interdisciplinary approach to understanding global energy issues may pursue the energy studies minor offered by the College of Engineering through the Center for Sustainable Energy at Notre Dame. This minor, which features courses taught by faculty from across the University, prepares students to understand the complexity of the energy challenge and gives them the technical and non-technical background to help lead us towards a sustainable energy future. The foundational courses teach the fundamental technical skills necessary to understanding energy and energy systems, and present a survey of energy resources and a quantification of the connection between energy use and global climate change. Students follow this with a one-credit seminar on energy policy, the
environment, and society offered by the Center for Social Concerns, and a three-course sequence focusing on either a technical or non-technical aspect of the global energy situation.

Students with a strong interest in integrating more of the mathematical and computational tools common to all disciplines into their engineering education may pursue a five-course minor in **computational engineering**. Students may select from a range of courses offered in all departments that together will expose them to the fundamentals of programming and numerical methods, experience and skills in computer usage, and knowledge of applications from a range of different areas.

The **environmental geosciences** minor comprises 16 credits of course work in areas relevant to the Earth’s geology. It emphasizes the inter-relationships of geosystems and human impact on the environment through courses in geology, geochemistry, geomicrobiology, mineralogy, and the environmental impact of resource utilization.

Broaden your skill and your marketability by adding a minor to your engineering degree. A minor shows commitment and expertise in a specialty area that can help you stand out from other job applicants; it can also satisfy your personal interests in a field related to your main area of study. Minors offered by the College of Engineering require at least four courses (12 credit hours) past degree requirements and include:

- Bioengineering
- Computational Engineering
- Energy Engineering
- Energy Studies
- Engineering Corporate Practice (MECP)
- Environmental Geosciences

www.engineering.nd.edu/academics/undergraduatedegreeprograms
Dual-degree Programs*

Dual Enrollment in ESTEEM
Students who enter their senior year with less than two full-time semesters of study remaining may apply for early, dual enrollment in the Engineering, Science and Technology Entrepreneurship Excellence Master’s (ESTEEM) program, which focuses on entrepreneurship and business development in a technical context. This dual enrollment enables students to complete the ESTEEM program and enter the employment market with an additional summer and one semester of study past the bachelor’s degree, rather than the two semesters and a summer of study typically required of ESTEEM program participants.

Engineering/Arts & Letters
Some students choose to enter the dual-degree program between the College of Arts & Letters and the College of Engineering. Although the dual-degree program takes an additional year to complete, you graduate with degrees from both colleges — a bachelor of arts from the College of Arts & Letters and a bachelor of science in your chosen degree program from the College of Engineering.

Qualified students may receive scholarship support from the John J. Reilly Endowed Scholarship program during the fifth year of study.

Engineering/Science
Engineering students who want to broaden their education with the more theoretical aspects of science may pursue a dual-degree program with the College of Science. Students may design individual programs to suit their interests in areas such as computer science and mathematics, chemical engineering and chemistry, and mechanical engineering and biology. These five-year programs lead to two bachelor of science degrees, one in engineering and the other in a science field.

Engineering/M.B.A.
Students who want to integrate their study of engineering with management may apply for the highly selective dual-degree program between the College of Engineering and the Mendoza College of Business. Students completing this five-year program earn a bachelor of science degree in engineering and a Master of Business Administration (M.B.A.).

Because it is a demanding program, it admits only those students of superior scholastic ability, who have both the aptitude and motivation necessary for the combined graduate and undergraduate program.

* Students interested in learning more about dual-degree programs should contact the undergraduate advisers in the College of Engineering during their first year of studies.
Advanced Placement Credits

University regulations require that students complete at least 90 hours of post-high-school college course work to receive a Notre Dame degree, which limits the number of AP credits that can be applied to degree requirements.

Credit by Examination
As an entering first-year student, you may earn credit by examination in three ways:

- Through the Advanced Placement Program and SAT II Subject Test for French, German, and Spanish administered by the College Entrance Examination Board.
- Through the International Baccalaureate Program administered by International North America.
- Through the Course Credit Examination Program administered by the University’s First Year of Studies Program.

Credit from Other Institutions
College courses completed on college campuses and used to satisfy high school graduation requirements or Notre Dame requirements for first-year admission are not accepted for credit.

College courses completed on college campuses after high school graduation but prior to enrollment as a first-year student at Notre Dame are considered for credit as determined by the First Year of Studies program and in consultation with other colleges and departments. Normally, courses specified in the first-year curriculum may not be satisfied through transfer credit. First-year students must resolve all college credit situations before or during their first semester at the University and must present an official transcript and a copy of the published description of the course.

More complete information is available in the University’s Bulletin of Information.

fys.nd.edu/incoming-students/credit-by-ap-ib-sat-ii-transfer/ap-exam-credit/
The College of Engineering is committed to helping you succeed, not only as a student but also as a professional engineer. We stay in close contact with our alumni, as well as with corporations and research facilities across the country, so that we can offer numerous opportunities for undergraduate research experiences and student internships. Working with the University’s Career Center, we also strive to help students locate, prepare for, and interview for positions in industry, government, and graduate schools.

We know that our graduates are technically excellent. Approximately 99 percent of Notre Dame engineers pass the Fundamentals of Engineering exam, compared to 77 percent nationally. Beyond technical proficiency, company representatives often comment on the outstanding communication skills and team attitude displayed by Notre Dame engineers. One of the many reasons companies hire Notre Dame engineers is that they know they are getting well-rounded professionals.

**After-graduation Statistics**

- 70% of our students choose full-time employment upon graduation
- 5% join service programs
- 10% pursue careers in the military
- 15% attend graduate or professional school
- 15% attend graduate or professional school

Every year, the College of Engineering, in conjunction with the Joint Engineering Council and the Society of Women Engineers, sponsors a career fair for students. The fair and related activities provide the opportunity for students and companies to interact with one another on professional and social levels for internships and full-time employment.

In preparation for Industry Day activities, the college and Career Center work with students to develop resume books and hone interviewing skills.

More than 80 companies typically attend Industry Day and hire Notre Dame engineering students, including:

- Accenture
- Analog Devices, Inc.
- Biomet, Inc.
- Boeing
- BP Energy Company
- Bristol-Myers Squibb
- Central Intelligence Agency
- Daimler Chrysler
- Delphi Automotive Systems
- DuPont
- Federal Bureau of Investigations
- General Electric
- Hewlett-Packard
- Honeywell
- Ingersoll-Rand
- Johnson and Johnson
- Kiewit Corporation
- Lockheed Martin Corporation
- Marathon Ashland Petroleum LLC
- Microsoft Corporation
- Northrop Grumman
- PPG Industries
- Raytheon
- Turner Construction
- Unisys Corporation
- Westinghouse Electric Company
- Xerox