

ELECTRICAL ENGINEERING

Electrical engineers create products and services for society out of materials that exist in nature using principles of science and common sense. The profession is broad, encompassing products valued by society in many technical specialties from electric power and energy utilization to our current information age.

The Program

The electrical engineering program at North Dakota State University is accredited by the Engineering Accreditation Commission of ABET, www.abet.org. It has the largest enrollment in the Dakotas. The department faculty, many of whom have years of experience in industry and teaching, give considerable attention to the individual student. Major components of the undergraduate program are basic science and mathematics, humanities and social sciences, communication, engineering science, engineering design and ethics, and both breadth and depth in electrical and computer engineering.

Areas Of Specialization

The curriculum is designed to reflect the broad nature of the field and allows the student to tailor his or her studies within broad parameters. Students are encouraged to develop an individual program of study in close consultation with their advisors. To aid this process, recommendations are available to illustrate how specialization may be obtained in a number of different technical areas. Students are free to mix and match from the following examples to suit their particular interests.

Biomedical Engineering -- is firmly based in engineering and in the life sciences. It integrates medicine and engineering in the effort against illness and disease by providing appropriate products, tools and techniques for research, diagnosis and treatment by health care professionals.

Communication and Signal Processing -- are closely related fields in electrical and computer engineering. Communication is the process of transferring information from one point in time and space to another. Signal processing deals with signal representation, signal design and filtering. Students with a specialty in communication and signal processing find challenging opportunities world-wide to meet the ever increasing need for more convenient, inexpensive and reliable communication and signal processing.

Computer Engineering -- deals with both hardware and software for small and large computers. It also deals with the increasing number of products that have dedicated computers within the product such as smart phones, game consoles and automobiles.

Control Engineering -- deals with the design and implementation of algorithms for controlling physical systems. Examples include active suspension for cars, active damping of vibrations in robotics and autopilots for aircraft.

Electromagnetics -- involves the study and application of electromagnetic compatibility, fiber optics, antennas, radar, sonar, satellite systems, power and communication transmission lines, grounding, and shielding and propagation.

Electronics and Microelectronics -- deals with integrated circuits, transistors, lasers, consumer electronics, defense electronics and electronic materials.

Power Systems -- deals with generation, transmission, distribution and utilization of electric energy subject to safety, environmental and economic concerns.

Optical Engineering -- This specialty, available both in electrical engineering and in physics, studies the theories and the practical uses of optics in the following areas: geometrical, physical and Fourier optics; lasers; fiber optics; optical image processing and acquisition; holography; and optical diagnostics using light of various wavelengths.

Nanotechnology -- deals with the study of electrical materials at the nanoscale level, for applications such as solar cells and sensors.

Cooperative Education Program

The Cooperative Education Program allows students to alternate classroom study with a series of paid professional work experiences related to electrical and computer engineering. These experiences increase in complexity as the student's background increases. The program provides opportunity for pre-graduation experience in the profession, exploration of several career opportunities, money for education, an enriched degree and enhanced opportunities for employment following graduation.

High School Preparation

High school students should attempt to complete one unit of physics, four units of mathematics and one unit of chemistry.

The Facilities

The Electrical and Computer Engineering building is part of an eight building engineering complex. The building contains specialized laboratories and equipment. Numerous grants and donations from the National Science Foundation and private industry have provided valuable equipment. Laboratories along with department and university computer capabilities support education and research.

Career Opportunities

NDSU electrical engineering graduates are working all over the world in a variety of exciting jobs at excellent salaries. They work in research, design, sales, manufacturing, testing, installation, development and teaching. Many graduates find an engineering education provides excellent training for fields other than engineering such as business, medicine or law. Since engineers are problem solvers, there is a constant demand for engineers to solve problems outside typical engineering fields.

Research And Graduate Study

Departmental faculty members are currently active in several areas of research including biomedical, nanotechnology, communication and signal processing, computers, controls, electromagnetics, electronics and power engineering. Graduate studies leading to the master's and doctoral degrees are offered in the department. Further details are available in the *Graduate Bulletin*.

Selective Admission

The department has admission requirements for freshmen and transfer students. For freshmen, a minimum math ACT (or equivalent) score of 23, or a top 30 percent class rank and a minimum math ACT of 20 is required. Domestic transfer students must have a 2.3 grade point average; international students, a 3.0.

Financial Aid

The Office of Financial Aid and Scholarships will make every effort to provide adequate financial assistance to all students demonstrating financial need.

Sample Curriculum	
Credits	General Education
	Communication
3	COMM 110 - Fundamentals of Public Speaking
3	ENGL 110 - College Composition I
3	ENGL 120 - College Composition II
3	Upper Division Writing
	Quantitative Reasoning
4	MATH 165 - Calculus I
	Science & Technology
3	CHEM 121 - General Chemistry I
4	PHYS 251 - University Physics I
4	PHYS 252 - University Physics II
1	Science Lab
6	Humanities & Fine Arts
6	Social & Behavioral Sciences
2	Wellness
-	Cultural Diversity
-	Global Perspective
39	TOTAL
Credits	Major Requirements
4	EE 206 - Circuit Analysis I
3	ECE 111 - Introduction to Electrical and Computer Engineering
4	ECE 173 - Introduction to Computing
4	ECE 275 - Digital Design
4	ECE 311 - Circuit Analysis II
3	ECE 320 - Electronics I
2	ECE 321 - Electronics II
4	ECE 331 - Energy Conversion
3	ECE 341 - Random Processes
4	ECE 343 - Signals and Systems
4	ECE 351 - Applied Electromagnetics
4	ECE 376 - Embedded Systems
1	ECE 401 - Design I (capstone)
2	ECE 403 - Design II (capstone)
3	ECE 405 - Design III (capstone)

3	ENGL 320 - Business and Professional Writing or ENGL 321 - Writing in the Technical Professions or ENGL 324 - Writing in the Sciences or ENGL 459 - Researching and Writing Grants and Proposals
1	ENGR 402 - Engineering Ethics and Social Responsibility
3	MATH 129 - Basic Linear Algebra
4	MATH 166 - Calculus II
4	MATH 265 - Calculus III (w/ vectors)
3	MATH 266 - Introduction to Differential Equations
12	Tech Electives
9	ECE Electives
88	TOTAL
126	Minimum Degree Credits to Graduate

Electives

The department has approved lists of elective courses from which students may choose particular courses to fulfill both student interest and degree requirements. For students interested in pursuing one of the department's areas of specialization, lists of recommendations are available from the faculty.

This sample curriculum is not intended to serve as a curriculum guide for current students, but rather an example of course offerings for prospective students. For the curriculum requirements in effect at the time of entrance into a program, consult with an academic advisor or with the Office of Registration and Records.

<https://bulletin.ndsu.edu/undergraduate/programs/>

Transferring Credits

View NDSU equivalencies of transfer courses at:
www.ndsu.edu/transfer/equivalencies

For Further Information	
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