

Electrical Engineering

Department Information

- **Department Location:**
Electrical and Computer Engineering
- **Department Phone:**
701-231-7019
- **Department Email:**
info@venus.ece.ndak.edu
- **Department Web Site:**
www.ndsu.edu/ece/
- **Credential Offered:**
B.S.E.E.
- **Official Program Curriculum:**
bulletin.ndsu.edu/undergraduate/program-curriculum/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 Bachelor of Science degree in Electrical Engineering 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 Electrical Engineering program is designed to reflect the broad nature of the field, and students may tailor their studies within broad parameters. Students are encouraged to develop an individual program of study in close consultation with their advisers. Examples are available to illustrate how specialization may be obtained in a number of different technical areas. Students may mix and match from the examples to suit their particular interests. Technical areas include the following:

- **Biomedical Engineering** is firmly based in engineering and the life sciences. The integration of medicine and engineering serves to provide appropriate products, tool, and techniques for research diagnosis and treatment by health care professionals. Some important products are artificial hearts, medical imaging (MRI, ultrasound, CT scans), prosthetic devices, and computer aids for diagnosis. Biomedical engineers help identify the problems and needs that can be solved using engineering technology and systems methodology to provide high-quality health care at reasonable cost.
- **Communication and Signal Processing** are closely related fields within electrical engineering. Communication is the process of transferring information from one point in time and space to another point. Signal processing involves signal representation, as well as signal design and filtering. Students with this specialization find challenging opportunities worldwide to meet the need for more convenient, inexpensive, and reliable communication and signal processing.
- **Computer Engineering** involves both hardware and software for small and large computers and for all products that include dedicated computers within, 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, autopilots for aircraft, and robot motion control.
- **Electromagnetics** includes electromagnetic compatibility, fiber optics, antennas, microwave devices, radar, sonar, satellite systems, power and communication transmission lines, grounding, shielding and propagation.
- **Electronics and Microelectronics** deal with integrated circuits, VLSI, transistors, lasers, consumer electronics, defense electronics, power electronics, and electronic materials.
- **Nanotechnology** deals with the study of electric materials at the nanoscale level for applications such as solar cells and sensors.
- **Optical Engineering**, developed jointly with the Department of Physics, prepares future engineers in such areas as quantum theory; coherent/incoherent polarized/non-polarized light; geometric, physical, and Fourier optics; holography; and image processing and acquisition.
- **Power Systems** deals with generation, transmission, distribution and utilization of electric energy subject to safety, environmental and economic concerns.

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

Departmental admission requirements for freshmen are an ACT (or equivalent) math test score of 23. Transfer students from U.S. institutions must have a 2.30 GPA; transfer students from international institutions must have a 3.00 GPA.

Further, the department policy is that transfer credits with grades less than 'C' in biology, chemistry, computer science, any field of engineering class, mathematics and physics are not accepted for the Electrical and Computer Engineering curricula.

Please note this is a sample plan of study and not an official curriculum. Actual student schedules for each semester will vary depending on start year, education goals, applicable transfer credit, and course availability. Students are encouraged to work with their academic advisor on a regular basis to review degree progress and customize an individual plan of study.

| Freshman | | | |
|--------------------|---------|-----------------------------|---------|
| Fall | Credits | Spring | Credits |
| CHEM 121 | 3 | ECE 111 ¹ | 3 |
| Wellness Gen Ed | 2 | ENGL 120 | 3 |
| ECE 173 | 4 | MATH 129 | 3 |
| ENGL 110 | 4 | MATH 166 | 4 |
| MATH 165 | 4 | PHYS 251 | 4 |
| | 17 | | 17 |
| Sophomore | | | |
| Fall | Credits | Spring | Credits |
| EE 206 | 4 | COMM 110 | 3 |
| MATH 265 | 4 | ECE 311 | 4 |
| PHYS 252 | 4 | MATH 266 | 3 |
| ECE 275 | 4 | Tech Elective | 3 |
| Gen Ed Science Lab | 1 | Humanities/Fine Arts Gen Ed | 3 |
| | 17 | | 16 |

| Junior | | | |
|--|----------------|--|----------------|
| Fall | Credits | Spring | Credits |
| ECE 320 | 3 | ECE 341 | 3 |
| ECE 321 | 2 | ECE 401 | 1 |
| ECE 376 | 4 | ECE 331 | 4 |
| ECE 351 | 4 | Tech Elective | 3 |
| ENGL/Upper Level Writing Gen Ed ³ | 3 | ECE 343 | 4 |
| | 16 | | 15 |
| Senior | | | |
| Fall | Credits | Spring | Credits |
| ECE 403 | 2 | ECE 405 | 3 |
| ENGR 402 | 1 | ECE Elective | 3 |
| ECE Elective | 3 | ECE Elective | 3 |
| Tech Elective | 3 | Humanities/Fine Arts Gen Ed ² | 3 |
| Social/Behavioral Sciences Gen Ed ⁴ | 3 | Tech Elective | 3 |
| Social/Behavioral Sciences Gen Ed ⁴ | 3 | | |
| | 15 | | 15 |

Total Credits: 128

- ¹ Students must take ECE 111 prior to enrolling in ECE courses listed above in the Junior and Senior year; otherwise, students must take an additional ECE Elective in lieu of ECE 111.
- ² Suggested to take ENGR 311.
- ³ Select from ENGL 320, 321, 324 or 459 to satisfy the Upper Level Writing for General Education.
- ⁴ Suggested to take either ENGR 312, ECON 105, ECON 201, or ECON 202.

PROGRAM NOTES:

ECE Elective: any didactic ECE 4xx course (not x93, 494, 496).

Tech Elective: ECE 374, any didactic ECE 4xx course, ECE x93 or 494 (max 6 credits total between x93 and 494), ECE 496 (max 3 credits), or any course from accompanying list.

Students must earn a "C" or better in ECE 173, ECE 275, EE 206 and all required MATH courses, before enrolling in ECE courses listed above in the Junior or Senior years.