NDSU NORTH DAKOTA STATE UNIVERSITY

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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, gives 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 a 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 smartphones, 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, VSLI, 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 Physic, 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 an 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

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.

Electrical Engineering Plan of Study

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 General Chemistry I	3	ECE 111 Introduction to Electrical and Computer Engineering [1]	3
Gen Ed Wellness	2	ENGL 120 College Composition II	3
ECE 173 Introduction to Computing	4	MATH 129 Basic Linear Algebra	3
ENGL 110 College Composition I	4	MATH 166 Calculus II	4
MATH 165 Calculus I	4	PHYS 251 University Physics I	4
	17		**17**
Sophomore			
Fall	**Credits**	**Spring**	**Credits**
EE 206 Circuit Analysis I	4	COMM 110 Fundamentals of Public Speaking	3
MATH 265 Calculus III	4	ECE 311 Circuit Analysis II	4
PHYS 252 University Physics II	4	MATH 266 Introduction to Differential Equations	3
ECE 275 Digital Design	4	Tech Elective	3
Gen Ed Science & Technology Lab	1	Gen Ed Humanities & Fine Arts	3
	17		**16**
Junior			
Fall	**Credits**	**Spring**	**Credits**
ECE 320 Electronics I	3	ECE 341 Random Processes	3
ECE 321 Electronics II	2	ECE 401 Design I	1
ECE 376 Embedded Systems	4	ECE 331 Energy Conversion	4
ECE 351 Applied Electromagnetics	4	Tech Elective	3
Gen Ed Upper-Level Writing [3]	3	ECE 343 Signals & Systems	4
	16		**15**
Senior			
Fall	**Credits**	**Spring**	**Credits**
ECE 403 Design II	2	ECE 405 Design III	3
ENGR 402 Engineering Ethics and Social Responsibility	1	ECE Elective	3
ECE Elective	3	ECE Elective	3
Tech Elective	3	Gen Ed Humanities & Fine Arts [2]	3
Gen Ed Social & Behavioral Sciences [4]	3	Tech Elective	3
Gen Ed Social & Behavioral Sciences [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.

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

For Further Information

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