

Computer Engineering

Department Information

- **Department Location:**
101 Electrical and Computer Engineering Bldg.
- **Department Phone:**
701-231-7019
- **Department Web Site:**
www.ndsu.edu/ece/ (<http://www.ndsu.edu/ece/>)
- **Credential Offered:**
B.S.Cpr.E.
- **Official Program Curriculum:**
catalog.ndsu.edu/undergraduate/program-curriculum/computer-engineering/ (<http://catalog.ndsu.edu/undergraduate/program-curriculum/computer-engineering/>)

Computer engineering deals with both hardware and software aspects of computer systems. Students take both essential electrical and computer engineering classes along with core classes specific to computer engineering design. Demand for computer engineers is strong due to the growing use of computers in all aspects of products and the need for engineers competent in computing practices.

The Program

Computer engineering is a degree program in the College of Engineering and provides a background in three broad areas: computer hardware, software, and hardware-software integration. Fundamental topics included in the program are embedded systems, computer architecture, digital systems, embedded machine learning, algorithms and operating systems. In addition, the program includes core subjects that are common to all engineering disciplines and basic university studies in humanities and social sciences. The Bachelor of Science degree in Computer Engineering is accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

Areas of Specialization

The Computer Engineering program allows students to 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:

Computer Architecture/Digital VLSI – VLSI designers and computer architects design computer system hardware, including how the CPU communicates with various types of memory and high-performance multi-processor systems. VLSI design focusses on the lower levels of abstraction: transistor-level and physical-level design; whereas computer architecture focuses on the higher levels of abstraction: architecture and gate-level designs.

Cyber Physical Systems – deals with the interaction of computing elements monitoring/controlling physical entities, often in a large network.

Embedded Systems – deals with the design of a dedicated computer system to perform a specific task, often requiring real-time constraints. An example is a smartphone.

Computer Systems – deals with the close interaction between a system's hardware and software.

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. Students also have full access to computer clusters located in the ECE building and throughout the campus. These and other major computer resources are tied to local, regional, national and international computer networks, and remote access is provided for all ECE software.

Selective Admission

Transfer students from international institutions must have a 3.00 GPA.

Further, the department policy is that transfer courses equivalent to ECE 173 (or CSCI 160), ECE 275, EE 206 and all required Math must have a "C" or better before enrolling in ECE courses listed in the curriculums for Junior & Senior years.

High School Preparation

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

Career Opportunities

Graduates may find work as design engineers (computer hardware, software and systems), computer consultants, sales and customer support engineers or as engineers involved with computer-aided manufacturing and testing.

Research and Graduate Study

Graduate studies leading to a master's degree or doctoral degree are offered in the department. Further details are available in the *Graduate Bulletin*.

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 opportunities 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.

Sample Program Guide

IMPORTANT DISCLAIMER: A Sample Program Guide provides an unofficial guide of program requirements and should be used by prospective students who are considering attending NDSU in the future. It is NOT an official curriculum and should NOT be used by current NDSU students for official degree planning purposes. Note that the official curriculum used by current NDSU students can vary from the Sample Program Guide due to a variety of factors such as, but not limited to, start year, education goals, transfer credit, and course availability.

To ensure proper program completion, enrolled students should utilize Degree Map (<https://www.ndsu.edu/registrar/degreemap/>) and Schedule Planner (<https://www.ndsu.edu/onestop/degree-map-and-planning/>) in Campus Connection and consult regularly with their academic advisor to ensure requirements are being met.

Freshman			
Fall	Credits	Spring	Credits
CHEM 121		3 ENGL 120	3
ENGL 110		3 MATH 166	4
CSCI 160		4 PHYS 251	4
MATH 165		4 CSCI 161	4
ECE 111		3 CHEM 121L/PHYS 251L/ PHYS 252L (Fulfills Gen Ed Sci/Tech Co-Req Lab)	1
		17	16
Sophomore			
Fall	Credits	Spring	Credits
EE 206		4 COMM 110	3
MATH 265		4 ECE 320	3
ECE 275		4 MATH 266	3
MATH 129		3 ECE 374	4
Wellness Gen Ed		2 CSCI 222	3
		17	16
Junior			
Fall	Credits	Spring	Credits
ECE 341		3 ECE 343	4
ENGR 327 (Fulfills Gen Ed Humanities & Fine Arts (A))		3 ECE 375	3
CPE Core ⁵		3 ECE 376	4
CPE Core ⁵		3 ECE 401	1
CPE Core ⁵		3 CPE Core ⁵	3

		Humanities/Fine Arts Gen Ed Elective	3
		15	18
Senior			
Fall	Credits	Spring	Credits
ECE 403		2 ECE 405	3
ENGL/Upper Level Writing ²		3 ECE Elective	3
ECE Elective		3 ECE Elective	3
Tech Elective		3 Social/Behavioral Sci. and Cultural Diversity	3
Social/Behavioral Sci. and Global Perspectives		3 Tech Elective	3
Humanities/Fine Arts Gen Ed		3	
		17	15

Total Credits: 131

- ¹ Students must take ECE 111 prior to enrolling in ECE courses listed above in the Junior or Senior years; otherwise, students must take an additional ECE Elective in lieu of ECE 111.
- ² Select from ENGL 320, 321, 324 or 459 to satisfy the Upper Level Writing for General Education.
- ³ Suggested to take ENGR 311.
- ⁴ Suggested to take ENGR 312, ECON 105, ECON 201 or ECON 202..
- ⁵ ECE 474, ECE 423, Embedded Machine Learning (new ECE course), CSCI 474, CSCI 467 (Algorithm Analysis), ECE 425

PROGRAM NOTES:

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

Tech Elective: See department for course listings

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.