NDSU NORTH DAKOTA STATE UNIVERSITY

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COMPUTER ENGINEERING

Computer engineering deals with both hardware and software aspects of computer systems. Students take essential electrical engineering classes along with specialized classes in computer engineering and computer science. Demand for computer engineers is strong due to the growing use of computers in all sorts of products and the need for engineers competent with computers in both hardware and software areas.

The Program

Computer engineering is a degree program in the College of Engineering. The Computer Engineering program 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, software engineering, computer networks, 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 science. 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 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.

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.

Computer 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 320 Electronics I	3
CSCI 222 Discrete Mathematics	3	MATH 266 Introduction to Differential Equations	3
ECE 275 Digital Design	4	ECE 374 Computer Organization	4
Gen Ed Science & Technology Lab	1	CSCI 161 Computer Science II	4
	16		**17**
Junior			
Fall	**Credits**	**Spring**	**Credits**
CSCI 413 Principles of Software Engineering	3	ECE 341 Random Processes	3
ECE 343 Signals & Systems	4	ECE 401 Design I	1
CSCI 459 Foundations of Computer Networks	3	ECE 376 Embedded Systems	4
ENGR 402 Engineering Ethics and Social Responsibility	1	CSCI 474 Operating Systems Concepts	3
ECE 474 Computer Architecture	3	ECE 475 Advanced Digital Design	4
	14		**15**
Senior			
Fall	**Credits**	**Spring**	**Credits**
ECE 403 Design II	2	ECE 405 Design III	3
Gen Ed Upper-Level Writing[2]	3	ECE Elective or CSCI 467 Algorithm Analysis	3
ECE Elective	3	Gen Ed Humanities & Fine Arts	3
Tech Elective	3	Gen Ed Social & Behavioral Sciences [4]	3
Gen Ed Humanities & Fine Arts [3]	3	Tech Elective	3
Gen Ed Social & Behavioral Sciences [4]	3		
	17		**15**
Total Credits: 128			

[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.

Notes:

- **ECE Elective:** any didactic ECE 4xx course (not x93, 494, 496).
- **Tech Elective:** any didactic 4xx course from ECE or CSCI, or any of the following: CSCI 336, CSCI 366, CSCI 372, ECE 311, ECE 321, ECE 351, ECE x93, ECE 494, ECE 496 (max 3 credits), ENGR 310, PHYS 252, IME 440, IME 456, IME 460 and IME 470.
- 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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