Computer Engineering

Computer Engineering Major

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 Computer Engineering program at NDSU is accredited by the Engineering Accreditation Commission of ABET (http://www.abet.org) .

CpE 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 focuses on the lower levels of abstraction: transistor-level and physical-level design; whereas Computer Architecture focusses on the higher levels of abstraction: architecture and gate-level design.
- **Cyber Physical Systems** deal with the interaction of computing elements monitoring/controlling physical entities, often in a large network.
- **Embedded Systems** deal 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** dealswith the close interaction between a system's hardware and software.

Major Requirements

Major: Computer Engineering

Degree Type: B.S.Cpr.E.
Required Degree Credits to Graduate: 128

General Education Requirements for Baccalaureate Degree

- A list of approved general education courses is available here (http://bulletin.ndsu.edu/past-bulletin-archive/2017-18/academic-policies/undergraduate-policies/general-education/#genedcoursestext) .
- General education courses may be used to satisfy requirements for both general education and the major, minor, and program emphases, where applicable. Students should carefully review the major, minor, and program emphases requirements for minimum grade restrictions, should they apply.

Code	Title	Credits
Communication (C)		12
ENGL 110	College Composition I	
ENGL 120	College Composition II	
COMM 110	Fundamentals of Public Speaking	
Upper Division Writing †		
Quantitative Reasoning (R) †		3
Science and Technology (S) †		10
Humanities and Fine Arts (A) †		6
Social and Behavioral Sciences (B) †		6
Wellness (W) †		2
Cultural Diversity (D) *†		
Global Perspectives (G) *†		
Total Credits		39

* May be satisfied by completing courses in another General Education category.

† May be satisfied with courses required in the major. Review major requirements to determine if a specific upper division writing course is required.

Major Requirements

Code	Title	Credits
Computer Engineering Core Requirements		
ECE 111	Introduction to Electrical and Computer Engineering	3
ECE 173	Introduction to Computing *	4
ECE 275	Digital Design *	4
ECE 320	Electronics for Computer Engineers	3
ECE 341	Random Processes	3
ECE 343	Signals & Systems	4
ECE 374	Computer Organization	4
ECE 376	Embedded Systems	4
ECE 401	Design I (capstone)	1
ECE 403	Design II (capstone)	2
ECE 405	Design III (capstone)	3
ECE 474	Computer Architecture	3
ECE 475	Advanced Digital Design	4
Math Courses Required		
MATH 129	Basic Linear Algebra *	3
MATH 165	Calculus I (May satisfy general education category R)	4
MATH 166	Calculus II *	4
MATH 265	Calculus III (w/ vectors) *	4
MATH 266	Introduction to Differential Equations *	3
CSCI Courses Required		
CSCI 161	Computer Science II (May satisfy general education category S for Computer Engineering majors only))	4
CSCI 222	Discrete Mathematics	3
CSCI 413	Principles of Software Engineering	3
CSCI 459	Foundations of Computer Networks	3
CSCI 474	Operating Systems Concepts	3
Other Courses Required		
CHEM 121	General Chemistry I (May satisfy general education category S)	3
CHEM 121L	General Chemistry I Laboratory (May satisfy general education category S)	1
or PHYS 251L	University Physics I Laboratory	
EE 206	Circuit Analysis I *	4
Select one of the following: (May satisfy general education category C)		3
ENGL 320	Business and Professional Writing	
ENGL 321	Writing in the Technical Professions	
ENGL 324	Writing in the Sciences	
ENGL 459	Researching and Writing Grants and Proposal	
ENGR 402	Engineering Ethics and Social Responsibility	1
PHYS 251	University Physics I (May satisfy general education category S)	4
ECE Electives	**Select 6 cr. of ECE 400 level electives (excluding 494 and 496); may include CSCI 467**	6
Includes the cross listed courses of ECE/IME 427; ECE/IME 429; ECE/PHYS 411; & ECE/PHYS 411L		
Tech Electives: Select 6 credits from the following:		6
CSCI 336	Theoretical Computer Science	
CSCI 366	Database Systems	
CSCI 372	Comparative Programming Languages	
CSCI 4XX	Any CSCI 400 level didactic course	
ECE 311	Circuit Analysis II	

ECE 321	Electronics for Electrical Engineers †
ECE 351	Applied Electromagnetics
ECE 4XX	Any ECE 400 level didactic course
ECE 494	Individual Study
ECE 496	Field Experience (max. of 3 cr.)
ENGR 310	Entrepreneurship for Engineers and Scientists
IME 440	Engineering Economy
IME 456	Program and Project Management
IME 460	Evaluation of Engineering Data
IME 470	Operations Research I
PHYS 252	University Physics II
Total Credits	100

* No grade less than a C accepted in these courses.

Degree Requirements and Notes

- A student must complete at least 60 semester credits of professional level course work in his/her program while in residence and enrolled in the college. Students transferring into the college from programs with professional accreditation are exempt from this residency requirement but are subject to the residency requirement of NDSU.
- Transfer Students – Transfer courses with grades less than 'C' in Biology, Chemistry, Computer Science, Mathematics, Physics, and any type of engineering class will not be accepted as a major requirement.
- In order to graduate, an ECE student must have at least a 2.0 GPA in all required EE and ECE courses taken at NDSU. Elective ECE courses are not included in this GPA requirement.
- All Students – Students are required to attain a grade of 'C' or better in ECE 173 Introduction to Computing, ECE 275 Digital Design, EE 206 Circuit Analysis I, and all required MATH courses.