

Computer Engineering

www.ece.iastate.edu

Administered by the Department of Electrical and Computer Engineering

Undergraduate Study

For the undergraduate curriculum in computer engineering leading to the degree Bachelor of Science. This curriculum is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

The Department of Electrical and Computer Engineering (ECpE) at Iowa State University provides undergraduate students with the opportunity to learn electrical and computer engineering fundamentals, study applications of the most recent advances in state-of-the-art technologies, and to prepare for the practice of computer engineering. The student-faculty interaction necessary to realize this opportunity occurs within an environment that is motivated by the principle that excellence in undergraduate education is enhanced by an integrated commitment to successful, long-term research and outreach programs.

The computer engineering curriculum offers focus areas in software systems, embedded systems, networking, information security, computer architecture, and VLSI.

Students also may take elective courses in control systems, electromagnetics, microelectronics, VLSI, power systems, and communications and signal processing.

The program objectives for the computer engineering programs describe accomplishments that graduates are expected to attain within five years after graduation. Graduates will have applied their expertise to contemporary problem solving, be engaged professionally, have continued to learn and adapt, and have contributed to their organizations through leadership and teamwork. More specifically, the objectives for expertise, engagement, learning, leadership and teamwork are defined below for each program.

The objectives of the computer engineering program at Iowa State University are:

- Graduates, within five years of graduation, should demonstrate peer-recognized **expertise** together with the ability to articulate that expertise and use it for contemporary problem solving in the analysis, design, and evaluation of computer and software systems, including system integration and implementation.
- Graduates, within five years of graduation, should demonstrate **engagement** in the engineering profession, locally and globally, by contributing to the ethical, competent, and creative practice of engineering or other professional careers.
- Graduates, within five years of graduation, should demonstrate sustained **learning** and adapting to a constantly changing field through graduate work, professional development, and self study.
- Graduates, within five years of graduation, should demonstrate **leadership** and initiative to ethically advance professional and organizational goals, facilitate the achievements of others, and obtain substantive results.
- Graduates, within five years of graduation, should demonstrate a commitment to **teamwork** while working with others of diverse cultural and interdisciplinary backgrounds.

As a complement to the instructional activity, the ECpE department provides opportunities for each student to have experience with broadening activities. Through the cooperative education and internship program, students have the opportunity to gain practical industry experience. Students have the opportunity to participate in advanced research activities, and through international exchange programs, students learn about engineering practices in other parts of the world. Well-qualified juniors and seniors in computer engineering who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue both the Bachelor of Science and Master of Science, the Bachelor of Science and Master of Business Administration, or the Bachelor of Science and Master of Engineering degrees.

Students are required to prepare and to maintain a portfolio of their technical and non-technical skills. This portfolio is evaluated for student preparation during the student's curriculum planning process. Results of the evaluation are used to advise students of core strengths and weaknesses.

Graduate Study

The department offers work for the degrees Master of Engineering, Master of Science, and Doctor of Philosophy with a major in computer engineering and minor work to students with other majors. Minor work for computer engineering

majors is usually selected from a wide range of courses outside computer engineering.

The Master of Engineering degree is course-work only. It is recommended for off-campus students.

The Master of Science degree with thesis is recommended for students who intend to continue toward the Doctor of Philosophy degree or to undertake a career in research and development. The non-thesis Master of Science degree requires a creative component.

The department also offers three graduate certificate programs in embedded systems, computer networking, and software systems.

The normal prerequisite to graduate major work in computer engineering is the completion of undergraduate work substantially equivalent to that required of computer engineering students at this university. It is possible for a student to qualify for graduate study in computer engineering even though the student's undergraduate or prior graduate training has been in a discipline other than computer engineering. Supporting work, if required, will depend on the student's background and area of research interest. Prospective students from a discipline other than computer engineering are required to submit, with the application for admission, a statement of the proposed area of graduate study.

The department requires submission of GRE General test scores by applicants. All students whose first language is not English and who have no U.S. degree must submit TOEFL examination scores. Students pursuing the Doctor of Philosophy must complete the department qualifying process.

The Department of Electrical and Computer Engineering is a participating department in the interdepartmental Master of Science and Doctor of Philosophy degree programs in bioinformatics and computational biology. Students interested in these programs may earn their degrees while working under an adviser in electrical and computer engineering.

The Department of Electrical and Computer Engineering also is a participating department in the interdepartmental certificate, Master of Engineering, and Master of Science in Information Assurance programs. Students interested in studying information assurance topics may earn a degree in computer engineering or in information assurance. (See catalog section on Information Assurance.)

Well-qualified juniors and seniors in computer engineering who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue both Bachelor of Science and Master of Science, or Bachelor of Science and Master of Business Administration, or Bachelor of Science and Master of Engineering degrees. Under concurrent enrollment, students are eligible for assistantships and simultaneously take undergraduate and graduate courses. Details are available in the Student Services Office and on the department's web site.

Curriculum in Computer Engineering

Administered by the Department of Electrical and Computer Engineering.

Leading to the degree Bachelor of Science.

Total credits required: 127 See also Basic Program and Special Programs. Note: Department does not allow Pass/Not Pass credits to be used to meet graduation requirements.

International Perspectives: 3 cr. ¹

U.S. Diversity: 3 cr. ¹

Communication Proficiency/Library requirement:

ENGL 150	Critical Thinking and Communication (C or better in this course)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (C or better in this course)	3
LIB 160	Information Literacy	1
One of the following:		3
ENGL 314	Technical Communication (C or better in this course)	
ENGL 309	Report and Proposal Writing (C or better in this course)	

General Education Electives: 15 cr. ³

Complete minimum of 6 cr. from Approved General Education Component at 300- or higher level. Complete additional 9 cr. from Approved General Education Component.

Basic Program: 27 cr.

A minimum GPA of 2.00 required for this set of courses, including any transfer courses. See Requirement for Entry into Professional Program in College of Engineering Overview section.

CHEM 167 or CHEM 177	General Chemistry for Engineering Students General Chemistry I	4
ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
ENGR 101	Engineering Orientation	R
CPR E 185	Introduction to Computer Engineering and Problem Solving I ²	3
LIB 160	Information Literacy	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4
PHYS 221	Introduction to Classical Physics I	5
Total Credits		27

Math and Physical Science: 20 cr.

COM S 227	Introduction to Object-oriented Programming	4
COM S 228	Introduction to Data Structures	3
MATH 265	Calculus III	4
MATH 267	Elementary Differential Equations and Laplace Transforms	4
PHYS 222	Introduction to Classical Physics II	5
Total Credits		20

Computer Engineering Core: 33 cr.

(A minimum GPA of 2.00 required for this set of courses, including any transfer courses).

CPR E 281	Digital Logic	4
CPR E 288	Embedded Systems I: Introduction	4
CPR E 308	Operating Systems: Principles and Practice	4
CPR E 310	Theoretical Foundations of Computer Engineering	3
CPR E 381	Computer Organization and Assembly Level Programming	4
COM S 309	Software Development Practices	3
CPR E 315 or COM S 311	Applications of Algorithms in Computer Engineering Design and Analysis of Algorithms	3
E E 201	Electric Circuits	4
E E 230	Electronic Circuits and Systems	4
Total Credits		33

Other Remaining Courses: 32 cr.

CPR E 491	Senior Design Project I and Professionalism	3
CPR E 492	Senior Design Project II	2
STAT 330	Probability and Statistics for Computer Science	3
One of the following:		3
ENGL 314	Technical Communication (C or better in this course)	
ENGL 309	Report and Proposal Writing (C or better in this course)	
Computer Science course ³		3
Computer Engineering ³		6
Technical Electives ³		9
Electrical Engineering course ³		3
Total Credits		32

Seminar/Co-op/Internships:

CPR E 166	Professional Programs Orientation	R
CPR E 294	Program Discovery	R
CPR E 394	Program Exploration	R
CPR E 494	Portfolio Assessment	R

Co-op or internship is optional.

Outcomes Assessment - Students are required to prepare and to maintain a portfolio of their technical and non-technical skills. This portfolio is evaluated for

student preparation during the student's curriculum planning process. Results of the evaluation are used to advise students of core strengths and weaknesses.

Transfer Credit Requirements

The degree program must include a minimum of 30 credits at the 300-level or above in professional and technical courses earned at ISU in order to receive a B.S. in computer engineering. These 30 credits must include CPR E 491 Senior Design Project I and Professionalism, CPR E 492 Senior Design Project II, and credits in the core professional curriculum and/or in technical electives. The Electrical and Computer Engineering Department requires a grade of C or better for any transfer credit course that is applied to the degree program.

1. These university requirements will add to the minimum credits of the program unless the university-approved courses are also approved by the department to meet other course requirements within the degree program. U.S. diversity and international perspectives courses may not be taken Pass/Not Pass, but are used to meet the general education electives.
2. See Basic Program for Professional Engineering Curricula for accepted substitutions for curriculum designated courses in the Basic Program.
3. From department approved lists. (<http://www.ece.iastate.edu/academics/bachelors-degree-requirements>)

See also: A 4-year plan of study grid showing course template by semester.

Note: International perspectives and U.S. diversity courses are used to meet the general education electives.