Computer Science and Engineering, B.S.E.

The Bachelor of Science in Engineering (B.S.E.) program in computer science and engineering combines the technical content of a computer science degree and a computer engineering degree in a single degree program. The program curriculum is jointly taught by faculty from the Departments of Electrical and Computer Engineering and Computer Science. The program provides students with a strong theoretical and conceptual understanding of the principles underlying computer software and hardware along with the engineering analysis, design, and multidisciplinary teamwork skills needed to develop large and complex systems containing both software and hardware components.

The computer science and engineering program encompasses the technical rigor of a Bachelor of Science program in computer science, but also provides a full component of computer engineering course work. Graduates gain the foundational knowledge provided by a computer science education together with the critical thinking, problem-solving, and system design skills at the heart of a computer engineering curriculum.

Graduates of the program will:
• exhibit leadership and vision in contributing to the technical and policy decision of industry, government, and research enterprises;
• demonstrate problem-solving abilities that permit them to contribute in a variety of technical, business, and academic careers;
• thrive in diverse, global, and multidisciplinary environments;
• possess the ability to communicate effectively and participate collaboratively in interactions with engineers and other professionals; and
• participate in lifelong learning activities that enhance their professional and personal development.

Requirements

The Bachelor of Science in Engineering with a major in computer science and engineering (CSE) requires a minimum of 129 s.h. The major provides technical depth and breadth as well as flexibility and the opportunity for students to customize their programs according to their own goals and interests. Students choose one of several elective focus areas according to the type of job or research they plan to pursue.

Students complete the B.S.E. core requirements, which include RHET:1030 Rhetoric, ENGR:1300 Introduction to Engineering Computing; and courses in chemistry, engineering mathematics and fundamentals, and physics. Students take Computer Science I: Fundamentals (CS:1210) instead of ENGR:1100 Introduction to Engineering Problem Solving. Those who complete ENGR:1100 Introduction to Engineering Problem Solving before entering the CSE program may use that course for elective credit. All students must earn a grade of C-minus or higher in the core requirements MATH:1550 Engineering Mathematics I: Single Variable Calculus and MATH:1560 Engineering Mathematics II: Multivariable Calculus.

They also complete the curriculum designed for their major program, which covers four major stems: mathematics and basic sciences, engineering topics, an elective focus area, and the general education component. For information about the curriculum stems, see Bachelor of Science in Engineering in the Catalog.

Elective Focus Area and Major Courses

Students select an elective focus area (EFA) to personalize their curriculum and to help them prepare for the type of job or research they plan to pursue. The EFA consists of five elective courses (15 s.h.). A number of areas are available, such as bioinformatics, business, medical imaging, embedded systems, and software engineering; for a complete list, see Elective Focus Areas on the Department of Electrical and Computer Engineering website. Students also may work with their academic advisor to create a customized plan tailored to their goals and interests.

CSE students must complete 15 required computer science and engineering program courses, one constrained program elective, five EFA courses, and a two-semester capstone design sequence. Students who choose their EFA courses carefully may be able to earn the Certificate in Sustainability, the Certificate in Technological Entrepreneurship, or one of several undergraduate minors offered by the University by taking minimal additional course work beyond that required for the computer science and engineering major.

The B.S.E. with a major in computer science and engineering requires the following course work.

Required Courses

All of these:
ECE:2400 Linear Systems I 3
ECE:2410 Principles of Electronic Instrumentation 4
ECE:3320 Introduction to Digital Design 3
ECE:3330 Introduction to Software Design 3
ECE:3350 Computer Architecture and Organization 3
ECE:3360 Embedded Systems 3
ECE:3540 Communication Networks 3
CS:1210 Computer Science I: Fundamentals 4
CS:2210 Discrete Structures 3
CS:2230 Computer Science II: Data Structures 4
CS:3330 Algorithms 3
CS:3620 Operating Systems 3
CS:3820 Programming Language Concepts 3
ENGR:1300 Introduction to Engineering Computing 3
ENGR:2730 Computers in Engineering 3

Constrained Program Elective

One of these:
## Elective Focus Area Courses
Students complete five elective focus area courses, which they select according to guidelines established by the department. For a list of EFAs and course selection guidelines, see Elective Focus Areas on the Department of Electrical and Computer Engineering website.

## Capstone Design Courses
In their senior year, students complete a two-semester capstone design sequence culminating in the development and implementation of a significant, original project. The capstone design experience emphasizes teamwork, professionalism, open-ended problem solving, and the ability to work within real-world constraints and engineering standards.

Both of these:
- **ECE:4880** Principles of Electrical and Computer Engineering Design 3
- **ECE:4890** Senior Electrical and Computer Engineering Design 3

## Double Major in Computer Science and Engineering/Electrical Engineering
Students may earn a double major in computer science and engineering (CSE) and electrical engineering (EE). They must satisfy all requirements of the electrical track of the EE major and all requirements of the CSE major. The double major may be achieved with as few as five courses.

The following list shows the required courses that are not in common between the EE and CSE majors. In addition to the courses below, students must take one computer science elective, one ECE 5000-level course, and an additional 5000-level course that is cross-listed in the Department of Electrical and Computer Engineering and the Department of Computer Science. For more information, contact the Department of Electrical and Computer Engineering.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ECE:3330</td>
<td>Introduction to Software Design (required for CSE, EE elective focus area)</td>
<td>3</td>
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<tr>
<td>ECE:3350</td>
<td>Computer Architecture and Organization (required for CSE, EE elective focus area)</td>
<td>3</td>
</tr>
<tr>
<td>ECE:3360</td>
<td>Embedded Systems (required for CSE, EE elective focus area)</td>
<td>3</td>
</tr>
<tr>
<td>ECE:3400</td>
<td>Linear Systems II (required for EE, CSE elective focus area elective)</td>
<td>3</td>
</tr>
<tr>
<td>ECE:3410</td>
<td>Electronic Circuits (required for EE, CSE elective focus area)</td>
<td>4</td>
</tr>
<tr>
<td>ECE:3500</td>
<td>Communication Systems (required for EE)</td>
<td>3</td>
</tr>
<tr>
<td>ECE:3540</td>
<td>Communication Networks (required for CSE, EE breadth elective)</td>
<td>3</td>
</tr>
</tbody>
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## Joint B.S.E./M.S.
The College of Engineering offers a joint Bachelor of Science in Engineering/Master of Science for computer science and engineering undergraduate students who intend to earn an M.S. in electrical and computer engineering. B.S.E./M.S. students may take up to 12 s.h. of graduate-level course work and do thesis-level research while they are still undergraduates. They may count 9 s.h. of graduate course work toward both degrees. Once students complete the requirements for the bachelor's degree, they are granted the B.S.E., and they normally complete the M.S. one year later.

To be admitted to the joint degree program, students must have completed at least 80 s.h., must have a cumulative g.p.a. of at least 3.25, and must submit a letter of application to the chair of the Department of Electrical and Computer Engineering. For more information, see Joint B.S./M.S. Degree on the Department of Electrical and Computer Engineering website.

## Academic Plans
The following study plan includes the B.S.E. core requirements and the curriculum for the computer science and engineering major. Some courses in the curriculum are prerequisites for others. Students who take courses in the order below satisfy the prerequisite requirements automatically. Students who do not follow this sequence still must satisfy all course prerequisites.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Year</strong></td>
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<tr>
<td><strong>Fall</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM:1110</td>
<td>Principles of Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>ENGR:1000</td>
<td>Engineering Success for First-Year Students</td>
<td>1</td>
</tr>
</tbody>
</table>
### Fourth Year

#### Fall
- ECE:3540 Communication Networks (systems elective) 3
- CS:3620 Operating Systems 3
- Principles of computer science and engineering design course 3
- Elective focus area course (technical, prefix CS) 3
- Elective focus area course (technical, prefix ECE) 3
- Hours 15

#### Spring
- CS:4330 or CS:4350 Theory of Computation (theory elective) 3
- or Logic in Computer Science 3
- Senior computer science and engineering design course 3
- Elective focus area course (advanced, prefix CS) 3
- Elective focus area course (advanced, prefix ECE) 3
- General education component course 3
- Hours 15
- Total Hours 129

### Career Advancement

Students who earn a major in computer science and engineering work in research, design, development, manufacturing, sales, market analysis, consulting, field service, and management. They are employed in computer, semiconductor, software, aerospace, telecommunication, medical, radio, television, and power industries, and many graduates pursue entrepreneurial ventures.

The major also prepares students for further study in many areas demanding computational and engineering skill sets.