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 and a Bachelor of Science program in computer engineering. 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.

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Requirements
Required Program Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tr>
<td>ECE:2400</td>
<td>Linear Systems I</td>
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<td>ECE:2410</td>
<td>Principles of Electronic Instrumentation</td>
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<tr>
<td>ECE:3000</td>
<td>Professional Seminar: Electrical Engineering</td>
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<tr>
<td>ECE:3320</td>
<td>Introduction to Digital Design</td>
<td>3</td>
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<td>ECE:3330</td>
<td>Introduction to Software Design</td>
<td>3</td>
</tr>
<tr>
<td>ECE:3350</td>
<td>Computer Architecture and Organization</td>
<td>3</td>
</tr>
<tr>
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<td>Embedded Systems</td>
<td>3</td>
</tr>
<tr>
<td>ECE:3540</td>
<td>Communication Networks</td>
<td>3</td>
</tr>
<tr>
<td>CS:2210</td>
<td>Discrete Structures</td>
<td>3</td>
</tr>
<tr>
<td>CS:2230</td>
<td>Computer Science II: Data Structures</td>
<td>4</td>
</tr>
<tr>
<td>CS:3330</td>
<td>Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CS:3620</td>
<td>Operating Systems</td>
<td>3</td>
</tr>
<tr>
<td>CS:3820</td>
<td>Programming Language Concepts</td>
<td>3</td>
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Constrained Program Elective

<table>
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<tr>
<th>Code</th>
<th>Title</th>
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<tr>
<td>One of these:</td>
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<tr>
<td>CS:4330</td>
<td>Theory of Computation</td>
<td>3</td>
</tr>
<tr>
<td>CS:4350</td>
<td>Logic in Computer Science</td>
<td>3</td>
</tr>
</tbody>
</table>

Elective Focus Area Courses

Students select an elective focus area (EFA) to personalize their curriculum and to prepare them for certain jobs or research study they intend to seek. A number of areas are available, such as bioinformatics, business, medical imaging, embedded systems, and software engineering. Students also may work with their academic advisor to create a customized plan tailored to their goals and interests.

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

Students who choose their EFA and general education component 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.

General Education Component

Students are required to take at least 15 s.h. of General Education Component (GEC) courses; see General Education Component on the College of Engineering website.

The requirements are:

- Engineering Be Creative: complete 3 s.h.

A full list of approved courses can be found on the College of Engineering GEC Options: Be Creative Course List web page.

- GE CLAS Core: complete 3 s.h.

Students must complete 3 s.h. of course work from one of the approved GE CLAS Core areas below.

- Interpretation of Literature
- World Languages
- Historical Perspectives
- International and Global Issues
- Literary, Visual, and Performing Arts
- Social Sciences
- Values and Culture

- Approved Course Subjects: complete 9 s.h.

See the College of Engineering GEC Options: Approved Course Subjects web page.

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.

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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</thead>
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<tr>
<td>Both of these:</td>
<td></td>
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</tr>
<tr>
<td>ECE:4880</td>
<td>Principles of Electrical and Computer Engineering Design</td>
<td>3</td>
</tr>
<tr>
<td>ECE:4890</td>
<td>Senior Electrical and Computer Engineering Design</td>
<td>3</td>
</tr>
</tbody>
</table>

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 six 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>
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<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>
</tr>
<tr>
<td>ECE:3350</td>
<td>Computer Architecture and Organization (required for CSE, EE elective focus area)</td>
<td>3</td>
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<tr>
<td>ECE:3360</td>
<td>Embedded Systems (required for CSE, EE elective focus area)</td>
<td>3</td>
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<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
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<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>
<tr>
<td>ECE:3600</td>
<td>Control Systems (required for EE)</td>
<td>3</td>
</tr>
<tr>
<td>ECE:3700</td>
<td>Electromagnetic Theory (required for EE)</td>
<td>3</td>
</tr>
<tr>
<td>ECE:3720</td>
<td>Semiconductor Devices (required for EE)</td>
<td>3</td>
</tr>
<tr>
<td>EE depth elective (required for EE)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CS:1210</td>
<td>Computer Science I: Fundamentals (required for CSE, EE substitute for ENGR:1100)</td>
<td>4</td>
</tr>
<tr>
<td>CS:2210</td>
<td>Discrete Structures (required for CSE, EE elective focus area)</td>
<td>3</td>
</tr>
<tr>
<td>CS:2230</td>
<td>Computer Science II: Data Structures (required for CSE)</td>
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<td>3</td>
</tr>
<tr>
<td>or CS:4350</td>
<td>Logic in Computer Science</td>
<td></td>
</tr>
<tr>
<td>CS elective (required for CSE)</td>
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<td>3</td>
</tr>
<tr>
<td>MATH:3550</td>
<td>Engineering Mathematics V: Vector Calculus (required for EE)</td>
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For more information, see Joint B.S./M.S. Degree on the Department of Electrical and Computer Engineering website.

**B.S.E./M.C.S.**

The College of Engineering and the Department of Computer Science (College of Liberal Arts and Sciences) offer a combined Bachelor of Science in Engineering/Master of Computer Science for computer science and engineering undergraduate students.

The combined degree program allows students to count a limited amount of credit toward both degrees. For more information, see Master of Computer Science in the Catalog.

**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.

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**Combined Programs**

### B.S.E./M.S. in Electrical and Computer Engineering

The College of Engineering offers a Bachelor of Science in Engineering/Master of Science for computer science and engineering undergraduate students who intend to earn a 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 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.