# Computer Science and Engineering, BSE

## Requirements

The Bachelor of Science in Engineering (BSE) with a major in computer science and engineering requires a minimum of 128 s.h. of credits. At the time of graduation, students must have a cumulative grade-point average of at least 2.00 in all college work used to complete degree requirements and in all UI coursework in order to be awarded the BSE.

All BSE students are required to take the same collegiate curriculum. For information about these collegiate requirements, see the Bachelor of Science in Engineering, BSE in the catalog. 6 s.h. of a student's major courses fulfill the basic science or college-level math collegiate requirement. Students completing the major in computer science and engineering fulfill the collegiate statistics requirement by completing STAT:2020 Probability and Statistics for the Engineering and Physical Sciences.

The major in computer science and engineering includes ECE:3000 Electrical and Computer Engineering Professional Seminar, typically taken in the third year.

The BSE with a major in computer science and engineering requires the following coursework.

| Requirements | Hours |
|---|---|
| Collegiate Curriculum | 49 |
| Basic Science and College-Level Math, from Major Requirements or Focus Area | 6 |
| Major Requirements | 52 |
| Focus Area | 21 |

# Major Requirements

Major requirements include a set of common courses (52 s.h.) and two capstone design courses (6 s.h.).

## Common Courses

| Course # | Title | Hours |
|---|---|---|
| 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:2120 | Electrical Circuits | 3 |
| ENGR:2730 | Computers in Engineering | 3 |
| PHYS:1612 | Introductory Physics II (with lab) | 4 |

## 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.

| Course # | Title | Hours |
|---|---|---|
| Both of these: | | |
| ECE:4880 | Electrical and Computer Engineering Senior Design 1 | 3 |
| ECE:4890 | Electrical and Computer Engineering Senior Design 2 | 3 |

# Focus Area

Students must select focus area courses according to guidelines established by the Department of Electrical and Computer Engineering. A number of established focus areas are available, and students may also work with their academic advisor to create a customized plan tailored to their goals and interests.

Students complete a minimum of 21 s.h. in electives, including at least one complementary theory elective course (3 s.h.). Carefully selected elective and general education courses may contribute to earning a minor and/or certificate, including the Certificate in Sustainability (College of Liberal Arts and Sciences) or the Certificate in Technological Entrepreneurship.

For a complete list of focus areas and course selection guidelines, see Focus Areas on the Department of Electrical and Computer Engineering website. Although general guidelines and requirements for elective courses are listed, course recommendations for specific focus areas differ. While some courses may apply to more than one focus area requirement, a single course may only count once toward completing a focus area.

## Electrical and Computer Engineering Electives

Students choose two focus area electives from electrical and computer engineering courses (prefix ECE) not already required for the major. Students must consult an academic advisor and gain approval from the undergraduate curriculum chair to count ECE:5998 Individual Investigations: Electrical and Computer Engineering toward this requirement.

| Course # | Title | Hours |
|---|---|---|
| Both of these: | | |
| Technical course in electrical and computer engineering (prefix ECE) numbered 3400 or above, excluding ECE:3998, ECE:5000, and ECE:5999 | | 3 |
| Advanced course in electrical and computer engineering (prefix ECE) numbered 5001-5995 | | 3 |

## Computer Science Electives

Students choose two focus area electives (at least 6 s.h.) from computer science courses (prefix CS) not already required

for the major. At least one course must be numbered 4000 or above.

| Course # | Title | Hours |
|---|---|---|
| Two of these, with at least one numbered 4000 or above: | | |
| ECE:5320/CS:5610 | High Performance Computer Architecture | 3 |
| ECE:5800/CS:5800 | Fundamentals of Software Engineering | 3 |
| ECE:5810/CS:5810 | Formal Methods in Software Engineering | 3 |
| ECE:5820/CS:5820 | Software Engineering Languages and Tools | 3 |
| ECE:5830/CS:5830 | Software Engineering Project | 3 |
| CS:3700/ MATH:3800 | Introduction to Numerical Methods | 3 |
| CS:3980 | Topics in Computer Science I | 3 |
| CS:4330 | Theory of Computation | 3 |
| CS:4350 | Logic in Computer Science | 3 |
| CS:4400 | Database Systems | 3 |
| CS:4420 | Artificial Intelligence | 3 |
| CS:4440 | Web Mining | 3 |
| CS:4470 | Health Data Analytics | 3 |
| CS:4500 | Research Methods in Human-Computer Interaction | 3 |
| CS:4630 | Mobile Computing | 3 |
| CS:4640 | Computer Security | 3 |
| CS:4700/ MATH:4860 | High Performance and Parallel Computing | 3 |
| CS:4720/ MATH:4820 | Optimization Techniques | 3 |
| CS:4740/IGPI:4740/ MATH:4740/ STAT:4740 | Large Data Analysis | 3 |
| CS:4980 | Topics in Computer Science II | 3 |
| CS:5340 | Limits of Computation | 3 |
| CS:5350 | Design and Analysis of Algorithms | 3 |
| CS:5360 | Randomized Algorithms | 3 |
| CS:5370 | Computational Geometry | 3 |
| CS:5430 | Machine Learning | 3 |
| CS:5620 | Distributed Systems and Algorithms | 3 |
| CS:5630 | Cloud Computing Technology | 3 |
| CS:5710/ MATH:5800 | Numerical Methods I | 3 |
| CS:5720/ MATH:5810 | Numerical Methods II | 3 |
| CS:5850 | Programming Language Foundations | 3 |
| CS:5860 | Lambda Calculus and Applications | 3 |
| CS:5980 | Topics in Computer Science III | arr. |

The following courses do not count towards the major; students take more advanced versions of these courses as part of their required coursework.

| Course # | Title | Hours |
|---|---|---|
| CS:2630 | Computer Organization | 4 |
| CS:2820 | Introduction to Software Development | 4 |
| CS:3210 | Programming Languages and Tools | arr. |
| CS:3640 | Introduction to Networks and Their Applications | 3 |

## Additional Electives

Students select an additional 6 s.h. in courses to reach a minimum of 18 s.h. in focus area electives. Courses may be from the electrical and computer engineering (prefix ECE) or computer science (prefix CS) categories in the previous lists, or they may be chosen from outside of those lists with the approval of an academic advisor.

## Theory Elective

| Course # | Title | Hours |
|---|---|---|
| One of these: | | |
| ECE:5330/IGPI:5331 | Graph Algorithms and Combinatorial Optimization | 3 |
| ECE:5450/IGPI:5450 | Machine Learning | 3 |
| ECE:5520 | Introduction to Information and Coding Theories | 3 |
| ECE:5525 | Cryptography | 3 |
| ECE:5810/CS:5810 | Formal Methods in Software Engineering | 3 |
| CS:4330 | Theory of Computation | 3 |
| CS:4350 | Logic in Computer Science | 3 |
| CS:4720/ MATH:4820 | Optimization Techniques | 3 |
| CS:5340 | Limits of Computation | 3 |
| CS:5360 | Randomized Algorithms | 3 |
| CS:5370 | Computational Geometry | 3 |
| CS:5430 | Machine Learning | 3 |
| CS:5620 | Distributed Systems and Algorithms | 3 |
| CS:5850 | Programming Language Foundations | 3 |
| CS:5860 | Lambda Calculus and Applications | 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.