

COMPUTER ENGINEERING

Home Department: Electrical and Computer Engineering

Department Head:

Mark G. Thompson, Ph.D.
Room 2-703 AB, 810-762-7900
ece@kettering.edu

Program Overview

Computer engineering is a branch of engineering concerned with the design, development, and application of computer systems. The Bachelor of Science in Computer Engineering (CE) program at Kettering University focuses on embedded-computer systems, in which a computer chip, module, or circuit board is built into a larger product or system. Examples of products containing embedded computers include "smart" phones, MP3 players, GPS navigation systems, hybrid and electric vehicle drive systems, unmanned vehicles, medical diagnostic devices, and manufacturing systems. Embedded systems applications span a wide range of industry sectors including consumer electronics, internet technology, computer hardware, automotive systems, and automated manufacturing. Computer engineers today can find employment in all these industries, and many more.

The Computer Engineering program is accredited by the Engineering Accreditation Commission (EAC) of ABET.

Program Educational Objectives

The Computer Engineering Program is designed to provide its graduates a solid educational foundation on which they can build successful and sustainable careers in computer engineering or a related field. In particular, graduates of the Computer Engineering Program will:

- Be employed or pursuing an advanced degree in the field of computer engineering or other related disciplines.
- Be productive members of interdisciplinary teams.
- Assume leadership positions in their industry, their continuing education, or in their communities, as their careers develop.
- Continue their professional development and engage in the life-long learning necessary for a sustainable career.

The Computer Engineering program is designed to meet its objectives through its curriculum, experiential learning including cooperative education, and co-curricular activities sponsored by the department and the university.

The curriculum includes a strong sequence of mathematics and basic science courses that provides the solid foundation in these areas that is common to all engineering programs at Kettering University. Engineering design and basic engineering concepts from a variety of disciplines are introduced in the freshman year in IME-100. Basic and practical computer programming and problem solving are introduced, also in the freshman year, in ECE-101.

The "core" curriculum covers hardware design, software development in both assembly and higher-level languages, computer networking, and embedded computer applications through a combination of computer engineering, electrical engineering, and computer science courses. Every

course in the core curriculum includes a strong laboratory experience, a hallmark of the program that both enhances students' learning and hones their abilities to apply technology effectively in the workplace. A flexible selection of electives allow students to deepen their knowledge in specific areas or applications of computer engineering, or to broaden their background through dual majors or minors, or simply well chosen combinations of courses that meet their individual educational goals.

The culminating experience in the curriculum takes place in CE-490, which gives students experience working in a team environment to complete a large engineering project that builds on the knowledge and skills they have gained in their coursework.

The curriculum is supported by modern lab facilities for digital systems, embedded systems, computer networks, virtual reality systems, logic systems, mobile robotics, mobile application development, circuits, and electronics.

BS/MASTERS PATHWAY

Undergraduate students also have an opportunity to get their bachelor's and master's degrees in five years with the BS/MASTERS Pathway.

Computer Engineering Program Curriculum Requirements

| Code | Title | Credit Hours |
|---|---------------------------------|--------------|
| First Year Experience | | |
| CILE-101 | First Year Foundations | 1 |
| General Education | | |
| COMM-101 | Rhetoric & Writing | 4 |
| ECON-201 | Economic Principles | 4 |
| 200-level Liberal Arts Electives | | 8 |
| LA-489 | Sr. Seminar: Leadership, Ethics | 4 |
| Advanced Humanities Electives ¹ | | 4 |
| Advanced Social Science Electives ¹ | | 4 |
| Advanced Humanities or Social Science Elective ¹ | | 4 |
| Total Credit Hours | | 33 |

¹ Humanities and Social Science advanced electives must be selected from approved 300 and 400 level courses.

| Code | Title | Credit Hours |
|--------------------------------------|---|--------------|
| Mathematics and Basic Science | | |
| CS-211 | Discrete Mathematics | 4 |
| MATH-101 | Calculus I | 4 |
| or MATH-101X | Calculus I | |
| MATH-102 | Calculus II | 4 |
| or MATH-102X | Calculus II | |
| or MATH-102H | Calculus II - Honors | |
| MATH-203 | Multivariate Calculus | 4 |
| or MATH-203X | Multivariate Calculus | |
| or MATH-203H | Multivariate Calculus - Honors | |
| MATH-204 | Differential Equations & Laplace Transforms | 4 |

| | | |
|---|---|------------|
| or MATH-204H | Differential Equations and Laplace Transforms - Honors | |
| MATH-258 | Probability and Statistics | 4 |
| PHYS-114 & PHYS-115 | Newtonian Mechanics and Newtonian Mechanics Laboratory | 4 |
| PHYS-224 & PHYS-225 | Electricity and Magnetism and Electricity and Magnetism Laboratory | 4 |
| Math/Science Electives | | 8 |
| <i>Credit Hours Subtotal:</i> | | 40 |
| Engineering Topics | | |
| CE-210 | Intro to Digital Systems Design | 4 |
| CE-320 | Intro to Microcomputers | 4 |
| CE-420 | Microcomputer Systems | 4 |
| CE-422 | Computer Architecture and Organization | 4 |
| CE-426 | Real-Time Embedded Systems | 4 |
| CE-480 | Computer Networks | 4 |
| CE-490 | Senior CE Design Project | 4 |
| ECE-101 | MATLAB and C Programming | 4 |
| EE-210 | Engineering Circuit Analysis 1 | 4 |
| EE-320 | Introduction to Microelectronic Devices and Circuits | 4 |
| IME-100 | Interdisciplinary Design and Manufacturing | 4 |
| Computer Engineering Electives | | 8 |
| Electrical Engineering Elective | | 4 |
| Computer Science | | |
| CS-101 | Computing & Algorithms I | 4 |
| CS-102 | Computing & Algorithms II | 4 |
| Computer Science Elective | | 4 |
| <i>Credit Hours Subtotal:</i> | | 68 |
| Electives | | |
| Free Electives | | 8 |
| Technical Elective | | 8 |
| <i>Credit Hours Subtotal:</i> | | 16 |
| Culminating Undergraduate Experience | | |
| CILE-400 & CILE-401 ² | Undergraduate Thesis Initiation and Undergraduate Thesis Completion | 4 |
| <i>Credit Hours Subtotal:</i> | | 4 |
| Total Credit Hours | | 128 |

(Minimum) Total Credits Required for Program: 161

² Students are automatically registered for CILE-400 in a co-op term when they reach Junior II status.

Electives

Computer Engineering Electives

A computer engineering elective may be any course with a CE prefix.

Computer Science Electives

A computer science elective may be any course with a CS prefix.

Electrical Engineering Elective

The electrical engineering elective may be any course with an EE prefix.

Free Elective

COMM-435 and MATH-100 are **not** accepted for free elective credit.

Math/Science Electives

A math/science elective may be any course with a BIOL, CHEM, EP, MATH, or PHYS prefix, *except* MATH-100 and EP-235.

Technical Electives

A technical elective may be any course numbered 200-level and above with a BIOL, CE, CHEM, CHME, CS, EE, IME, MATH, MECH, or PHYS prefix, except IME-211, that is not used to complete core degree requirements. Additionally, BUSN-303, BUSN-304, and MGMT-419 also qualify as technical electives.

Representative Program

| Course | Title | Credit Hours |
|---------------------------------|--|--------------|
| Freshman I | | |
| CILE-101 | First Year Foundations | 1 |
| COMM-101 | Rhetoric & Writing | 4 |
| ECE-101 | MATLAB and C Programming | 4 |
| MATH-101 | Calculus I | 4 |
| Math/Science Elective | | 4 |
| Credit Hours | | 17 |
| Freshman II | | |
| ECON-201 | Economic Principles | 4 |
| IME-100 | Interdisciplinary Design and Manufacturing | 4 |
| MATH-102 | Calculus II | 4 |
| PHYS-114 | Newtonian Mechanics | 3 |
| PHYS-115 | Newtonian Mechanics Laboratory | 1 |
| Credit Hours | | 16 |
| Sophomore I | | |
| CE-210 | Intro to Digital Systems Design | 4 |
| MATH-203 | Multivariate Calculus | 4 |
| 200-level Liberal Arts Elective | | 4 |
| PHYS-224 | Electricity and Magnetism | 3 |
| PHYS-225 | Electricity and Magnetism Laboratory | 1 |
| Credit Hours | | 16 |
| Sophomore II | | |
| CE-320 | Intro to Microcomputers | 4 |
| EE-210 | Engineering Circuit Analysis 1 | 4 |
| 200-level Liberal Arts Elective | | 4 |
| MATH-204 | Differential Equations & Laplace Transforms | 4 |
| Credit Hours | | 16 |
| Junior I | | |
| CE-420 | Microcomputer Systems | 4 |
| CS-101 | Computing & Algorithms I | 4 |
| EE-320 | Introduction to Microelectronic Devices and Circuits | 4 |

| | | |
|--|--|------------|
| MATH-258 | Probability and Statistics | 4 |
| Advanced Humanities or Social Science Elective | | 4 |
| Credit Hours | | 20 |
| Junior II | | |
| CE-422 | Computer Architecture and Organization | 4 |
| CE-426 | Real-Time Embedded Systems | 4 |
| CS-102 | Computing & Algorithms II | 4 |
| CS-211 | Discrete Mathematics | 4 |
| Advanced Humanities or Social Science Elective | | 4 |
| Credit Hours | | 20 |
| Senior I | | |
| CE-480 | Computer Networks | 4 |
| LA-489 | Sr. Seminar: Leadership, Ethics | 4 |
| Computer Science Elective | | 4 |
| Electrical Engineering Elective | | 4 |
| Math/Science Elective | | 4 |
| Credit Hours | | 20 |
| Senior II | | |
| CE-490 | Senior CE Design Project | 4 |
| Computer Engineering Elective | | 4 |
| Free Elective | | 4 |
| Technical Elective | | 4 |
| Credit Hours | | 16 |
| Senior III | | |
| Advanced Humanities or Social Science Elective | | 4 |
| Computer Engineering Elective | | 4 |
| Free Elective | | 4 |
| Technical Elective | | 4 |
| Credit Hours | | 16 |
| Any Term | | |
| CILE-400 & CILE-401 | Undergraduate Thesis Initiation and Undergraduate Thesis Completion | 4 |
| Credit Hours | | 4 |
| Total Credit Hours | | 161 |

(Minimum) Total Credits Required for Program: 161