

# COMPUTER SCIENCE

**Home Department:** Computer Science (<https://my.kettering.edu/academics/departments/computer-science>)

## Department Head:

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## Program Overview

Computer Science (<https://www.kettering.edu/programs-and-degrees/computer-science>) touches virtually every aspect of human endeavor. Its impact on society is seen in the proliferation of computers, information systems, game systems, web browsers, search engines, computerization and automation of automobiles, and all the wonderful application programs that have been developed to make computers more productive and easier to use. An important aspect of the field deals with how to make programming easier, software more reliable, and the processing and retrieval of information more accessible, but fundamentally, computer science is a science of abstraction - creating the correct models for real-world problems that can be represented and manipulated inside a computer.

Computer scientists are experts on the subject of computation and information representation, both in terms of the theory of the fundamental capabilities and limitations of computation, as well as how computation can be practically realized and applied. A computer scientist understands how to design and analyze algorithms that apply computation effectively, and how to represent, store, and retrieve information efficiently, and how to design software systems to solve complex problems.

The program for Computer Science majors is broad and rigorous; students are required to have a solid foundation in computer software, hardware, and theory. Yet, the program is structured in a way that supports in-depth study of areas in and outside the computing field. Technical and free electives give students the opportunity to take advanced courses in areas of computer science such as information retrieval, computer graphics, cryptography, computer and network security, and artificial intelligence; students may elect to concentrate their studies in computer gaming, or cybersecurity; students can easily obtain minors in diverse fields such as applied mathematics, applied physics, computer engineering, and literature.

A wide variety of exciting professional and academic opportunities exist for graduates of computer science including software engineering, Internet systems and technology, security, hardware development, information systems, biotechnology, business, and consulting, as well as masters and doctoral studies in computing related fields. With the aid of a Computer Science faculty advisor, the computer science student is expected to put together a coherent program of study that supports career objectives and is true to the aims of a liberal education.

The program in Computer Science is accredited by the Computing Accreditation Commission of ABET (<http://www.abet.org>).

## Computer Science vs. Computer Engineering

Historically, the discipline of computer science draws its roots from two separate disciplines.

- Electrical Engineering: the development of devices that depend on electricity and magnetism.
- Mathematics: the study of the properties and interactions of idealized objects, such as numbers and symbols.

Computer science lies at the intersection of these two disciplines. It is the study of a particular class of electrical devices (i.e. computers) which can perform mathematical, logical operations (i.e. software).

The computer engineering (<http://catalog.kettering.edu/undergrad/academic-programs/computer-engineering>) and computer science programs have a common core of classes. Students in both programs study programming, the design of digital systems, computer architecture, and operating systems, as well as a solid foundation in mathematics, science, and general education.

The computer engineering program emphasizes the design and development of physical computer systems. In addition to a common engineering core, students in computer engineering study topics such as the analysis of electrical circuits, and electronics, with an emphasis on electrical and digital design.

The computer science program emphasizes the design and development of software systems. Students in computer science study topics such as algorithms and data structures, software engineering, compiler design, database systems, artificial intelligence, and the theoretical foundations of computation.

Both programs prepare students for work in the computer industry, though with emphasis on different areas. Students should select the program which fits their skills and interests best. Both programs offer minors (<http://catalog.kettering.edu/undergrad/academic-programs/minors>), so students may take additional courses in these areas and have it designated on their transcript.

## Program Educational Objectives

1. Computer Science graduates will have sufficient depth of understanding of the fundamental areas of computer science to enable them for success in today's workplace.
2. Computer Science graduates will have sufficient breadth of understanding to enable continued professional development and lifelong learning throughout their careers.
3. Computer Science graduates will have sufficient teamwork, communication, and interpersonal skills to enable them to work with others effectively in their professional careers.
4. Computer Science graduates will be sufficiently prepared to be innovative and ethical leaders in a global society.

## Computer Science Program Curriculum Requirements

### First Year Experience

FYE-101	First Year Foundations	1
<i>Credit Hours Subtotal:</i>		<i>1</i>

### General Education

COMM-101	Written & Oral Communication I	4
COMM-301	Written & Oral Communication II	4
ECON-201	Economic Principles	4
HUMN-201	Introduction to Humanities	4
LS-489	Senior Seminar: Leadership, Ethics, and Contemporary Issues	4
SSCI-201	Introduction to the Social Sciences	4
Advanced Humanities Elective		4
Advanced Social Science Elective		4
Liberal Studies Electives		8
<i>Credit Hours Subtotal:</i>		<i>40</i>
<b>Basic Science</b>		
Science Electives		16
<i>Credit Hours Subtotal:</i>		<i>16</i>
<b>Computer Science</b>		
CS-101	Computing & Algorithms I	4
CS-102	Computing & Algorithms II	4
CS-203	Computing & Algorithms III	4
CS-211	Discrete Mathematics	4
CS-231	Programming Language Paradigms	4
CS-300	The Computing Professional	4
CS-312	Theory of Computation	4
CS-351	Cloud Computing	4
CS-451	Operating Systems	4
CS-471	Software Engineering	4
Computer Science Technical Electives		16
<i>Credit Hours Subtotal:</i>		<i>56</i>
<b>Computer Engineering</b>		
CE-210	Digital Systems I	4
CE-320	Microcomputers I	4
<i>Credit Hours Subtotal:</i>		<i>8</i>
<b>Mathematics</b>		
MATH-101	Calculus I	4
or MATH-101X	Calculus I	
Select one of the following:		4
MATH-102	Calculus II	
MATH-102X	Calculus II	
MATH-102H	Calculus II - Honors	
Mathematics Electives		12
<i>Credit Hours Subtotal:</i>		<i>20</i>
<b>Electives</b>		
Free Electives		16
<i>Credit Hours Subtotal:</i>		<i>16</i>
<b>Culminating Undergraduate Experience</b>		
CUE-495	Culminating Undergraduate Experience Introductory Course (No credit, Pass/Fail)	
Select one of the following:		4
CUE-495C	Co-op Thesis	
CUE-495E	Intra/Entre/Social E-ship Thesis	
CUE-495P	Professional Practice Thesis	
CUE-495R	Research Thesis	

*Credit Hours Subtotal:* 4

Total Credit Hours 161

**(Minimum) Total Credits Required for Program: 161**

## Concentrations

The Computer Science concentrations provide students with a technical depth of study in an emerging area of interest. The student's degree remains in Computer Science, and this concentration does not prevent students from working within any government or industry position in the computer science arena. Students interested in either the Computer Gaming or Cybersecurity concentrations should contact Professor John Geske, Department Head of Computer Science.

### Computer Gaming

Students majoring in Computer Science may select a concentration in Computer Gaming consisting of the following 16 credit hours of Computer Science technical electives as listed below.

#### Required Courses

CS-320	Computer Graphics	4
CS-385	Introduction to Game Design	4
CS-420	Introduction to Virtual Reality	4
CS-485	Advanced Game Development	4

### Cybersecurity

Students majoring in Computer Science may select a concentration in Cybersecurity consisting of the following 16 credit hours of Computer Science technical electives as listed below.

#### Required Courses

CS-415	Cryptography	4
CS-455	Computer and Network Security	4
CS-457	Wireless and Mobile Security	4
CS-458	Computer and Network Forensics	4

## Representative Program

Course	Title	Credit Hours
<b>Freshman I</b>		
FYE-101	First Year Foundations	1
COMM-101	Written & Oral Communication I	4
CS-101	Computing & Algorithms I	4
MATH-101	Calculus I	4
Science Elective <sup>1</sup>		4
<i>Credit Hours</i>		<i>17</i>
<b>Freshman II</b>		
CS-102	Computing & Algorithms II	4
CS-211	Discrete Mathematics	4
MATH-102	Calculus II	4
HUMN-201 or SSCI-201	Introduction to Humanities or Introduction to the Social Sciences	4
<i>Credit Hours</i>		<i>16</i>
<b>Sophomore I</b>		
CS-203	Computing & Algorithms III	4

HUMN-201 or SSCI-201	Introduction to Humanities or Introduction to the Social Sciences	4
Mathematics Elective		4
Science Elective <sup>1</sup>		4
Credit Hours		16
<b>Sophomore II</b>		
CE-210	Digital Systems I	4
CS-231	Programming Language Paradigms	4
ECON-201	Economic Principles	4
Science Elective <sup>1</sup>		4
Credit Hours		16
<b>Junior I</b>		
CE-320	Microcomputers I	4
COMM-301	Written & Oral Communication II	4
CS-312	Theory of Computation	4
CS Technical Elective <sup>2</sup>		4
Credit Hours		16
<b>Junior II</b>		
CS-351	Cloud Computing	4
Advanced Humanities or Advanced Social Science Elective		4
CS Technical Elective <sup>2</sup>		4
Free Elective		4
Mathematics Elective		4
Credit Hours		20
<b>Senior I</b>		
CS-300	The Computing Professional	4
Advanced Humanities or Advanced Social Science Elective		4
CS Technical Elective <sup>2</sup>		4
Free Electives		8
Credit Hours		20
<b>Senior II</b>		
CS-471	Software Engineering	4
LS-489	Senior Seminar: Leadership, Ethics, and Contemporary Issues	4
CS Technical Elective <sup>2</sup>		4
Free Elective		4
Mathematics Elective		4
Credit Hours		20
<b>Senior III</b>		
CS-451	Operating Systems	4
Liberal Studies Electives		8
Science Elective <sup>1</sup>		4
Credit Hours		16
<b>Any Term</b>		
CUE -495C/E/P/R Culminating Undergraduate Experience		4
Credit Hours		4
Total Credit Hours		161

<sup>2</sup> A list of approved technical electives is available from the department and listed on the department web-site.

**(Minimum) Total Credits Required for Program: 161**

<sup>1</sup> Must include two courses (8 credits) with a laboratory component.