The Computer Science major includes the following optional industrial internship.

thesis. The non-thesis option requires a capstone project and an optional thesis option. The thesis option requires original research and a written pursuit applied research and development in industry may select the non-academic research should select the thesis option. Students planning to thesis or non-thesis. Students planning to pursue a Ph.D. degree an/or

The M.S. degree in Computer Science has two culminating options: thesis or non-thesis. Students planning to pursue a Ph.D. degree an/or academic research should select the thesis option. Students planning to pursue applied research and development in industry may select the non-thesis option. The thesis option requires original research and a written thesis. The non-thesis option requires a capstone project and an optional industrial internship.

The Master of Science degree in Computer Science provides students with an educational and research environment to develop career paths through necessary training with emerging technologies. Graduates have the technical knowledge and skills necessary for success within the information and high technology industries.

Fully Offered

- Kent Campus

Admission Terms

- Fall
- Spring
- Summer

Description

The Master of Science degree in Computer Science provides students with an educational and research environment to develop career paths through necessary training with emerging technologies. Graduates have the technical knowledge and skills necessary for success within the information and high technology industries.

The M.S. degree in Computer Science has two culminating options: thesis or non-thesis. Students planning to pursue a Ph.D. degree an/or academic research should select the thesis option. Students planning to pursue applied research and development in industry may select the non-thesis option. The thesis option requires original research and a written thesis. The non-thesis option requires a capstone project and an optional industrial internship.

The Computer Science major includes the following optional concentrations:

- The Computational Data Science concentration prepares students to process big data. In a spectrum of real-world applications, the collected data (from such sources as mobile devices, GPS, sensor/RFID networks, Internet, social media, etc.) is so large and complex, the traditional data processing tools cannot efficiently and effectively handle it. This concentration focuses on algorithms development, machine learning, computation techniques, network and computing infrastructure and software.

- The Computer Engineering concentration prepares students to meet the need of computer engineering professionals in the industry for designing and managing emerging smart devices and computer-integrated physical systems with programmable intelligence. Students learn the hardware-software co-design principles and theory, architecture of the associated software and hardware, devices and sensors communication protocols and the interfaces to effectively design, build and evolve such smart devices and computer-driven intelligent physical systems.

- The Computer Security concentration exposes students to a wide range of topics on the security of computer systems. Students study the vulnerabilities in software and networks and develop algorithms and software to protect data, using digital encryption coding, protected databases and protected computer networking techniques.

Students opting to not pursue a concentration will create a 12-credit hour individualized plan of study with their advisor.

Admission Requirements

- Bachelor's degree from an accredited college or university for unconditional admission
- Minimum 3.000 undergraduate GPA on a 4.000 point scale for unconditional admission
- Core components of an undergraduate computer science curriculum\(^1\)
- Official transcript(s)
- GRE scores
- Résumé
- Goal statement
- Three letters of recommendation
- English language proficiency - all international students must provide proof of English language proficiency (unless they meet specific exceptions) by earning one of the following:
  - Minimum 525 TOEFL PBT score (paper-based version)
  - Minimum 71 TOEFL IBT score (Internet-based version)
  - Minimum 74 MELAB score
  - Minimum 6.0 IELTS score
  - Minimum 50 PTE score
  - Minimum 100 Duolingo English Test score

For more information about graduate admissions, please visit the Graduate Studies admission website. For more information on international admission, visit the Office of Global Education’s admission website.

\(^1\) Prospective students must successfully have completed high-level algebra, geometry and calculus coursework (equivalent to the following Kent State courses: MATH 12002, MATH 12003, and MATH 21001). In addition, it is strongly recommended that students successfully have completed coursework in computer science, including programming, data structures, abstraction, operating systems, combinatorial analysis and discrete structures, (equivalent to the following Kent State courses: CS 13001, CS 23001, CS 23022, CS 33211, CS 35101, and CS 46101). Highly qualified students lacking preparation in certain standards areas may be admitted.

Program Learning Outcomes

Graduates of this program will be able to:

1. Demonstrate breadth-of-knowledge and understanding of essential facts, concepts, principles and theories relating to advanced topics in computer science.
2. Conduct literature searches, comprehend advanced research materials and uncover connections between related work and critical evaluation and synthesis.
3. Perform research, discovery and integration by applying advanced knowledge of computer science.
## Program Requirements
### Major Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 69191</td>
<td>MASTER'S SEMINAR</td>
<td>2</td>
</tr>
</tbody>
</table>

Core Courses, choose one course each from four out of the five categories:

- **Computational Data Science Category**
  - See courses under Computational Data Science concentration

- **Computer Engineering Category**
  - See courses under Computer Engineering concentration

- **Computer Security Category**
  - See courses under Computer Security concentration

- **Software and Application Category**
  - CS 57201 HUMAN COMPUTER INTERACTION
  - CS 63005 ADVANCED DATABASE SYSTEMS DESIGN
  - CS 63100 COMPUTATIONAL HEALTH INFORMATICS
  - CS 63901 SOFTWARE ENGINEERING METHODOLOGIES
  - CS 63902 SOFTWARE EVOLUTION
  - CS 64401 IMAGE PROCESSING
  - CS 64402 MULTIMEDIA SYSTEMS AND BIOMETRICS
  - CS 67101 ADVANCED COMPUTER GRAPHICS
  - CS 67301 SCIENTIFIC VISUALIZATION
  - CS 67302 INFORMATION VISUALIZATION

- **Theory and Algorithms Category**
  - CS 63301 PARALLEL AND DISTRIBUTED COMPUTING
  - CS 64201 ADVANCED ARTIFICIAL INTELLIGENCE
  - CS 64301 PATTERN RECOGNITION PRINCIPLES
  - CS 66101 ADVANCED TOPICS IN ALGORITHMS
  - CS 66105 PARALLEL AND DISTRIBUTED ALGORITHMS
  - CS 66110 COMPUTATIONAL GEOMETRY

Culminating Requirement, choose from the following:

- CS 69099 CAPSTONE PROJECT (taken twice)
- CS 69099 CAPSTONE PROJECT & CS 69192 and GRADUATE INTERNSHIP
- CS 69199 THESIS

### Additional Requirements or Concentrations

Choose from the following:

- Additional Requirements for Students Not Declaring a Concentration
- Computational Data Science Concentration
- Computer Engineering Concentration
- Computer Security Concentration

Minimum Total Credit Hours: 32

### Additional Requirements for Students Not Declaring a Concentration

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Core Courses, choose one course each from four out of the five categories:

- **Computational Data Science Category**
  - See courses under Computational Data Science concentration

- **Computer Engineering Category**
  - See courses under Computer Engineering concentration

- **Computer Security Category**
  - See courses under Computer Security concentration

- **Software and Application Category**
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Culminating Requirement, choose from the following:

- CS 69099 CAPSTONE PROJECT (taken twice)
- CS 69099 CAPSTONE PROJECT & CS 69192 and GRADUATE INTERNSHIP
- CS 69199 THESIS

Minimum Total Credit Hours: 32

## Computational Data Science Concentration Requirements

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<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>CS 54001</td>
<td>COMPUTER SCIENCE III - PROGRAMMING PATTERNS</td>
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<tr>
<td>CS 54201</td>
<td>ARTIFICIAL INTELLIGENCE</td>
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</tr>
<tr>
<td>CS 54202</td>
<td>MACHINE LEARNING AND DEEP LEARNING</td>
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</tr>
<tr>
<td>CS 63005</td>
<td>ADVANCED DATABASE SYSTEMS DESIGN</td>
<td></td>
</tr>
<tr>
<td>CS 63015</td>
<td>DATA MINING TECHNIQUES</td>
<td></td>
</tr>
<tr>
<td>CS 63016</td>
<td>BIG DATA ANALYTICS</td>
<td></td>
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<tr>
<td>CS 63017</td>
<td>BIG DATA MANAGEMENT</td>
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</tr>
<tr>
<td>CS 63018</td>
<td>PROBABILISTIC DATA MANAGEMENT</td>
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</table>

Minimum Total Credit Hours: 12

## Computer Engineering Concentration Requirements

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<thead>
<tr>
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<tbody>
<tr>
<td>CS 53301</td>
<td>SOFTWARE DEVELOPMENT FOR ROBOTICS</td>
<td>12</td>
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<tr>
<td>CS 53302</td>
<td>ALGORITHMIC ROBOTICS</td>
<td></td>
</tr>
<tr>
<td>CS 53303</td>
<td>INTERNET OF THINGS</td>
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</tr>
<tr>
<td>CS 53305</td>
<td>ADVANCED DIGITAL DESIGN</td>
<td></td>
</tr>
<tr>
<td>CS 53334</td>
<td>HUMAN-ROBOT INTERACTION</td>
<td></td>
</tr>
<tr>
<td>CS 63201</td>
<td>ADVANCED OPERATING SYSTEMS</td>
<td></td>
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<tr>
<td>CS 63304</td>
<td>CLUSTER COMPUTING</td>
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<tr>
<td>CS 63305</td>
<td>MULTICORE COMPUTING</td>
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</tr>
<tr>
<td>CS 63306</td>
<td>EMBEDDED COMPUTING</td>
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</tr>
<tr>
<td>CS 65101</td>
<td>ADVANCED COMPUTER ARCHITECTURE</td>
<td></td>
</tr>
<tr>
<td>CS 65202</td>
<td>ADVANCED COMMUNICATION NETWORKS</td>
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<tr>
<td>CS 65203</td>
<td>WIRELESS AND MOBILE COMMUNICATION NETWORKS</td>
<td></td>
</tr>
<tr>
<td>CS 65301</td>
<td>SYSTEM MODELING AND PERFORMANCE EVALUATION</td>
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</table>

Minimum Total Credit Hours: 12

## Computer Security Concentration Requirements

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</table>

Minimum Total Credit Hours: 12

1 Courses taken for the core cannot be counted again as an elective or concentration course. The list of courses offered each semester, including department-approved special topics, is available in the department’s graduate office.
Students may complete a capstone-related elective course in place of an internship with approval from the graduate coordinator. Students selecting the thesis option must form a master’s thesis committee, which will include the advisor and at least two other graduate faculty members. The thesis topic and committee must be approved by the advisor and graduate coordinator. The final version of the thesis must be approved by the advisor, thesis committee and graduate coordinator.

**Graduation Requirements**

- Maximum 12 credit hours of 50000-level courses may be applied toward the degree.