The undergraduate curriculum in Computer Science leading to the Bachelor of Science degree is accredited by the Computing Accreditation Commission of ABET, http://www.abet.org. This degree equips students with a sound knowledge of the foundations of Computer Science as well as problem-solving and system design skills necessary to create robust, efficient, reliable, scalable, and flexible software systems. The B.S. degree in Computer Science prepares students for graduate study in Computer Science and for various business, industry, and government positions including computer scientists, information technologists, and software developers. The main educational objectives of the Computer Science program at Iowa State University are that its graduates demonstrate expertise, engagement, and learning within two to five years after graduation.

- **Expertise:** Graduated students should have the ability to establish peer-recognized expertise in the discipline. They should have the ability to articulate this expertise by formulating and solving problems of interest, by creating or deriving value through the application of technology, and by using mathematical foundations, algorithmic principles, and computer science theory in designing, implementing and evaluating computer-based systems and processes which meet the desired needs of their employers.

- **Engagement:** Graduated students should have the ability to be engaged in the profession through the practice of computer science in industry, academia, or the public sector. They should demonstrate effective teaming and commitment to working with others by applying communications skills and professional knowledge.

- **Learning:** Graduated students should have the ability to engage in sustained learning through graduate work, professional improvement opportunities, and self-study so that they can adapt to the role played by information processing in ever-changing areas of science, technology, and society.

**Student Learning Outcomes**

Upon graduation, students should have:

1. An ability to analyze a complex computing problem, and to apply principles of computing and other relevant disciplines to identify solutions.
2. An ability to design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. An ability to communicate effectively in a variety of professional contexts.
4. An ability to recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. An ability to function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. An ability to apply computer science theory and software development fundamentals to produce computing-based solutions.

**Undergraduate Curriculum in Software Engineering**

The Department of Computer Science, together with the Department of Electrical and Computer Engineering, also offer a curriculum leading to an undergraduate degree in Software Engineering (http://catalog.iastate.edu/collegeofliberalartsandsciences/softwareengineering/). The Software Engineering curriculum offers emphasis areas in Software Engineering principles, process, and practice. Students may also take elective courses in Computer Engineering and Computer Science.

**Degree Requirements**

A student seeking a B.S. degree in Computer Science must satisfy the requirements of the University and College of Liberal Arts and Sciences (see Liberal Arts and Sciences, Curriculum) and the departmental requirements.

The departmental requirements consist of a minimum of 50 credits in Computer Science and satisfaction of written and oral requirements. Students must earn at least a C- in Math 165, Math 166, and each Computer Science course taken to fulfill the Degree Program. The LAS College requires the major must contain at least 8 credits in courses taken at Iowa State University that are numbered 300 or above and in which the student's grade is C or higher.

The following courses are required:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM S 101</td>
<td>Orientation</td>
<td>R</td>
</tr>
<tr>
<td>COM S 127</td>
<td>Introduction to Computer Programming</td>
<td>4</td>
</tr>
<tr>
<td>COM S 227</td>
<td>Object-oriented Programming</td>
<td>4</td>
</tr>
<tr>
<td>COM S 228</td>
<td>Introduction to Data Structures</td>
<td>3</td>
</tr>
<tr>
<td>COM S 309</td>
<td>Software Development Practices</td>
<td>3</td>
</tr>
<tr>
<td>COM S 311</td>
<td>Introduction to the Design and Analysis of Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>COM S 321</td>
<td>Introduction to Computer Architecture and Machine-Level Programming</td>
<td>3</td>
</tr>
<tr>
<td>COM S 327</td>
<td>Advanced Programming Techniques</td>
<td>3</td>
</tr>
<tr>
<td>COM S 331</td>
<td>Theory of Computing</td>
<td>3</td>
</tr>
<tr>
<td>COM S 342</td>
<td>Principles of Programming Languages</td>
<td>3</td>
</tr>
</tbody>
</table>
At least 15 credits, including at least 6 credits of 400-level courses, all with a grade of C- or better, from the following:

- **COM S 319** Construction of User Interfaces
- **COM S 336** Introduction to Computer Graphics
- **COM S 362** Object-Oriented Analysis and Design
- **COM S 363** Introduction to Database Management Systems
- **COM S 407** Applied Formal Methods
- **COM S 409** Software Requirements Engineering
- **COM S 410** Distributed Development of Software
- **COM S 412** Formal Methods in Software Engineering
- **COM S 413** Foundations and Applications of Program Analysis
- **COM S 415** Software System Safety
- **COM S 417** Software Testing
- **COM S 418** Introduction to Computational Geometry
- **COM S 421** Logic for Mathematics and Computer Science
- **COM S 424** Introduction to High Performance Computing
- **COM S 425** High Performance Computing for Scientific and Engineering Applications
- **COM S 426** Introduction to Parallel Algorithms and Programming
- **COM S 430** Concurrent Programming in Practice
- **COM S 433** Molecular Programming of Nanoscale Devices and Processes
- **COM S 435** Algorithms for Large Data Sets: Theory and Practice
- **COM S 437** Computer Game and Media Programming
- **COM S 440** Principles and Practice of Compiling
- **COM S 441** Programming Languages
- **COM S 453** Privacy Preserving Algorithms and Data Security
- **COM S 454** Distributed Systems
- **COM S 455** Simulation: Algorithms and Implementation
- **COM S 461** Principles and Internals of Database Systems
- **COM S 472** Principles of Artificial Intelligence
- **COM S 474** Introduction to Machine Learning
- **COM S 476** Motion Strategy Algorithms and Applications
- **COM S 477** Foundations of Robotics and Computer Vision
- **COM S 481** Numerical Methods for Differential Equations
- **COM S 486** Fundamental Concepts in Computer Networking
- **COM S 487** Network Programming, Applications, and Research Issues
- **CPR E 430** Network Protocols and Security
- **CPR E 431** Basics of Information System Security
- **CPR E 458** Real Time Systems
- **CPR E 489** Computer Networking and Data Communications

Total Credits: 50

Com S 414 may not be applied towards fulfilling the 400-level electives.

Toward satisfying the requirements of the College of Liberal Arts and Sciences, the following courses should be included:

- **PHIL 343** Philosophy of Technology 3
- **SP CM 212** Fundamentals of Public Speaking 3

At least 17 credits of Math and Statistics 17

- **MATH 165** Calculus I 4
- **MATH 166** Calculus II 4
- **COM S 230** Discrete Computational Structures 3

One Statistics course from:

- **STAT 305** Engineering Statistics 3
- **STAT 330** Probability and Statistics for Computer Science 3
- **STAT 341** Introduction to the Theory of Probability and Statistics I 4

At least one Math course from:

- **MATH 207** Matrices and Linear Algebra 3
- **MATH 265** Calculus III 4
- **MATH 266** Elementary Differential Equations 3
- **MATH 267** Elementary Differential Equations and Laplace Transforms 4
- **MATH 304** Combinatorics 3
- **MATH 314** Graph Theory 3
- **MATH 317** Theory of Linear Algebra 4

One of the following 2-course Natural Science sequences (with labs):

- **BIOL 211** & 211L Principles of Biology I and Principles of Biology Laboratory I 8
- **BIOL 212** & 212L Principles of Biology II and Principles of Biology Laboratory II 8

Or

- **BIOL 255** & 255L Fundamentals of Human Anatomy and Fundamentals of Human Anatomy Laboratory 8
- **BIOL 256** & 256L Fundamentals of Human Physiology and Fundamentals of Human Physiology Laboratory 8
The following courses meet the communication proficiency requirement:

- LIB 160 Introduction to College Level Research 1
- ENGL 150 Critical Thinking and Communication 3
- ENGL 250 Written, Oral, Visual, and Electronic Composition 3
- One of the following
  - ENGL 302 Business Communication 3
  - ENGL 305 Creative Writing: Nonfiction 3
  - ENGL 309 Proposal and Report Writing 3
  - ENGL 314 Technical Communication 3

According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 250. The Department requires a C or higher in the upper-level ENGL course (302, 305, 309, 314).

To obtain a bachelor's degree from the College of Liberal Arts and Sciences, curriculum in liberal arts and sciences, a student must earn at least 45 credits at the 300 level or above taken at a four-year college. All such credits, including courses taken on a pass/not pass basis, may be used to meet this requirement.

Students must take at least 15 credits of Computer Science courses at the 300 level or higher at Iowa State University while resident here. Computer Science transfer courses need to be a minimum grade of C or higher to be considered for course substitution.

Undergraduate Minor in Computer Science

The Department of Computer Science offers an undergraduate minor in Computer Science. The minor requires at least 16 credits in computer science courses. Com S 414 cannot be used to fulfill minor requirements.
A minimum grade of C- is required in Com S 227 and Com S 228. A minimum grade of C is required in both Com S 311 and the three credits of 300-level Computer Science courses and above. Students must meet all prerequisites for Computer Science courses taken to fulfill the minor. At least 6 credits of the minor must be in courses numbered 300 and above and taken at ISU with a grade of C or higher. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

**Certificate in Computing Applications**

Students interested in the computing applications, may want to explore the Certificate in Computing Applications (http://catalog.iastate.edu/collegeofliberalartsandsciences/computingapplicationscertificate/); it is a cross-disciplinary course of study in the Colleges of Liberal Arts and Sciences, Engineering, and Business.

**Concurrent Bachelors and Masters Degrees**

The concurrent B.S./M.S. degree in Computer Science offers highly motivated and focused students the opportunity for accelerated study. Students will be allowed to double count up to 12 credits. This program will pair undergraduate students in the concurrent program with research teams of graduate students and dedicated faculty members prominent in their fields of expertise. Students that declare concurrent enrollment will be considered graduate-level students, and therefore eligible for graduate research assistantships and scholarships. Click here for application instructions (https://www.cs.iastate.edu/concurrent-bsms-computer-science/).

More information can be found here: https://www.cs.iastate.edu/cs.iastate.edu/concurrent-comajor-transfer (https://www.cs.iastate.edu/cs.iastate.edu/concurrent-comajor-transfer/)

**Graduate programs**

The department offers graduate programs leading to degrees of Master of Science (MS) and Doctor of Philosophy (PhD) with a major in Computer Science. The Doctor of Philosophy degree may also be earned with computer science as a co-major with some other discipline. Additionally, the department offers a minor for the students majoring in other disciplines. The department also offers a Master of Science (MS) in Artificial Intelligence. This program is for graduate-level students with strong quantitative backgrounds who are interested in learning AI and machine-learning techniques.

Established research areas include algorithms, artificial intelligence, computational complexity, computer architecture, bioinformatics, computational biology, computer networks, database systems, formal methods, information assurance, machine learning and neural networks, multimedia, operating systems, parallel and distributed computing, programming languages, robotics, and software engineering. There are also numerous opportunities for interdisciplinary research.

Typically, students beginning graduate work in the Department of Computer Science have completed a bachelor’s degree or equivalent in Computer Science. However, some students with undergraduate majors in other areas, such as Mathematical, physical, or biological science or engineering become successful graduate students in Computer Science.

For the degree Master of Science, 31 - 34 semester credits is required. A thesis or a creative component demonstrating research and the ability to organize and express significant ideas in computer science is required.

The purpose of the doctoral program is to train students to do original research in Computer Science. Each student is also required to attain knowledge and proficiency commensurate with a leadership role in the field. The PhD requirements are governed by the student’s program of study committee within established guidelines of the department and the graduate college. They include coursework (demonstrating breadth and depth of knowledge), a research skills requirement, a preliminary examination, and a doctoral dissertation and final oral examination. The department recommends that all graduate students majoring in Computer Science teach as part of their training for an advanced degree.