COMPUTER SCIENCES, B.S.

Our graduates discover that computer science (CS) opens up a world of possibilities.

Computer scientists enjoy exceptional career opportunities, in settings ranging from large, established companies to adventurous new start-ups. They are also well qualified to pursue graduate study in a number of fields.

Our students are creative, analytical problem-solvers. This is a rich, collaborative and varied field that you will find challenging, no matter where your individual interests lie.

And there is more to CS than programming. While software engineering is an important skill, computer scientists also work with robots and other physical devices, design hardware that runs faster and more efficiently, and apply machine learning techniques to gain insight from large data sets—to name just a few examples.

Because CS has become highly interconnected with medicine, business and many other fields, it is a great fit with other interests you may have. You will enjoy a strong career outlook while having an impact on society.

HOW TO GET IN

DECLARATION REQUIREMENTS

To declare the computer sciences major, students must complete one COMP SCI course at UW–Madison and achieve a grade of C or better in that course. The course must be worth 2 or more credits.

Information on declaring the major is available on the Department of Computer Sciences advising pages (https://www.cs.wisc.edu/advising).

REQUIREMENTS

UNIVERSITY GENERAL EDUCATION REQUIREMENTS

All undergraduate students at the University of Wisconsin–Madison are required to fulfill a minimum set of common university general education requirements to ensure that every graduate acquires the essential core of an undergraduate education. This core establishes a foundation for living a productive life, being a citizen of the world, appreciating aesthetic values, and engaging in lifelong learning in a continually changing world. Various schools and colleges will have requirements in addition to the requirements listed below. Consult your advisor for assistance, as needed. For additional information, see the university Undergraduate General Education Requirements (http://guide.wisc.edu/undergraduate/#requirementsforundergraduatetestudytext) section of the Guide.

COLLEGE OF LETTERS & SCIENCE BREADTH AND DEGREE REQUIREMENTS: BACHELOR OF SCIENCE (B.S.)

Students pursuing a bachelor of science degree in the College of Letters & Science must complete all of the requirements below. The College of Letters & Science allows this major to be paired with either a bachelor of arts or a bachelor of science curriculum. View a comparison of the degree requirements here. (https://pubs.wisc.edu/home/archives/ug15/images/bbs2009.pdf)

BACHELOR OF SCIENCE DEGREE REQUIREMENTS

Mathematics

Two (2) 3+ credits of intermediate/advanced level MATH, COMP SCI, STAT

Limit one each: COMP SCI, STAT

Foreign Language

Complete the third unit of a foreign language

Note: A unit is one year of high school work or one semester/term of college work.

L&S Breadth

• Humanities, 12 credits: 6 of the 12 credits must be in literature
• Social Sciences, 12 credits
• Natural Sciences, 12 credits: must include 6 credits in biological science; and must include 6 credits in physical science

Liberal Arts and Science Coursework

108 credits

Depth of Intermediate/Advanced work

60 intermediate or advanced credits

Major

Declare and complete at least one (1) major

Total Credits

120 credits

UW-Madison Experience

Minimum 2,000 in all coursework at UW–Madison

Minimum 2,000 in intermediate/advanced coursework at UW–Madison

Non–L&S Students Pursuing an L&S Major

Non–L&S students who have permission from their school/college to pursue an additional major within L&S only need to fulfill the major requirements and do not need to complete the L&S breadth and
degree requirements above. Please note that the following special degree programs are not considered majors so are not available to non-L&S-degree-seeking candidates:

- Applied Mathematics, Engineering and Physics (Bachelor of Science–Applied Mathematics, Engineering and Physics)
- Journalism (Bachelor of Arts–Journalism; Bachelor of Science–Journalism)
- Music (Bachelor of Music)
- Social Work (Bachelor of Social Work)

### REQUIREMENTS FOR THE MAJOR

#### REQUIRED COURSEWORK

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>No course may be used to satisfy more than one requirement in the computer sciences major. Courses taken on a pass/fail basis will not count toward any major requirements.</td>
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</table>

#### BASIC COMPUTER SCIENCES

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Complete all of the following courses: 14</td>
<td></td>
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</tr>
<tr>
<td>COMP SCI/ MATH 240</td>
<td>Introduction to Discrete Mathematics</td>
<td></td>
</tr>
<tr>
<td>COMP SCI/ E C E 252</td>
<td>Introduction to Computer Engineering</td>
<td></td>
</tr>
<tr>
<td>COMP SCI 300</td>
<td>Programming II</td>
<td></td>
</tr>
<tr>
<td>COMP SCI/ E C E 354</td>
<td>Machine Organization and Programming</td>
<td></td>
</tr>
<tr>
<td>COMP SCI 400</td>
<td>Programming III</td>
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</tbody>
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#### BASIC CALCULUS

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Select one of the following options: 9-14</td>
<td></td>
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</tr>
<tr>
<td>MATH 221 &amp; MATH 222</td>
<td>Calculus and Analytic Geometry I and Calculus and Analytic Geometry II</td>
<td></td>
</tr>
<tr>
<td>MATH 171 &amp; MATH 217 &amp; MATH 222</td>
<td>Calculus with Algebra and Trigonometry I and Calculus with Algebra and Trigonometry II and Calculus and Analytic Geometry II</td>
<td></td>
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<tr>
<td>MATH 275 &amp; MATH 276</td>
<td>Topics in Calculus I and Topics in Calculus II</td>
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#### ADDITIONAL MATHEMATICS

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Select two from the following: 6-10</td>
<td></td>
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</tr>
<tr>
<td>MATH 340</td>
<td>Elementary Matrix and Linear Algebra (recommended) 1</td>
<td></td>
</tr>
<tr>
<td>STAT 324</td>
<td>Introductory Applied Statistics for Engineers (recommended)</td>
<td></td>
</tr>
<tr>
<td>COMP SCI 412</td>
<td>Introduction to Numerical Methods</td>
<td></td>
</tr>
</tbody>
</table>

1 MATH 375 may not be combined with MATH 234 Calculus–Functions of Several Variables, MATH 320 Linear Algebra and Differential Equations, or MATH 340 Elementary Matrix and Linear Algebra. The math department may have additional restrictions on giving credit to certain pairs of math courses.
## ADVANCED COMPUTER SCIENCES

Some of the advanced COMP SCI courses listed below have prerequisites not specifically required for the major. It is recommended that students plan ahead to ensure prerequisites are completed in advance of their selected coursework.

### THEORY

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP SCI 577</td>
<td>Introduction to Algorithms (recommended)</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI 520</td>
<td>Introduction to Theory of Computing</td>
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</tbody>
</table>

### SOFTWARE/HARDWARE

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>COMP SCI 407</td>
<td>Foundations of Mobile Systems and Applications</td>
<td>6-8</td>
</tr>
<tr>
<td>COMP SCI/E C E 506</td>
<td>Software Engineering</td>
<td></td>
</tr>
<tr>
<td>COMP SCI 536</td>
<td>Introduction to Programming Languages and Compilers 1</td>
<td></td>
</tr>
<tr>
<td>COMP SCI 537</td>
<td>Introduction to Operating Systems</td>
<td></td>
</tr>
<tr>
<td>COMP SCI 538</td>
<td>Introduction to the Theory and Design of Programming Languages 1</td>
<td></td>
</tr>
<tr>
<td>COMP SCI/E C E 552</td>
<td>Introduction to Computer Architecture</td>
<td></td>
</tr>
<tr>
<td>COMP SCI 564</td>
<td>Database Management Systems: Design and Implementation</td>
<td></td>
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<tr>
<td>COMP SCI 640</td>
<td>Introduction to Computer Networks</td>
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<tr>
<td>COMP SCI 642</td>
<td>Introduction to Information Security</td>
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</tbody>
</table>

1 COMP SCI 536 Introduction to Programming Languages and Compilers may not be combined with COMP SCI 538 Introduction to the Theory and Design of Programming Languages.

### APPLICATIONS

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>COMP SCI 412</td>
<td>Introduction to Numerical Methods 1</td>
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<tr>
<td>COMP SCI/I SY E/ MATH 425</td>
<td>Introduction to Combinatorial Optimization</td>
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<tr>
<td>COMP SCI/I SY E/ MATH 513</td>
<td>Numerical Linear Algebra</td>
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<tr>
<td>COMP SCI/E C E/ MATH 514</td>
<td>Numerical Analysis</td>
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</tr>
<tr>
<td>COMP SCI/E C E/ I SY E 524</td>
<td>Introduction to Optimization</td>
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</tr>
<tr>
<td>COMP SCI/I SY E/ MATH/STAT 525</td>
<td>Linear Programming Methods</td>
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</tr>
<tr>
<td>COMP SCI/I SY E/ MATH 526</td>
<td>Advanced Linear Programming</td>
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</tr>
<tr>
<td>COMP SCI/E C E/ M E 532</td>
<td>Matrix Methods in Machine Learning</td>
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</tr>
<tr>
<td>COMP SCI/E C E/ M E 533</td>
<td>Image Processing</td>
<td></td>
</tr>
<tr>
<td>COMP SCI 534</td>
<td>Computational Photography</td>
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</tr>
<tr>
<td>COMP SCI 536</td>
<td>Introduction to Programming Languages and Compilers</td>
<td></td>
</tr>
<tr>
<td>COMP SCI 537</td>
<td>Introduction to Operating Systems</td>
<td></td>
</tr>
<tr>
<td>COMP SCI 538</td>
<td>Introduction to the Theory and Design of Programming Languages</td>
<td></td>
</tr>
<tr>
<td>COMP SCI/E C E/ M E 539</td>
<td>Introduction to Artificial Neural Network and Fuzzy Systems</td>
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<tr>
<td>COMP SCI 540</td>
<td>Introduction to Artificial Intelligence</td>
<td></td>
</tr>
<tr>
<td>COMP SCI 545</td>
<td>Natural Language and Computing</td>
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<tr>
<td>COMP SCI 547</td>
<td>Computer Systems Modeling Fundamentals</td>
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</table>
**HONORS IN THE MAJOR**

Students may declare Honors in the Computer Sciences Major in consultation with the Computer Sciences undergraduate coordinator(s).

**HONORS IN THE MAJOR IN COMPUTER SCIENCES: REQUIREMENTS**

To earn Honors in the Major in Computer Sciences, students must satisfy both the requirements for the major (above) and the following additional requirements:

- Earn a 3.300 overall university GPA
- Earn a 3.500 GPA for all COMP SCI courses, and all courses accepted in the major
- Complete the following coursework, earning a B or better in each individual course:
  - One COMP SCI course, at the 500 level or above, taken for Honors credit, which counts toward the computer sciences major
  - A two-semester Senior Honors Thesis in COMP SCI 681 Senior Honors Thesis and COMP SCI 682 Senior Honors Thesis, for a total of 6 credits.¹

¹ The thesis proposal must be approved by both the thesis/project advisor and the department undergraduate coordinator before enrollment in COMP SCI 681. A final thesis or project must be filed with the Department of Computer Sciences before a final grade for COMP SCI 682 can be awarded.

**LEARNING OUTCOMES**

1. Recognize and apply the core principles of Computing (abstractions and algorithms) to solve real-world problems.
2. Describe and apply the theoretical foundations of Computer Science (e.g., complexity analysis) in practical settings.
3. Demonstrate knowledge of key elements of computer systems, e.g., hardware, operating systems, networks.
4. Use fundamental and detailed knowledge, skills, and tools (e.g., specific algorithms, techniques methods, etc.) of computer science and develop the ability to acquire new knowledge, skills, and tools.
5. Design, implement, and evaluate software in multiple programming paradigms and languages.
6. Develop a substantial piece of software, and recognize the challenges of designing and developing software.
7. Exhibit technical (designing, implementing, and testing) and teamwork (communication, collaboration, and professional practice) skills in order to develop solutions as a computer science practitioner.
8. Can solve problems by applying a broad toolbox of knowledge and techniques.

**ADVISING AND CAREERS**

The undergraduate coordinators in the Department of Computer Sciences are ready to help students with questions about the major, L&S degree
requirements and policy, and course selection. Information on academic
advising for students interested or declared in the computer sciences
major is posted to the Computer Sciences advising page (https://

CAREERS
Demand for those with a computer sciences education is exceptionally
strong. According to figures from the U.S. Bureau of Labor Statistics, the
vast majority of growth in STEM (science, technology, engineering, and
math) occupations through 2020 will occur within computing fields.

Computer sciences majors are encouraged to begin working on their
career exploration and preparation soon after arriving on campus
to explore different career paths, participate in co-ops or summer
internships, prepare for the job search and/or graduate school
applications, and network with professionals in the field.

Department of Computer Sciences: the department hosts one major
career fair (https://www.cs.wisc.edu/connect/job-fair) per year, in the
fall, as well as other opportunities to connect with employers, such as
technical talks and information sessions.

SuccessWorks at the College of Letters & Science: SuccessWorks
offers two major career fairs per year, assists with resume writing and
interviewing skills, and offers individual career advising appointments for
L&S students.

Engineering Career Services (ECS): ECS (https://ecs.engr.wisc.edu/
public) offers two major career fairs per year, assists with resume writing
and interviewing skills, and hosts workshops on the job search.

L&S CAREER RESOURCES
SuccessWorks at the College of Letters & Science helps students
leverage the academic skills learned in their major, certificates, and
liberal arts degree; explore and try out different career paths; participate
in internships; prepare for the job search and/or graduate school
applications; and network with professionals in the field (alumni and
employers).

SuccessWorks can also assist students in career advising, résumé
and cover letter writing, networking opportunities, and interview skills, as well
as course offerings for undergraduates to begin their career exploration
early in their undergraduate career.

- SuccessWorks (https://careers.ls.wisc.edu)
- Set up a career advising appointment (https://careers.ls.wisc.edu/
make-an-appointment)
- INTER-LS 210 L&S Career Development: Taking Initiative (1 credit,
targeted to first- and second-year students)—for more information,
see Inter-LS 210: Career Development, Taking Initiative (https://
careers.ls.wisc.edu/inter-ls-210-career-development-taking-initiative)
- Learn how we’re transforming career preparation: L&S Career
Initiative (http://ls.wisc.edu/lsci)

PEOPLE

Professors A. Arpaci-Dusseau, R. Arpaci-Dusseau, Bach, Barford,
Banerjee, Cai, Doan, Dyer, Ferris, Gleicher, Hill, Jha, Livny, Miller, Patel,
Reps, Ron, Shavlik, Sohi, van Melkebeek, Wood, Wright, Zhu

Associate Professors Akella, Chawla, Liblit, Mutlu, Sankaralingam, Swift

Assistant Professors Albarghouthi, D’Antoni, Gupta, Koutris, Sifakis

Faculty Associates Dahl, Deppeler, Hasti, Legault, Lewis-Williams,
Skrentny, Williams

RESOURCES AND SCHOLARSHIPS

Visit Scholarships@UW-Madison (https://scholarships.wisc.edu/
Scholarships) to find UW-Madison scholarships and apply online.

Visit the scholarships page (https://www.cs.wisc.edu/academics/
scholarships) on the Department of Computer Sciences website for a
compendium of opportunities available to students studying computer
sciences.