

# COMPUTER SCIENCES, B.S.

## 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/#requirementsforundergraduatestudytext>) section of the *Guide*.

General Education	<ul style="list-style-type: none"> <li>• Breadth—Humanities/Literature/Arts: 6 credits</li> <li>• Breadth—Natural Science: 4 to 6 credits, consisting of one 4- or 5-credit course with a laboratory component; or two courses providing a total of 6 credits</li> <li>• Breadth—Social Studies: 3 credits</li> <li>• Communication Part A &amp; Part B *</li> <li>• Ethnic Studies *</li> <li>• Quantitative Reasoning Part A &amp; Part B *</li> </ul>
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\* The mortarboard symbol appears before the title of any course that fulfills one of the Communication Part A or Part B, Ethnic Studies, or Quantitative Reasoning Part A or Part B requirements.

### COLLEGE OF LETTERS & SCIENCE 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 the Bachelor of Arts or the Bachelor of Science degree requirements.

#### BACHELOR OF SCIENCE DEGREE REQUIREMENTS

**Mathematics** Complete two courses of 3+ credits at the Intermediate or Advanced level in MATH, COMP SCI, or STAT subjects. A maximum of one course in each of COMP SCI and STAT subjects counts toward this requirement.

**Foreign Language** Complete the third unit of a foreign language.

**L&S Breadth** Complete:

- 12 credits of Humanities, which must include at least 6 credits of Literature; and
- 12 credits of Social Science; and
- 12 credits of Natural Science, which must include 6 credits of Biological Science and 6 credits of Physical Science.

**Liberal Arts and Science Coursework** Complete at least 108 credits.

**Depth of Intermediate/Advanced Coursework** Complete at least 60 credits at the Intermediate or Advanced level.

**Major** Declare and complete at least one major.

**Total Credits** Complete at least 120 credits.

**UW-Madison Experience** Complete both:

- 30 credits in residence, overall, and
- 30 credits in residence after the 86th credit.

**Quality of Work**

- 2.000 in all coursework at UW–Madison
- 2.000 in Intermediate/Advanced level 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. They do not need to complete the L&S Degree Requirements above.

### REQUIREMENTS FOR THE MAJOR

#### BASIC COMPUTER SCIENCES

Code	Title	Credits
COMP SCI/ MATH 240	Introduction to Discrete Mathematics	3
COMP SCI/E C E 252	Introduction to Computer Engineering	3
COMP SCI 300	Programming II	3
COMP SCI/E C E 354	Machine Organization and Programming	3
COMP SCI 400	Programming III	3
<b>Total Credits</b>		<b>15</b>

#### BASIC CALCULUS

Code	Title	Credits
<b>Complete one of these sequences:</b>		
MATH 221 & MATH 222	Calculus and Analytic Geometry 1 and Calculus and Analytic Geometry 2	9-14
MATH 171 & MATH 217 & MATH 222	Calculus with Algebra and Trigonometry I and Calculus with Algebra and Trigonometry II and Calculus and Analytic Geometry 2	
MATH 275 & MATH 276	Topics in Calculus I and Topics in Calculus II	
<b>Total Credits</b>		<b>9-14</b>

#### ADDITIONAL MATHEMATICS (BEYOND CALCULUS)

Code	Title	Credits
<b>Complete two courses for at least 6 credits:</b>		
MATH 340	Elementary Matrix and Linear Algebra <sup>1</sup>	6-10

or MATH 375	Topics in Multi-Variable Calculus and Linear Algebra
STAT 324	Introductory Applied Statistics for Engineers
COMP SCI 412	Introduction to Numerical Methods <sup>2</sup>
COMP SCI/E C E/ MATH 435	Introduction to Cryptography
COMP SCI/ MATH 513	Numerical Linear Algebra
COMP SCI/ MATH 514	Numerical Analysis
COMP SCI/I SY E/ MATH/STAT 525	Linear Optimization
COMP SCI/ I SY E 526	Advanced Linear Programming
E C E 331	Introduction to Random Signal Analysis and Statistics
MATH 234	Calculus–Functions of Several Variables <sup>1</sup>
or MATH 375	Topics in Multi-Variable Calculus and Linear Algebra
MATH 319	Techniques in Ordinary Differential Equations
MATH 320	Linear Algebra and Differential Equations <sup>1</sup>
or MATH 375	Topics in Multi-Variable Calculus and Linear Algebra
MATH 321	Applied Mathematical Analysis
MATH 322	Applied Mathematical Analysis
MATH 331	An Introduction to Probability and Markov Chain Models
MATH 341	Linear Algebra
MATH 376	Topics in Multi-Variable Calculus and Differential Equations
MATH/STAT 431	Introduction to the Theory of Probability
MATH 443	Applied Linear Algebra
MATH 461	College Geometry I
MATH/COMP SCI/ STAT 475	Introduction to Combinatorics
MATH 521	Analysis I
MATH 541	Modern Algebra
MATH 542	Modern Algebra
MATH 567	Modern Number Theory
MATH/ PHILOS 571	Mathematical Logic
STAT/MATH 309	Introduction to Probability and Mathematical Statistics I
STAT/MATH 310	Introduction to Probability and Mathematical Statistics II
STAT 311	Introduction to Theory and Methods of Mathematical Statistics I
STAT 312	Introduction to Theory and Methods of Mathematical Statistics II

<sup>1</sup> MATH 375 Topics in Multi-Variable Calculus and Linear Algebra will not meet the requirement if a student already has credit for MATH 234 Calculus–Functions of Several Variables, MATH 320 Linear Algebra and Differential Equations or MATH 340 Elementary Matrix and Linear Algebra.

## ADVANCED COMPUTER SCIENCE COURSES

### THEORY OF COMPUTER SCIENCE

Code	Title	Credits
<b>Complete one:</b>		<b>3</b>
COMP SCI 577	Introduction to Algorithms	
COMP SCI 520	Introduction to Theory of Computing	

### SOFTWARE & HARDWARE

Code	Title	Credits
<b>Complete two:</b>		<b>6-8</b>
COMP SCI 407	Foundations of Mobile Systems and Applications	
COMP SCI/ E C E 506	Software Engineering	
COMP SCI 536	Introduction to Programming Languages and Compilers	
or COMP SCI 531	Introduction to the Theory and Design of Programming Languages	
COMP SCI 537	Introduction to Operating Systems	
COMP SCI 542	Introduction to Software Security	
COMP SCI/ E C E 552	Introduction to Computer Architecture	
COMP SCI 564	Database Management Systems: Design and Implementation	
COMP SCI 640	Introduction to Computer Networks	
COMP SCI 642	Introduction to Information Security	

### APPLICATIONS

Code	Title	Credits
<b>Complete one:</b>		<b>3</b>
COMP SCI 412	Introduction to Numerical Methods <sup>1</sup>	
COMP SCI/I SY E/ MATH 425	Introduction to Combinatorial Optimization	
COMP SCI/ MATH 513	Numerical Linear Algebra	
COMP SCI/ MATH 514	Numerical Analysis	
COMP SCI/E C E/ I SY E 524	Introduction to Optimization	
COMP SCI/I SY E/ MATH/STAT 525	Linear Optimization	
COMP SCI 534	Computational Photography	
COMP SCI 540	Introduction to Artificial Intelligence	
COMP SCI 545	Natural Language and Computing	
COMP SCI 559	Computer Graphics	
COMP SCI 570	Introduction to Human-Computer Interaction	
COMP SCI 571	Building User Interfaces	

<sup>2</sup> In every case, a course used toward one requirement may not be used again toward another requirement. For example, if COMP SCI 412 is applied to the ADDITIONAL MATH (BEYOND CALCULUS) requirement, it cannot also apply to the APPLICATIONS requirement.

## ELECTIVES

Code	Title	Credits
<b>Complete two:</b>		
COMP SCI 407	Foundations of Mobile Systems and Applications	6-8
COMP SCI 412	Introduction to Numerical Methods	
COMP SCI/I SY E/ MATH 425	Introduction to Combinatorial Optimization	
COMP SCI/E C E/ MATH 435	Introduction to Cryptography	
COMP SCI/ STAT 471	Introduction to Computational Statistics	
COMP SCI/MATH/ STAT 475	Introduction to Combinatorics	
COMP SCI/ E C E 506	Software Engineering	
COMP SCI/ MATH 513	Numerical Linear Algebra	
COMP SCI/ MATH 514	Numerical Analysis	
COMP SCI 520	Introduction to Theory of Computing	
COMP SCI/E C E/ I SY E 524	Introduction to Optimization	
COMP SCI/I SY E/ MATH/STAT 525	Linear Optimization	
COMP SCI/ I SY E 526	Advanced Linear Programming	
COMP SCI/E C E/ M E 532	Matrix Methods in Machine Learning	
COMP SCI/ E C E 533	Image Processing	
COMP SCI 534	Computational Photography	
COMP SCI 536	Introduction to Programming Languages and Compilers	
COMP SCI 537	Introduction to Operating Systems	
COMP SCI 538	Introduction to the Theory and Design of Programming Languages	
COMP SCI/E C E/ M E 539	Introduction to Artificial Neural Networks	
COMP SCI 540	Introduction to Artificial Intelligence	
COMP SCI 542	Introduction to Software Security	
COMP SCI 545	Natural Language and Computing	
COMP SCI/ E C E 552	Introduction to Computer Architecture	
COMP SCI/I SY E/ M E 558	Introduction to Computational Geometry	
COMP SCI 559	Computer Graphics	
COMP SCI 564	Database Management Systems: Design and Implementation	

COMP SCI/ B M I 567	Medical Image Analysis
COMP SCI 570	Introduction to Human-Computer Interaction
COMP SCI 571	Building User Interfaces
COMP SCI/ B M I 576	Introduction to Bioinformatics
COMP SCI 577	Introduction to Algorithms
COMP SCI/ DS 579	Virtual Reality
COMP SCI/ I SY E 635	Tools and Environments for Optimization
COMP SCI 640	Introduction to Computer Networks
COMP SCI 642	Introduction to Information Security
COMP SCI 679	Computer Game Technology
COMP SCI 639	Undergraduate Elective Topics in Computing

## RESIDENCE AND QUALITY OF WORK

- 2.000 GPA in all COMP SCI courses and courses counting toward the major
- 2.000 GPA on 15 upper-level credits, taken in residence<sup>3</sup>
- 15 credits in COMP SCI, taken on campus

<sup>3</sup> COMP SCI courses numbered 400 through 699 count as Upper Level.

## HONORS IN THE MAJOR

Students may declare Honors in the Computer Sciences Major in consultation with the Computer Sciences undergraduate coordinator(s). 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 minimum 3.300 University GPA
- Earn a minimum 3.500 GPA for all COMP SCI and major courses
- Complete one COMP SCI course numbered 500 through 699, taken for Honors with a grade of B or higher
- Complete COMP SCI 681 and COMP SCI 682 for a total of 6 credits.<sup>4</sup>

<sup>4</sup> Senior Honors 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.

## DISTINCTION IN THE MAJOR

Distinction will be awarded at graduation to majors who are **not** declared for Honors in the Major, and who meet this criteria:

- Earn a minimum 3.750 GPA or higher in all COMP SCI and major courses, or
- Earn a minimum 3.500 GPA in all COMP SCI and major courses, plus:
- Complete one COMP SCI courses numbered 500 through 699 for Honors credit and at least a "B" grade
- Complete COMP SCI 691 - COMP SCI 692 for at least 6 credits