

# 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 | • Breadth–Humanities/Literature/Arts: 6 credits   |
|                   | • 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 |
|                   | • Breadth–Social Studies: 3 credits   |
|                   | • Communication Part A & Part B *   |
|                   | • Ethnic Studies *  |
|                   | • Quantitative Reasoning Part A & Part B *  |

\* 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/<br>MATH 240  | Introduction to Discrete Mathematics | 3         |
| COMP SCI/<br>E C E 252 | Introduction to Computer Engineering | 3         |
| COMP SCI 300           | Programming II                       | 3         |
| COMP SCI/<br>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**  
**Complete one of these sequences:** **9–14**

|                                      |  |  |
|--------------------------------------|--|--|
| MATH 221<br>& MATH 222               | Calculus and Analytic Geometry 1 and Calculus and Analytic Geometry 2                  |  |
| MATH 171<br>& MATH 217<br>& MATH 222 | Calculus with Algebra and Trigonometry I and Calculus with Algebra and Trigonometry II |  |
|                                      | and Calculus and Analytic Geometry 2   |  |

|                        |   |             |
|------------------------|---|-------------|
| MATH 275<br>& MATH 276 | Topics in Calculus I<br>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> |       |         |
| <b>6-10</b>   |       |         |

|                                   |  |  |
|-----------------------------------|--|--|
| MATH 340                          | Elementary Matrix and Linear Algebra <sup>1</sup>            |  |
| 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/<br>MATH 435       | Introduction to Cryptography                                 |  |
| COMP SCI/<br>MATH 513             | Numerical Linear Algebra                                     |  |
| COMP SCI/<br>MATH 514             | Numerical Analysis   |  |
| COMP SCI/I SY E/<br>MATH/STAT 525 | Linear Optimization  |  |
| COMP SCI/<br>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                          | Introductory Probability                                     |  |
| 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/<br>COMP SCI/<br>STAT 475    | Introduction to Combinatorics                                |  |
| MATH 521                          | Analysis I   |  |
| MATH 541                          | Modern Algebra   |  |
| MATH 542                          | Modern Algebra   |  |
| MATH 567                          | Modern Number Theory   |  |

|                     |  |  |
|---------------------|--|--|
| MATH/<br>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 |  |

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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/<br>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 544           | Introduction to Big Data Systems                               |         |
| COMP SCI/<br>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/<br>MATH 425 | Introduction to Combinatorial Optimization     |         |
| COMP SCI/<br>MATH 513        | Numerical Linear Algebra                       |         |
| COMP SCI/<br>MATH 514        | Numerical Analysis                             |         |

COMP SCI/E C E/ Introduction to Optimization  
I SY E 524

COMP SCI/I SY E/ Linear Optimization  
MATH/STAT 525

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 566 Introduction to Computer Vision

COMP SCI 570 Introduction to Human-Computer  
Interaction

COMP SCI 571 Building User Interfaces

## 2

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> |       |            |
|                      |       | <b>6-8</b> |

COMP SCI 407 Foundations of Mobile Systems and  
Applications

COMP SCI 412 Introduction to Numerical Methods

COMP SCI/I SY E/ Introduction to Combinatorial  
MATH 425 Optimization

COMP SCI/E C E/ Introduction to Cryptography  
MATH 435

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/DS/  
I SY E 518 Wearable Technology

COMP SCI 520 Introduction to Theory of  
Computing

COMP SCI/E C E/ Introduction to Optimization  
I SY E 524

COMP SCI/I SY E/ Linear Optimization  
MATH/STAT 525

COMP SCI/  
I SY E 526 Advanced Linear Programming

COMP SCI/E C E/ Matrix Methods in Machine Learning  
M E 532

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/ Introduction to Computational  
M E 558 Geometry

COMP SCI 559 Computer Graphics

COMP SCI/  
E C E 561 Probability and Information Theory  
in Machine Learning

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 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

## 3

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

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- 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>

**4**

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 completed before a final grade for COMP SCI 682 can be awarded.