

# **BACHELOR OF SCIENCE IN COMPUTER SCIENCE**

## *For students beginning Spring 2018*

**College of Engineering**  
**Department of Electrical Engineering & Computer Science**  
**201 Naka Hall**  
**University of Missouri**  
**Columbia, MO 65211**  
**(573) 884-6342**  
<http://engineering.missouri.edu/cs>

The Bachelor of Science in Computer Science through the College of Engineering emphasizes the study of software systems and graphics, computational theories and algorithms, computer organization, networking, multimedia, and programming methodology. Students who complete the BS in Computer Science can work for government agencies, academic institutions, or private industry creating and applying new technologies to solve complex problems.

To receive the BS CS, the candidate must successfully complete 126 semester hours of credit with the following distribution: CS course requirements – 63 hours, related math requirements - 22 hours, science course requirements - 12 hours, and general requirements – 29 hours. BS graduates with a GPA of 3.0 or better satisfy the undergraduate GPA entrance requirements for graduate work in Computer Science.

The BS CS requires the completion of at least six hours of mathematics beyond the 13-hour calculus sequence. Taking an additional 4000-level math course as a technical elective results in a minor in Math with C range grade or higher. Nine hours of the course work required for the minor must be completed at University of Missouri. Application for the minor must be completed in the Math Department prior to graduation.

Computer Science students must get a C-range grade or better in all CS courses that are prerequisites for other CS courses that the student takes, except for CS 3050 and CS 3330. For these two courses, the prerequisite is passing CS 2050 with a C or better. To graduate, a student must earn an overall grade point average of 2.0 or better and a 2.0 grade point average or better in all CS or IT courses. Students must meet all prerequisites for courses. See the MU Undergraduate Catalog for additional graduation requirements.

Course requirements listed apply to students beginning at MU in the Spring 2018 and after. A student who started at MU before Spring 2018 and who has been continuously enrolled as a full-time student may be pursuing the previous program and should contact the department for more information.

The MU Engineering Leadership, Engagement & Career Development Academy, W1025 Lafferre Hall, can assist students in searching for employment opportunities upon graduation and for internship/co-op positions during the college years. Students can also visit [www.hiremizzoutigers.com](http://www.hiremizzoutigers.com) for internships and full- or part-time jobs.

## REQUIREMENTS FOR A BS DEGREE IN COMPUTER SCIENCE – 126 credit hours

The minimum requirements for the Bachelor of Science Degree in Computer Science are listed below. The following requirements apply to students who began college Spring 2018 and who have been continuously enrolled. Courses in parentheses are prerequisites for the course listed.

### Computer Science Courses (42 hours)

|  |   |
|--|---|
| Cmp_Sc 1000: Introduction to Computer Science .....  | 1 |
| Cmp_Sc 1050: Algorithm Design and Programming I (Math 1100) .....                              | 4 |
| Cmp_Sc 2050: Algorithm Design and Programming II (Cmp_Sc 1050).....                            | 4 |
| Cmp_Sc 2270: Introduction to Digital Logic (Cmp_Sc 1050) .....                                 | 3 |
| Cmp_Sc 3050: Advanced Algorithm Design (Cmp_Sc 2050 with C or higher) .....                    | 3 |
| Cmp_Sc 3280: Computer Organization & Assembly Language (Cmp_Sc 2270).....                      | 3 |
| Cmp_Sc 3330: Object Oriented Programming (Cmp_Sc 2050 with C or higher).....                   | 3 |
| Cmp_Sc 3380: Database Applications and Information Systems (Cmp_Sc 2050).....                  | 3 |
| Cmp_Sc 4050: Design and Analysis of Algorithms I (Cmp_Sc 3050, Math 2320) .....                | 3 |
| Cmp_Sc 4320: Software Engineering I (Cmp_Sc 3380).....   | 3 |
| Cmp_Sc 4520: Operating Systems I (Cmp_Sc 3050 and Math 1700) .....                             | 3 |
| Cmp_Sc 4850: Computer Networks I (Cmp_Sc 2270 & Math 2320).....                                | 3 |
| Cmp_Sc 4970: Senior Capstone Design I – writing intensive (Cmp_Sc 4320 and English 1000) ..... | 3 |
| Cmp_Sc 4980: Senior Capstone Design II (Cmp_Sc 4970) .....                                     | 3 |

Twenty-one (21) hours of CS courses chosen from the following list. At least 15 hours of the CS electives must be numbered above 4000. **One of the courses CS 4410 or 4450 is required for graduation.**

A maximum of 6 hours of IT courses can be taken as CS electives with the following stipulations: One 3000/4000 level IT course (excluding IT 4400 and IT 4500) can be taken as a CS elective but it is counted as a lower level (below 4000) CS course. IT 4400 and IT 4500 are counted as CS 4000-level courses.

Students may also take six hours of problems or research courses. ECE 3220 Software Design in C and C++ can count as a lower level CS elective.

|   |          |
|---|----------|
| Cmp_Sc 2830: Intro to the Internet, WWW & Multimedia (Cmp_Sc 2050) [every fall, spring] .....   | 3        |
| Cmp_Sc 3530: UNIX Operating System (Advanced C programming language) [offered fall only]....    | 3        |
| Cmp_Sc 3940: Internship in Computer Science (Cmp_Sc 2050) [every fall, spring, summer] .....    | 3        |
| Cmp_Sc 4001: Topics in Computer Science (prerequisites vary) [every fall, spring] .....         | 3        |
| Cmp_Sc 4060: String Algorithms (Cmp_Sc 4050) [semester varies] .....                            | 3        |
| Cmp_Sc 4080: Parallel Prog for High Perf Comp (Cmp_Sc 3280 & 3050) [semester varies] .....      | 3        |
| Cmp_Sc 4085: Problems in CS (instructor consent) [every fall, spring, summer].....              | varies   |
| Cmp_Sc 4270: Computer Architecture I (Cmp_Sc 2270) [semester varies].....                       | 3        |
| Cmp_Sc 4280: Network Systems Architecture (Cmp_Sc 2050 & 3280) [semester varies].....           | 3        |
| Cmp_Sc 4330: Object Oriented Design (Cmp_Sc 3330) [offered spring only].....                    | 3        |
| Cmp_Sc 4350: Big Data Analytics (Cmp_Sc 3330 and 3380) [offered fall only] .....                | 3        |
| Cmp_Sc 4380: Database Management Systems I (Cmp_Sc 3380) [offered spring only] .....            | 3        |
| <b>Cmp_Sc 4410: Theory of Computation I (Math 2320) [offered spring only] .....</b>             | <b>3</b> |
| Cmp_Sc 4430: Compilers I (Cmp_Sc 3280 & CS 4450 & Math 2320) [offered spring only].....         | 3        |
| Cmp_Sc 4440: Malware Analysis and Defense (Cmp_Sc 3280) [offered spring only] .....             | 3        |
| <b>Cmp_Sc 4450: Principles of Programming Languages (Cmp_Sc 2050) [offered fall only] .....</b> | <b>3</b> |
| Cmp_Sc 4460: Intro to Cryptography (Cmp_Sc 3050 & Math 2320) [semester varies].....             | 3        |
| Cmp_Sc 4530: Cloud Computing (Cmp_Sc 3330) [offered spring only] .....                          | 3        |
| Cmp_Sc 4610: Computer Graphics I (Cmp_Sc 3050, Math 1500 or Math 1300&1400) [spring only]       | 3        |
| Cmp_Sc 4620: Physically Based Modeling & Animation (Cmp_Sc 4610) [semester varies].....         | 3        |

|   |        |
|---|--------|
| Cmp_Sc 4650: Digital Image Processing (Cmp_Sc 2050 & Stat 4710) [offered fall only]                 | 3      |
| Cmp_Sc 4670: Digital Image Compression (Cmp_Sc 2050) [semester varies]                              | 3      |
| Cmp_Sc 4720: Intro to Machine Learning & Pattern Recognition (Cmp_Sc 2050 & Stat 4710)              | 3      |
| Cmp_Sc 4730: Building Intelligent Robots (junior standing & programming exp) [semester varies]      | 4      |
| Cmp_Sc 4740: Interdisc. Intro. to Natural Language Processing (senior standing) [fall only]         | 3      |
| Cmp_Sc 4750: Artificial Intelligence I (Cmp_Sc 3050 & at least junior standing) [offered fall only] | 3      |
| Cmp_Sc 4770: Intro to Computational Intelligence [offered fall only]                                | 3      |
| Cmp_Sc 4830: Science and Engineering of the WWW (Cmp_Sc 2830) [offered fall only]                   | 3      |
| Cmp_Sc 4990: Undergraduate Research in CS [every fall, spring, summer]                              | varies |
| Cmp_Sc 4995: Undergraduate Research in CS – Honors [every fall, spring, summer]                     | varies |

**Related Courses** (22 hours)

|  |   |
|--|---|
| MATH 1500: Analytic Geometry and Calculus I (Math 1160)                  | 5 |
| MATH 1700: Calculus II (Math 1500)                                       | 5 |
| MATH 2300: Calculus III (Math 1700)                                      | 3 |
| MATH 2320: Discrete Math (Math 1700)                                     | 3 |
| STAT 4710/MATH 4315: Introduction to Mathematical Statistics (Math 2300) | 3 |

**Technical Elective** ..... 3

Technical electives can be 2000 level and above CS courses, 4000 level Math courses, 2000 level and above Engineering courses, Management 3000, Marketing 3000, Finance 3000, and other courses that meet the prior approval of the student's CS advisor. An IT course at the 2000 level or above can be taken as a technical elective. However, students cannot take the IT Fundamentals of Network Technology or Cyber Security course as a technical elective if they have already taken the higher level CS 4850 Computer Networks I class. **All technical electives taken outside the CS Department must meet the prior approval of the student's CS advisor.**

**Science Courses** (12 hours minimum)

Twelve hours in science courses are required including one of the following 2-semester sequences. At least one of the courses must include a lab. Labs listed separately are not considered a 2<sup>nd</sup> science course (for example, Bio 1010 and 1020 = one science course).

**Science Sequences** (choose **one** of the following 4 sequences)

**Physics Sequence** (credit not given for both Physics 1210 & 2750 and Physics 1220 & 2760)

|   |   |
|---|---|
| Physics 2750 University Physics I (Math 1500, co-requisite Math 1700)                   | 5 |
| Physics 2760 University Physics II (Math 1700 and Physics 2750, co-requisite Math 2300) | 5 |

**Or**

|  |   |
|--|---|
| Physics 1210 College Physics I (Math 1100)     | 4 |
| Physics 1220 College Physics II (Physics 1210) | 4 |

**Chemistry Sequence**

|  |   |
|--|---|
| Chemistry 1320 College Chem I (Math 1100)  | 4 |
| Chemistry 1330 College Chem II (Chem 1320) | 4 |

**Biology Sequence** Two courses in Biology/Biochemistry. One must be Bio 1010 and 1020.

Biological Sci 1010 & 1020 Gen Prin & Concepts of Biology & Lab (Math 1100/concurrent enrollment) .. 5

And one of the following courses:

|  |   |
|--|---|
| Biological Sci 1200 General Botany   | 5 |
| Anthropology 2050 or 2051 & 2052 Intro to Biological Anthropology with Lab (Math 1100/sophomore) | 5 |
| Biological Sci 2060 Community Biology (Bio Sc 1010)  | 3 |
| Biological Sci 2100 Infectious Diseases (Bio Sc 1010)  | 3 |
| Biological Sci 2150 Genetic Diseases (Bio Sci 1010)  | 4 |
| Biological Sci 3050 Genetics & Society (a college science course or adv high school bio)         | 3 |
| Biochemistry 2110 The Living World: Molecular Scale  | 3 |

Biochemistry 2112 Biotechnology in Society ..... 3

**Geology Sequence**

Geology 1100 or 1200 Principles of Geology or Environmental Geology ..... 4

And one of the following courses:

Geology 2150 The Age of the Dinosaurs (1000 level science course)..... 3

Geology 2200 Oceanography (Math 1100) ..... 3

Geology 2300 Earth Systems & Global Change (1000 level science course)..... 3

Geology 2350 Historical Geology (Geol 1100/1200 and English 1000)..... 3

Geology 2400 Surficial Earth Processes and Products (Geol 1100/1200 and Math 1100) ..... 4

Geology 2450 Global Water Cycle (Geol 1100/1200 and Math 1100)..... 3

Geology 2600 Mineral and Energy Resources of the Earth ..... 3

**Courses to Complete 12 Hours in Science**

Astronomy 1010 Intro to Astronomy I (Math 1100) ..... 4

Astronomy 1020 Intro to Laboratory Astronomy (Astron 1010) ..... 2

Any science sequence courses outside the student’s selected sequence.

Any Biology, Biochemistry, Chemistry, Geology, or Physics courses beyond the levels listed above.

Other science courses pre-approved by your advisor.

**General Requirements (30 hours)**

1. English 1000 - Exposition and Argumentation - 3 hours "C" range grade is required
2. Complete at least 9 hours in each of the following categories. One course in one of the categories must be numbered 2000 or higher. A list of MU courses that count for social sciences, behavioral sciences, and humanities can be found at: <http://generaleducation.missouri.edu/courses/>.
  - (1) Humanities/Fine Arts - Must include Comm 1200 Public Speaking and courses from at least two departments
  - (2) Social/Behavioral Sciences - Must include a course from at least two different departments. One of the following courses is required for the Missouri Constitutional Requirement: History 1100, 1200, 1400, 2440, 2210, 4000, 4220, 4230 or Poli Sci 1100, 1700, 2100
3. Complete 8 hours of non-science electives. Non-science courses cannot include math, science, computer science, or engineering courses. These can be additional humanities or social or behavioral sciences beyond those requirements or business or education courses.
4. Complete enough elective hours to bring the total credit hours that count towards the degree to 126. The electives may not include remedial courses (i.e., Math 1100, Math 1160), some courses in PE or Education.
5. Two courses must be designated “Writing Intensive.” A C-range grade in English 1000 is a prerequisite for all WI courses. A C-range grade is required in the WI courses. For more information on WI guidelines and courses, visit [cwp.missouri.edu](http://cwp.missouri.edu).

**Don't Forget To**

Work with your advisor on your graduation requirements

1. Fill out the Graduation Form the semester before you plan to graduate ([engineering.missouri.edu/current-students/graduation/](http://engineering.missouri.edu/current-students/graduation/))
2. Submit your Math Minor form ([www.math.missouri.edu](http://www.math.missouri.edu)) or other minor, if you are getting a minor.

**COMPUTER SCIENCE BS SAMPLE DEGREE PROGRAM** (Prerequisites are in parentheses)

**First Semester (16 hours)**

|   |   |
|---|---|
| Cmp_Sc 1000: Introduction to Computer Science .....               | 1 |
| Cmp_Sc 1050: Algorithm Design and Programming I (Math 1100) ..... | 4 |
| MATH 1500: Analytic Geometry and Calculus I (Math 1160) .....     | 5 |
| Constitutional Elective.....                                      | 3 |
| Comm 1200: Public Speaking .....                                  | 3 |

**Second Semester (15 hours)**

|   |   |
|---|---|
| Cmp_Sc 2050: Algorithm Design & Programming II (Cmp_Sc 1050)..... | 4 |
| MATH 1700: Calculus II (Math 1500).....                           | 5 |
| English 1000 .....  | 3 |
| Cmp_Sc 2270: Intro to Digital Logic (Cmp_Sc 1050).....            | 3 |

**Third Semester (16 hours)**

|   |   |
|---|---|
| Cmp_Sc 3330: Object Oriented Programming (Cmp_Sc 2050 with C or higher) ..... | 3 |
| MATH 2300: Calculus III (Math 1700).....                                      | 3 |
| Non-Science Elective.....   | 2 |
| Science Sequence.....   | 5 |
| Humanities/Fine Art (writing intensive).....                                  | 3 |

**Fourth Semester (17 hours)**

|  |   |
|--|---|
| Social/Behavioral Science .....  | 3 |
| Cmp_Sc 2xxx/3xxx Elective.....   | 3 |
| Cmp_Sc 3050: Advanced Algorithm Design (Cmp_Sc 2050 with C or higher)..... | 3 |
| MATH 2320: Discrete Math (Math 1700).....                                  | 3 |
| Science Sequence.....  | 5 |

**Fifth Semester (15 hours)**

|   |   |
|---|---|
| Cmp_Sc 3280: Computer Organization and Assembly Language (Cmp_Sc 2270) .....  | 3 |
| Cmp_Sc 2xxx/3xxx Elective.....  | 3 |
| Cmp_Sc 3380: Database Applications and Information Systems (Cmp_Sc 2050)..... | 3 |
| STAT 4710: Introduction to Mathematical Statistics (Math 2300) .....          | 3 |
| Social/Behavioral Science 2000 level or higher .....                          | 3 |

**Sixth Semester (17 hours)**

|  |   |
|--|---|
| Cmp_Sc 4050: Design and Analysis of Algorithms I (Cmp_Sc 3050, Math 2320)..... | 3 |
| Cmp_Sc 4xxx Elective .....   | 3 |
| Cmp_Sc 4320: Software Engineering I (Cmp_Sc 3380).....                         | 3 |
| Science Elective .....   | 2 |
| Technical Elective.....  | 3 |
| Non-Science Elective.....  | 3 |

**Seventh Semester (15 hours)**

|   |   |
|---|---|
| Cmp_Sc 4970: Senior Capstone Design (Cmp_Sc 4320/English 1000 and senior standing)..... | 3 |
| One of Cmp_Sc 4410 or 4450 (prerequisites vary) .....                                   | 3 |
| Cmp_Sc 4xxx Elective.....   | 3 |
| Cmp_Sc 4850: Computer Networks I (Cmp_Sc 2270 and Math 2320) .....                      | 3 |
| Humanities/Fine Art.....  | 3 |

**Eighth Semester (15 hours)**

|   |   |
|---|---|
| Cmp_Sc 4980: Senior Capstone Design II (Cmp_Sc 4970).....         | 3 |
| Cmp_Sc 4520: Operating Systems I (Cmp_Sc 3050 and Math 1700)..... | 3 |
| Cmp_Sc 4xxx Elective.....   | 3 |
| Cmp_Sc 4xxx Elective.....   | 3 |
| Non-Science Elective.....   | 3 |