### Suggested Sequence of Courses

<table>
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<tr>
<th>SEMESTER</th>
<th>COURSES</th>
<th>HOURS</th>
<th>SEMESTER</th>
<th>COURSES</th>
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<tr>
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<td>C S 142</td>
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<td>First-year Writing or American Heritage</td>
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<td>6th</td>
<td>C S 340</td>
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<td>C S 418</td>
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<td>PWS 340</td>
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<td>C S 404</td>
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<td>Total Hours</td>
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</table>

Note 1: The sequence of courses suggested may not fit the circumstances of every student. Students should contact their college advisement center for help in outlining an efficient schedule.

Note 2: Students are encouraged to complete an average of 15 credit hours each semester or 30 credit hours each year, which could include spring and/or summer terms. Taking fewer credits substantially increases the cost and the number of semesters to graduate.

FOR UNIVERSITY CORE OR PROGRAM QUESTIONS, CONTACT THE ADVISEMENT CENTER.
**BS in Computer Science: Bioinformatics (693222)**

**2019-2020 Program Requirements (88 Credit Hours)**

**REQUIREMENT 1** Complete 11 courses

**CORE COURSES:**
- C S 142 - Introduction to Computer Programming 3.0
- C S 224 - Introduction to Computer Systems 3.0
- C S 235 - Data Structures and Algorithms 3.0
- C S 236 - Discrete Structures 3.0
- C S 240 - Advanced Programming Concepts 4.0
- C S 252 - Introduction to Computational Theory 3.0
- C S 312 - Algorithm Design and Analysis 3.0
- C S 324 - Systems Programming 3.0
- C S 340 - Software Design and Testing 3.0
- C S 404 - Ethics and Computers in Society 2.0
- C S 418 - Bioinformatics 3.0

**REQUIREMENT 2** Complete 3 options

**SUPPORTING COURSES:**

**OPTION 2.1** Complete 10 courses

*Bio 130 - Biology 4.0
Bio 365 - Computational Biology 3.0
Bio 465 - Capstone in Bioinformatics 3.0
Chem 105 - General College Chemistry 1 with Lab (Integrated) 4.0
*ENGL 316 - Technical Communication 3.0
Math 112 - Calculus 1 4.0
Math 113 - Calculus 2 4.0
MMBIO 240 - Molecular Biology 3.0
PHSCS 121 - Introduction to Newtonian Mechanics 3.0
PWS 340 - Genetics 3.0

**OPTION 2.2** Complete 1 group

**GROUP 2.2.1** Complete 1 course
- Math 313 - (Not currently offered)

**GROUP 2.2.2** Complete 2 courses
- Math 213 - Elementary Linear Algebra 2.0
- Math 215 - Computational Linear Algebra 1.0

**OPTION 2.3** Complete 1 course

**OPTION 3.1** Complete up to 15.0 hours from the following course(s)

**COMPLETE 4-5 ELECTIVE COURSES (12-15 CREDIT HOURS) FROM THE FOLLOWING LIST:**

- BIO 463 - Genetics of Human Disease 3.0
- C S 260 - Web Programming 3.0
- C S 292 - Testing, Analysis, and Verification 3.0
- C S 330 - Concepts of Programming Languages 3.0
- C S 345 - Operating System Design 3.0
- C S 355 - Interactive Graphics and Image Processing 3.0
- C S 401R - Topics in Computer Science 3.0

You may take up to 3 credit hours.

**OPTION 3.2** Complete up to 6.0 hours from the following course(s)

**COMPLETE 0-2 ELECTIVE COURSES (0-6.0 CREDIT HOURS) FROM THE FOLLOWING LIST:**

- C S 431 - Algorithmic Languages and Compilers 3.0
- C S 450 - Computer Vision 3.0
- C S 452 - Database Modeling Concepts 3.0
- C S 453 - Fundamentals of Information Retrieval 3.0
- C S 455 - Computer Graphics 3.0
- C S 456 - Introduction to User Interface Software 3.0
- C S 460 - Computer Communications and Networking 3.0
- C S 462 - Large-Scale Distributed System Design 3.0
- C S 465 - Computer Security 3.0
- C S 470 - Introduction to Artificial Intelligence 3.0
- C S 472 - Introduction to Machine Learning 3.0
- C S 474 - Introduction to Deep Learning 3.0
- C S 479 - (Not currently offered) 3.0
- C S 486 - Verification and Validation 3.0

You may take up to 3 credit hours.

**OPTION 3.3** Complete up to 15.0 hours from the following course(s)

**COMPLETE 5 ELECTIVE COURSES (15.0 CREDIT HOURS) FROM THE FOLLOWING LIST:**

- C S 440 - Computer Security 3.0
- C S 445 - Computer Networks 3.0
- C S 447 - Introduction to Artificial Intelligence 3.0
- C S 448 - Introduction to Machine Learning 3.0
- C S 449 - Introduction to Deep Learning 3.0
- C S 450 - Computer Vision 3.0
- C S 452 - Database Modeling Concepts 3.0
- C S 453 - Fundamentals of Information Retrieval 3.0
- C S 455 - Computer Graphics 3.0
- C S 456 - Introduction to User Interface Software 3.0
- C S 460 - Computer Communications and Networking 3.0
- C S 462 - Large-Scale Distributed System Design 3.0
- C S 465 - Computer Security 3.0
- C S 470 - Introduction to Artificial Intelligence 3.0
- C S 472 - Introduction to Machine Learning 3.0
- C S 474 - Introduction to Deep Learning 3.0
- C S 479 - (Not currently offered) 3.0
- C S 486 - Verification and Validation 3.0

You may take up to 3 credit hours.

**REQUIREMENT 3** Complete 15.0 hours from the following option(s)

**COMPLETE A TOTAL OF 5 ELECTIVE COURSES (15.0 CREDIT HOURS) FROM THE FOLLOWING OPTIONS.**

**NOTE:** IF C S 401R, 497R, OR 498R IS CHOSEN, IT MUST BE TAKEN FOR 3 CREDIT HOURS.

**OPTION 3.1** Complete up to 15.0 hours from the following course(s)

**COMPLETE 4-5 ELECTIVE COURSES (12-15 CREDIT HOURS) FROM THE FOLLOWING LIST:**

- BIO 463 - Genetics of Human Disease 3.0
- C S 260 - Web Programming 3.0
- C S 292 - Testing, Analysis, and Verification 3.0
- C S 330 - Concepts of Programming Languages 3.0
- C S 345 - Operating System Design 3.0
- C S 355 - Interactive Graphics and Image Processing 3.0
- C S 401R - Topics in Computer Science 3.0

You may take up to 3 credit hours.

**OPTION 3.2** Complete up to 6.0 hours from the following course(s)

**COMPLETE 0-2 ELECTIVE COURSES (0-6.0 CREDIT HOURS) FROM THE FOLLOWING LIST:**

- C S 431 - Algorithmic Languages and Compilers 3.0
- C S 450 - Computer Vision 3.0
- C S 452 - Database Modeling Concepts 3.0
- C S 453 - Fundamentals of Information Retrieval 3.0
- C S 455 - Computer Graphics 3.0
- C S 456 - Introduction to User Interface Software 3.0
- C S 460 - Computer Communications and Networking 3.0
- C S 462 - Large-Scale Distributed System Design 3.0
- C S 465 - Computer Security 3.0
- C S 470 - Introduction to Artificial Intelligence 3.0
- C S 472 - Introduction to Machine Learning 3.0
- C S 474 - Introduction to Deep Learning 3.0
- C S 479 - (Not currently offered) 3.0
- C S 486 - Verification and Validation 3.0

You may take up to 3 credit hours.

**OPTION 3.3** Complete up to 15.0 hours from the following course(s)

**COMPLETE 5 ELECTIVE COURSES (15.0 CREDIT HOURS) FROM THE FOLLOWING LIST:**

- C S 440 - Computer Security 3.0
- C S 445 - Computer Networks 3.0
- C S 447 - Introduction to Artificial Intelligence 3.0
- C S 448 - Introduction to Machine Learning 3.0
- C S 449 - Introduction to Deep Learning 3.0
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- C S 472 - Introduction to Machine Learning 3.0
- C S 474 - Introduction to Deep Learning 3.0
- C S 479 - (Not currently offered) 3.0
- C S 486 - Verification and Validation 3.0

You may take up to 3 credit hours.

**REQUIREMENT 4** Complete Senior Exit Interview with the CS department during your last semester or term.

**THE DISCIPLINE**

Computer science touches virtually every area of human endeavor. Software is responsible for everything from the control of kitchen appliances to sophisticated climate models used in predicting future environmental change. Students in computer science learn to approach complex problems in business, science, and entertainment using their strong background in mathematics, algorithms, and data structures.

The degree programs in the Computer Science Department prepare students to be confident software developers and technical problem solvers. The curriculum also trains students for research into new avenues where computers will have a significant impact.

The BS curriculum is accredited by the Computing Accreditation Commission of ABET.

**CAREER OPPORTUNITIES**

Graduates pursue exciting opportunities in graphics, artificial intelligence, software engineering, database design, scientific programming, systems administration, and research at universities and national laboratories.

Students completing the animation emphasis will be prepared for technical positions at animation and game programming studios. Students will learn both the technical and artistic side of creating and implementing digital animations and games.

The bioinformatics emphasis is designed for students who are interested in building software to assist in analyzing biological data structures.
systems. Students will graduate with a significant background in biology coupled with the software development and analysis skills necessary to implement large bioinformatics applications.

MAP DISCLAIMER

While every reasonable effort is made to ensure accuracy, there are some student populations that could have exceptions to listed requirements. Please refer to the university catalog and your college advisement center/department for complete guidelines.

DEPARTMENT INFORMATION

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Brigham Young University
3361 Talmage Building
Provo, UT 84602
Telephone: (801) 422-3027

ADVISEMENT CENTER INFORMATION

Physical and Mathematical Sciences College Advisement Center
Brigham Young University
N-181 ESC
Provo, UT 84602
Telephone: (801) 422-2674