### University Core and Graduation Requirements

#### University Core Requirements:

<table>
<thead>
<tr>
<th>Requirements</th>
<th>#Classes</th>
<th>Hours</th>
<th>Classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Religion Cornerstones</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teachings and Doctrine of The Book of Mormon</td>
<td>1</td>
<td>2.0</td>
<td>REL A 275</td>
</tr>
<tr>
<td>Jesus Christ and the Everlasting Gospel</td>
<td>1</td>
<td>2.0</td>
<td>REL A 250</td>
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<tr>
<td>Foundations of the Restoration</td>
<td>1</td>
<td>2.0</td>
<td>REL C 225</td>
</tr>
<tr>
<td>The Eternal Family</td>
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<td>2.0</td>
<td>REL C 200</td>
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<tr>
<td>The Individual and Society</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Heritage</td>
<td>1-2</td>
<td>3-6.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Global and Cultural Awareness</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Skills</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>First Year Writing</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Advanced Written and Oral Communications</td>
<td>1</td>
<td>3.0</td>
<td>ENGL 316*</td>
</tr>
<tr>
<td>Quantitative Reasoning</td>
<td>1</td>
<td>4.0</td>
<td>MATH 112* or 113*</td>
</tr>
<tr>
<td>Languages of Learning (Math or Language)</td>
<td>1</td>
<td>4.0</td>
<td>MATH 112* or 113*</td>
</tr>
<tr>
<td>Arts, Letters, and Sciences</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Civilization 1</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Civilization 2</td>
<td>1</td>
<td>3.0</td>
<td>ARTHC 202* or from approved list</td>
</tr>
<tr>
<td>Arts</td>
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<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Letters</td>
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<td>3.0</td>
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<tr>
<td>Biological Science</td>
<td>1</td>
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<tr>
<td>Physical Science</td>
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<td>3.0</td>
<td>CS 312*</td>
</tr>
<tr>
<td>Social Science</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Core Enrichment: Electives</td>
<td></td>
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<tr>
<td>Religion Electives</td>
<td>3-4</td>
<td>6.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Open Electives</td>
<td>Variable</td>
<td>Variable</td>
<td>personal choice</td>
</tr>
</tbody>
</table>

*THESE CLASSES FILL BOTH UNIVERSITY CORE AND PROGRAM REQUIREMENTS (13–23 hours overlap)*

#### Graduation Requirements:

- Minimum residence hours required: **30.0**
- Minimum hours needed to graduate: **120.0**

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#### Suggested Sequence of Courses

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Junior Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Semester</td>
<td>5th Semester</td>
</tr>
<tr>
<td>C S 142</td>
<td>ENGL 316</td>
</tr>
<tr>
<td>STAT 121 or 201</td>
<td>C S 324</td>
</tr>
<tr>
<td>First-year Writing or American Heritage</td>
<td>MATH 112</td>
</tr>
<tr>
<td>MATH 112</td>
<td>CS 355</td>
</tr>
<tr>
<td>Religion Cornerstone course</td>
<td>Religion elective</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td><strong>15.0</strong></td>
</tr>
<tr>
<td>2nd Semester</td>
<td>6th Semester</td>
</tr>
<tr>
<td>First-year Writing or American Heritage</td>
<td>C S 235</td>
</tr>
<tr>
<td>MATH 113</td>
<td>CS 455</td>
</tr>
<tr>
<td>Religion Cornerstone course</td>
<td>C S 340</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td><strong>15.0</strong></td>
</tr>
<tr>
<td>Sophomore Year</td>
<td></td>
</tr>
<tr>
<td>3rd Semester</td>
<td></td>
</tr>
<tr>
<td>C S 236</td>
<td></td>
</tr>
<tr>
<td>CSANM 150</td>
<td></td>
</tr>
<tr>
<td>C S 224</td>
<td></td>
</tr>
<tr>
<td>Civilization 1</td>
<td></td>
</tr>
<tr>
<td>Religion Cornerstone course</td>
<td></td>
</tr>
<tr>
<td>Arts</td>
<td></td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td><strong>15.5</strong></td>
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<tr>
<td>4th Semester</td>
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<tr>
<td>C S 240</td>
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</tr>
<tr>
<td>C S 252</td>
<td></td>
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<tr>
<td>MATH 213</td>
<td></td>
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<tr>
<td>MATH 215</td>
<td></td>
</tr>
<tr>
<td>Social Science</td>
<td></td>
</tr>
<tr>
<td>Religion Cornerstone course</td>
<td></td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td><strong>15.0</strong></td>
</tr>
</tbody>
</table>

Note 1: The sequence of courses 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: Animation (693223)
#### 2019-2020 Program Requirements (77 - 80.5 Credit Hours)

Grades below C- are not allowed in major courses.

**REQUIREMENT 1** Complete 3 courses

**PREREQUISITE COURSES:**
- C S 142 - Introduction to Computer Programming 3.0
- C S 235 - Data Structures and Algorithms 3.0
- CSANM 150 - Introduction to Three-Dimensional Computer Graphics 1.5

Be admitted to the program.

**REQUIREMENT 2** Complete 10 courses

**COMPLETE THE FOLLOWING AFTER BEING ADMITTED TO THE PROGRAM:**
- C S 224 - Introduction to Computer Systems 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 355 - Interactive Graphics and Image Processing 3.0
- C S 404 - Ethics and Computers in Society 2.0
- C S 455 - Computer Graphics 3.0

**REQUIREMENT 3** Complete 5 courses

**SUPPORTING COURSES:**
- CSANM 354 - Shader Programming 3.0
- "ENGL 316 - Technical Communication 3.0
- MATH 112 - Calculus 1 4.0
- MATH 113 - Calculus 2 4.0
- PHSCS 121 - Introduction to Newtonian Mechanics 3.0

**REQUIREMENT 4** Complete 1 option

**OPTION 4.1** Complete 1 course
- MATH 313 - (Not currently offered)

**OPTION 4.2** Complete 2 courses
- MATH 213 - Elementary Linear Algebra 2.0
- MATH 215 - Computational Linear Algebra 1.0

**REQUIREMENT 5** Complete 1 course

- CSANM 450R - Advanced Senior Film Production 1 3.0
  - You may take this course up to 2 times.
- CSANM 459R - Video Game Production 1 3.0
  - You may take this course up to 2 times.

**REQUIREMENT 6** Complete 1 course

- STAT 121 - Principles of Statistics 3.0
- STAT 201 - Statistics for Engineers and Scientists 3.0

**REQUIREMENT 7** Complete 1 course

**NOTE:** IF C S 401R IS CHOSEN, IT MUST BE TAKEN FOR THREE HOURS.
- C S 260 - Web Programming 3.0
- C S 329 - Testing, Analysis, and Verification 3.0
- C S 330 - Concepts of Programming Languages 3.0
- C S 345 - Operating Systems Design 3.0
- C S 356 - Designing the User Experience 3.0
- C S 401R - Topics in Computer Science 3.0
  - You may take up to 3 credit hours.
- C S 412 - Linear Programming and Convex Optimization 3.0
- C S 418 - Bioinformatics 3.0
- C S 428 - Software Engineering 3.0
- 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 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)
- C S 486 - Verification and Validation 3.0
- C S 498R - Undergraduate Special Projects 3.0
  - You may take up to 3 credit hours.
- C S 501R - Advanced Topics in Computer Science 3.0
  - You may take up to 3 credit hours.
- C S 513 - Robust Control 3.0
- C S 537 - (Not currently offered)
- CSANM 351R - Lighting for Three-Dimensional Graphics 3.0
- CSANM 355 - Photography for Animation 3.0
- CSANM 452R - Advanced Senior Film Production 2 3.0
- CSANM 454 - Advanced Shading 3.0
- CSANM 458 - Three-Dimensional Visual Effects 3.0
- CSANM 460R - Video Game Production 2 3.0
- EC EN 425 - Real-Time Operating Systems 4.0

**REQUIREMENT 8** Complete 3 courses

**COURSES USED TO FULFILL REQUIREMENT 6 CANNOT BE DOUBLE COUNTED HERE. NOTE:** IF C S 401R, C S 498R, OR C S 501R IS CHOSEN, IT MUST BE TAKEN FOR THREE HOURS.
- C S 401R - Topics in Computer Science 3.0
  - You may take up to 3 credit hours.
- C S 412 - Linear Programming and Convex Optimization 3.0
- C S 418 - Bioinformatics 3.0
- C S 428 - Software Engineering 3.0
- 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 456 - Introduction to User Interface Software 3.0
- C S 460 - Computer Communications and Networking 3.0
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- 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)
- C S 486 - Verification and Validation 3.0
- C S 498R - Undergraduate Special Projects 3.0
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  - You may take up to 3 credit hours.
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- CSANM 454 - Advanced Shading 3.0
- CSANM 458 - Three-Dimensional Visual Effects 3.0
- CSANM 460R - Video Game Production 2 3.0
- EC EN 425 - Real-Time Operating Systems 4.0

**REQUIREMENT 9** Complete 1 course

- ARTHC 111 - Introduction to Art History 3.0
- ARTHC 202 - World Civilization Since 1500 3.0
- TECH 201 - (Not currently offered) 3.0
- TMA 294 - History of Animation 3.0

**REQUIREMENT 10** 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 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**

Computer Science Department  
Brigham Young University  
3361 Talmage Building  
Provo, UT 84602

<table>
<thead>
<tr>
<th>BS in Computer Science: Animation (693223)</th>
<th>2019-2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>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. <strong>CAREER OPPORTUNITIES</strong> 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 systems. Students will graduate with a significant background in biology coupled with the software development and analysis skills necessary to implement large bioinformatics applications. <strong>MAP DISCLAIMER</strong> 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. <strong>DEPARTMENT INFORMATION</strong> Computer Science Department Brigham Young University 3361 Talmage Building Provo, UT 84602</td>
<td>Telephone: (801) 422-3027</td>
</tr>
</tbody>
</table>