# BS in Computer Science: Animation (693223) MAP Sheet

Physical and Mathematical Sciences, Computer Science

For students entering the degree program during the 2020-2021 curricular year.

This is a limited-enrollment program requiring departmental admissions approval. Please see the department office for information regarding requirements for admission to this emphasis.

Application deadline: April 15 and December 15 after completing the prerequisite courses listed below.

## 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><strong>Religion Cornerstones</strong></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>
</tr>
<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>
<td>1</td>
<td>2.0</td>
<td>REL C 200</td>
</tr>
<tr>
<td><strong>The Individual and Society</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Heritage</td>
<td>1-2</td>
<td>3.0</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><strong>Skills</strong></td>
<td></td>
<td></td>
<td></td>
</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>WRTG 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><strong>Arts, Letters, and Sciences</strong></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>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Letters</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Biological Science</td>
<td>1</td>
<td>3.0-4.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Physical Science</td>
<td>1</td>
<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><strong>Core Enrichment: Electives</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<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

### Suggested Sequence of Courses

#### FRESHMAN YEAR

<table>
<thead>
<tr>
<th>1st Semester</th>
<th>2nd Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>C S 142</td>
<td>First-year Writing or American Heritage</td>
</tr>
<tr>
<td>STAT 121 or 201</td>
<td>MATH 112</td>
</tr>
<tr>
<td>First-year Writing or American Heritage</td>
<td>Religion Cornerstone course</td>
</tr>
<tr>
<td>MATH 112</td>
<td><strong>Total Hours</strong> 15.0</td>
</tr>
<tr>
<td>Religion Cornerstone course</td>
<td>2nd Semester</td>
</tr>
<tr>
<td>First-year Writing or American Heritage</td>
<td>MATH 113</td>
</tr>
<tr>
<td>MATH 113</td>
<td>Religion Cornerstone course</td>
</tr>
<tr>
<td>MATH 112</td>
<td><strong>Total Hours</strong> 15.0</td>
</tr>
</tbody>
</table>

#### SOPHOMORE YEAR

<table>
<thead>
<tr>
<th>3rd Semester</th>
<th>4th Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>C S 236</td>
<td>C S 238</td>
</tr>
<tr>
<td>CSANM 150</td>
<td>C S 224</td>
</tr>
<tr>
<td>C S 224</td>
<td>Civilization 1</td>
</tr>
<tr>
<td>C S 211</td>
<td>Religion Cornerstone course</td>
</tr>
<tr>
<td>Arts</td>
<td>Arts</td>
</tr>
<tr>
<td>Total Hours 15.5</td>
<td>Total Hours 15.5</td>
</tr>
</tbody>
</table>

#### JUNIOR YEAR

<table>
<thead>
<tr>
<th>5th Semester</th>
<th>6th Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRTG 316</td>
<td>C S 324</td>
</tr>
<tr>
<td>MATH 312</td>
<td>C S 355</td>
</tr>
<tr>
<td>Religion elective</td>
<td>Open elective</td>
</tr>
<tr>
<td><strong>Total Hours</strong> 15.0</td>
<td><strong>Total Hours</strong> 15.0</td>
</tr>
</tbody>
</table>

#### SENIOR YEAR

<table>
<thead>
<tr>
<th>7th Semester</th>
<th>8th Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>C S 240</td>
<td>Computer Science Elective</td>
</tr>
<tr>
<td>C S 252</td>
<td>CSANM Elective</td>
</tr>
<tr>
<td>MATH 213</td>
<td>Biological Science</td>
</tr>
<tr>
<td>MATH 215</td>
<td>CSANM Elective</td>
</tr>
<tr>
<td>Social Science</td>
<td>Religion elective</td>
</tr>
<tr>
<td>Religion Cornerstone course</td>
<td>Open Elective</td>
</tr>
<tr>
<td><strong>Total Hours</strong> 15.0</td>
<td><strong>Total Hours</strong> 15.0</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)**

**2020-2021 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

#### REQUIREMENT 2 Complete 20 courses

**COMPLETE THE FOLLOWING AFTER BEING ADMITTED TO THE PROGRAM:**

- **SUPPORTING COURSES:**
  - CSANM 224 - Introduction to Computer Systems 3.0
  - CS 236 - Discrete Structures 3.0
  - CS 240 - Advanced Programming Concepts 4.0
  - CS 252 - Introduction to Computational Theory 3.0
  - CS 312 - Algorithm Design and Analysis 3.0
  - CS 324 - Systems Programming 3.0
  - CS 340 - Software Design 3.0
  - CS 355 - Interactive Graphics and Image Processing 3.0
  - CS 404 - Ethics and Computers in Society 2.0
  - CS 455 - Computer Graphics 3.0

**COMPLETE 5 courses**

**SUPPORTING COURSES:**
- CSANM 354 - Shader Programming 3.0
- MATH 112 - Calculus 1 4.0
- MATH 113 - Calculus 2 4.0
- PHSCS 121 - Introduction to Newtonian Mechanics 3.0
- WRTG 116 - Technical Communication 3.0

#### REQUIREMENT 3 Complete 1 course

**OPTION 4.1 Complete 1 course**
- MATH 133 - (Not currently offered)

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

#### REQUIREMENT 4 Complete 1 course

**OPTION 4.3 Complete 1 course**
- C S 401R - Topics in Computer Science 3.0v
- C S 418 - Linear Programming and Convex Optimization 3.0
- C S 418 - Software Engineering 3.0
- C S 431 - Algorithmic Languages and Compilers 3.0
- C S 440 - 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 465 - Computer Security 3.0
- C S 470 - Introduction to Artificial Intelligence 3.0
- C S 472 - Introduction to Deep Learning 3.0
- C S 474 - Introduction to Machine Learning 3.0
- C S 479 - Verification and Validation 3.0
- C S 486 - Verification and Validation 3.0
- CSANM 150 - Introduction to Three-Dimensional Computer Graphics 3.0

**COMPLETE 3 courses**

**COURSES USED TO FULFILL REQUIREMENT 6 CANNOT BE DOUBLE CREDITED HERE. NOTE: IF C S 401R, C S 486R, OR C S 501R IS CHOSEN, IT MUST BE TAKEN FOR THREE HOURS.**

- C S 401R - Topics in Computer Science 3.0v
- C S 412 - Linear Programming and Convex Optimization 3.0
- C S 418 - Software Engineering 3.0
- C S 431 - Algorithmic Languages and Compilers 3.0
- C S 440 - Computer Vision 3.0
- C S 452 - Database Modeling Concepts 3.0
- C S 453 - Fundamentals of Information Retrieval 3.0

#### REQUIREMENT 5 Complete 1 course

- C S 450 - 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 - Verification and Validation 3.0
- CSANM 351R - Lighting for Three-Dimensional Graphics 3.0
- CSANM 355 - Photography for Animation 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 6 Complete 1 course

- C S 401R - Topics in Computer Science 3.0v
- C S 412 - Linear Programming and Convex Optimization 3.0
- C S 418 - Software Engineering 3.0
- C S 431 - Algorithmic Languages and Compilers 3.0
- C S 440 - Computer Vision 3.0
- C S 452 - Database Modeling Concepts 3.0
- C S 453 - Fundamentals of Information Retrieval 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 3.0v

- C S 412 - Linear Programming and Convex Optimization 3.0
- C S 418 - (Not currently offered)
- 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 457 - 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 465 - Computer Security 3.0
- C S 470 - Introduction to Artificial Intelligence 3.0
- C S 472 - Introduction to Deep Learning 3.0
- C S 474 - Introduction to Machine Learning 3.0
- C S 479 - Verification and Validation 3.0
- CSANM 351R - Lighting for Three-Dimensional Graphics 3.0
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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 8 Complete 1 course

- C S 450 - 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 - Verification and Validation 3.0
- CSANM 351R - Lighting for Three-Dimensional Graphics 3.0
- CSANM 355 - Photography for Animation 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 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)
- 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
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

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2020-2021