## 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>
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<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>3-6.0</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><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 Commun.</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Quantitative Reasoning</td>
<td>1</td>
<td>3-4.0</td>
<td>from approved list</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>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>
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<td>4.0</td>
<td>BIO 130*</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 Electives: 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 full both University Core and Program Requirements (12 hours overlap)

### Graduation Requirements:

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

## Suggested Sequence of Courses

### Freshman Year

**1st Semester**
- BIO 130: 4.0
- CS 111: 4.0
- MATH 112: 4.0
- Arts or Letters Elective: 3.0
- Religion Cornerstone course: 2.0

**2nd Semester**
- CS 235: 3.0
- MMBIO 240: 3.0
- Religion Cornerstone course: 2.0

**Total Hours**: 16.0

### Sophomore Year

**3rd Semester**
- BIO 264: 4.0
- CHEM 105: 4.0
- CS 236: 3.0
- REL 250: 3.0
- Religion Cornerstone course: 2.0

**Total Hours**: 16.0

**4th Semester**
- CHEM 301: 3.0
- CS 312: 3.0
- PWS 340: 3.0
- Religion Cornerstone course: 2.0
- Social Science elective: 3.0

**Total Hours**: 16.0

### Junior Year

**5th Semester**
- CS 240: 4.0
- Adv. Written and Oral Communication: 3.0
- Civilization 1 elective: 3.0
- Religion elective: 2.0

**6th Semester**
- CS 312: 3.0
- Civilization Elective 2: 3.0
- Global and Cultural Awareness: 3.0
- Major elective: 2.0
- Religion elective: 2.0

**Total Hours**: 15.0

### Senior Year

**7th Semester**
- BIO 364 (only taught Fall semesters): 3.0
- Major elective: 3.0
- General electives: 8.0

**8th Semester**
- BIO 465 (only taught Winter semesters): 3.0
- Major elective: 3.0
- General electives: 8.0

**Total Hours**: 14.0

Note: This degree program requires a minimum of 120.0 hours for graduation. 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.
BS in Bioinformatics (282021)  
2022-2023 Program Requirements (60 - 62 Credit Hours)

**REQUIREMENT 1**  Complete 7 courses  
- BIO 130 - Biology 4.0  
- BIO 165 - Introduction to Bioinformatics 3.0  
- BIO 264 - Statistical Analysis for Biologists 4.0  
- BIO 364 - Bioinformatics Algorithms 3.0  
- BIO 465 - Capstone in Bioinformatics 3.0  
- MMBIO 240 - Molecular Biology 3.0  
- PWS 340 - Genetics 3.0

**REQUIREMENT 2**  Complete 1 course  
- BIO 250 - Evolutionary Medicine 2.0  
- BIO 420 - Evolutionary Biology 4.0

**REQUIREMENT 3**  Complete 8 courses  
- C S 240 - Introduction to Computer Science 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 312 - Algorithm Design and Analysis 3.0  
- CHEM 105 - General College Chemistry 1 with Lab (Integrated) 4.0  
- CHEM 106 - General College Chemistry 2 3.0  
- MATH 112 - Calculus 1 4.0

**REQUIREMENT 4**  Complete 8.0 hours from the following course(s)  
**NOTE:** UP TO 2 TOTAL CREDIT HOURS OF BIO 194 AND BIO 494R ALLOWED.  
**NOTE:** EITHER BIO 370 OR PHIL 212R CAN BE USED TO PARTIALLY FULFILL THIS REQUIREMENT, BUT NOT BOTH.  
- BIO 194 - Introduction to Mentored Research 0.5  
- BIO 265 - Biological Data Science 3.0  
- BIO 318 - Advanced Scientific Writing and Communication 3.0  
- BIO 350 - Ecology 3.0  
- BIO 370 - Bioethics 2.0  
- BIO 450 - Capstone in Biodiversity and Conservation 3.0  
- BIO 462 - Computational Cancer Biology 3.0  
- BIO 463 - Genetics of Human Disease 3.0  
- BIO 468 - (Bio-MMBIO-PWS) Genomics 3.0  
- BIO 494R - Mentored Research 6.0v  
  You may take up to 2 credit hours.  
- BIO 530 - Advanced Genetic Analysis 3.0  
- BIO 555 - Evolutionary and Ecological Modeling 2.0  
- BIO 560 - Population Genetics 4.0  
- C S 260 - Web Programming 3.0  
- C S 340 - Software Design 3.0  
- C S 355 - Interactive Graphics and Image Processing 3.0  
- C S 450 - Computer Vision 3.0  
- C S 452 - Database Modeling Concepts 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  
- CELL 360 - Cell Biology 3.0  
- CHEM 350 - Organic Chemistry 3.0  
- CHEM 352 - Organic Chemistry 2 3.0  
- CHEM 353 - Organic Chemistry Laboratory—Nonmajors 2.0v  
- CHEM 481 - Biochemistry 3.0  
- CHEM 482 - Mechanisms of Molecular Biology 3.0  
- CHEM 489 - Structural Biochemistry 3.0  
- MATH 113 - Calculus 2 4.0  
- MATH 213 - Elementary Linear Algebra 2.0  
- MATH 215 - Computational Linear Algebra 1.0  
- MATH 314 - Calculus of Several Variables 3.0  
- MATH 334 - Ordinary Differential Equations 3.0  
- MMBIO 450 - Genetic Counseling 3.0  
- MMBIO 460 - Bacterial Genetics 4.0  
- PHIL 212R - Introduction to Medical Ethics 3.0  
- STAT 381 - Statistical Computing 3.0  
- STAT 435 - Nonparametric Statistical Methods 3.0  
- STAT 531 - Experimental Design 3.0

**THE DISCIPLINE:**  
Bioinformatics is an interdisciplinary program offering substantial training in both the biological sciences and the physical and mathematical sciences with an emphasis on computer programming coupled with genetics and molecular biology. Students are expected to acquire programming, databaseing, and operating system skills coupled with a foundation in mathematics and statistics. In addition, students will be well trained in molecular biology and genetics and can pursue individual interests in a variety of areas (chemistry, physics, bioengineering, computer science, molecular biology, genetics, etc.).

**RESEARCH OPPORTUNITIES:**

Undergraduates majoring in bioinformatics are expected to participate in research training both on and off campus. The bioinformatics faculty has substantial research programs in phylogenetics, biophysics, ecological modeling, and proteomics with developing programs in biodiversity informatics and biotechnology/agricultural genomics. Students are encouraged to participate in one of these bioinformatic research programs. For a further description of research opportunities and research groups on campus see our website at http://bioinformatics.byu.edu.

**INTERNSHIPS, CO-OP ED, PRACTICAL EXPERIENCE:**  
The bioinformatics major offers an abundance of internship opportunities off campus in addition to working with faculty on campus as described above. Students have worked at federal research labs (NIH, NCBI, NCI), at other universities, and at private biotech and pharmaceutical companies seeking summer interns in bioinformatics. The bioinformatics major offers placement assistance for such programs and encourages students to gain a variety of external research experiences.

**CAREERS:**  
The bioinformatics major is designed to develop the skills of those students with interests in both computer science and the biological sciences and to merge these interests in the area of bioinformatics or computational biology. The breadth of skills acquired will provide students with exciting options from graduate school, professional school (medical, dental, law), to employment opportunities directly out of this undergraduate program, especially with biotechnology companies.

**FINANCING:**  
Students in this major may apply for university, college, and department scholarships. A limited number of research or teaching assistant positions for undergraduate students also exist.
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.

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