University Core and Graduation Requirements:

### University Core Requirements:

#### Religion Cornerstones
- Teachings and Doctrine of The Book of Mormon
- Jesus Christ and the Everlasting Gospel
- Foundations of the Restoration
- The Eternal Family

#### The Individual and Society
- American Heritage
- Global and Cultural Awareness

#### Skills
- First Year Writing
- Advanced Written and Oral Communications
- Quantitative Reasoning
- Languages of Learning (Math or Language)

#### Arts, Letters, and Sciences
- Civilization 1
- Civilization 2
- Arts
- Letters
- Biological Science
- Physical Science
- Social Science

#### Core Enrichment: Electives
- Religion Electives
- Open Electives

#### University Core Requirements: 

<table>
<thead>
<tr>
<th>Requirements</th>
<th>#Classes</th>
<th>Hours</th>
<th>Classes</th>
</tr>
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<tbody>
<tr>
<td>Religion Cornerstones</td>
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<tr>
<td>Teachings and Doctrine of The Book of Mormon</td>
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<td>Jesus Christ and the Everlasting Gospel</td>
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<td>Foundations of the Restoration</td>
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<td>REL C 225</td>
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<td>The Eternal Family</td>
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<td>American Heritage</td>
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<td>First Year Writing</td>
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<td>from approved list</td>
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<td>Advanced Written and Oral Communications</td>
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<td>WRTG 316 recommended</td>
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<td>Quantitative Reasoning</td>
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<td>from approved list</td>
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<td>Languages of Learning (Math or Language)</td>
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<td>MATH 112*, 119*, or STAT 121*</td>
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<td>from approved list</td>
</tr>
<tr>
<td>Arts</td>
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<tr>
<td>Letters</td>
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<tr>
<td>Biological Science</td>
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<td>BIO 130*, PDBIO 120*, or MMBIO 121*</td>
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<tr>
<td>Physical Science</td>
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<td>CHEM 105*, PHSCS 105*</td>
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<tr>
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<td>from approved list</td>
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#### Core Enrichment: Electives

- Religion Electives
- Open Electives

*THESE CLASSES FILL BOTH UNIVERSITY CORE AND PROGRAM REQUIREMENTS (16 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>Semester</th>
<th>Total Hours</th>
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<tbody>
<tr>
<td>1st Semester</td>
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<tr>
<td>First-year Writing or American Heritage*</td>
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<tr>
<td>REL A 275</td>
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<tr>
<td>MMBIO 122 or BIO 130 or CELL 120</td>
<td>3.0-4.0</td>
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<tr>
<td>CHEM 105</td>
<td>4.0</td>
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<td>Open electives</td>
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<td>Total Hours</td>
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<tr>
<td>2nd Semester</td>
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</tr>
<tr>
<td>First-year Writing or American Heritage*</td>
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<tr>
<td>REL A 250</td>
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<tr>
<td>MMBIO 240</td>
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<tr>
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<tr>
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#### Sophomore Year

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<tr>
<td>3rd Semester</td>
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<tr>
<td>BIO 165</td>
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<td>BIO 250</td>
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<tr>
<td>MATH 112 or 119 or STAT 121</td>
<td>3.0-4.0</td>
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<tr>
<td>PHSCS 105</td>
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<td>4th Semester</td>
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<td>Major Elective (Requirement 7)</td>
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<tr>
<td>REL C 200</td>
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<tr>
<td>Civilization 2 elective*</td>
<td>3.0</td>
</tr>
<tr>
<td>Social Science elective*</td>
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<tr>
<td>Total Hours</td>
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#### Junior Year

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<tbody>
<tr>
<td>5th Semester</td>
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<td>CHEM 351 or CHEM 285</td>
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<td>Major electives (Requirement 7)</td>
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<td>Requirement 2 choice</td>
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<tr>
<td>Total Hours</td>
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<tr>
<td>6th Semester</td>
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<td>MMBIO 441</td>
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<td>Open electives</td>
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<td>Major electives (Requirement 7)</td>
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<tr>
<td>Requirement 2 choice</td>
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#### Senior Year

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<td>7th Semester</td>
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<tr>
<td>MMBIO 468</td>
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<td>Requirement 2 choice</td>
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<tr>
<td>Total Hours</td>
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</table>

Note: Quantitative Reasoning elective fulfilled by Math 112 or Math 119. Note: 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.

Note: Quantitative Reasoning can be fulfilled by ACT Math subscore of 22 or higher.

*Double counting options available for some GE courses
BS in Molecular Biology (285125)
2021-2022 Program Requirements (57 - 60 Credit Hours)

REQUIREMENT 1 Complete 1 course
  *BIO 130 - Biology 4.0
  CELL 120 - Science of Biology 3.0
  MMBIO 121 - General Biology: Health and Disease 3.0

REQUIREMENT 2 Complete 10 courses
  BIO 165 - Introduction to Bioinformatics 3.0
  BIO 250 - Evolutionary Medicine 2.0
  CELL 360 - Cell Biology 3.0
  MMBIO 240 - Molecular Biology 3.0
  MMBIO 241 - Molecular and Cellular Biology Laboratory 1.0
  MMBIO 390R - Readings in Molecular Biology 1.0
  MMBIO 441 - Advanced Molecular Biology 3.0
  MMBIO 468 - (MMBioBio-PWS) Genomics 3.0
  MMBIO 490R - Molecular Biology Seminar 1.0
  PWS 340 - Genetics 3.0

REQUIREMENT 3 Complete 2.0 hours from the following course(s)
  MMBIO 294R - Mentored Research 3.0v
  MMBIO 442 - Advanced Molecular Biology Laboratory 2.0
  MMBIO 494R - Advanced Mentored Research 3.0v

REQUIREMENT 4 Complete 4 courses
  *CHEM 105 - General College Chemistry 1 with Lab (Integrated) 4.0
  CHEM 106 - General College Chemistry 2 3.0
  CHEM 107 - General College Chemistry Laboratory 1.0
  *PHSCS 105 - General Physics 1 3.0

REQUIREMENT 5 Complete 1 course
  CHEM 285 - Introductory Bio-organic Chemistry 4.0
  CHEM 351 - Organic Chemistry 1 3.0

REQUIREMENT 6 Complete 1 course
  *MATH 112 - Calculus 1 4.0

REQUIREMENT 7 Complete 12.0 hours from the following option(s)
  A COURSE USED TO FULFIL REQUIREMENTS 1-6 MAY NOT BE USED TO FULFIL REQUIREMENT 7. FOR CERTAIN ELECTIVE COURSES, A LIMITED NUMBER OF CREDIT HOURS CAN COUNT TOWARD THIS ELECTIVE REQUIREMENT.

  OPTION 7.1 Complete up to 12.0 hours from the following course(s)
  BIO 350 - Ecology 3.0
  BIO 420 - Evolutionary Biology 4.0
  BIO 463 - Genetics of Human Disease 3.0
  BIO 465 - Capstone in Bioinformatics 3.0
  CELL 210 - Human Anatomy (with virtual lab) 3.0
  CELL 220 - Human Anatomy (with lab) 4.0
  CELL 305 - Human Physiology 4.0
  CELL 325 - Tissue Biology (with lab) 3.0
  CELL 362 - Advanced Physiology 3.0
  CELL 363 - Advanced Physiology Laboratory 1.0
  CELL 382 - Developmental Biology 3.0
  CELL 444 - Bio-Innovation and -Entrepreneurship 1 2.0
  CELL 445 - Bio-Innovation and -Entrepreneurship 2 2.0
  CELL 582 - Developmental Genetics 3.0
  CHEM 351 - Organic Chemistry 1 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
  MMBIO 110R - Extremophiles: Life in Extreme Environments 1.0
  MMBIO 122 - General Biology: Health and Disease Laboratory 1.0
  MMBIO 151 - Introduction to Microbiology 4.0
  MMBIO 162R - Careers in Biomedical Sciences 1.0
  MMBIO 261 - Infection and Immunity 3.0
  MMBIO 350 - Genetic Counseling 3.0
  MMBIO 360 - Microbial Genetics 4.0
  MMBIO 363 - Microbial Ecology 2.0
  MMBIO 364 - Bacterial Pathogenesis 3.0
  MMBIO 365 - Bacterial Pathogenesis Laboratory 1.0
  MMBIO 366 - Microbial Ecology Laboratory 1.0
  MMBIO 409 - Hematology 3.0
  MMBIO 411 - Molecular Diagnostics 3.0
  MMBIO 418 - Medical Parasitology 2.0
  MMBIO 463 - Advanced Bacterial Physiology 3.0
  MMBIO 463 - Immunology 3.0
  MMBIO 465 - Virology 3.0
  MMBIO 466 - Virology Laboratory 1.0
  MMBIO 467 - Virology Lab 1.0
  MMBIO 471 - Applied and Industrial Microbiology 2.0
  MMBIO 493R - Curriculum and Instruction Practicum 2.0
  MMBIO 510 - History and Philosophy of Microbiology and Molecular Bio 2.0
  MMBIO 512 - Gene Regulation 2.0
  MMBIO 514 - Advanced Immunology 2.0

  MMBIO 516 - Bacteria-Host Interactions 2.0
  MMBIO 518 - Select Pathogens 2.0
  MMBIO 520 - Molecular Virology 2.0
  MMBIO 522 - Flow Cytometry 2.0
  MMBIO 528R - Current Topics in Pathogenesis 1.0
  PHSCS 106 - General Physics 2 3.0
  PWS 470 - Analysis of Genetic and Genomic Data 3.0

  OPTION 7.2 Complete up to 6.0 hours from the following course(s)
  MMBIO 194 - Phage Hunters: Discovery 3.0
  MMBIO 195 - Phage Hunters: Comparative Genomics 3.0
  MMBIO 294R - Mentored Research 3.0v
  MMBIO 299R - Academic Internship 9.0v
  You may take up to 2 credit hours.
  MMBIO 494R - Advanced Mentored Research 3.0v
  You may take up to 2 credit hours.

REQUIREMENT 8
Pass the Biology Major Field Exam.

REQUIREMENT 9
Complete an exit interview.

THE DISCIPLINE:
Molecular biology is the basic science that has as its goal an explanation of life processes at the subcellular and molecular level. Recent years have seen explosive advances in the study of DNA and molecular genetics, including gene cloning, sequencing, and mapping. Developments in molecular biology have opened new areas of study and provided powerful techniques that are revolutionizing the pharmaceutical, health, and agricultural industries. They have spawned new industries in biotechnology, and opened avenues for answering basic and applied questions in all of the life sciences.

PROGRAM OBJECTIVES:
The objectives of the molecular biology major are to provide a conceptual knowledge base and critical thinking skills related to the following areas:

- Molecular biology
- Cell biology
• Integrating themes (biochemistry, evolution, and diversity)

At the completion of the program, the student will be able to:

1. Possess basic knowledge and demonstrate critical thinking in molecular biology, cell biology, and evaluate literature in related areas.

2. Demonstrate basic laboratory skills including laboratory safety and basic molecular biology techniques.

3. Demonstrate laboratory thinking skills including cognitive processes, analytical skills, communication skills, and interpersonal and citizenry skills.

4. Demonstrate basic research skills to include formulating a clear, answerable question, developing a testable hypothesis, predicting expected results, developing, modifying, and/or following an experimental protocol, collecting and organizing data in a systematic fashion, presenting data in an appropriate form, assessing the validity of the data and drawing appropriate conclusions based on the results.

CAREER OPPORTUNITIES:

Graduates are well prepared for continued study toward advanced degrees in agriculture, animal science biochemistry, biology, microbiology, molecular biology, medicine, and related fields or to enter the biotechnology work force. Molecular biology is an excellent pre-professional course of study for those interested in health professions, law, or business.

FINANCING:

Students may be employed either as research or teaching assistants. Several endowed scholarships are available.

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

Microbiology and Molecular Biology
Brigham Young University
4007 Life Sciences Building
Provo, UT 84602
Telephone: (801) 422-2889

ADVISEMENT CENTER INFORMATION

Life Sciences Advisement
Brigham Young University
2060 Life Sciences Building
Provo, UT 84602
Telephone: (801) 422-3042
lifesciences@byu.edu