BS in MICROBIOLOGY (285120) MAP Sheet
Department of Microbiology and Molecular Biology
For students entering the degree program during the 2016–2017 curricular year.

**UNIVERSITY CORE AND GRADUATION 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 &amp; Doctrine, Book of Mormon</td>
<td>1</td>
<td>2.0</td>
<td>Rel A 275</td>
</tr>
<tr>
<td>Jesus Christ &amp; 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>The Individual and Society</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Citizenship</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 &amp; Cultural Awareness</td>
<td>1</td>
<td>3.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Arts, Letters, and Sciences</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Civilization 1 and 2</td>
<td>2</td>
<td>6.0</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>Scientific Principles &amp; Reasoning</td>
<td>1–2</td>
<td>4–5.0</td>
<td>from approved list</td>
</tr>
<tr>
<td>Biological Science</td>
<td>1–2</td>
<td>4–5.0</td>
<td>Bio 130*, or MMBio 121*, or MMBio 240* and PDBio 120*</td>
</tr>
<tr>
<td>Physical Science</td>
<td>2</td>
<td>7.0</td>
<td>Chem 105* and Phscs 105*</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>Religion Electives</td>
<td>3–4</td>
<td>6.0</td>
</tr>
<tr>
<td>Open Electives</td>
<td>Variable</td>
<td>Variable</td>
<td>personal choice</td>
</tr>
</tbody>
</table>

**PROGRAM REQUIREMENTS**

<table>
<thead>
<tr>
<th>Complete one of the following courses:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio 130* Biology</td>
<td>4.0</td>
</tr>
<tr>
<td>MMBio 121* General Biology: Hlth &amp; Disease</td>
<td>3.0</td>
</tr>
<tr>
<td>PDBio 120* Science of Biology</td>
<td>2.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Complete the following biology core courses:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MMBio 151 Introduction to Microbiology</td>
<td>4.0</td>
</tr>
<tr>
<td>MMBio 240* Molecular Biology</td>
<td>3.0</td>
</tr>
<tr>
<td>MMBio 241 Molecular &amp; Cellular Biology Lab</td>
<td>1.0</td>
</tr>
<tr>
<td>MMBio 261 Infection and Immunity</td>
<td>3.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Complete three courses from the following ( at least two of which must have a lab component):</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MMBio 360+ Microbial Genetics</td>
<td>4.0</td>
</tr>
<tr>
<td>MMBio 363+ Microbial Ecology</td>
<td>3.0</td>
</tr>
<tr>
<td>MMBio 364+ Bacterial Pathogenesis</td>
<td>4.0</td>
</tr>
<tr>
<td>MMBio 461 Advanced Bacterial Physiology</td>
<td>3.0</td>
</tr>
<tr>
<td>MMBio 463 Immunology</td>
<td>3.0</td>
</tr>
<tr>
<td>MMBio 465 Virology</td>
<td>3.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Complete the following physical science courses:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem 105* General College Chemistry</td>
<td>4.0</td>
</tr>
<tr>
<td>Chem 106* General College Chemistry</td>
<td>3.0</td>
</tr>
<tr>
<td>Chem 107 General College Chemistry Lab</td>
<td>1.0</td>
</tr>
<tr>
<td>Phscs 105 General Physics 1</td>
<td>3.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Complete one of the following quantitative courses:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 112* Calculus 1</td>
<td>4.0</td>
</tr>
<tr>
<td>Math 119* Introduction to Calculus</td>
<td>4.0</td>
</tr>
<tr>
<td>Stat 121* Principles of Statistics</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Note: Math 119 is offered through BYU Independent Study.

(Continued in next column)

**GRADUATION REQUIREMENTS:**

| Minimum residence hours required | 30.0 |
| Minimum hours needed to graduate | 120.0 |

FOR UNIVERSITY CORE QUESTIONS CONTACT THE ADVISEMENT CENTER

* THESE CLASSES FILL BOTH UNIVERSITY CORE AND PROGRAM REQUIREMENTS (14–15 hours overlap)

Complete at least 14 elective hours from the following:

Bio 165 Intro to Bioinformatics | 3.0 |
Bio 350 Ecology | 3.0 |
Bio 420 Evolutionary Biology | 2.0 |
Bio 421 Evolutionary Biology Lab | 1.0 |
Chem 351 Organic Chemistry | 3.0 |
Chem 352 Organic Chemistry | 3.0 |
Chem 353 Organic Chemistry Lab–Nonmajors | 2.0V |
Chem 481 Biochemistry | 3.0 |
Chem 482 Mechanisms of Molecular Biology | 3.0 |
Chem 110R Extremophiles: Life In Extreme Environ | 1.0 |
MMBio 162R Careers in Biomedical Sciences | 1.0 |
MMBio 194A Phage Hunters: Discovery | 2.0 |
MMBio 194B Phage Hunters: Comp. Genomics | 2.0 |
MMBio 390R Readings in Molecular Biology | 1.0 |
MMBio 399R Academic Internship | 9.0V |
MMBio 417 Medical Parasitology | 3.0 |
MMBio 430 Advanced Cell Biology | 3.0 |
MMBio 441 Advanced Molecular Biology | 3.0 |
MMBio 442 Advanced Molecular Biology Lab | 2.0 |
MMBio 466+ Virology Laboratory | 1.0 |
MMBio 467+ Immunology Lab | 1.0 |
MMBio 468 Genomics | 3.0 |
MMBio 470R Synthetic Biology | 2.0V |
MMBio 494R Mentored Research | 3.0V |
MMBio 510 History and Philosophy of MMBio | 2.0 |
MMBio 512 Gene Regulation | 2.0 |
MMBio 514 Advanced Immunology | 2.0 |
MMBio 516 Advanced Immunology Lab | 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 |
NDFS 361 Food Microbiology | 3.0 |
PDBio 220 Human Anatomy (with lab) | 3.0 |
PDBio 305 Human Physiology | 4.0 |
PDBio 325 Tissue Biology (with lab) | 3.0 |
PDBio 360 Cell Biology | 3.0 |
PDBio 362 Advanced Physiology | 3.0 |
PDBio 363 Advanced Physiology Laboratory | 1.0 |
Phscs 106 General Physics 2 | 3.0 |
PWS 340 Genetics | 3.0 |
PWS 385 Environmental Microbiology | 3.0 |
PWS 514 Soil Microbiology | 2.0 |

*Note: Only 6 total credit hours of MMBio 194A, 194B, 399R, 470R, and 494R will count toward major hours with a 4 credit hour max. for each individual course. (More credit hours may be taken but they will not count toward major requirements.)
or courses not chosen previously:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMBio 360</td>
<td>Microbial Genetics</td>
<td>4.0</td>
</tr>
<tr>
<td>MMBio 363</td>
<td>Microbial Ecology</td>
<td>3.0</td>
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<td>3.0</td>
</tr>
<tr>
<td>MMBio 465</td>
<td>Virology</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Successfully pass the Biology Major Field Exam.

Complete an exit interview

Recommended Courses:

- Engl 316, Math 113, Phscs 107, 108.

Note: Students desiring a minor in chemistry must take Chem 223 and 2 hours of Chem 353.

**Suggested Sequence of Courses:**

**FRESHMAN YEAR**

1st Semester
- First-Year Writing or A Htg 100: 3.0
- Rel A 275: 2.0
- MMBio 121 or PDbio 120 or Bio 130: 2–4.0
- Chem 105: 4.0

Total Hours: 11–13.0

2nd Semester
- First-Year Writing or A Htg 100: 3.0
- Rel A 250: 2.0
- MMBio 151: 4.0
- Chem 106: 3.0
- Chem 107: 1.0
- Arts or Letters elective: 3.0

Total Hours: 16.0

**SOPHOMORE YEAR**

3rd Semester
- Rel C 225: 2.0
- MMBio 240: 3.0
- MMBio 241: 1.0
- Phscs 105 (Physical Science elective): 3.0
- Civilization I elective: 3.0
- Social Science elective: 3.0

Total Hours: 15.0

4th Semester
- Rel C 200: 2.0
- MMBio 261: 3.0
- Phscs 106 (if opted): 3.0
- Civilization 2 elective: 3.0
- Stats 121, Math 112 or Math 119: 3–4.0

Total Hours: 14–15.0

**JUNIOR YEAR**

5th Semester
- Religion elective: 2.0
- Chem 351 or Chem 285: 3.0
- Stats 121, Math 112, or Math 119: 3–4.0
- MMBio 360–465 choice: 4.0
- Micro elective: 3.0

Total Hours: 15–16.0

6th Semester
- Religion elective: 2.0
- MMBio 360–465 choice: 3.0
- Micro electives: 8.0
- General elective: 3.0

Total Hours: 16.0

**SENIOR YEAR**

7th Semester
- Religion elective: 2.0
- Micro elective: 3.0
- MMBio 360–465 choice: 4.0
- Adv. Written & Oral Communication: 3.0

Recommended: Engl 316
- Arts or Letters elective: 3.0

Total Hours: 15.0

8th Semester
- MMBio 360–465 choice: 3.0
- Micro elective: 4.0
- Global/Cultural Awareness: 3.0
- General electives, if needed: 2–6.0

Total Hours: 12–16.0

**THE DISCIPLINE:**

Microbiology applies the tools of chemistry, molecular biology, mathematics, and physics to the study of the structure, biochemistry, genetics, immunology, physiology, and ecology of microorganisms (bacteria, viruses, fungi, protozoa).

This is an excellent degree for majors who desire an advanced degree in microbiology, virology, immunology, parasitology, cell biology, or epidemiology (master’s or doctorate).

**CAREERS:**

Environmental microbiologists are concerned with microorganisms that cause pollution as well as those that can degrade pollutants in bioremediation processes.

Microbial ecologists work on land and in water studying how microbes recycle dead plants and animals and how they can be used to maintain environmental quality or correct environmental mishaps.

Industrial microbiologists fit into many categories. Food microbiologists seek better strains of organisms used to make products; some microbiologists work in pharmaceutical plants, in antibiotic development; others work on the production of solvents and other products from waste material.

Microbial geneticists and biotechnologists study microbial gene function, improve desirable microorganism qualities and increase understanding of cell-regulation processes.

Microbial physiologists and biochemists study life processes that employ microbial systems and conduct basic research on microbial growth and development.

Clinical microbiologists are involved in diagnosis and identification of microbial infections and approaches to treatment.

Medical microbiologists study the biology of bacterial pathogens and the mechanisms they use to cause disease.

Virologists study the biology of viruses, the etiology and mechanisms of viral infections and diseases in biological species, and the use of viruses as molecular and biological tools.

**FINANCING:**

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

**PROGRAM OBJECTIVES:**

The objectives of the microbiology major program are to provide a conceptual knowledge base and critical thinking skills related to the following areas:

- Microbial cell biology
- Microbial genetics
- Interactions and impact of microorganisms and humans
- Interactions and impact of microorganisms in the environment
- Integrating themes (microbial evolution and diversity)
- Immunology
- Virology
- Parasitology
- Epidemiology
- Cell Biology

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