

# BS in Microbiology (285120) MAP Sheet

## Life Sciences, Microbiology and Molecular Biology

For students entering the degree program during the 2017-2018 curricular year.



University Core and Graduation Requirements	Suggested Sequence of Courses	
<b>University Core Requirements:</b>		
<b>Requirements</b>	<b>#Classes</b>	<b>Hours</b>
<b>Religion Cornerstones</b>	<b>Classes</b>	
Teachings and Doctrine of The Book of Mormon	1	2.0
Jesus Christ and the Everlasting Gospel	1	2.0
Foundations of the Restoration	1	2.0
The Eternal Family	1	2.0
<b>The Individual and Society</b>		
American Heritage	1-2	3-6.0
Global and Cultural Awareness	1	3.0
<b>Skills</b>		
First Year Writing	1	3.0
Advanced Written and Oral Communications	1	3.0
Quantitative Reasoning	1	3-4.0
Languages of Learning (Math or Language)	1	3-4.0
<b>Arts, Letters, and Sciences</b>		
Civilization 1	1	3.0
Civilization 2	1	3.0
Arts	1	3.0
Letters	1	3.0
Biological Science	1	3-4.0
Physical Science	1-2	3.0-7.0
Social Science	1	3.0
<b>Core Enrichment: Electives</b>		
Religion Electives	3-4	6.0
Open Electives	Variable	Variable
*THESE CLASSES FILL BOTH UNIVERSITY CORE AND PROGRAM REQUIREMENTS (14-15 hours overlap)		
<b>Graduation Requirements:</b>		
Minimum residence hours required		30.0
Minimum hours needed to graduate		120.0
<b>FRESHMAN YEAR</b>		
<u>1st Semester</u>		
First-year Writing or American Heritage		3.0
REL A 275		2.0
MMBIO 121 or PDBIO 120 or BIO 130		3.0-4.0
CHEM 105		4.0
General Education courses, and/or general electives		3.0
<b>Total Hours</b>		<b>15-16.0</b>
<u>2nd Semester</u>		
First-year Writing or American Heritage		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
<b>Total Hours</b>		<b>16.0</b>
<b>SOPHOMORE YEAR</b>		
<u>3rd Semester</u>		
REL C 225		2.0
MMBIO 240		3.0
MMBIO 241		1.0
PHSCS 105		3.0
Civilization 1 elective		3.0
Social Science elective		3.0
<b>Total Hours</b>		<b>15.0</b>
<u>4th Semester</u>		
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
<b>Total Hours</b>		<b>14-15.0</b>
+Quantitative Reasoning - can be fulfilled by ACT Math subscore of 22 or higher		
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.		
<b>JUNIOR YEAR</b>		
<u>5th Semester</u>		
Religion elective		2.0
CHEM 351 or CHEM 285		3.0-4.0
STAT 121, MATH 112, or MATH 119		3.0-4.0
MMBIO 360, 363, or 461 (Option 3.1)		3.0-4.0
Micro elective		3.0
<b>Total Hours</b>		<b>14-17.0</b>
<u>6th Semester</u>		
Religion elective		2.0
Option 3.2		2.0-4.0
Micro electives		8.0
General elective		3.0
<b>Total Hours</b>		<b>15-17.0</b>
<b>SENIOR YEAR</b>		
<u>7th Semester</u>		
Religion elective		2.0
Micro elective		3.0
Option 3.2 choice		2-4.0
Adv. Written & Oral Communication (Recommended: ENGL 316)		3.0
Arts or Letters elective		3.0
Open elective		3.0
<b>Total Hours</b>		<b>16-18.0</b>
<u>8th Semester</u>		
Micro elective		4.0
Global/Cultural Awareness		3.0
Open electives, if needed		8.0
<b>Total Hours</b>		<b>15.0</b>

## BS in Microbiology (285120)

### 2017-2018 Program Requirements (53 - 59 Credit Hours)

<p><b>REQUIREMENT 1</b> Complete 1 course</p> <p>BIO 130 - Biology 4.0</p> <p>MMBIO 121 - General Biology: Health and Disease 3.0</p> <p>PDBIO 120 - Science of Biology 3.0</p> <p><b>REQUIREMENT 2</b> Complete 4 courses</p> <p>MMBIO 151 - Introduction to Microbiology 4.0</p> <p>MMBIO 240 - Molecular Biology 3.0</p> <p>MMBIO 241 - Molecular and Cellular Biology Laboratory 1.0</p> <p>MMBIO 261 - Infection and Immunity 3.0</p> <p><b>REQUIREMENT 3</b> Complete 2 options</p> <p><b>OPTION 3.1</b> Complete 1 course</p> <p>MMBIO 360 - Microbial Genetics 4.0</p> <p>MMBIO 363 - Microbial Ecology 3.0</p> <p>MMBIO 461 - Advanced Bacterial Physiology 3.0</p> <p><b>OPTION 3.2</b> Complete 2 courses</p> <p><b>COMPLETE TWO OR MORE COURSES FROM THE FOLLOWING (NOTE: THE COURSE TAKEN ABOVE WILL NOT DOUBLE COUNT FOR THIS REQUIREMENT):</b></p> <p>MMBIO 360 - Microbial Genetics 4.0</p> <p>MMBIO 363 - Microbial Ecology 3.0</p> <p>MMBIO 364 - Bacterial Pathogenesis 3.0</p> <p>MMBIO 418 - Medical Parasitology 2.0</p> <p>MMBIO 461 - Advanced Bacterial Physiology 3.0</p> <p>MMBIO 463 - Immunology 3.0</p> <p>MMBIO 465 - Virology 3.0</p> <p><i>Note: It is recommended students take any courses not used to fill this requirement as electives.</i></p> <p><b>REQUIREMENT 4</b> Complete 4 courses</p> <p><b>PHYSICAL SCIENCE COURSES:</b></p> <p>CHEM 105 - General College Chemistry 1 with Lab (Integrated) 4.0</p> <p>CHEM 106 - General College Chemistry 2 3.0</p> <p>CHEM 107 - General College Chemistry Laboratory 1.0</p> <p>PHSCS 105 - General Physics 1 3.0</p> <p><b>REQUIREMENT 5</b> Complete 1 course</p> <p><b>FOR MEDICAL SCHOOL AND SOME GRADUATE SCHOOLS, CHEM 351, 352, 353, AND 481 ARE REQUIRED CLASSES. THESE CLASSES MAY BE USED AS ELECTIVES FOR THE MICROBIOLOGY DEGREE PROGRAM (SEE BELOW).</b></p> <p>CHEM 285 - Introductory Bio-organic Chemistry 4.0</p> <p>CHEM 351 - Organic Chemistry 1 3.0</p> <p><b>REQUIREMENT 6</b> Complete 1 option</p> <p><b>OPTION 6.1</b> Complete 1 course</p>	<p><b>QUANTITATIVE COURSES:</b></p> <p>*MATH 112 - Calculus 1 4.0</p> <p>MATH 119 - Introduction to Calculus 4.0</p> <p>*STAT 121 - Principles of Statistics 3.0</p> <p><i>Note: Math 119 is offered through BYU Independent Study.</i></p> <p><b>REQUIREMENT 7</b> Complete 14.0 hours from the following option(s)</p> <p><b>OPTION 7.1</b> Complete up to 14.0 hours from the following course(s)</p> <p>BIO 165 - Introduction to Bioinformatics 3.0</p> <p>BIO 350 - Ecology 3.0</p> <p>BIO 420 - Evolutionary Biology 2.0</p> <p>BIO 421 - Evolutionary Biology Laboratory 1.0</p> <p>BIO 463 - Genetics of Human Disease 3.0</p> <p>CHEM 351 - Organic Chemistry 1 3.0</p> <p>CHEM 352 - Organic Chemistry 2 3.0</p> <p>CHEM 353 - Organic Chemistry Laboratory--Nonmajors 2.0v</p> <p>CHEM 481 - Biochemistry 3.0</p> <p>CHEM 482 - Mechanisms of Molecular Biology 3.0</p> <p>MMBIO 110R - Extremophiles: Life in Extreme Environments 1.0</p> <p>MMBIO 162R - Careers in Biomedical Sciences 1.0</p> <p>MMBIO 365 - Bacterial Pathogenesis Laboratory 1.0</p> <p>MMBIO 390R - Readings in Molecular Biology 1.0</p> <p><i>You may take up to 3 credit hours.</i></p> <p>MMBIO 420 - Molecular Parasitology Laboratory 2.0</p> <p>MMBIO 441 - Advanced Molecular Biology 3.0</p> <p>MMBIO 442 - Advanced Molecular Biology Laboratory 2.0</p> <p>MMBIO 466 - Virology Laboratory 1.0</p> <p>MMBIO 467 - Immunology Lab 1.0</p> <p>MMBIO 468 - (MMBio-Bio-PWS) Genomics 3.0</p> <p>MMBIO 471 - Applied and Industrial Microbiology 2.0</p> <p>MMBIO 510 - History and Philosophy of Microbiology and Molecular Bi 2.0</p> <p>MMBIO 512 - Gene Regulation 2.0</p> <p>MMBIO 514 - Advanced Immunology 2.0</p> <p>MMBIO 516 - Bacteria-Host Interactions 2.0</p> <p>MMBIO 518 - Select Pathogens 2.0</p> <p>MMBIO 520 - Molecular Virology 2.0</p> <p>MMBIO 522 - Flow Cytometry 2.0</p> <p>MMBIO 528R - Current Topics in Pathogenesis 1.0</p> <p><i>You may take this course up to 1 time.</i></p> <p>NDFS 361 - Food Microbiology 3.0</p> <p>PDBIO 220 - Human Anatomy (with lab) 3.0</p> <p>PDBIO 305 - Human Physiology 4.0</p> <p>PDBIO 325 - Tissue Biology (with lab) 3.0</p>	<p>PDBIO 360 - Cell Biology 3.0</p> <p>PDBIO 362 - Advanced Physiology 3.0</p> <p>PDBIO 363 - Advanced Physiology Laboratory 1.0</p> <p>PHSCS 106 - General Physics 2 3.0</p> <p>PWS 340 - Genetics 3.0</p> <p>PWS 365 - Environmental Microbiology and Biogeochemistry 3.0</p> <p>PWS 514 - Soil Microbiology 2.0</p> <p><b>OPTION 7.2</b> Complete up to 6.0 hours from the following course(s)</p> <p><b>NOTE: ONLY 6 TOTAL CREDITS OF MMBIO 194A, 194B, 399R, 470R, AND 494R WILL COUNT TOWARD MAJOR HOURS WITH A 4 CREDIT HOUR MAXIMUM FOR EACH INDIVIDUAL COURSE. (MORE CREDIT HOURS MAY BE TAKEN BUT THEY WILL NOT COUNT TOWARDS MAJOR REQUIREMENTS.)</b></p> <p>MMBIO 194A - Phage Hunters: Discovery 2.0</p> <p>MMBIO 194B - Phage Hunters: Comparative Genomics 2.0</p> <p>MMBIO 399R - Academic Internship 9.0v</p> <p><i>You may take up to 4 credit hours.</i></p> <p>MMBIO 470R - Synthetic Biology 2.0v</p> <p><i>You may take up to 4 credit hours.</i></p> <p>MMBIO 494R - Mentored Research 3.0v</p> <p><i>You may take up to 4 credit hours.</i></p> <p><b>OPTION 7.3</b> Complete up to 14.0 hours from the following course(s)</p> <p><b>COURSES NOT CHOSEN PREVIOUSLY IN REQUIREMENT 3 ABOVE:</b></p> <p>MMBIO 360 - Microbial Genetics 4.0</p> <p>MMBIO 363 - Microbial Ecology 3.0</p> <p>MMBIO 364 - Bacterial Pathogenesis 3.0</p> <p>MMBIO 461 - Advanced Bacterial Physiology 3.0</p> <p>MMBIO 463 - Immunology 3.0</p> <p>MMBIO 465 - Virology 3.0</p> <p><b>REQUIREMENT 8</b></p> <p>Successfully pass the Biology Major Field Exam.</p> <p><b>REQUIREMENT 9</b></p> <p>Complete an exit interview.</p> <p><b>RECOMMENDED</b> Complete 4 courses</p> <p><b>ALTHOUGH NOT REQUIRED, THESE COURSES ARE RECOMMENDED.</b></p> <p>ENGL 316 - Technical Communication 3.0</p> <p>MATH 113 - Calculus 2 4.0</p> <p>PHSCS 107 - General Physics Lab 1 1.0</p> <p>PHSCS 108 - General Physics Lab 2 1.0</p> <p><i>Note: Students desiring a minor in chemistry must take Chem 223 and 2 hours of Chem 353.</i></p>
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## **BS in Microbiology (285120)**

### **2017-2018 Program Requirements Cont...**

#### **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 microbial 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. Immunologists study the molecular and cellular biology of the immune system and its interactions with microorganisms. Parasitologists study the biology, etiology, and epidemiology of parasites and the mechanisms by which they interact with their hosts. Cell biologists study the molecular biology, signal transduction and cell signaling pathways involved in all aspects of biological function. This includes studies at the molecular level of diseases such as heart disease, cancer, diabetes, and AIDs, etc. Epidemiologists study disease epidemics with an effort to track down the method and cause of the disease. (See faculty advisor for additional career choices.)

#### **RESEARCH OPPORTUNITIES:**

Students are encouraged to participate in laboratory research. Faculty- directed research programs are available to undergraduates throughout the year.

#### **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

#### **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 Science Student Services**

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