

# BS in Microbiology

## Degree Program Description

From the Greek words **mikros** (small), **bios** (life), and **logos** (science), microbiology is the branch of science that studies microscopic forms of life, including bacteria, viruses, algae, fungi, protozoa, and parasites. Although most commonly thought of as causing infection and disease, microorganisms are often beneficial, with many uses in the pharmaceutical, biotech, food, and agricultural industries. A bachelor of science (BS) in microbiology provides direct entry into a number of employment opportunities in the private sector with medical, animal health, pharmaceutical, and biotechnology-based companies and with government laboratories such as the Center for Disease Control and Prevention (CDC), the National Institutes of Health, and the United States Department of Agriculture. A degree in microbiology provides a strong science background which can be beneficial for specialization in such diverse careers as journalism (science and public health reporting) and law (biotech, environmental, medical, and patent law). This degree also provides excellent preparation for professional schools (medical, veterinary, dental, and nursing) and for admission to masters and PhD degree programs in numerous areas of study.

The faculty in the Department of Veterinary Pathobiology has designed a comprehensive and challenging curriculum for this degree program. Subject matter to be covered includes microbial structure and physiology, genetics and genomics, pathogenic mechanisms, beneficial microbes, and the immune response. Supporting courses from other departments include mathematics, physics, chemistry, biology, and biochemistry. Numerous opportunities for undergraduate research are available. The microbiology courses are taught by faculty whose areas of expertise include bacteriology, immunology, parasitology, and virology.

## Major Program Requirements

To earn a bachelor's degree in microbiology, all undergraduate students must complete the university's general education requirements, degree specific requirements set by the Department of Veterinary Pathobiology, and university total credit hour and writing intensive class requirements.

The following courses are required for the microbiology major.

All courses other than free electives must be taken for a letter grade except V\_PBio 2950, which is graded Satisfactory/Unsatisfactory. V\_PBio 2950H is letter grade only.

### Required Courses

PHYSICS 1210 or PHYSICS 2750	College Physics I University Physics I	4-5
PHYSICS 1220 or PHYSICS 2760	College Physics II University Physics II	4
BIO_SC 1500	Introduction to Biological Systems with Laboratory	5
MATH 1400	Calculus for Social and Life Sciences I	3
CHEM 1320	College Chemistry I	4
CHEM 1330	College Chemistry II	4
CHEM 2100	Organic Chemistry I	3
CHEM 2110 & CHEM 2130	Organic Chemistry II and Organic Laboratory I	5
BIOCHM 3630 or BIOCHM 4270	General Biochemistry Biochemistry	3

V_PBio 2001 or BIO_SC 3750 & BIO_SC 3760	Fundamentals of Microbiology General Microbiology and Microbiology Laboratory	5
MICROB 3200	Medical Microbiology and Immunology	4
V_PBio 3345 or V_PBio 3554	Fundamentals of Parasitology Introduction to Virology	3
V_PBio 3551	Introduction to Immunology I	3
V_PBio 3600	Bacterial Genetics and Genomics	3
V_PBio 4970 or V_PBio 4980	Capstone Undergraduate Research in Microbiology Capstone Senior Seminar	3
V_PBio 4970H	Honors Capstone Undergraduate Research in Microbiology	3
Microbiology Electives (15 credit hours selected from the following):		
ANTHRO 3560W	Plagues and Peoples - Writing Intensive	3
BIOCHM 4272	Biochemistry	3
BIO_SC 2300	Introduction to Cell Biology	4
BIO_SC 4976	Molecular Biology	3
ENV_SC 4312	Environmental Soil Microbiology	3
F_S 2172	Elements of Food Microbiology	3
F_S 4370	Food Microbiology	3
F_S 4375	Food Microbiology Laboratory	2
P_HLTH 3450 or P_HLTH 3760	Introduction to Epidemiology Infectious Disease and Public Health Approaches	3
PLNT_SCI 4500	Biology and Pathogenesis of Plant- Associated Microbes	4
V_PBio 2950	Undergraduate Research in Microbiology	1-3
V_PBio 2950H	Honors Undergraduate Research in Microbiology	1-3
V_PBio 3345	Fundamentals of Parasitology *	3
V_PBio 3554	Introduction to Virology *	3
V_PBio 3500W	Issues in Vector-borne and Emerging Infectious Diseases - Writing Intensive	3
V_PBio 3557	Microbial Pathogenesis I	3
V_PBio 3560	Microbial Physiology	3
V_PBio 3650	Applied Microbiology and Biotechnology	3
V_PBio 3658	Public Health Microbiology	3
V_PBio 3700	Medical and Veterinary Entomology	3
V_PBio 3900W	Beneficial Microbes - Writing Intensive	3
V_PBio 4600W	Host-Associated Microbiomes in Health and Disease - Writing Intensive	3
V_PBio 4950	Advanced Undergraduate Research in Microbiology **	1-3
V_PBio 4950H	Honors Advanced Undergraduate Research in Microbiology	1-3

\*One of these 2 courses must be taken as a major requirement; the other can be taken as a major elective.

\*\*Can be repeated for a maximum of 6 credit hours.

If all degree requirements are met, microbiology majors who enroll in the MU College of Veterinary Medicine prior to receiving their baccalaureate degree will be eligible to receive the BSM degree at the end of their second year in the professional curriculum. The following course substitutions for required core courses will be accepted:

- V\_PBio 5552 Veterinary Bacteriology with Laboratory and V\_PBio 5553 Veterinary Bacteriology II for MICROB 3200 Medical Microbiology and Immunology

- V\_PBio 5511 Veterinary Immunology and V\_PBio 5512 Veterinary Immunology for V\_PBio 3551 Introduction to Immunology I
- V\_PBio 5557 Veterinary Parasitology with Laboratory for V\_PBio 3345 Fundamentals of Parasitology

Elective	6
<b>16</b>	<b>16</b>

**Total Credits: 122**

The following courses will be accepted as major electives:

- V\_PBio 5554 Veterinary Virology
- V\_PBio 5555 Epidemiology and Biostatistics with Laboratory
- V\_PBio 5558 Veterinary Public Health

**University Requirements for Graduation**

- Satisfactory completion (grade of C- or better) of a 3 credit upper division writing intensive class in the microbiology major. Acceptable classes are:

- ANTHRO 3560W Plagues and Peoples - Writing Intensive
- HLTH\_SCI 4200W Introduction to The Research Process and Evidence Base - Writing Intensive
- V\_PBio 3500W Issues in Vector-borne and Emerging Infectious Diseases - Writing Intensive
- V\_PBio 3900W Beneficial Microbes - Writing Intensive
- V\_PBio 4600W Host-Associated Microbiomes in Health and Disease - Writing Intensive

- Additional electives to meet the 120 credit hour minimum for graduation. These electives can be taken using the satisfactory/unsatisfactory grading system if in compliance with university academic policies.

**Semester Plan**

First Year			
Fall	CR	Spring	CR
ENGLISH 1000		3 V_PBio 2001	5
CHEM 1320		4 CHEM 1330	4
MATH 1100		3 MATH 1400 or 1500	3
BIO_SC 1500		5 Gen Ed Requirements	3
<b>15</b>		<b>15</b>	

Second Year			
Fall	CR	Spring	CR
CHEM 2100		3 CHEM 2110	3
MICROB 3200		4 CHEM 2130	2
Gen Ed Requirements		6 Elective	3
Elective		3 Gen Ed Requirement	3
		Major Elective	3
<b>16</b>		<b>14</b>	

Third Year			
Fall	CR	Spring	CR
V_PBio 3551		3 BIOCHM 3630	3
V_PBio 3345 (or Major Elective)		3 V_PBio 3600	3
Elective		3 Elective	3
Gen Ed Requirement		6 V_PBio 3554 (or Major Elective)	3
		Gen Ed Requirement	3
<b>15</b>		<b>15</b>	

Fourth Year			
Fall	CR	Spring	CR
PHYSICS 1210		4 PHYSICS 1220	4
Major Elective		6 V_PBio 4970 or 4980	3
Elective		6 Major Elective	3