

# 2009-2010 Course Catalog

The University Of Montana

---

## Microbiology

- [Special Degree Requirements](#)
- [Suggested Course of Study](#)
- [Courses](#)

Microbiology is the study of microorganisms, including the bacteria, yeasts, molds, viruses, protozoa and other microscopic parasites. Two options are available. The microbiology degree emphasizes microbial structure, function, and interactions and relationships with humans. The microbial ecology option emphasizes microbial structure, function, and interactions and relationships with the environment and other organisms including plants and animals.

A B.S. in Microbiology is offered as a general degree or with an option in microbial ecology. Initial work provides the student with a working knowledge of the basic principles of the physical and biological sciences and mathematics. The remaining study is devoted to a more intense and broadened training in microbiology and allied fields, and may include independent study which offers the student an opportunity to prepare for graduate work.

### Special Degree Requirements

Refer to the graduation requirements listed previously in the catalog. See index.

In accordance with American Society for Microbiology recommendations, the following courses must be completed in addition to the General Education requirements for the Bachelor of Science in Microbiology: Thirty-two upper-division credits (300-level or above) in biology, biochemistry and microbiology including BIOL 340; BIOC 380 or 481-482; MICB 300-301, 404-405, 422, 450-451; and at least 7-9 credits chosen from the following courses (with lab if available):

MICB 309, 400-401, 406-407, 410-411, 412-413, 418, 420, 423, 497. BIOL 108N-109N, 110N, 221, 223; M 162 (MATH 150) STAT 216 (MATH 241); CHMY 141N-143N, 221-222, 223-224, 311 (CHEM 161N-162N, 221-223, 222-224, 341); PHYS 111N-113N, 112N-114N also are required.

Microbial Ecology Option: In addition to the General Education requirements and the Upper-Division Writing Expectation described below, the following must be completed for the Bachelor of Science in Microbiology with an option in microbial ecology:

Thirty-two or more credits (300-level or above) in biology, biochemistry, microbiology including BIOL 340; BIOC 380 or 481-482; MICB 300-301, 404-405, 422, 450-451, and at least 7-9 credits chosen from the following courses (with lab if available): MICB 400-401, 410-411, 418, 420, 423, 497; BIOL 341, 366, 413, 440, 444/445, 453, 454,.

BIOL 108N/109N, 110N, 221, 223; M 162 or 171, STAT 216 (MATH 150 or 152, 241); CHMY 141N-143N, 221-222, 223-224 or CHMY 121N, 123N, 124N, (CHEM 161N-162N, 221-223, 222-224 or CHEM 151N, 152N,154N); PHYS 111N-113N also

are required. In addition, choose at least 6 credits from: CHMY 311 (CHEM 341); CS 131; FOR 210N; GEO 301, 382, 420 (GEOS 301, 382, 480); M 172, 273 (MATH 153, 251) and STAT 451, 452, 457, 458 (MATH 444, 445, 447, 448); PHYS 112N/114N.

Upper-Division Writing Expectation: To meet the Upper-Division Writing Expectations for the major, Microbiology students must take MICB 404 (required), plus one more course chosen from: BIOL 482, BIOC 486, BIOL 366, BIOL 445, MICB 410, MICB 411, MICB 412 or MICB 499.

## Suggested Course of Study

### Microbiology

First Year	A	S
BIOL 108N-109N Diversity 5 of Life and Laboratory	-	-
BIOL 110N Principles of Biology	-	4
CHMY 141N-143N (CHEM 161N-162N) College Chemistry and Laboratory	5	5
+M 162 (MATH 150) Applied Calculus	4	-
+WRIT 101 (ENEX 101) College Writing I	-	3
STAT 216 (MATH 241) Introduction to Statistics	-	4
Total	14	16
+Depends on placement exam.		
Second Year	A	S
BIOL 221 Cell and Molecular Biology	4	-
BIOL 223 Genetics & Evolution	-	4
CHMY 221-222, 223-224 (CHEM 221-222, 223-224) Organic Chemistry and Laboratory	5	5
MICB 300-301 General Microbiology and Laboratory	-	5
Lower-Division Writing Course	3	-
General Education	3	-
Elective	-	1
Total	15	15

Third Year		A	S
BIOC 481-482 (or 380 and 3 two upper-division BIOL or MICB*)			3
MICB 410-411 Immunology and Laboratory*	5		-
MICB 422 Microbial Diversity and Ecology	-		3
PHYS 111N-113N, 112N-114N General Physics	5		5
Upper-division General Education	-		3
Electives	2		1
Total	15		15

Fourth Year		A	S
BIOL 340 Ecology	-		3
CHMY 311 (CHEM 341) Quantitative Analysis and Instrumental Methods	4		-
MICB 404-405 Microbial Genetics and Laboratory	-		4
MICB 420 Virology*	-		3
MICB 450-451 Microbial Physiology and Laboratory	4		-
General Education	6		6
Total	14		16

\*Choose 7-9 credits from MICB 309, 400-401, 406-407, 410-411, 412-413, 418, 420, 423, 497.

### Microbiology with Microbial Ecology Option

First Year		A	S
BIOL 108N-109N Diversity of Life and Laboratory	5		-
BIOL 110N Principles of Biology	-		4
CHMY 141N-143N (CHEM 161N-162N) College Chemistry and Laboratory	5		5
+M 162 (MATH 150) Applied Calculus	4		-

+WRIT 101 (ENEX 101) College Writing I	-		3	
STAT 216 (MATH 241) Introduction to Statistics	-		4	
Total	14		16	

+Depends on placement exam.

Second Year		A		S
BIOL 221 Cell and Molecular Biology	4		-	
BIOL 223 Genetics & Evolution	-		4	
CHMY 221-222, 223-224 (CHEM 221-222, 223-224) Organic Chemistry and Laboratory	5		5	
MICB 300-301 General Microbiology and Laboratory	-		5	
Lower-Division Writing Course	3		-	
General Education Elective	3 -		- 1	
Total	15		15	

Third Year		A		S
BIOC 481-482 (or 380 and 3 two upper-division BIOL or MICB*)			3	
BIOL 340 Ecology	3		-	
FOR 210N Introductory Soils+	-		3	
MICB 400-401 General Parasitology and Laboratory	4		-	
MICB 422 Microbial Diversity and Ecology	-		3	
General Education	3		3	
Upper-division elective	-		4	
Electives	1		-	
Total	14		16	

Fourth Year		A		S
GEO 382 Global Change	-		3	
MICB 404-405 Molecular Genetics and Laboratory	-		4	

MICB 423 Applied and Environmental Microbiology*	-	3
MICB 450-451 Microbial Physiology and Laboratory	4	-
PHYS 111N/113N, 112N/114N General Physics I	5	-
General Education	3	6
Elective	2	-
Total	14	16

\*Choose 7 credits from BIOL 341, 366, 440, 444; MICB 400-401, 410-411, 418, 420, 423, 497.

+Choose 6 credits from CHMY 311 (CHEM 341); CS 131; FOR 210N; GEO 301, 382, 420 (GEOS 301; 382 or 480); M 172, 273 (MATH 153, 251) Stat 451, 452, 457, 458 (MATH 444-447, 445-448); PHYS 112N/114N.

### Requirements for a Minor

To earn a minor in microbiology, the student must complete MICB 300-301, 404-405, 422, and 450-451, as well as at least three additional credits at the 300 or 400-level in Microbiology.

### Courses

U=for undergraduate credit only, UG=for undergraduate or graduate credit, G=for graduate credit. R after the credit indicates the course may be repeated for credit to the maximum indicated after the R. Credits beyond this maximum do not count toward a degree.

### Microbiology (MICB)

- U 107 Elementary Microbiology Laboratory 1 cr. Offered spring. Same as BIOL 107. Observation of live microorganisms, their characteristics and activities. Experience with microbiological techniques. Credit not allowed toward a major in microbiology.
- U 300 General Microbiology 3 cr. Offered autumn and spring. Prereq., CHMY 141N, 143N (CHEM 161N, 162N); Prereq. or coreq., CHMY 221 (CHEM 221), BIOL 221. Microbial structure and function, growth and reproduction, physiology, ecology, genetics, environmental factors, control of microorganisms and sterility, antimicrobial agents, microbial diversity.
- U 301 General Microbiology Laboratory 2 cr. Offered autumn and spring. Prereq. or coreq., MICB 300. Basic microbiology procedures and techniques.
- UG 302 Medical Microbiology 3 cr. Offered autumn. Microbial structure and functions, pathogenic microorganisms, virology, immunology. Credit not allowed toward a major in microbiology.

- U 309 Hematology 3 cr. Offered autumn. Prereq., junior level or consent of instr., MICB 300. Study of blood and diseases of the circulatory system. Blood banking and serology.
- UG 400 General Parasitology 2 cr. Offered autumn. Prereq., BIOL 223. Same as BIOL 400. Parasitism as a biological phenomenon, origin of parasitism, adaptations and life cycles, parasite morphology, fine structure, physiology, parasites and their environment.
- UG 401 General Parasitology Laboratory 2 cr. Offered autumn. Coreq., MICB 400. Same as BIOL 401. Taxonomy, morphology and identification of parasitic protozoa, helminths and arthropods.
- UG 404 Microbial Genetics 3 cr. Offered spring. Prereq., MICB 300 and 301. The molecular genetics of prokaryotic organisms including: structure and replication of the prokaryotic chromosome; gene expression; mutagenesis and DNA repair; plasmids and other tools of genetic engineering; transmission of genetic material and recombination in prokaryotes; regulation of gene expression in prokaryotes; recombinant DNA and biotechnology.
- UG 405 Experimental Microbial Genetics Laboratory 1 cr. Offered spring. Prereq. or coreq., MICB 404. Experiments in microbial genetics: Analysis of genes and genomes.
- UG 406 Clinical Diagnosis 2 cr. Offered spring. Prereq., MICB 412-413. Principles of blood chemistry, urinalysis, hematology and other clinical parameters of disease and health.
- UG 407 Clinical Diagnosis Laboratory 1 cr. Offered spring. Prereq., MICB 406, 412-413. Clinical diagnostic methods.
- U 408 Seminar 1 cr. (R-3) Offered autumn and spring. Prereq., senior standing in natural sciences. Recent topics in microbiology and related subjects.
- UG 410 Immunology 3 cr. Offered autumn. Prereq., MICB 300-301. Modern concepts and methods in immunology.
- UG 411 Immunology Laboratory 2 cr. Offered autumn. Coreq., MICB 410. Modern techniques for analysis of immune responses.
- UG 412 Medical Bacteriology and Mycology 3 cr. Offered spring. Prereq., MICB 300, 301. A study of the pathogenic bacteria and fungi and the diseases they produce.
- UG 413 Medical Bacteriology and Mycology Laboratory 2 cr. Offered spring. Prereq. or coreq., MICB 412. Laboratory study of pathogenic bacteria and fungi.
- UG 418 Fungal Biology 3 cr. Offered autumn even-numbered years. Prereq., BIOL 108N-109N and 221-223 or MICB 300 or consent of instr. Same as BIOL 418. Reviews the definition, evolution, genetics, physiology, and ecology of fungi (including organisms in the Chromista), provides overview of all fungal phyla (Chytridiomycota, Zygomycota, Ascomycota, Basidiomycota, Hyphochytriomycota, Labyrinthulomycota, Oomycota), and highlights the importance of fungi to human affairs (food production, fungal pathogens).
- UG 420 Virology 3 cr. Offered spring. Prereq., MICB 410. The general nature of viruses, with emphasis on the molecular biology of animal and human viruses.
- UG 422 Microbial Diversity and Ecology 3 cr. Offered spring. Prereq., BIOL 221-223, MICB 300-301 or consent of instr. A broad overview of the physiological, phylogenetic and genomic diversity and ecology of microorganisms within a framework of general ecological principles. Focuses on microbial interactions with their environment at the level of the individual, population and community,

- including intimate associations with plants and animals. Surveys current methods for studying microbial ecology and diversity in the environment.
- UG 423 Applied and Environmental Microbiology 3 cr. Offered spring odd-numbered years. Prereq., MICB 300 or consent of instr. Study of microorganisms and their relation to environment including foods, water and wastewater treatment, bioremediation and industrial processes. Includes field trips and specialized laboratory exercises.
  - UG 447 Terrestrial Ecosystem Ecology 3 cr. Offered autumn odd-numbered years. Prereq., BIOL 110N and any ecology-themed course or consent of instr. Same as BIOL 447. Introduction to systems thinking and the ecosystem concept, review of water and energy balance, carbon cycling and production processes, nutrient cycling, trophic dynamics, and species effects on ecosystem functioning.
  - UG 450 Microbial Physiology 3 cr. Offered autumn. Prereq., MICB 300-301. Microbial structure and function, physiological diversity, microbial metabolism, role of microbial activity in the environment.
  - UG 451 Microbial Physiology Laboratory 1 cr. Offered autumn. Coreq., MICB 450. Experimental approaches to analysis of microbial structure, composition and metabolism.
  - UG 490 Medical Technology Internship 1-16 cr. Offered every term. Prereq., consent of instr.
  - UG 495 Special Topics 1-10 cr. (R-10) Offered intermittently. Experimental offerings of new courses, experimental offerings of visiting professors, or one-time offerings of current topics.
  - U 497 Advanced Undergraduate Research 1-10 cr. (R-10) Offered every term. Prereq., MICB 300, junior or senior standing and consent of instr. Independent research under the direction of a faculty member. Graded credit/no credit.
  - U 498 Internship 1-6 cr. Offered intermittently. Prereq., consent of the Division. Extended classroom experience that provides practical application of learning during placement off campus. Prior approval must be obtained from the faculty supervisor and the Internship Services office. A maximum of 6 credits of Internship (198, 298, 398, 498) may count toward graduation.
  - U 499 Undergraduate Thesis 3-6 cr. (R-6) Offered every term. Prereq., senior standing and consent of instr. Preparation of a thesis or manuscript based on undergraduate research for presentation and/or publication. Student must give an oral or poster presentation at the Biological Sciences Undergraduate Research Symposium or a scientific meeting. Graded credit/no credit.
  - G 502 Advanced Immunology 3 cr. Offered autumn even-numbered years. Advanced topics and immunological techniques used in modern immunology.
  - G 509 Advanced Virology 3 cr. Offered spring add-numbered years. Prereq., MICB 420-421. Students are presented with research papers that have been pivotal to the understanding of important molecular or genetic concepts in virology.
  - G 520 Medical Parasitology 2 cr. Offered spring. Prereq., BIOL 400 or equiv. Offered alternate years. Epidemiology, pathology, immunology, diagnosis and treatment of protozoan and helminth parasites of humans. Stresses current advances in parasitology.
  - G 530 Grant Writing 2 cr. Offered spring. Prereq., graduate standing. Same as BIOC 530. Required course for biochemistry and microbiology graduate students. Students become acquainted with the grant writing process by writing grants that have received University approval for submission based on student research projects.

- G 540 Molecular Pathogenesis 3 cr. Offered fall. Prereq., graduate standing. Current concepts in pathogenesis at the molecular and cellular levels. Focus is on microbial (viral, bacterial) and genetic factors leading to disease and the host's involvement in the process.
- G 545 Advanced Topics in Microbial Ecology 1 cr. Offered every term. Prereq., graduate standing or consent of instr. Discussion of selected themes of the ecology of microorganisms with a focus on the recent primary literature.
- G 546 Experimental Microbial Ecology 1 cr. Offered every term. Prereq., graduate standing or consent of instr. Focus on experimental design, methods, and presentation of experimental results in the area of microbial ecology.
- G 570 Introduction to Research 1 cr. (R-2) Offered autumn and spring. Prereq., graduate standing. Required course for biochemistry and microbiology graduate students. Instruction in basic research techniques, research equipment and reading in the relevant scientific literature. Students conduct research projects under faculty mentors of their choosing.
- G 580 Training Seminar 1 cr. (R-2) Offered autumn and spring. Prereq., graduate standing or consent of instr. Same as BIOC 580. A one semester offering required of all new students.
- G 594 Professional Seminar 1 cr. (R-4) Offered autumn and spring. Prereq., graduate standing or consent of instr. Same as BIOC 594. Presentation of current research in biochemistry and molecular biology by senior graduate students, faculty, and invited outside speakers.
- G 595 Special Topics 1-3 cr. (R-6) Offered intermittently. Prereq., graduate standing. Experimental offerings of visiting professors, experimental offerings of new courses, or one-time offerings of current topics.
- G 597 Research Variable cr. (R-18) Offered intermittently. Prereq., graduate standing, one semester residence.
- G 599 Thesis 1-10 cr. (R-10) Offered intermittently. Prereq., master's student in microbiology. Laboratory research for and preparation of a master's thesis.
- G 699 Dissertation 1-10 cr. (R-20) Offered intermittently. Prereq., doctoral student in microbiology. Laboratory research for and preparation of a doctoral dissertation.