

2010-2011 Course Catalog

The University Of Montana

Microbiology

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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 BIOE 370 (BIOL 340); BCH 380 or 480-482 (BIOC 380 or 481-482); BIOM 360-361, 410-411, 415, 450-451 (MICB 300-301, 404-405, 422, 450-451); and at least 7-9 credits chosen from the following courses (with lab if available):

BIOH 405 (MICB 309), BIOM 427-428 (MICB 400-401), BIOM 407-408 (MICB 406-407), BIOB 410-411 (MICB 410-411), BIOM 402-403 (MICB 412-413), BIOM 423 (MICB 418), BIOM 435 (MICB 420), BIOM 430 (MICB 423), BIOM 490 (MICB 497). BIOB 170N-171N, 160N, 260, 275 (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); PHSX 205N-206N, 207N-208N (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 BIOE 371 (BIOL 340); BCH 380 or 482-482 (BIOC 380 or 481-482); BIOM 360-361, 410-411, 415, 450-451 (MICB 300-301, 404-405, 422, 450-451), and at least 7-9 credits chosen from the following courses (with lab if available): BIOM 427-428

(MICB 400-401), BIOB 410-411 (MICB 410-411), BIOM 423 (MICB 418), BIOM 435 (MICB 420), BIOM 430, 490 (MICB 423, 497); BIOE 371 (BIOL 341), BIOE 428 (BIOL 366), BIOL 413, BIOB 440 (BIOL 440), BIOO 444 (BIOL 444/445), BIOL 453, 454.

BIOB 170N-171N, 160N, 260, 275, (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); PHSX 121N-122N (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); PHSX 207N/208N (PHYS 112N/114N).

Upper-Division Writing Expectation: To meet the Upper-Division Writing Expectations for the major, Microbiology students must take BIOM 410 (MICB 404) (required), plus one more course chosen from: BIOE 482 (BIOL 482), BCH 486 (BIOC 486), BIOE 328 (BIOL 366), BIOO 434 (BIOL 445), BIOB 410, 411 (MICB 410, 411), BIOM 402, or 499 (MICB 412 or 499).

Suggested Course of Study

Microbiology

First Year	A	S
BIOB 170N-171N (BIOL 108N-109N) Principles Biological Diversity and Laboratory	5	-
BIOB 160N (BIOL 110N) Principles of Living Systems	-	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
BIOB 206 (BIOL 221) Cellular and Molecular Biology	4	-
BIOB 275 (BIOL 223) General Genetics	-	4

CHMY 221-222, 223-224 (CHEM 221-222, 223-224) Organic Chemistry and Laboratory	5		5	
BIOM 360-361 (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
BHC 480-482 (BIOC 481-482) (or 380 and two upper-division Biology or Microbiology*)	3		3	
BIOB 410-411 (MICB 410-411) Immunology and Laboratory*	5		-	
BIOM 415 (MICB 422) Microbial Diversity & Ecology & Evltn	-		3	
PHSX 205N-206N, 207N-208N (PHYS 111N-113N, 112N-114N) College of Physics I, II and Lab	5		5	
Upper-division General Education	-		3	
Electives	2		1	
Total	15		15	
Fourth Year		A		S
BIOE 370 (BIOL 340) General Ecology	-		3	
CHMY 311 (CHEM 341) Quantitative Analysis and Instrumental Methods	4		-	
BIOM 410-411 (MICB 404-405) Microbial Genetics and Experimental Microbial Genetics Laboratory	-		4	
BIOM 435 (MICB 420) Virology*	-		3	

BIOM 450-451 (MICB 450-451) Microbial Physiology and Laboratory	4	-
General Education	6	6
Total	14	16

*Choose 7-9 credits from BIOH 405 (MICB 309), BIOM 427-428 (MICB 400-401), BIOM 407-408 (MICB 406-407), BIOB 410-411 (MICB 410-411), BIOM 402-403 (MICB 412-413), BIOM 423 (MICB 418), BIOM 435 (MICB 420), BIOM 430, 490 (MICB 423, 497).

Microbiology with Microbial Ecology Option

First Year	A	S
BIOB 170N-171N (BIOL 108N-109N) Principles Biological Diversity and Laboratory	5	-
BIOB 160N (BIOL 110N) Principles of Living Systems	-	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
BIOB 260 (BIOL 221) Cellular and Molecular Biology	4	-
BIOB 275 (BIOL 223) General Genetics	-	4
CHMY 221-222, 223-224 (CHEM 221-222, 223-224) Organic Chemistry and Laboratory	5	5
BIOM 360-361 (MICB 300-301) General	-	5

Microbiology and Laboratory			
Lower-Division Writing Course	3		-
General Education	3		-
Elective	-		1
Total	15		15

Third Year

A

S

BCH 480-482 (BIOC 481-482) (or 380 and two upper-division Biology or Microbiology*) Advanced Biochemistry I, II	3		3
BIOE 370 (BIOL 340) General Ecology	3		-
FOR 210N Introductory Soils+	-		3
BIOM 427-428 (MICB 400-401) General Parasitology and Laboratory	4		-
BIOM 415 (MICB 422) Microbial Diversity & Ecology & Evltn	-		3
General Education	3		3
Upper-division elective	-		4
Electives	1		-
Total	14		16

Fourth Year

A

S

GEO 382 Global Change	-		3
BIOM 410-411 (MICB 404-405) Molecular Genetics and Experimental Microbial Genetics Laboratory	-		4
BIOM 430 (MICB 423) Applied and Environmental Microbiology*	-		3
BIOM 450-451 (MICB 450-451) Microbial Physiology and Laboratory	4		-
PHSX 205N-206N (PHYS 111N-113N) College Physics I, II and Lab	5		-
General Education	3		6

Elective	2	-
Total	14	16

*Choose 7 credits from BIOE 371, 366 (BIOL 341, 366), BIOB 440 (BIOL 440), BIOC 433 (BIOL 444); BIOM 427-428 (MICB 400-401), BIOB 410-411 (MICB 410-411), BIOM 423 (MICB 418), BIOM 435 (MICB 420), BIOM 430, 490 (MICB 423, 497).

+Choose 6 credits from CHMY 311 (CHEM 341); CSCI 135 (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 207N/208N.

Requirements for a Minor

To earn a minor in microbiology, the student must complete BIOM 360-361, 410-411, 450-451 (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 483 Molecular Phylogenetics and Evolution 3 cr. Alternating spring semesters. Phylogenies, or evolutionary trees, provide insights into the history of life on Earth, including our own origins. This course focuses on the theoretical foundations of popular methods of reconstructing phylogenies from molecular sequence data and how to implement these methods with computational software for real data sets. Other current methods for testing evolutionary hypotheses with sequence data will also be introduced.

Biology - Microbiology (BIOM)

U 250N (BIOL 106N) Microbiology for Health Sciences 3 cr. Offered spring. Infectious diseases, including concepts of virulence, resistance, prevention and control of microbial diseases in the individual and in the community. If laboratory experience is desired, the student may enroll concurrently in BIOM 251 (BIOL 107). Credit not allowed toward a major in microbiology.

U 251 (BIOL 107) Microbiology for Health Sciences Laboratory 1 cr. Offered spring. Prereq. or coreq., BIOM 250N (BIOL 106N). Observation of live microorganisms, their characteristics and activities. Experience with microbiological techniques. Credit not allowed toward a major in microbiology.

U 291 (MICB 295) Special Topics

U 360 (MICB 300) General Microbiology 3 cr. Offered autumn and spring. Prereq., CHMY 141N, 143N (CHEM 161N, 162N); Prereq. or coreq., CHMY 221 (CHEM 221), BIOB 260 (BIOL 221). Microbial structure and function, growth and reproduction, physiology, ecology, genetics, environmental factors, control of microorganisms and sterility, antimicrobial agents, microbial diversity.

U 361 (MICB 301) General Microbiology Laboratory 2 cr. Offered autumn and spring. Prereq. or coreq., BIOM 360 (MICB 300). Basic microbiology procedures and techniques.

UG 400 (MICB 302) Medical Microbiology 3 cr. Offered autumn. Microbial structure and functions, pathogenic microorganisms, virology, immunology. Credit not allowed toward a major in microbiology.

UG 402 (MICB 412) Medical Bacteriology and Mycology 3 cr. Offered spring. Prereq., BIOM 360, 361 (MICB 300, 301). A study of the pathogenic bacteria and fungi and the diseases they produce.

UG 403 (MICB 413) Medical Bacteriology and Mycology Laboratory 2 cr. Offered spring. Prereq. or coreq., BIOM 402 (MICB 412). Laboratory study of pathogenic bacteria and fungi.

UG 407 (MICB 406) Clinical Diagnosis 2 cr. Offered spring. Prereq., BIOM 402-403 (MICB 412-413). Principles of blood chemistry, urinalysis, hematology and other clinical parameters of disease and health.

UG 408 (MICB 407) Clinical Diagnosis Laboratory 1 cr. Offered spring. Prereq., BIOM 407 (MICB 406), BIOM 402-403 (MICB 412-413). Clinical diagnostic methods.

UG 410 (MICB 404) Microbial Genetics 3 cr. Offered spring. Prereq., BIOM 360 and 361 (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 411 (MICB 405) Experimental Microbial Genetics Laboratory 1 cr. Offered spring. Prereq. or coreq., BIOM 410 (MICB 404). Experiments in microbial genetics: Analysis of genes and genomes.

UG 415 (MICB 422) Microbial Diversity Ecology & Evltn 3 cr. Offered spring. Prereq., BIOB 260, 275 (BIOL 221-223), BIOM 360-361 (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 (BIOL 418) Mycology 3 cr. Offered autumn even-numbered years. Prereq., BIOB 170N-171N and BIOB 260 and BIOB 275 or BIOM 360 (BIOL 108N-109N and 221-223 or MICB 300) or consent of instr. Same as BIOM 423 (MICB 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 427 (BIOL 400) General Parasitology 2 cr. Offered autumn. Prereq., BIOB 275 (BIOL 223). Parasitism as a biological phenomenon, origin of parasitism, adaptations and life cycles, parasite morphology, fine structure, physiology, parasites and their environment.

UG 428 (BIOL 401) General Parasitology Laboratory 2 cr. Offered autumn. Coreq., BIOM 427 (BIOL 400). Taxonomy, morphology and identification of parasitic protozoa, helminths and arthropods.

UG 430 (MICB 423) Applied and Environmental Microbiology 3 cr. Offered spring odd-numbered years. Prereq., BIOM 360 (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 435 (420 Virology) 3 cr. Offered spring. Prereq., BIOB 410 (MICB 410). The general nature of viruses, with emphasis on the molecular biology of animal and human viruses.

UG 450 (MICB 450) Microbial Physiology 3 cr. Offered autumn. Prereq., BIOM 630-361 (MICB 300-301). Microbial structure and function, physiological diversity, microbial metabolism, role of microbial activity in the environment.

UG 451 (MICB 451) Microbial Physiology Laboratory 1 cr. Offered autumn. Coreq., BIOM 450 (MICB 450). Experimental approaches to analysis of microbial structure, composition and metabolism.

U 490 (MICB 497) Advanced Undergraduate Research 1-10 cr. (R-10) Offered every term. Prereq., BIOM 360 (MICB 300), junior or senior standing and consent of instr. Independent research under the direction of a faculty member. Graded credit/no credit.

UG 491 (MICB 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 494 (MICB 408) Seminar 1 cr. (R-3) Offered autumn and spring. Prereq., senior standing in natural sciences. Recent topics in microbiology and related subjects.

UG 498 (MICB 490) Medical Technology Internship 1-16 cr. Offered every term. Prereq., consent of instr.

U 499 (MICB 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 (MICB 502) Advanced Immunology 3 cr. Offered autumn even-numbered years. Advanced topics and immunological techniques used in modern immunology.

G 509 (MICB 509) Advanced Virology 3 cr. Offered spring odd-numbered years. Prereq., BIOM 435 (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 (MICB 520) Medical Parasitology 2 cr. Offered spring. Prereq., BIOM 427 (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 (MICB 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 (MICB 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 (MICB 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 (MICB 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 (MICB 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 (MICB 580) Training Seminar 1 cr. (R-2) Offered autumn and spring. Prereq., graduate standing or consent of instr. Same as BCH 580(BIOC 580). A one semester offering required of all new students.

G 594 (MICB 594) Professional Seminar 1 cr. (R-4) Offered autumn and spring. Prereq., graduate standing or consent of instr. Same as BCH 594 (BIOC 594). Presentation of current research in biochemistry and molecular biology by senior graduate students, faculty, and invited outside speakers.

G 595 (MICB 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 (MICB 597) Research Variable cr. (R-18) Offered intermittently. Prereq., graduate standing, one semester residence.

G 599 (MICB 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 (MICB 699) Dissertation 1-10 cr. (R-20) Offered intermittently. Prereq., doctoral student in microbiology. Laboratory research for and preparation of a doctoral dissertation.