

Mapping Microbiology 5160 Learning Goals to BS and Ph.D. Degree Program Learning Goals

Microbiology BS Degree Program Learning Goals (B, beginning; I, Intermediate; A, Advanced)

1. Students acquire the ability to interrelate and apply the fundamental concepts of chemistry, physics and mathematics to the functions of living cells.
2. Students understand the chemical properties of biological molecules and how these molecules function in the molecular mechanisms underlying physiological processes in microbial cells.
3. Students understand evolutionary processes, the diversity of microorganisms, and how microorganisms impact their environment, including their roles in human health and disease.
4. Students acquire the ability to design experiments to test hypotheses, perform analyses, interpret and analyze data, and present scientific information in written and oral formats.
5. Students acquire the ability to appraise scientific data presented in the popular press for accuracy and scientific merit and understand issues and ethical conflicts associated with applications of biotechnology.

Microbiology 5160 Learning Goals (Mapped to BS Degree Program Learning Goals)

1. Understanding the physical properties of microorganisms as they relate to respiration, mineral nucleation, and transport of solutes. **(PLG 1&2 Advanced)**
 2. Understanding the principles of microbial ecology and current knowledge of microbial diversity. **(PLG 3 Advanced)**
 3. Understanding mechanisms via which microorganisms can exist in the absence of oxygen, and how these metabolisms can alter the local and global environment (e.g. sulfide generation, iron oxidation). **(PLG 1&2 Advanced)**
 4. Understanding microbially-catalyzed cycling of iron and sulfur in the present and the early-earth. **(PLG 1&2 Advanced)**
 5. Understanding how microbial metabolism can be harnessed for the in situ remediation of contaminant metals and organic compounds. **(PLG 1&2 Advanced)**
 6. Understanding how microorganisms can accelerate mineral precipitation, and also catalyze the weathering of certain substrates. **(PLG 1&2 Advanced)**
 7. Understanding the role of microorganisms in early Earth, including the generation of reduced chemical species, and the response to oxygenation of Earth's atmosphere. **(PLG 1&2 Advanced)**
- In addition to the specific topics noted above, students will read and analyze primary literature and present their analyses in directed discussions. **These represent Advanced-level activity under the PLGs 4 and 5.**

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Microbiology BS: Learning Goal Map

Required Prerequisites for the Major

Learning Goals

Semester Course Number	Course Title	Semester hrs	1	2	3	4	5
BIOL 1113	Biological Sciences: Energy Transfer and Development	4	B			B	
BIOL 1114	Biological Sciences: Form, Function, Diversity, and Ecology	4	B			B	
MATH Requirement 1	MATH 1151 Calculus 1 (5 Hrs)	5	B				
or	MATH 1156 Calculus for Biol. Sciences (5 Hrs)						
MATH Requirement 2	MATH 1152 Calculus 2 (5 Hrs)	3 - 5	B				
or	MATH 1157 Math. Modeling for Biol. Sciences (5 Hrs)						
or	STATS 1450 Intro. to the Practice of Statistics (3 Hrs)						
or	STATS 2480 Statistics for the Life Sciences (3 Hrs)						
CHEM 1210	General Chemistry 1	5	B				
CHEM 1220	General Chemistry 2	5	B				
CHEM 2510	Organic Chemistry 1	4	B	B			
CHEM 2520	Organic Chemistry 2	4	B	B			
CHEM 2540	Organic Chemistry Lab 1	2	B	B		B	
PHYS 1200	Mechanics, Thermal Physics, Waves	5	B			B	
PHYS 1201	E&M, Optics, Modern Physics	5	B			B	
Total Hrs.		46 - 48					

Goal: B: Beginning; I, Intermediate; A, Advanced

Required Core for the Major

Learning Goals

Semester Course Number	Course Title	Semester hrs	1	2	3	4	5
MICRBIOL 4100	General Microbiology	5	I	I	I	I	I
MICRBIOL 4110	Pathogenesis and Immunobiology	3	A	A	A		
MICRBIOL 4120	Microbial Physiology and Diversity	3	A	A	A		
MICRBIOL 4130	Microbial Genetics	3	A	A	I		
MICRBIOL 4140	Molecular Microbiology Laboratory	3	I	I	I	A	A
BIOCHEM 4511	Biochemistry	4	I	A			I
Total Hrs.		21					

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Electives: Total Required 9 hrs Group 1: 3-9 hrs

Learning Goals

Semester Course Number	Course Title	Semester hrs	1	2	3	4	5
MICRBIOL 4150	Immunobiology Laboratory	3	I	I	A	A	A
MICRBIOL 4193	Individual Studies	1-3					
MICRBIOL 4194	Group Studies	1-3					
MICRBIOL 4591S	DNA Finger Printing Workshops in Columbus PS	1				A	A
MICRBIOL 4797	Study at a Foreign Institution	1-19					
MICRBIOL 4798	Study Tour Domestic	1-19					
MICRBIOL 4998	Undergrad Research in Microbiology	1-5				A	A
MICRBIOL 4998H	Honors Research	1-5				A	A
MICRBIOL 4999	Undergrad Research in Microbiology- Thesis	1-5				A	A
MICRBIOL 4999H	Honors Research- Thesis	1-5				A	A
MICRBIOL 5122	Immunology	2			A		
MICRBIOL 5129	Cellular and Molecular Biology of Pathogenic Eukaryotes	3		A	A		
MICRBIOL 5147	Eukaryotic Pathogens	3		A	A	A	
MICRBIOL 5149	Introductory Virology	3		A	A		
MICRBIOL 5150	Microbial Ecology	3	A	A	A		
MICRBIOL 5155	Environmental Microbiology	3	A	A	A		
MICRBIOL 5160	Geomicrobiology	3	A	A	A	A	A
MICRBIOL 5161H	Bioinformatics and Molecular Microbiology	3	A	A	A		A
MICRBIOL 5169H	Microbial Evolution	3			A		
MICRBIOL 5170	Microbes and Evolution	3			A		
MICRBIOL 5536	Food Microbiology Lecture	3		A	I		A
MICRBIOL 5546	Food Microbiology Laboratory	3		A	I	A	A
Total Hrs.		3-9					

*Indicated graduate-level course. Requires special permission to enroll.

Goal: B: Beginning; I, Intermediate; A, Advanced

Electives: Total Required 9 hrs Group 2: 0-6 hrs

Learning Goals

Semester Course Number	Course Title	Semester Hrs.	1	2	3	4	5
MICRBIOL 3300	The Biology of Pollution	2	B				
BIOCHEM 5621	Intro Biological Chemistry Laboratory	4	I			I	I
MOLGEN 4500	General Genetics	3		I			
MOLGEN 4606	Molecular Genetics I	4		I			
MVIMG 5000	Evolution of Emerging Viruses	2			A		
PLPATH 5010	Phylobacteriology	2		I	A		
PLPATH 5020	Introduction to Plant Virology	2		I	A		
PLPATH 5040	Science of Fungi: Mycology Lecture	3	I	I	A		
ANSCI 6090*	Anaerobic Microbiology	3		A			
ENR 5263	Biology of Soil Ecosystems	3	I	A			
ENR 5266	Field Soil Investigations	3	I			A	
Total Hrs.		0-6					
Total Hrs. for the Major		30					

*Indicated graduate-level course. Requires special permission to enroll.

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Microbiology Ph.D. Degree Program Learning Goals

PhD graduates of Microbiology should be able to:

1. Demonstrate a broad base of knowledge in several areas, including microbial physiology, genetics, biochemistry, and pathogenesis.
2. Demonstrate in-depth knowledge in an area of interest.
3. Make an original and substantial contribution to the field, as indicated by at least one first-author publication.
4. Effectively communicate science through oral and written presentations to both scientific and general audiences.

Microbiology 5160 Learning Goals (Mapped to Ph.D. Degree Program Learning Goals)

Learning goals for Microbiology 5160 align with our graduate degree PLG 1,2 and 4. Although this is a 5000-level course, the course content represents a specialization and we envision that this course will meet intermediate and advanced level goals for Microbiology graduate students.