### **MICROBIOLOGY MAJOR INFORMATION**

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Department Chair:	Honors Advisor:
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Coordinating Advisor:	Coordinator Undergraduate Research:
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#### **Required Prerequisites\* to the Major**

Credits from these courses do not count toward the 30 hours required to complete the Major; however, some are prerequisites for required major courses. All Prerequisites must be completed prior to graduation. Unless required to take more advanced courses, a minimum grade of "D" in every major prerequisite course is required.

Biology 1113, 1114	8 hr.
Mathematics 1156** or 1151** or 1140** and 1141**:	5-8 hr.
One of the following:	
Mathematics 1152** or 1157**, or Statistics 1450, 2450, or 2480	3-5 hr.
Chemistry 1210**, 1220**	10 hr.
Chemistry 2510, 2520, 2540	10 hr.
Physics 1200** and 1201, or 1250 and 1251	10 hr.

\*Honors courses can substitute where available.

\*\*Prerequisites for this course include earning a "C-" or higher in a relevant math course.

#### Additional science courses may be required or suggested for pre-professional students.

#### Microbiology Major Courses—General Information

The Microbiology Major consists of a minimum of 30 semester hours. Required Core courses make up 21 of these 30 hours. All students must complete the six Core Courses and nine (9) hours of elective courses (outlined below). A minimum grade of "C-" in every major course is required.

The elective courses are divided into two groups: Group 1 and Group 2. Students must take at least three (3) hours of Group 1 courses and may take all nine (9) elective hours from Group 1. Students are <u>not</u> required to take any Group 2 courses but may have up to six (6) hours from this group count as elective hours. Students are encouraged to discuss with their microbiology major advisor any courses that are not listed in Group 2 that would be suitable to include in the Microbiology Major.

A total of three (3) semester hours graded S/U may be counted toward the Microbiology Major. These are usually earned through Individual Study, Undergraduate Research or Honors Research (Microbiology 4193, 4998, 4998H, 4999 or 4999H). Individual Study courses may be arranged by contacting any faculty member in the department. You may also discuss your research options with the Coordinator of Undergraduate Research.

Students must receive a C- or better in Microbiology courses to use them as prerequisites for other courses. Students must earn a grade of C- or higher for a course to transfer to Ohio State. The only exception to this is courses transferred from a public institution in Ohio since 2006. In these cases, credit for courses with grades of D and D+ will transfer to Ohio State. This rule cannot be appealed.

Department #	Credit Hours	Course Title (Semester taught)	Prerequisites*
Biochemistry 4511	4	Introduction to Biological Chemistry (Au, Sp, Su)	Chemistry 2310 or 2510 and one semester of Biological Sciences, or permission of instructor
Microbiology 4100	5	General Microbiology (Au, Sp, Su)	Biology 1113, Chemistry 2510 or concurrent
Microbiology 4110	3	Pathogenesis and Immunobiology (Au, Sp)	Microbiology 4100 (C- or better)
Microbiology 4120	3	Microbial Physiology and Diversity (Au, Sp)	Microbiology 4100 (C- or better), Biochem 4511 or concurrently.
Microbiology 4130	3	Microbial Genetics (Au, Sp)	Microbiology 4100 (C- or better) or Molecular Genetics 4500 or 4606
Microbiology 4140	3 Molecular Microbiology Laboratory (Au, Sp)		Microbiology 4100 (C- or better), Microbiology 4130 or concurrently, or permission of instructor

## Microbiology Major Required Core Courses, 21 Hours

\*or honors equivalent

# ELECTIVE COURSES, GROUP 1: Take 3-9 hr. from this group

Micro. Course No.	Credit Hours	Course Title (Semester taught)	Prerequisites	
2000*	1.5	Introduction to MicrOHbIOlogy Research (Au)	Biology 1113(H)	
2100*	3	Wild Yeast: From Isolation to Fermentation (Au)	Biology 1110 or 1113(H) AND Chemistry 1110, 1210, or 1610	
3704*	3	HIV: From Microbiology to Macrohistory (Sp)	English 1110.xx, or permission of instructor. Not open to students with credit for Hist. 3704	
4193	1-3 Graded S/U	Individual Studies (Au, Sp, Su)	Permission of instructor. Maximum of 3 credit hours can be counted toward the Major	
4591S	1 Graded S/U	DNA Fingerprinting; Service learning course (Sp)	Students present workshops at Columbus Public High Schools.	
5122	3	Immunobiology (Au)	C- or better in either Microbiology 4000 or 4110	
5129	3	Cellular and Molecular Biology of Pathogenic Eukaryotes (Sp)	Microbiology 4100 or permission of instructo	
5147	3	Eukaryotic Pathogens (Au)	Microbiology 4100 (C- or better)	
5149	3	Introductory Virology (Sp)	Microbiology 4100 (C- or better)	
5150	3	Microbial Ecology (TBD)	C- or better in Microbiology 4000 or equivalent	
5155	3	Environmental Microbiology (Au)	C- or better in Microbiology 4000 or equivalent	
5160	3	Geomicrobiology (Sp)	Senior standing in Microbiology, School of Earth Sciences, Department of Civil, Environmental, and Geodetic Engineering, or School of Environment and Natural Resources.	
5161	3	Bioinformatics and Molecular Microbiology (Sp)	Microbiology 4130 or Molecular Genetics 4500; Biochemistry 4511; or permission of instructor	

5169	3	Microbial Evolution (Au)	6 credits of biological sciences course work	
5270	3	Microbial Natural Products: Discovery, Biosynthesis, and Antibiotic Activity (Sp)	C- or better in Microbiology 4120; or C- or better in Biochemistry 5614; or consent of the instructor.	
5536	3	Food Microbiology Lecture (Au)	C- or better in either Microbiology 4000 or 4100	
5546	3	Food Microbiology Laboratory (Sp)	Microbiology 5536	
5800	2	Organelle Biology (Au)	Molecular Genetics 4500 or permission of instructor	
		Undergraduate Resea	arch**	
4998/4998H 4999/4999H	1-5 Graded S/U	Undergraduate Research in Microbiology (Au, Sp, Su) Undergraduate Research in Microbiology—Thesis (Au, Sp, Su)	Permission of instructor. Maximum of 3 credit hours for any combination of these courses can be counted toward the Major. Thesis requires a minimum of 4 cumulative credit hours and final thesis examination. Check with your advisor for details.	

\* Only three credit hours of 2000 or 3000 level microbiology elective course can count towards the BS-major. Students must meet with an advisor to have coursework pre-approved for Study at a Foreign Institution or a Domestic Study Tour. A maximum of 3 credits of S/U coursework may be applicable to the Microbiology Major. \*\* If you plan to earn credit for conducting research in a lab outside of Microbiology you must talk with your major advisor PRIOR to registering to confirm if it will count towards the Major.

### ELECTIVE COURSES, GROUP 2: Take 0-6 hr. from this group

Course No.	Credit Hours	Course Title (Semester taught**)	Prerequisites
Microbiology 2200*	1	Genome Biology (Sp)	Biology 1113(H). Not open to students with credit for Biology 2200
Microbiology 3798.05*	4	HIV in Context: East Africa (Su) [Study Abroad]	English 1110.xx or instructor permission. Not open to students with credit for Hist. 3798.05
Biochemistry 5621	4	Introduction to Biological Chemistry Laboratory (Au, Sp)	Biochemistry 4511 or 5613 or equivalent
CBE 5765	3	Principles of Biochemical Engineering (Sp)	CBE 2523 or 3610, or permission of instructor.
ENVENG 5120	3	Bioremediation of Groundwater and Soil (Sp)	EnvEng 5110 and a class in Microbiology or permission of instructor.
ENR 5263	3	Biology of Soil Ecosystems (Sp)	ENR 3000
ENR 5266	3	Field Soil Investigation: Soil Chemistry, Fertility and Biology (Su)	Not open to students with credit for 7740
Molecular Genetics 4500	3	General Genetics (Au, Sp, Su)	Biology 1101, 1113, or 1113H, & 3 additional semester credit hours in Biological Sciences
Molecular Genetics 4501	1	General Genetics Laboratory (Au, Sp, Su)	Molecular Genetics 4500 or permission of instructor
Molecular Genetics 4606	4	Molecular Genetics (Au, Sp)	Biology 1113, 1113H, 1114, 1114H, or Chem 1220 or equiv.
Plant Pathology 5010	2	Phytobacteriology (Au)	Plant Pathology 3002 or Microbiology 4100, or permission of instructor
Plant Pathology 5020	2	Introduction to Plant Virology (Au)	Plant Pathology 3001, Biochemistry 4511, or Microbiology 4000 or permission of instructor
Plant Pathology 5040	3	Science of Fungi: Mycology (Au)	Biology 1114 or Plant Pathology 3001

\* Only three credit hours of 2000 or 3000 level microbiology elective course can count towards the BS-major.

\*\*For courses offered through another department, confirming the semester taught is strongly encouraged.

Name	Scientific Focus	@osu.edu
Stephen Abedon	Bacteriophage ecology; phage therapy (OSU-Mansfield)	abedon.1
Brian Ahmer	Detection of microbes and host environment by Salmonella	ahmer.1
Birgit Alber	Biochemistry of central carbon metabolism	alber.8
Juan Alfonzo	tRNA in mitochondrial bio-genesis and disease	alfonzo.1
Amal Amer	Innate immunity against Legionella and Burkholderia	amer.13
Matthew Anderson	Phenotypic consequences of genomic variation	anderson.3196
Irina Artsimovitch	Regulation of transcription	artsimovitch.1
Charles Bell	Molecular and cellular biochemistry	bell.489
Tammy Bullwinkle	tRNA biology	bullwinkle.1
Ross Dalbey	Membrane protein assembly; proteases; biophysics	dalbey.1
Charles Daniels	Molecular biology of the archaea; archaeal SNO-RNAs	daniels.7
Rajendar Deora	Molecular determinants of pathogenesis and biofilm development	<u>deora.6</u>
Kurt Fredrick	Mechanistic studies of protein biosynthesis	fredrick.5
Venkat Gopalan	Protein-aided RNA catalysis	gopalan.5
John Gunn	Salmonella and Francisella host-pathogen interactions	<u>gunn.43</u>
Patrice Hamel	Mitochondria and chloroplast membrane biogenesis	<u>hamel.16</u>
Tina Henkin	Transcription termination control in Gram positive bacteria; RNA structure/function	<u>henkin.3</u>
Mette Ibba	General microbiology	<u>ibba.2</u>
Michael Ibba	Translation of the genetic code; tRNA biology	<u>ibba.1</u>
Igor Jouline	Computational biology, evolutionary genomics, signal transduction	jouline.1
Kou-San Ju	Natural products; microbial metabolism; biocatalysis	<u>ju.109</u>
Pravin Kaumaya	Peptide and protein design and folding; antigenic determinants	<u>kaumaya.1</u>
Joseph Krzycki	Biochemistry and molecular biology of methanogenic archaea	<u>krzycki.1</u>
Jesse Kwiek	HIV pathogenesis and public health	<u>kwiek.2</u>
Shan-Lu Liu	Host restriction to viral infection; innate immunity to viruses; viral oncogenesis	<u>liu.6244</u>
Thomas Magliery	Combination and statistical approaches to protein stability	<u>magliery.1</u>
Madhura Pradhan	Microbial pathogenesis and immunology	pradhan.2
Chad Rappleye	Molecular mechanisms of fungal virulence	<u>rappleye.1</u>
John Reeve (Emeritus)	Molecular biology of archaea; molecular adaptations to extreme environments	<u>reeve.2</u>
Virginia Rich	Global change microbiology; microbial meta-omics; Genes-to-Ecosystems inquiry	<u>rich.270</u>
Yasuko Rikihisa	Obligatory intracellular bacteria; Anaplasma, Ehrlichia, and Neorickettsia	<u>rikihisa.1</u>
Natividad Ruiz	Envelope biogenesis in Gram-negative bacteria	<u>ruiz.82</u>
Zakee Sabree	Insect microbe interactions; nutrient cycling; microbial evolution and ecology	<u>sabree.8</u>
Abhay Satoskar	Immune mechanisms	<u>satoskar.2</u>
Stephanie Seveau	Bacterial toxins and infectious diseases	<u>seveau.1</u>
Paul Stoodley	Biofilm development and dynamics	stoodley.4
Matthew Sullivan	Phage ecology, evolution, host interaction, and discovery through (meta)genomics	<u>sullivan.948</u>
Robert Tabita	Microbial physiology; carbon sequestration; bioenergy/biofuel production	<u>tabita.1</u>
Olli Tuovinen (Emeritus)	Environmental and industrial microbiology	<u>tuovinen.1</u>
Hua Wang	Biofilm formation involving food-borne pathogens	<u>wang.707</u>
Marshall Williams	Deoxyuridine metabolism in eukaryotic systems; DNA repair and replication	williams.70
David Wood	Applied protein engineering for biotechnology development	<u>wood.750</u>
Daniel Wozniak	Bacterial pathogenesis; gene regulation	wozniak.1
Jacob Yount	Post-translational modifications; protein fatty-acylation; innate immunity to viruses	<u>yount.37</u>
Ahmed Yousef	Microbial safety of food; foodborne pathogens; preservation technologies	yousef.1

# Microbiology Faculty (https://microbiology.osu.edu/directory)

# Sample Curriculum for a Microbiology B.S.

			S	amp	le 1			
Year	Autumn	Credit Hrs	Comment*		Spring	Credit Hrs	Comment	Year Total
1	Gen Chem 1210	5	GE-Nat Sci/Micro-PreRec		Gen Chem 1220	5	GE-Nat Sci/Micro-PreRec	
					Math 1152 (2) or			
					Math 1157 (3) or			
	Math 1151 or 1156	5	GE-Math/Micro-PreRec		Stats 1450(3) or	3 - 5	Micro-PreRec	
					Stats 2450 (3) or			
					Stats 2480 (3)			
	Bio 1113	4	GE-Nat Sci/Micro-PreRec		Bio 1114	4	GE-Open Opt/Micro-PreRe	ec
	Freshman Survey	1	GE		GE Comp I	3	GE	
	Semester Sum	15			Semester Sum	15-17		30 - 32
Year	Autumn	Credit Hrs	Comment*		Spring	Credit Hrs	Comment	Year Total
2	Org Chem 2510	4	Micro-PreRec		Org Chem 2520	4	Micro-PreRec	
	Physics 1200	5	GE-Open Opt/Micro-PreRec		Org Chem Lab 2540	2	Micro-PreRec	
	GE: F.L. 1	4	GE		Physics 1201	5	Micro-PreRec	
	GE: Comp II	3	GE		GE: F.L. 2	4	GE	
	Semester Sum	16			Semester Sum	15		31
Year	Autumn	Credit Hrs	Comment*		Spring	Credit Hrs	Comment	Year Total
3	Micro 4100	5	Micro-Core		Micro 4110	3	Micro-Core	
	BioChem 4511	4	Micro-Core		Micro 4130	3	Micro-Core	
	GE: F.L. 3	4	GE		#Micro Elective 1	3	Micro-Required	
	GE: Soc. Sci. I	3	GE		GE: Soc. Sci. 2	3	GE	
					GE: Literature	3	GE	
	Semester Sum	16			Semester Sum	15		31
Year	Autumn	Credit Hrs	Comment*		Spring	Credit Hrs	Comment	Year Total
4	Micro 4120	3	Micro-Core		Micro 4140	3	Micro-Core	
	Micro Elective 2	3	Micro-Required		Micro Elective 3	3	Micro-Required	
	GE: Visual Art	3	GE		GE: Cult. & Ideas	3	GE	
	GE: Historical Study	3	GE		Electives	4 - 6	Free elective	
	Electives	2	Free elective					
	Semester Sum	14			Semester Sum	13-15		27 - 29
							Total Hrs.	121

Placement of specific GE courses will vary depending on the student's individual requirements and preferences. Where available, honors courses can substitute
# Micro electives include 3-9 hours from Group 1 and 00-6 hours from Group 2 courses. Up to 3 hrs of S/U graded courses, including independent research (Micro 4998), can be counted toward the elective requirement.

			Sar	nple 2			
Year	Autumn	Credit Hrs	Comment*	Spring	Credit Hrs	Comment	Year Total
1	Gen Chem 1210	5	GE-Nat Sci/Micro-PreRec	Gen Chem 1220	5	GE-Nat Sci/Micro-PreRec	
	Math 1151 or 1156	5	GE-Math/Micro-PreRec	Bio 1113	4	GE-Nat Sci/Micro-PreRec	
	*GE: F.L. 1	4	GE	GE: F.L. 2	4	GE	
	Arts Sci 1100.07	1	GE	GE: Comp 1	3	GE	
	Semester Sum	15		Semester Sum	16		31
Voor	Autump	Credit Hre	Comment*	Spring	Credit Hre	Comment	Vear Tota
2	Ora Chom 2510		Micro-BroBoo	Ora Chom 2520		Mioro-BroBoo	Tear Tota
2	Dig Chem 2010	4	GE Open Opt/Miero BroBoo	Org Chem Lob 2540	4	Micro ProPoo	
		4	GE-Open Op/Micro-Frenec	Miero 4100	2	Micro Coro	
	Math 1152 (2) or Math 1157 (3) or Stats 1450(3) or Stats 2450 (3) or Stats 2480 (3)	3 - 5	Micro-PreRec	GE: Comp 2	3	GE	
	Semester Sum	15-17		Semester Sum	14		29 - 31
Year	Autumn	Credit Hrs	Comment*	Spring	Credit Hrs	Comment	Year Total
3	Physics 1200	5	GE-Open Opt/Micro-PreRec	Physics 1201	5	Micro-PreRec	
	BioChem 4511	4	Micro-Core	Micro 4110	3	Micro-Core	
	GE: Soc. Sci 1	3	GE	Micro 4130	3	Micro-Core	
	GE: Literature	3	GE	GE: Soc. Sci 2	3	GE	
	Semester Sum	15		Semester Sum	15		30
Year	Autumn	Credit Hrs	Comment*	Spring	Credit Hrs	Comment	Year Tota
4	Micro 4120	3	Micro-Core	Micro 4140	3	Micro-Core	
	#Micro Elective 1	3	Micro-Required	Micro Elective 3	3	Micro-Required	
	Micro Elective 2	3	Micro-Required	GE: Cult & Ideas	3	GE	
	GE: Visual Art	3	GE	Electives	5-7	Free elective	
	GE: Historical Study	3	GE		-		
	Semester Sum	15		Semester Sum	14-16		29 - 31
						Total Has	101
* Discon	ant of apositio CE course	o will vonu do	pending on the student's individual re-	autromonto and proferences	Mhore eveile	I Dial HIS.	121
# Micro	electives include 3-9 hours	es will vary de	1 and 00-6 hours from Group 2 cours	quirements and preferences	d courses inc	luding independent research (M	licro 4998)
		o nom Group	Tana oo o noaro nom aroup 2 douro	set op to e ma er ere grade	a ooa.ooo, mo	ading mappendont resource (in	

			Sai	nple 3			
Year	Autumn	Credit Hrs	Comment*	Spring	Credit Hrs	Comment	Year Total
1	Math 1148	4	GE-Math	Math 1149	3	GE-Math	
	GE: Cult. & Ideas	3	GE	Gen Chem 1210	5	GE: Nat. Sci/Micro-PreRec	
	GE: Soc. Sci. 1	3	GE	Bio 1113	4	GE-Nat Sci/Micro-PreRec	
	GE: Visual Art	3	GE	GE: Comp I	3	GE	
	ArtsSci 1100.07	1	GE				
	Semester Sum	14		Semester Sum	15		29
Year	Autumn	Credit Hrs	Comment*	Spring	Credit Hrs	Comment	Year Total
2	Gen Chem 1220	5	GE-Nat Sci/Micro-PreRec	Org Chem 2510	4	Micro-PreRec	
	Bio 1114	4	GE-Open Opt/Micro-PreRec	Org Chem Lab 2540	2	Micro-PreRec	
	GE: Comp II	3	GE	GE: F.L. 1	4	GE	
				Math 1152 (2) or			
				Math 1157 (3) or			
	Math 1151 or 1156	5	GE-Math/Micro-PreRec	Stats 1450(3) or	3 - 5	Micro-PreRec	
				Stats 2450 (3) or			
				Stats 2480 (3)			
	Semester Sum	17		Semester Sum	13-15		30-32
Year	Autumn	Credit Hrs	Comment*	Spring	Credit Hrs	Comment	Year Total
3	GE: F.L. 2	4	GE	GE: F.L. 3	4	GE	
	Org Chem 2520	4	Micro-PreRec	Micro 4110	3	Micro-Core	
	Micro 4100	5	Micro-Core	#Micro Elective 1	3	Micro-Required	
	GE: Historical Study	3	GE	BioChem 4511	4	Micro-Core	
	Semester Sum	16		Semester Sum	14		30
Year	Autumn	Credit Hrs	Comment*	Spring	Credit Hrs	Comment	Year Total
4	Micro 4120	3	Micro-Core	Micro 4140	3	Micro-Core	
	Micro 4130	3	Micro-Core	Micro Elective 3	3	Micro-Required	
	Micro Elective 2	3	Micro-Required	Physics 1201	5	Micro-PreRec	
	Physics 1200	5	GE-Open Opt/Micro-PreRec	GE: Literature	3	GE	
				Electives	1-3	Free Electives	
	Semester Sum	15		Semester Sum	15-17		30-32
						Total Hrs.	121
* Placen # Micro (	hent of specific GE course electives include 3-9 hour	es will vary de s from Group	pending on the student's individual re 1 and 00-6 hours from Group 2 cours	quirements and preferences. es. Up to 3 hrs of S/U graded	Where availat I courses, incl	ble, honors courses can substitu uding independent research (Mic	te ro 4998),

# Micro electives include 3-9 hours from Group 1 can be counted toward the elective requirement. Up to 3 hrs of 5/U gr