Bachelor of Science in Microbiology

Microbiology

Microbiology is the study of bacteria, viruses, the immune system, and their roles in human health, the environment and beyond. Job prospects for microbiologists with a bachelor's or higher degree continue to be strong. Upper-division courses in immunology, bacterial infectious diseases, virology, and microbial genetics couple laboratory courses with lecture courses to provide students with hands-on practical experience. The B.S. Microbiology major includes all four of the upper-division lecture and laboratory course pairs.

Undergraduate Admission

Admission to KU

All students applying for admission must send high school and college transcripts to the Office of Admissions. Prospective first-year students should be aware that KU has qualified admission requirements that all new first-year students must meet to be admitted. Consult the Office of Admissions (http://admissions.ku.edu/) for application deadlines and specific admission requirements.

Visit the International Support Services (http://www.iss.ku.edu/) for information about international admissions.

Students considering transferring to KU may see how their college-level course work will transfer on the Office of the University Registrar (https://registrar.ku.edu/credittransfer/) website.

First- and Second-Year Preparation

Because biology study requires preparation in other sciences, students should begin meeting major requirements in the first year. It is particularly important to take CHEM 130 and CHEM 135 in the first year and, for several majors, to take CHEM 330, CHEM 331, CHEM 335, and CHEM 336 in the second year. Ideally, most majors should also take BIOL 150 and BIOL 152 during the first year, as well as BIOL 105.

Requirements for the B.S. Degree in Microbiology

In addition to degree and major requirements, all students must complete the KU Core.

Code	Title	Hours
General Science Requirements		
Majors must complete 47-56 hours of the following general science requirements that serve as foundational courses for this major.		
Biology Orientation Seminar. Satisfied by:		
BIOL 105	Biology Orientation Seminar	
Molecular & Cellular Biology. Satisfied by one of the following:		
BIOL 150	Principles of Molecular and Cellular Biology	
BIOL 151	Principles of Molecular and Cellular Biology, Honors	
Principles of Organismal Biology. Satisfied by one of the following:		
BIOL 152	Principles of Organismal Biology	
BIOL 153	Principles of Organismal Biology, Honors	
Introductory Biology Lab for STEM Majors. Satisfied by:		
BIOL 154	Introductory Biology Lab for STEM Majors	
Principles of Genetics. Satisfied by one of the following:		
BIOL 350	Principles of Genetics	
BIOL 360	Principles of Genetics, Honors	
Statistics. Satisfied by:		
BIOL 370	Introduction to Biostatistics	
Biochemistry. Satisfied by one of the following:		
BIOL 600	Introductory Biochemistry, Lectures	
BIOL 636 & BIOL 638	Biochemistry I and Biochemistry II	
Chemistry I. Satisfied by one of the following:		
CHEM 130	General Chemistry I	
CHEM 190 & CHEM 191	Foundations of Chemistry I, Honors and Foundations of Chemistry I Laboratory, Honors	
Chemistry II. Satisfied by one of the following:		
CHEM 135	General Chemistry II	
CHEM 195 & CHEM 196	Foundations of Chemistry II, Honors and Foundations of Chemistry II Laboratory, Honors	
Organic Chemistry I. Satisfied by one of the following:		
CHEM 330	Organic Chemistry I	
CHEM 380	Organic Chemistry I, Honors	
Organic Chemistry I Laboratory. Satisfied by:		
CHEM 331	Organic Chemistry I Laboratory	
Organic Chemistry II. Satisfied by one of the following:		
CHEM 335	Organic Chemistry II	
CHEM 385	Organic Chemistry II, Honors	
Calculus. Satisfied by one of the following:		
MATH 115	Calculus I	
MATH 125	Calculus I	
MATH 145	Calculus I, Honors	
Physics. Satisfied by one of the following:		
Option 1: College Physics		
PHSX 114 & PHSX 115	College Physics I and College Physics II	
Option 2: General Physics		
PHSX 211 & PHSX 216	General Physics I and General Physics I Laboratory	
or PHSX 213	General Physics I Honors	
PHSX 212 & PHSX 236	General Physics II and General Physics II Laboratory	
or PHSX 214	General Physics II Honors	
Microbiology Course Requirements		
Satisfied by completing 34-35 hours from the following courses:		
Fundamentals of Microbiology. Satisfied by one of the following:		3-4
BIOL 400	Fundamentals of Microbiology	
BIOL 401	Fundamentals of Microbiology, Honors	
Fundamentals of Microbiology Laboratory. Satisfied by:		
BIOL 402	Fundamentals of Microbiology Laboratory	2
Cell Structure & Function. Satisfied by one of the following:		
BIOL 416	Cell Structure and Function	3

Immunology. Satisfied by:		
BIOL 503	Immunology	3
or BIOL 543	Immunology, Honors	
Immunology Laboratory. Satisfied by:		
BIOL 504	Immunology Laboratory	2
Bacterial Infectious Diseases. Satisfied by:		
BIOL 506	Bacterial Infectious Diseases	3
General Virology. Satisfied by:		
BIOL 512	General Virology	3
Virology Laboratory. Satisfied by:		
BIOL 513	Virology Laboratory	2
Microbial Genetics. Satisfied by:		
BIOL 518	Bacterial Genetics	3
Microbial Genetics Laboratory. Satisfied by:		
BIOL 519	Bacterial Genetics Laboratory	2
Microbiology Required Electives		
Satisfied by completing 6 hours of BIOL courses numbered 400 or higher.		6
Capstone Course		
Bacterial Infectious Diseases Laboratory. Satisfied by:		
BIOL 507	Bacterial Infectious Diseases Laboratory (Capstone)	3
Total Hours		**35-36**

Major Hours & Major GPA

While completing all required courses, majors must also meet each of the following hour and grade-point average minimum standards:

Major Hours
Satisfied by 35-36 hours of major courses.

Major Hours in Residence
Satisfied by a minimum of 15 hours of KU resident credit in the major.

Major Junior/Senior Hours
Satisfied by a minimum of 12 hours from junior/senior courses (300+) in the major.

Major Junior/Senior Graduation GPA
Satisfied by a minimum of a 2.0 KU GPA in junior/senior courses (300+) in the major. GPA calculations include all junior/senior courses in the field of study including F's and repeated courses. See the Semester/Cumulative GPA Calculator (https://sis.ku.edu/gpa-calculator/).

Below is a sample 4-year plan for students pursuing the B.S. in Microbiology. To view the list of courses approved to fulfill Core 34, please visit the KU Core 34 page (https://catalog.ku.edu/core34/).

This degree plan assumes students will have the equivalent of MATH 101 or MATH 104, or equivalent prior to the freshman year, fall semester.

Freshman

Fall	Hours	Spring	Hours
BIOL 150 or 152 (Core 34: Natural and Physical Sciences (SGE), General Science Requirement)[040*, 2]	3	BIOL 150 or 152 (General Science Requirement)[2]	3
CHEM 130 (General Science Requirement)[1]	5	BIOL 154 (Core 34: Natural and Physical Sciences (SGE), General Science Requirement)[040*, 2]	2
BIOL 105 (General Science Requirement)[9]	1	CHEM 135 (General Science Requirement)	5
Core 34: English (SGE)[010]	3	MATH 115 or 125 (Core 34: Math and Statistics (SGE))[030*, 1]	3-4
Core 34: Social and Behavioral Science (SGE)[050]	3	Core 34: English (SGE)[010]	3
	15		**16-17**

Sophomore

Fall	Hours	Spring	Hours
CHEM 330 (General Science Requirement)	3	BIOL 350 (General Science Requirement)	4
CHEM 331 (General Science Requirement)	2	BIOL 370 (General Science Requirement)	4
BIOL 400 or 401 (Major Requirement)[4]	3-4	CHEM 335 (General Science Requirement)[3]	3
BIOL 402 (Major Requirement)[4]	2	Core 34: US Culture (SGE)[070]	3
Core 34: Global Culture (SGE)[070]	3	Core 34: Communications (SGE)[020]	3
	13-14		**17**

Junior

Fall	Hours	Spring	Hours
PHSX 114 (or PHSX 211 & 216, General Science Requirement)	4	PHSX 115 (or PHSX 212 & 236, General Science Requirement)	4
BIOL 416 (Major Requirement)[7]	3	BIOL 512 (Major Requirement)[3]	3
BIOL 518 (Major Requirement)[4]	3	BIOL 513 (Major Requirement)[3]	2
BIOL 519 (Major Requirement)[4]	2	BIOL 600 or 636 ***and*** 638 (General Science Requirement)[6]	3
Core 34: Arts and Humanities (SGE)[060]	3	BIOL 400+ Elective (Major Requirement)[5]	3
	15		**15**

Senior

Fall	Hours	Spring	Hours
BIOL 503 (Major Requirement)	3	BIOL 506 (Major Requirement)[3]	3
BIOL 504 (Major Requirement)[4]	2	BIOL 507 (Major Requirement; Capstone)[3]	3
Second Area of Study/Elective/Degree/Junior-Senior Hours[8]	3	BIOL 400+ (Major Requirement)[5]	3
Core 34: Arts and Humanities (SGE)[060]	3	Core 34: Social and Behavioral Science (SGE)[050]	3

Second Area of Study/ Elective/Degree/Junior-Senior Hours[8]	3	Second Area of Study/ Elective/Degree/Junior-Senior Hours[8]	3
	14		**15**

Total Hours 120-122

1 MATH 115 and CHEM 130 require MATH ACT scores of 26+, a comparable SAT or KU Math Placement Exam score, or credit for a MATH 101 or MATH 104 equivalent course. MATH 125 requires a MATH ACT score of 28+, a comparable SAT or KU Math Placement Exam score, or credit for MATH 104.

2 Concurrent or prior enrollment in CHEM 130 is required. BIOL 151 is the honors equivalent of BIOL 150 and offered in the fall semesters. BIOL 153 is the honors equivalent of BIOL 152 and offered in the spring semesters.

3 BIOL 512, BIOL 513, BIOL 506, BIOL 507, and CHEM 335 are offered only in the spring.

4 BIOL 401, BIOL 402, BIOL 504, BIOL 518, BIOL 519, and BIOL 636 are offered only in the fall.

5 6 hrs of Biol courses numbered 400-level or above.

6 BIOL 600 (3 hours) or BIOL 636 and BIOL 638 (8 hours) required. BIOL 636 is offered only in the fall semester, BIOL 638 is offered only in the spring semester, and BIOL 600 is offered in both the fall and spring semesters.

7 BIOL 416 is recommended prior to BIOL 512 and BIOL 503.

8 Hour requirements (incl. 45 jr/sr hrs) are typically met through Core 34, degree, major, second area of study and/or elective hours. Students completing the BGS with a major must choose a secondary area of study. Individual degree mapping is done in partnership with your advisor.

9 BIOL 105 (1 hour online course) is required for the major. It can be taken the summer prior to your freshman year.

Please note:

Students may earn degrees in more than one major within biological sciences, or in a biological science and an area outside biology by meeting the requirements of both degree programs and taking at least 15 hours of courses unique to each major.

All students in the College of Liberal Arts and Sciences are required to complete 120 total hours of which 45 hours must be at the Jr/Sr (300+) level.

*Courses with a * designate courses that are degree requirements but can also be taken to fulfill the KU Core 34 requirement. If another course if used to fulfill the Core 34 requirement, the course listed is still required as a degree requirement.

Notes:

* - This course is a Required major course and is also part of Core 34: Systemwide General Education. If this course is not taken to fulfill the Core 34:SGE requirement, it must be taken in place of elective hours.

** - This course is a Recommended Core 34: Systemwide General Education course. This specific course is not required but is recommended by the program's faculty.

*** - This course is a Required Core 34: Systemwide General Education course. This program is approved by the Kansas Board of Regents to require this specific Core 34:Systemwide General Education course. If a student did not take this course it must be taken in addition to other degree requirements.

At the completion of this program, students will be able to:

- Explain the sources of genetic variation within populations, how variation is maintained or lost in populations and mechanisms of evolutionary change operating in populations and how these may lead to the formation of biological species. Use the principles of evolution to explain the diversity of life on Earth; describe evidence that supports the conclusion that evolution explains the diversity of life on Earth.
- Describe how organisms inherit genetic information that influences the location, timing, and intensity of gene expression. Explain that cells/organs/organisms have multiple mechanisms to perceive and respond to changing environmental conditions.
- Describe how complex networks are formed by interactions at many biological scales (i.e., molecules, genes, cells, tissues, organs, individuals and ecosystems), and that organisms integrate internal and external information to respond to environmental changes.
- Explain that biological structures exist at all levels of organization, from molecules to ecosystems, and the physical and chemical characteristics of a structure influence its function.
- Apply the scientific method and communicate scientific arguments, ideas, and results clearly and explicitly through writing and speech. Demonstrate a knowledge of the ethical considerations related to scientific research.
- Apply quantitative reasoning, mathematical, statistical, and/or informatics tools to explain, evaluate, and effectively interpret claims, theories, and assumptions in the biological sciences.

Departmental Honors

Undergraduate majors are eligible to graduate with honors in biology if they fulfill the following requirements:

1. Complete all course work required for the appropriate degree in biology.
2. Achieve a minimum grade-point average of 3.5 in the major.
3. Complete BIOL 499 Introduction to Honors Research with a grade of B or higher, or complete two credits total of BIOL 423 and/or BIOL 424 with a grade of B or higher
4. Complete BIOL 699 Biology Honors Research Colloquium with a grade of B or higher.
5. Complete an independent research project under the supervision of a faculty member in an area appropriate to the degree sought.
6. Submit an honors thesis to the honors committee once the research is complete and present the results of the completed research at the honors research symposium.

Specific guidelines and intent forms are available in the Undergraduate Biology Program office and online (http://www.kuub.ku.edu/). Candidates must declare their intent to graduate with honors at least 2 semesters before graduation.

Study Abroad

Consult an advisor at least 4 months before undertaking study abroad. Consult the Office of Study Abroad (http://www.studyabroad.ku.edu/), 108

Lippincott Hall, for information about study in one of the many countries (e.g., Scotland, Australia, Switzerland) with special arrangements with KU.