

# BACHELOR OF SCIENCE: BIOLOGY - CELLULAR AND MOLECULAR BASIS OF HEALTH AND DISEASE EMPHASIS

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**Not accepting students in the 23-24 academic year.**

## University Requirements

### General Education

UMKC Essentials is the university-wide curriculum that all undergraduate students will complete. The 30-credit hour program includes a First Year Experience course; three critical thinking courses in the areas of Arts & Humanities, Natural & Physical Sciences, and Social & Behavioral Sciences; a Culture and Diversity course; a Civic & Urban Engagement course; two courses in Written Composition and one course in Oral Communication; and a Math Pathway course. Transfer students entering UMKC will elect from the UMKC Essentials General Education Program or the Missouri Core 42 General Education Curriculum. Academic advisors will meet with incoming transfer students to determine which option best serves the student's educational needs. More information about General Education may be found here: <https://catalog.umkc.edu/undergraduate-academic-regulations-information/general-education-requirements/> (<http://catalog.umkc.edu/undergraduate-academic-regulations-information/general-education-requirements/>)

### Constitution Course

Every undergraduate student must take a course covering the United States Constitution and the Missouri State Constitution before graduation. Course options are included in the program requirements section below.

### Exit Examinations

Information on exit examinations is available in the Undergraduate Academic Regulations and Information (<http://catalog.umkc.edu/undergraduate-academic-regulations-information/graduation/exitexams/>) section of the catalog.

### Missouri Higher Education Civics Achievement Examination

In accordance with Missouri Senate Bill 807 (section 170.013.1), 'any student entering a public institution of higher education for the first time after July 2019 who is pursuing an associate's or bachelor's degree from such institution shall successfully pass an examination on the provisions and principles of American civics with a score of seventy percent or greater as a condition of graduation from such institution'. To satisfy this requirement at UMKC, students access the exam through the Canvas site. This requirement will be listed in the degree audit system as, 'Take State Mandated Missouri Higher Education Civics Achievement Examination', and listed on the transcript as 'Missouri Civics Examination'.

## Student Learning Outcomes

Students graduating from this program will:

- Identify fundamental concepts in the biological sciences, including the relationship between structure and function at all levels of biological organization, evolution and the role of natural selection in the process, ecological relationships between organisms and their environment.
- Describe cellular structure and explain the major biochemical processes that occur in cells.
- Describe and explain the mechanisms of heredity and the flow of genetic information.
- Apply knowledge in basic mathematics, chemistry, and physics to solve biological problems.
- Employ techniques and procedures commonly used in modern biology laboratories.
- Analyze and critically evaluate scientific data.
- Write clearly about topics in the biological sciences for a peer or professional audience.

Students interested in pursuing undergraduate degree programs offered by Biological Sciences are admitted through the UMKC Office of Admissions (<http://www.umkc.edu/admissions/>). Transfer or Readmitted students should contact the University admissions office and the School of Biological and Chemical Sciences for information about transfer admissions and evaluation of transfer coursework. Transfer admission eligibility includes an overall grade-point average of at least 2.0 for all college-level coursework attempted at previous institutions, an overall GPA of at least 2.0 in courses used to fulfill Biological Sciences major requirements, and a University of Missouri Biology GPA of at least 2.0.

## Program Requirements

This instructional program fully prepares individuals for admission to a professional school in medicine, including allopathic, osteopathic or podiatric medicine programs. By completing the requirements of the bachelor's of science in biology with the cellular and molecular basis of health and disease emphasis, students will complete all of the minimum prerequisites and the upper level biology electives which are highly recommended by most medical schools.

The courses selected provide a foundation of knowledge in modern cellular and molecular biology, essential for understanding medical science. The curriculum of general education and biology majors courses, combined with the mathematics, chemistry and physics components, provides the background essential to understanding the latest diagnostic and treatment technologies.

UMKC Essentials requirements are the same as for all students seeking a bachelor's degree in biology. Completion of the emphasis requirements will be noted on the UMKC transcript.

## UMKC Essentials

Code	Title	Credits
First Semester Experience Course (GEFSE)		3
Written Communication:		
ENGLISH 110	Introduction to Academic Prose	3
ENGLISH 225	English II: Intermediate Academic Prose	3
Oral Communication (choose one of the following):		3
COMM-ST 110	Fundamentals of Effective Speaking and Listening	
COMM-ST 140	Introduction to Communication	
COMM-ST 212	Argumentation And Debate (offered via dual credit only)	
COMM-ST 277	Interpersonal Communication	
Math Pathway (satisfied in major requirements below)		
Critical Thinking in Arts & Humanities (GECRT-AH)		3
Critical Thinking in Natural & Physical Sciences (GECRT-SC)		3
Critical Thinking in Social & Behavioral Sciences (GECRT-SS)		3
Culture & Diversity Course (GECDV)		3
Civic & Urban Engagement Course (GECUE)		3
<b>Total Credits</b>		<b>27</b>

## Constitution Course Requirement

Section 170.011.1 of the Missouri Revised Statutes, 2015, states that all candidates for a degree issued by a college or university in the state of Missouri must have "satisfactorily passed an examination on the provisions and principles of the Constitution of the United States and of the state of Missouri, and in American history and American institutions."

Courses at UMKC that satisfy this state requirement are:

Code	Title	Credits
Choose one of the following:		3
CJC 364	The Supreme Court And The Criminal Process	
HISTORY 101	U.S. History to 1877	
HISTORY 102	U.S. History Since 1877	
HONORS 230	Honors American Government	
POL-SCI 210	American Government	
<b>Total Credits</b>		<b>3</b>

There are a few other ways this requirement can be satisfied for students transferring to UMKC:

- Take an equivalent course from the list above at a regionally accredited institution.
- Earn credit for one of the above courses through AP, IB, or CLEP.
- Take a course that directly satisfies the Missouri Constitution Requirement at another Missouri institution.
- Have a previous bachelors degree (or higher) from a regionally accredited institution.
- Have an Associate of Arts degree from a regionally accredited institution.
- Complete the 42 Hour Core at a Missouri institution and have it listed on the official transcript.

## Major Requirements

### Biology course requirements

Core courses:

Code	Title	Credits
BIOLOGY 108L & BIOLOGY 108 or MOTRBIOL 100LB or MOTRBIOL 150LB	General Biology I Laboratory and General Biology I MOTR Essential Biology w/ Lab - Botany MOTR Biology with Lab	4
BIOLOGY 109L & BIOLOGY 109 or MOTRBIOL 100LZ or MOTRBIOL 150LZ	General Biology II Laboratory and General Biology II MOTR Essential Biology with Lab MOTR Biology w/Lab	4
BIOLOGY 202	Cell Biology	3
BIOLOGY 206	Genetics	3
BIOLOGY 441	Biochemistry	3
<b>Total Credits</b>		<b>17</b>

**Emphasis course requirements:**

Code	Title	Credits
BIOLOGY 313	Microbiology	3
BIOLOGY 313WL or BIOLOGY 313L	Laboratory in Microbiology Laboratory in Microbiology	3
BIOLOGY 316	Principles of Physiology	3
BIOLOGY 409	Developmental Biology	3
BIOLOGY 430	Molecular Biology and Genetic Engineering	3
BIOLOGY 435	Immunology	3
<b>Total Credits</b>		<b>18</b>

**Laboratory course requirements:**

Code	Title	Credits
Select one of the following:		2
BIOLOGY 218L or MOTRLIFS 100LA or MOTRLIFS 150LA	Introductory Anatomy Laboratory MOTR Anatomy focused Essentials in Human Biology with Lab MOTR Anatomy focused Human Biology w/Lab	
BIOLOGY 312WL	Laboratory in Developmental Biology, Genetics and Cell Biology	
BIOLOGY 328L or BIOLOGY 328WL	Laboratory in Histology and Cellular Ultrastructure Laboratory in Histology and Cellular Ultrastructure	
BIOLOGY 360L or BIOLOGY 360WL	Laboratory in Biochemistry and Molecular Biology Laboratory in Biochemistry and Molecular Biology	
<b>Total Credits</b>		<b>2</b>

**Biology Synthesis requirement:**

Code	Title	Credits
Select from the following to total three credit hours:		3
BIOLOGY 498WI	Critical Analysis of Biological Issues	
LIFE-SCI 497 or LIFE-SCI 497WI	Directed Studies—Biological Sciences Directed Studies—Biological Sciences	
LIFE-SCI 499 or LIFE-SCI 499WI	Undergraduate Research-Biological Sciences Undergraduate Research-Biological Sciences	
<b>Total Credits</b>		<b>3</b>

A total of 42 credit hours of biology courses must be completed with grades of C- or better. At least 26 of these must be at the 300- or 400-level. A minimum of 21 credit hours of biology courses must be taken from BIOLOGY or LIFE-SCI coursework at UMKC with one course designated as Writing Intensive (WI or WL). The UM Biology GPA must be at least 2.0.

Code	Title	Credits
Additional Majors Coursework		2

**Physical sciences and mathematics requirements**

All of the following courses are required. A grade of C- or better is required in each course used to fulfill these requirements.

Code	Title	Credits
CHEM 211 or MOTRCHEM 150	General Chemistry I MOTR Chemistry I	4
CHEM 211L	Experimental General Chemistry I	1
CHEM 212R	General Chemistry II	4
CHEM 212LR	Experimental General Chemistry II	1
CHEM 321	Organic Chemistry I	3
CHEM 321L	Organic Chemistry Laboratory I	1
CHEM 322R	Organic Chemistry II	3
CHEM 322L	Organic Chemistry Laboratory II	1
MATH 120	Precalculus (satisfies Math Pathway)	5
MATH 210	Calculus I	4
select one of the following:		3-4
BIOLOGY 304	Biostatistics 1	
MATH 220	Calculus II	
STAT 235 or STAT 115 or MOTRMATH 110	Elementary Statistics Statistical Reasoning MOTR Statistical Reasoning	
PHYSICS 210 or PHYSICS 240	General Physics I Physics For Scientists and Engineers I	4-5
PHYSICS 220 or PHYSICS 250	General Physics II Physics For Scientists and Engineers II	4-5
<b>Total Credits</b>		<b>38-41</b>

A minimum of 120 credit hours is required; and 36 of these must be at the 300- or 400-level. Electives may be taken from any area once other degree requirements have been met.

A maximum of 12 hours for a combination of 399, 497, and 499 coursework may be applied toward with major with only 4 credit hours at the 400-level.

Code	Title	Credits
<b>General Electives</b>		<b>10</b>

**Minimum GPA: 2.0** (*UM cumulative; UM Biology*)

**Total Credit Hours: 120**

## Tools for Planning and Fulfilling Academic Requirements

UMKC's Major Maps are detailed, semester by semester plans that lead a student to complete all degree requirements within four years. Plans include benchmarks and critical courses by term that assist a student's evaluation of progress and major "fit". In order to ensure that the appropriate courses are taken, students are encouraged to consult with the undergraduate advisor for this major. Please see the tab above to view the major map for this program.

UMKC's Transfer Guides (<https://www.umkc.edu/transfer/transfer-credit/transfer-guides.html>) provide detailed guidance on recommended transfer coursework, plans of study, transfer timelines, and transfer contact information. To ensure a seamless transfer experience, students are encouraged to work with both their community college advisor and a UMKC advisor when planning their coursework.

UMKC's PlanMyDegree 'Audit' (<https://www.umkc.edu/registrar/academic-programs/plan-my-degree.html>) degree audit system provides an individual evaluation of all degree requirements (General Education, Degree Specific, Major Specific, etc.) for students' officially recorded (Office of the Registrar) and "what if" exploratory plans of study. This evaluation is used to certify all graduation requirements.

UMKC's PlanMyDegree 'Plans' (<https://www.umkc.edu/registrar/academic-programs/plan-my-degree.html>) degree planning tool enables students to develop a personalized semester by semester plan of study towards completion of degree requirements for student's officially recorded (Office of the

Registrar) and “what if” exploratory plans of study. Update and edit your full plan to degree completion each term and confirm accuracy each semester with your Academic Advisor(s).

## Major Map

### Four Year Graduation Plan - Courses & Critical Benchmarks for First Time College Students:

UMKC's Major Maps are detailed, undergraduate four-year course outlines that inform students on the classes they should take and when to take them. Outlines are updated yearly. Graduate students should visit their program's individual school for program outlines.

The following is a sample course of study. Your path to graduation may vary based on factors such as college credit you earned while in high school, transfer work from other institutions of higher learning, and placement in Mathematics. You are responsible for checking prerequisites to any courses. It is the Student's responsibility to ensure that all program requirements are met. This guide is not a substitute for academic advisement.

#### First Year

Fall Semester	Credits	Spring Semester	Credits
BIOLOGY 108 & 108L (or BIOLOGY 109 & 109L) <sup>CC</sup>		4 BIOLOGY 109 & 109L (or BIOLOGY 108 & 108L) <sup>CC</sup>	4
CHEM 211 & 211L <sup>CC</sup>		5 CHEM 212R & CHEM 212LR <sup>CC</sup>	5
GEFSE 101		3 ENGLISH 110	3
GECRT-SC 101 or 102		3 MATH 120	5
		<b>15</b>	<b>17</b>

#### Second Year

Fall Semester	Credits	Spring Semester	Credits
BIOLOGY 202 or 206 <sup>CC</sup>		3 BIOLOGY 206 or 202 <sup>CC</sup>	3
CHEM 321 & 321L <sup>CC</sup>		4 CHEM 322R & CHEM 322L <sup>CC</sup>	4
MATH 210		4 MATH 220, STAT 235, or BIOLOGY 304	4
LIFE-SCI 201 (recommended Major Elective)		1 ENGLISH 225	3
COMM-ST 110, 277, or 140		3 GECRT-SS 101, 102, 104, 105, 106, 107, 108, or 111	3
		<b>15</b>	<b>17</b>

#### Third Year

Fall Semester	Credits	Spring Semester	Credits
BIOLOGY 441		3 BIOLOGY 430	3
BIOLOGY 313		3 BIOLOGY Laboratory Elective	2
BIOLOGY 313L or 313WL		3 PHYSICS 220 or 250	4
PHYSICS 210 or 240		4 LIFE-SCI 202 (recommended Major Elective)	1
GECRT-AH 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 112, or 113		3 GECDV 201, 202, 203, 204, 205, 206, 207, 208, 209, or 210	3
		<b>16</b>	<b>13</b>

#### Fourth Year

Fall Semester	Credits	Spring Semester	Credits
BIOLOGY 316		3 BIOLOGY 498WI, LIFE-SCI 497, or LIFE-SCI 499	3
BIOLOGY 409		3 BIOLOGY 435	3
GECUE 201, 203, 204, 205, or 272		3 HISTORY 101, 102, or POL-SCI 210	3

3XX/4XX General Elective	3 General Elective (3XX/4XX/WI Writing Intensive Course, if needed)	3
General Elective	3	
	15	12

**Total Credits: 120**

CC Critical Courses provide feedback regarding major fit and help indicate likelihood of successful completion of chosen academic program and degree.

## Recommendations to Maintain Progress toward 4-Year Degree Completion

- Completion of the First Semester Experience (FSE) course in first term.
- Early completion of Written Communication, Oral Communication, and Math Pathway requirements.
- Maintain the minimum GPA required for academic Good Standing for your degree program.
- Completion at least 15 credit hours toward degree each regular semester. (*Students may use the summer to ensure completion of 30 hours per academic year or to lighten Fall and Spring course loads.*)
- Enrollment in Critical Courses as listed on the Major Map is recommended in order to maintain timely progress and completion of prerequisite coursework.
- Regular consultation with Academic Advisor(s) for program(s) of study is strongly recommended and may be required for some degree programs..

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