BACHELOR OF SCIENCE: BIOLOGY - BIOINFORMATICS EMPHASIS

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.
- Differentiate among cellular structures and explain the major biochemical processes that occur in cells.
- 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.

Students interested in pursuing undergraduate degree programs offered by Division of Biological and Biomedical Systems 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 Division of Biological and Biomedical Systems 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 incorporates courses from biology, computer science and mathematics. Students will obtain skills for the analysis of complex data, extraction of information from genomic and proteomic databases, and the design and development of software and algorithms to support these activities.

The curriculum of UMKC Essentials and biology majors courses, combined with the mathematics, chemistry and physics components is designed to provide undergraduate students with a clear program for the undergraduate background needed for a career in bioinformatics or to provide them with a solid, biologically oriented curriculum to pursue graduate level research in this area.

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
Total Credits		27

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	
Total Credits		3

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

The following core courses:

Code	Title	Credits
BIOLOGY 108L & BIOLOGY 108	General Biology I Laboratory and General Biology I	4
or MOTRBIOL 100LB	MOTR Essential Biology w/ Lab - Botany	
or MOTRBIOL 150LB	MOTR Biology with Lab	
BIOLOGY 109L & BIOLOGY 109	General Biology II Laboratory and General Biology II	4

or MOTRBIOL 100LZ	MOTR Essential Biology with Lab	
or MOTRBIOL 150LZ	MOTR Biology w/Lab	
BIOLOGY 202	Cell Biology	3
BIOLOGY 206	Genetics	3
BIOLOGY 441	Biochemistry	3
Total Credits		17

Emphasis course requirements:

Code	Title	Credits
BIOLOGY 304	Biostatistics 1	3
BIOLOGY 404	Biostatistics 2	3
BIOLOGY 452	Bioinformatics	3
Two Upper-Level Biology Courses		6
Total Credits		15

Biology laboratory courses:

Biology Synthesis requirement:

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

The UM Biology GPA must be 2.0 or higher.

Code	Title	Credits
Additional Majors Coursework Options		**8**
BIOLOGY 115	First Year Seminar	
BIOLOGY 199L	Methods in Biological Research	
BIOLOGY 250	Careers in Biological & Chemical Sciences I	
or LIFE-SCI 201	Careers in Health I	
BIOLOGY 302	General Ecology	
BIOLOGY 303	Invertebrate Zoology	
BIOLOGY 305	Marine and Freshwater Biology	
BIOLOGY 308	Vertebrate Zoology	
BIOLOGY 310	Herpetology	
BIOLOGY 314	Entomology	
BIOLOGY 319	Global Health: New and Emerging Infectious Diseases	
BIOLOGY 322	General Parasitology	
BIOLOGY 326	Biological Conservation	
BIOLOGY 327	Biogeography and Biodiversity	
BIOLOGY 328	Histology	
BIOLOGY 329	Endocrinology	
BIOLOGY 346	Plant Biology	
BIOLOGY 350	Assisting Undergraduate Learning in Biology	
BIOLOGY 385	Special Topics	
BIOLOGY 397	Experience Based Education	
BIOLOGY 405	Introduction to Evolution	
BIOLOGY 409	Developmental Biology	

BIOLOGY 431	Virology	
BIOLOGY 442	Neurobiology	
BIOLOGY 445	Evolutionary Ecology	
Total Credits		8

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	General Chemistry I	4
or MOTRCHEM 150	MOTR Chemistry I	
CHEM 211L	Experimental General Chemistry I	1
CHEM 212R	General Chemistry II	4
CHEM 212LR	Experimental General Chemistry II	1
CHEM 320	Elementary Organic Chemistry	4
CHEM 320L	Experimental Organic Chemistry	1
COMP-SCI 101	Problem Solving and Programming I	3
COMP-SCI 101L	Problem Solving & Programming I Lab	1
MATH 120	Precalculus (satisfies Math Pathway)	5
MATH 210	Calculus I	4
MATH 220	Calculus II	4
Total Credits		32

Students may choose one of the following tracks:

Statistics track:

Code	Title	Credits
STAT 436	Introduction To Mathematical Statistics I	3
STAT 441	Introduction To Mathematical Statistics II	3
STAT 400	Machine Learning and Statistical Modeling	3
or STAT 415	Statistical Design of Experiments	
or STAT 451	Applied Statistical Analysis	

Computer Science track:

Code	Title	Credits
COMP-SCI 191	Discrete Structures I	3
COMP-SCI 201R	Problem Solving and Programming II	3
COMP-SCI 201L	Problem Solving and Programming II - Lab	1
COMP-SCI 303	Data Structures	3
Two Upper-Level COMP-SCI Courses		6

A minimum of 120 credit hours is required; and 36 of these must be at the junior/senior 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.

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/admissions/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)[CC]	4	BIOLOGY 109 & 109L (or BIOLOGY 108 & 108L)[CC]	4
CHEM 211 & 211L[CC]	5	CHEM 212R & CHEM 212LR (or CHEM 211 & 211L)[CC]	5
GEFSE 101	3	ENGLISH 110	3
GECRT-SC 101 or 102	3	MATH 110 (or MATH 120 (5cr))	3
	15		15

Second Year

Fall Semester	Credits	Spring Semester	Credits
BIOLOGY 202 or 206[CC]	3	BIOLOGY 206 or 202[CC]	3
BIOLOGY 304 (or CHEM 212R & CHEM 212LR if not yet completed)	3	CHEM 320 & 320L[CC]	5
BIOLOGY 250 (recommended elective)	1	COMM-ST 110, 140, or 277	3
ENGLISH 225	3	GECDV 201, 202, 203, 204, 205, 206, 207, 208, 209, or 210	3
GECRT-AH 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 112, or 113	3		
BIOLOGY 199L	2		
	15		14

Third Year

Fall Semester	Credits	Spring Semester	Credits
BIOLOGY 441	3	BIOLOGY 370L	3
BIOLOGY 306	3	Track elective	3
Track elective	3	HISTORY 101, 102, or POL-SCI 210	3
Track elective	3	GECUE 201, 203, 204, 205, or 272	3

GECRT-SS 101, 102, 104, 105, 106, 107, 108, or 111	3	Track Elective	3
	15		15

Fourth Year

Fall Semester	Credits	Spring Semester	Credits
COMP-SCI 101 & 101L	4	LIFE-SCI 499	3
CHEM 341WI	4	Track elective	3
Track Elective	3	Track elective	3
Track Elective	3	General Elective	3
General Elective	3	General Elective	3
	17		15

Total Credits: 121

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..

Roo Advising (http://catalog.umkc.edu/roo-advising/)

Email: rooadvising@umkc.edu

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