

# BACHELOR OF SCIENCE: BIOLOGY - BIOMEDICAL SCIENCES EMPHASIS

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## 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

The B.S. Biology, Biomedical Sciences Emphasis is designed to prepare highly motivated students for entrance into medical school, dental school, physician assistant programs, anesthesia assistant programs, and other graduate or professional programs in the life and health sciences. Entrance into the emphasis is competitive. Students seeking the B.S. in Biology may apply for admission to the Biomedical Sciences Emphasis during the Spring semester of their sophomore year. Please contact the Undergraduate Programs Office in Biological Sciences at (816) 235-2580 for more information.

## 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

In addition to the UMKC Essentials requirements, students pursuing the B.S. Biology, Biomedical Sciences Emphasis must meet the following requirements:

**Biology course requirements.** The following core courses (17 credit hours)

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

|   |  |           |
|---|--|-----------|
| BIOLOGY 109L<br>& BIOLOGY 109<br>or MOTRBIOL 100LZ<br>or MOTRBIOL 150LZ | General Biology II Laboratory<br>and General Biology II<br>MOTR Essential Biology with Lab<br>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**

| <b>Code</b>  | <b>Title</b>   | <b>Credits</b> |
|--|--|----------------|
| BIOLOGY 218  | Introductory Anatomy   | 3              |
| BIOLOGY 218L<br>or MOTRLIFS 100LA<br>or MOTRLIFS 150LA | Introductory Anatomy Laboratory<br>MOTR Anatomy focused Essentials in Human Biology with Lab<br>MOTR Anatomy focused Human Biology w/Lab | 2              |
| BIOLOGY 313  | Microbiology   | 3              |
| BIOLOGY 313L   | Laboratory in Microbiology   | 3              |
| BIOLOGY 316  | Principles of Physiology   | 3              |
| LIFE-SCI 201   | Careers in Health I  | 1              |
| LIFE-SCI 202   | Careers in Health II   | 1              |
| LIFE-SCI 310   | Fundamentals of Medicine I   | 2              |
| LIFE-SCI 320   | Fundamentals of Medicine II  | 2              |
| LIFE-SCI 330   | Fundamentals of Medicine III   | 2              |
| LIFE-SCI 340   | Fundamentals of Medicine IV  | 2              |
| MEDICINE 9115<br>or HLSC 125<br>or NURSE 125           | Medical Terminology<br>Medical Terminology<br>Medical Terminology  | 1              |
| <b>Total Credits</b>                                   |  | <b>25</b>      |

**Biology Synthesis requirement** (Choose a total of 3 credit hours)

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

**Physical Sciences and Mathematics Course Requirements.** The following courses must be completed with grades of C- or better.

| <b>Code</b>                 | <b>Title</b>                            | <b>Credits</b> |
|-----------------------------|---|----------------|
| CHEM 211<br>or MOTRCHEM 150 | General Chemistry I<br>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              |

|   |  |           |
|---|--|-----------|
| MATH 220<br>or BIOLOGY 304<br>or STAT 235<br>or STAT 115<br>or MOTRMATH 110 | Calculus II<br>Biostatistics 1<br>Elementary Statistics<br>Statistical Reasoning<br>MOTR Statistical Reasoning | 4         |
| PHYSICS 210<br>or PHYSICS 240   | General Physics I<br>Physics For Scientists and Engineers I  | 4         |
| PHYSICS 220<br>or PHYSICS 250   | General Physics II<br>Physics For Scientists and Engineers II  | 4         |
| <b>Total Credits</b>  |  | <b>39</b> |

Students must complete additional biology majors coursework for a total of 42 credit hours of biology courses with grades of C- or better. 26 of these hours must be 300- or 400-level. A minimum of 21 credit hours of biology courses must be taken from BIOLOGY or LIFE-SCI coursework at UMKC. The UM Biology GPA Must be at least 2.0.

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.

| Code                     | Title | Credits  |
|--------------------------|-------|----------|
| <b>General Electives</b> |       | <b>6</b> |

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 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**

| <b>Fall Semester</b>  | <b>Credits</b> | <b>Spring Semester</b>  | <b>Credits</b> |
|---|----------------|---|----------------|
| BIOLOGY 108<br>& 108L (or BIOLOGY 109 & 109L) <sup>CC</sup> |                | 4 BIOLOGY 109<br>& 109L (or BIOLOGY 108 & 108L) <sup>CC</sup> | 4              |
| CHEM 211<br>& 211L <sup>CC</sup>                            |                | 5 CHEM 212R<br>& CHEM 212LR <sup>CC</sup>                     | 5              |
| GEFSE 101   |                | 3 ENGLISH 110   | 3              |
| GECRT-SC 101, 102, or 103                                   |                | 3 MATH 120  | 5              |
|   |                | <b>15</b>   | <b>17</b>      |

**Second Year**

| <b>Fall Semester</b>             | <b>Credits</b> | <b>Spring Semester</b>                   | <b>Credits</b> |
|----------------------------------|----------------|--|----------------|
| BIOLOGY 202 or 206 <sup>CC</sup> |                | 3 BIOLOGY 206 or 202 <sup>CC</sup>       | 3              |
| CHEM 321<br>& 321L <sup>CC</sup> |                | 4 CHEM 322R<br>& CHEM 322L <sup>CC</sup> | 4              |
| MATH 210                         |                | 4 MATH 220, STAT 235, or BIOLOGY<br>304  | 4              |
| ENGLISH 225                      |                | 3 COMM-ST 110, 140, or 277               | 3              |
|                                  |                | GECRT-SS 101                             | 3              |
|                                  |                | <b>14</b>                                | <b>17</b>      |

**Third Year**

| <b>Fall Semester</b>  | <b>Credits</b> | <b>Spring Semester</b>  | <b>Credits</b> |
|---|----------------|---|----------------|
| BIOLOGY 218   |                | 3 BIOLOGY 441   | 3              |
| BIOLOGY 218L  |                | 2 LIFE-SCI 202  | 1              |
| LIFE-SCI 201  |                | 1 LIFE-SCI 320  | 2              |
| LIFE-SCI 310  |                | 2 MEDICINE 9115 or HLSC 125   | 1              |
| PHYSICS 210 or 240  |                | 4 PHYSICS 220 or 250  | 4              |
| GECRT-AH 101, 102, 103, 104, 105,<br>106, 107, 108, 109, 110, 112, 113, or<br>114 |                | 3 GECDV 201, 202, 203, 204, 205, 206,<br>207, 208, 209, 210, or 211 | 3              |
|   |                | <b>15</b>   | <b>14</b>      |

**Fourth Year**

| <b>Fall Semester</b>                     | <b>Credits</b> | <b>Spring Semester</b>                            | <b>Credits</b> |
|--|----------------|---|----------------|
| BIOLOGY 313                              |                | 3 BIOLOGY 498WI, LIFE-SCI 497, or<br>LIFE-SCI 499 | 3              |
| BIOLOGY 313L or 313WL                    |                | 3 LIFE-SCI 340                                    | 2              |
| BIOLOGY 316                              |                | 3 3XX/4XX General Elective                        | 3              |
| LIFE-SCI 330                             |                | 2 3XX/4XX General Elective                        | 3              |
| GECUE 201, 203, 204, 205, 206, or<br>272 |                | 3 HISTORY 101, 102, or POL-SCI 210                | 3              |
|  |                | <b>14</b>   | <b>14</b>      |

**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..

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

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