

# BACHELOR OF SCIENCE: PHYSICS - ASTRONOMY 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:

- Have a functional knowledge of the basic areas of astronomy, astrophysics, and physics.
- Be able to integrate their knowledge with critical thinking skills in order to become quantitative problem solvers.
- Be able to clearly articulate scientific information, both orally and in writing.
- Be able to effectively use the scientific literature.

## Description of the Bachelor of Science Program with an Emphasis in Astronomy

The Bachelor of Science (BS) degree in Physics with an Emphasis in Astronomy is recommended for students that are seeking to continue their academic careers in graduate school or for those that are interested in seeking career employment in industrial, governmental, or private organizations that require a strong scientific background.

Astronomy advising questions should be directed to Professor Daniel McIntosh ([McIntoshDH@umkc.edu](mailto:McIntoshDH@umkc.edu)).

Students graduating with a BS degree in Physics with an Emphasis in Astronomy will be prepared for entry into graduate programs or the job market for career employment.

## Program Requirements

### 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 (GECDDV)	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:		
CJC 364	The Supreme Court And The Criminal Process	3
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

Students must successfully complete the major requirements below with at least 12 hours of the noted upper division (300+) course requirements completed at UMKC.

Code	Title	Credits
ASTR/PHYSICS 353	Practical Astronomy	3
ASTR/PHYSICS 355	Stellar Astrophysics	3
ASTR/PHYSICS 356	Galaxies	3
ASTR/PHYSICS 465	Cosmology	3
COMP-SCI 101	Problem Solving and Programming I	3
CHEM 211 & 211L	General Chemistry I and Experimental General Chemistry I	5
MATH 120	Precalculus	5
MATH 210	Calculus I	4
MATH 220	Calculus II	4
MATH 250	Calculus III	4
PHYSICS 240 & PHYSICS 250	Physics For Scientists and Engineers I and Physics For Scientists and Engineers II	10
PHYSICS 310 & PHYSICS 311	Mechanics I and Mechanics II	6
PHYSICS 330	Methods Of Theoretical Physics I	3

PHYSICS 350	Modern Physics With Engineering Applications	3
PHYSICS 410	Thermal Physics	3
PHYSICS 460 & PHYSICS 461	Electricity And Magnetism I and Electricity And Magnetism II	6
PHYSICS 472	Introduction To Quantum Mechanics	3
PHYSICS 476LW or PHYSICS 395L	Advanced Laboratory Computer Interfacing Laboratory	3
<b>Total Credits</b>		<b>74</b>

## Math and Science Requirements

The Bachelor of Science degree requires a minimum of 60 hours in math and science coursework. The number of credit hours needed to meet this minimum requirement are listed below.

Code	Title	Credits
<b>Additional Math/Science Coursework (Satisfied in program requirements above)</b>		

## General Electives

Students must take elective credit hours to meet the minimum credit hour requirement for their degree, including at least 36 credit hours of coursework at the 300-level or above. The minimum required by the university is 120 credit hours, of which at least 30 credit hours must be taken at UMKC, but some degree programs require more.

Code	Title	Credits
<b>General Electives</b>		<b>16</b>

**Minimum GPA: 2.0**

**Total Credit Hours: 120**

## Formulating a Plan of Study

In order to ensure that the appropriate courses are taken, students are encouraged to consult with the undergraduate advisor for astronomy (Professor Dan McIntosh, [mcintoshdh@umkc.edu](mailto:mcintoshdh@umkc.edu)) before beginning the major.

## 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
MATH 210 <sup>CC</sup>		4 MATH 220 <sup>CC</sup>	4
GEFSE 101		3 PHYSICS 240 <sup>CC</sup>	5
ENGLISH 110		3 ENGLISH 225	3
COMM-ST 110, 140, or 277		3 GECRT-AH 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 112, 113, or 114	3
GECRT-SC 101, 102, or 103		3	
		<b>16</b>	<b>15</b>

**Second Year**

Fall Semester	Credits	Spring Semester	Credits
MATH 250 <sup>CC</sup>		4 PHYSICS 350 <sup>CC</sup>	3
PHYSICS 250 <sup>CC</sup>		5 COMP-SCI 101 <sup>CC</sup>	3
CHEM 211 & 211L <sup>CC</sup>		5 ASTR 353 or PHYSICS 410	3
		GECRT-SS 101, 102, 104, 105, 106, 107, 108, or 111	3
		General Elective (ASTR 150 or 155 recommended)	3
		<b>14</b>	<b>15</b>

**Third Year**

Fall Semester	Credits	Spring Semester	Credits
PHYSICS 310		3 PHYSICS 311	3
PHYSICS 330		3 ASTR 353 or PHYSICS 410	3
ASTR 355 or 356		3 GECUE 201, 203, 204, 205, 206, or 272	3
GECDV 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, or 211		3 General Elective (ASTR 150 or 155 recommended)	3
HISTORY 101, 102, or POL-SCI 210		3 General Elective	3
		<b>15</b>	<b>15</b>

**Fourth Year**

Fall Semester	Credits	Spring Semester	Credits
ASTR 355 or 356		3 ASTR 465	3
PHYSICS 460		3 PHYSICS 461	3
PHYSICS 472		3 General Elective	3
PHYSICS 476LW or 395L		3 General Elective	3
General Elective		3 General Elective	3
		<b>15</b>	<b>15</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.
- Early and continuous enrollment in Foreign Language through completion of level required for degree program is recommended. (*The Foreign Language placement exam is highly recommended to ensure placement in the correct course level.*)
- 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](mailto:rooadvising@umkc.edu)

Phone: 816-235-1148