

# Bachelor of Arts in Astronomy

## Why study physics and astronomy?

Our goal is to understand the physical universe. The questions addressed by our department's research and education missions range from the applied, such as an improved understanding of the materials that can be used for solar cell energy production, to foundational questions about the nature of mass and space and how the Universe was formed and subsequently evolved, and how astrophysical phenomena affected the Earth and its evolution. We study the properties of systems ranging in size from smaller than an atom to larger than a galaxy on timescales ranging from billionths of a second to the age of the universe. Our courses and laboratory/research experiences help students hone their problem solving and analytical skills and thereby become broadly trained critical thinkers. While about half of our majors move on to graduate studies in STEM, many find employment in the private sector in diverse situations ranging from financial analysts to physicians. Graduates of all our degree programs can be found in key positions regionally, nationally, and internationally. In this way, our department is at the forefront of telling the academic story of the University of Kansas to people around the state and around the world.

## Undergraduate programs in astronomy

Astronomy degrees are offered through the Department of Physics and Astronomy. The astronomy curriculum offers undergraduates a survey of modern astronomy and an introduction to physical science, gives science and engineering students an introduction to astronomy and astrophysics, and prepares students majoring in astronomy for graduate study in astronomy or related fields.

## Courses for Nonmajors

ASTR 191 surveys a wide range of contemporary astronomy topics while ASTR 293 discusses a shorter list of astrophysically extreme objects in greater detail; both courses require eligibility for MATH 101. ASTR 394 is open to students with previous coursework in astronomy, biology, or geology; ASTR 391 offers an introduction to physical astronomy at a calculus-based level.

## Undergraduate Admission

### Admission to KU

All students applying for admission must send high school and college transcripts to the Office of Admissions. Unless they are college transfer students with at least 24 hours of credit, prospective students must send ACT or SAT scores 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 Admissions (<http://credittransfer.ku.edu/>) website.

## Admission to the College of Liberal Arts and Sciences

Admission to the College is a different process from admission to a major field. Some CLAS departments have admission requirements. See individual department/program sections for departmental admission requirements.

## Advising

Students considering a major in astronomy should confer early with a departmental representative about the selection of courses. The B.A. degree is appropriate for students who want a general education in astronomy as part of a broadly structured liberal education. The B.S. is a more specialized program with a substantial emphasis on physics content as well as astronomy. It provides preparation for a professional career or graduate work in astronomy, astrophysics, or related fields. A total of 120 credit hours is required for graduation.

## First- and Second-Year Preparation

All major programs in physics and astronomy share requirements in basic physics and mathematics including PHSX 150, a seminar course for majors. Completion of MATH 125 and MATH 126 in the first year allows students to start calculus-based physics foundation courses (PHSX 211 and PHSX 216 or PHSX 213, followed by PHSX 212 and PHSX 236 or PHSX 214) by the second semester. Majors are encouraged to take PHSX 213 and PHSX 214, the honors versions of PHSX 211 and PHSX 212. Students should take these courses and ASTR 391 in their first two years. B.S. astronomy majors normally complete additional course work in mathematics (M (<http://catalog.ku.edu/search/?P=MATH+127>)ATH 127, MATH 290, and MATH 320), as well as PHSX 313 and PHSX 316, in the second year.

## Requirements for the B.A. Major in Astronomy

All students pursuing the Bachelor of Arts in Astronomy must complete the KU Core requirements and the College BA specific requirements, listed in the KU Core and College sections of the catalog.

Code	Title	Hours
<b>Additional general science requirements</b>		
Majors must complete courses as specified in each of the following areas. Majors are advised to take honors courses when eligible. These hours do not contribute to the minimum number of hours required for the major.		
Calculus I. Satisfied by one of the following:		
Or equivalent		
MATH 125	Calculus I	4
	or MATH 145	Calculus I, Honors
Calculus II. Satisfied by one of the following:		
Or equivalent		
MATH 126	Calculus II	4
	or MATH 146	Calculus II, Honors
Seminar in Physics, Astronomy, & Engineering Physics. Satisfied by the following:		
PHSX 150	Seminar in Physics, Astronomy and Engineering Physics	0.5
General Physics I. Satisfied by one of the following:		

PHSX 211 & PHSX 216	General Physics I and General Physics I Laboratory	5
PHSX 213	General Physics I Honors	5
General Physics II. Satisfied by one of the following:		
PHSX 212 & PHSX 236	General Physics II and General Physics II Laboratory	4
PHSX 214	General Physics II Honors	4
Foundations of Chemistry I. Satisfied by one of the following:		
CHEM 130	General Chemistry I	5
or CHEM 150	Chemistry for Engineers	
or CHEM 170	Chemistry for the Chemical Sciences I	
or CHEM 190 & CHEM 191	Foundations of Chemistry I, Honors and Foundations of Chemistry I Laboratory, Honors	

**Astronomy Major Requirements**

Majors must complete each of the four following courses:

ASTR 391	Physical Astronomy, Honors	3
ASTR 591	Stellar Astronomy	3
ASTR 596	Observational Astrophysics	3
ASTR 592	Galactic and Extragalactic Astronomy	3

**Additional astronomy, astrophysics, or physics courses required for major**

In addition to the above specifically required courses, Astronomy BA candidates must complete at least 4 additional credits in physics or astronomy at the 300+ level. Students may enroll in ASTR 390 for undergraduate problems for 1 or more credit hours and in ASTR 503 (ASTR 501 honors) for research credit. ASTR 394 is highly recommended. Other recommended courses include ASTR 691 and 692, PHSX 594, GEOL 572, PHSX 313/316 and other PHSX courses 500 and above; most of these course have pre-requisites that may require additional preparation in mathematics and/or physics.

**Major Hours & Major GPA**

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

**Major Hours**

Satisfied by 25.5 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 (300+) Hours**

Satisfied by a minimum of 16 hours from junior/senior courses (300+) in the major.

**Major Junior/Senior (300+) 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://degreeprogress.ku.edu/node/2/>).

Below is a sample 4-year plan for students pursuing the BA in Astronomy. To view the list of courses approved to fulfill KU Core Goals, please visit the KU Core website (<http://kucore.ku.edu/courses/>).

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

<b>Freshman</b>		
<b>Fall</b>	<b>Hours Spring</b>	<b>Hours</b>
ENGL 101 (Goal 2.1 Written Communication/BA Writing I) <sup>1</sup>	3 ENGL 102 (Goal 2.1 Written Communication/BA Writing II)	3
Goal 1.1 Critical Thinking	3 Goal 2.2 Communication	3
CHEM 130 or 190 (Goal 3 Natural Science, BA Lab, Major Pre-requisite) <sup>2</sup>	5 MATH 126 (Major Pre-requisite)	4
MATH 125 (Major Pre-requisite)	4 PHSX 211 & PHSX 216 (Major Requirement), or	5
PHSX 150 (Major Requirement)	0.5 PHSX 213	
	Second Area of Study/ Elective/Degree/Junior-Senior Hours <sup>5</sup>	3
	<b>15.5</b>	<b>18</b>

<b>Sophomore</b>		
<b>Fall</b>	<b>Hours Spring</b>	<b>Hours</b>
Goal 3 Arts and Humanities	3 ASTR 391 (Major Requirement SPRING ONLY)	3
PHSX 212 & PHSX 236 (Major Requirement), or	4 Goal 3 Social Science	3
PHSX 214	2nd Semester Language (BA Second Language)	5
1st Semester Language (BA Second Language)	5 Second Area of Study/ Elective/Degree/Junior-Senior Hours <sup>5</sup>	3
Second Area of Study/ Elective/Degree/Junior-Senior Hours <sup>5</sup>	3	
	<b>15</b>	<b>14</b>

<b>Junior</b>		
<b>Fall</b>	<b>Hours Spring</b>	<b>Hours</b>
ASTR 591 (Major Requirement) <sup>4</sup>	3 ASTR 592 (Major Requirement) <sup>4</sup>	3
ASTR Elective (Major Requirement) <sup>3,4</sup>	3 Goal 5 Social Responsibility & Ethics	3
Goal 4.1 US Diversity	3 4th Semester Language, or 1st semester of Another Language (BA Second Language) <sup>6</sup>	3
3rd Semester Language (BA Second Language)	3 Second Area of Study/ Elective/Degree/Junior-Senior Hours <sup>5</sup>	3
Second Area of Study/ Elective/Degree/Junior-Senior Hours <sup>5</sup>	3 Second Area of Study/ Elective/Degree/Junior-Senior Hours <sup>5</sup>	1
	<b>15</b>	<b>13</b>

Senior Fall	Hours Spring	Hours
ASTR 596 (Major Requirement) <sup>4</sup>	3 PHSX 503 (Major Requirement, Goal 6 Integration & Creativity) <sup>4</sup>	3
ASTR Elective (Major Requirement) <sup>3,4</sup>	3 Elective or possible minor course 300+ (Total Hours)	3
Goal 4.2 Global Awareness	3 Elective or possible minor course 300+ (Total Hours)	3
Second Area of Study/ Elective/Degree/Junior-Senior Hours	3 Elective or possible minor course 300+ (Total Hours)	3
Second Area of Study/ Elective/Degree/Junior-Senior Hours	3 Elective or possible minor course 300+ (Total Hours)	3
	<b>15</b>	<b>15</b>

**Total Hours 120.5**

- <sup>1</sup> The BA requires completion of two courses of collegiate-level writing instruction. Students who test out of Composition will still need to complete ENGL 102 (or equivalent) and one additional Goal 2.1 course.
- <sup>2</sup> CHEM 130 requires MATH 115 eligibility for enrollment.
- <sup>3</sup> Majors are required to complete a minimum of 5 hours of 300+ level electives in Physics or Astronomy.
- <sup>4</sup> Course Timing is interchangeable between Junior and Senior years and is dependent on course offering/availability. ASTR 591 is taught in fall semesters of odd-numbered years and ASTR 592 is taught in spring semesters of even-numbered years.
- <sup>5</sup> Hour requirements (incl. 45 jr/sr hrs) are typically met through KU core, 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.
- <sup>6</sup> For students completing the language requirement via the 3+1 language option, note that many first semester languages are 5 credit hours.

Please note:

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.

The same course cannot be used to fulfill more than one KU Core Goal. However, overlap of a KU Core course with a major or degree-specific requirement is allowed. Overlapping is recommended to allow more opportunities to explore other majors and/or minors.

## Departmental Honors in Physics and Astronomy

Qualified students earning either a B.A. or a B.S. degree in the College of Liberal Arts and Sciences with a major in astronomy or physics may graduate with Honors in Physics & Astronomy by fulfilling the following requirements: (1) By the end of the candidate's final semester, achieve a GPA of 3.5 in the major, in all courses taken in residence and elsewhere; and (2) Complete at least 24 semester hours of astronomy and physics courses numbered 500 or above, including undergraduate research represented by two hours of credit in ASTR 503, PHSX 501 or PHSX 503.

A grade of B or better must be earned in one of the following: ASTR 503, PHSX 501 or PHSX 503. All of our department's honors requirements include student research, for which results shall be presented in either: (1) a written research summary, read by 3 faculty members in physics and astronomy or related fields or authorship on a peer-reviewed manuscript; or (2) a research-based oral presentation at an appropriate venue (e.g., Undergraduate Research symposium, a presentation in an advanced department seminar class, a discipline specific meeting); or (3) presentation of a poster at an appropriate venue. Students planning to graduate with honors in physics and astronomy must file a Declaration of Intent Form with the Departmental Honors Coordinator, preferably during their junior year but no later than enrollment for the final undergraduate semester.