Bachelor of Science 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/PHSX 216 and PHSX 212 /PHSX 236. Students should take these courses and ASTR 391 in their first two years. B.S. astronomy majors normally complete additional course work in mathematics (MATH 127, MATH 290, and MATH 320), as well as PHSX 313 and PHSX 316, in the second year.

Requirements for the B.S. Degree in Astronomy

All students pursuing the Bachelor of Science in Astronomy must complete the KU Core requirements in addition to the degree and major requirements. For details regarding the KU Core requirements, please see the KU Core section of the catalog.

Code	Title	Hours
General science requirements		
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.		
Computing and Programming. Satisfied by one of the following:		
EECS 138	Introduction to Computing: _____	3-4
or EECS 168	Programming I	
or EECS 169	Programming I: Honors	
Calculus I. Satisfied by one of the following:		
MATH 125	Calculus I	4
or MATH 145	Calculus I, Honors	
Calculus II. Satisfied by one of the following:		
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:		5
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:		4
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	
Advanced Mathematics Core Knowledge and Skills		
Vector Calculus. Satisfied by the following:		
MATH 127	Calculus III	4
or MATH 147	Calculus III, Honors	
Elementary Linear Algebra. Satisfied by the following:		
MATH 290	Elementary Linear Algebra	2
or MATH 291	Elementary Linear Algebra, Honors	
Elementary Differential Equations. Satisfied by the following:		
MATH 320	Elementary Differential Equations	3
or MATH 220	Applied Differential Equations	
or MATH 221	Applied Differential Equations, Honors	
Math Elective. Satisfied by one of the following:		3
PHSX 518	Mathematical Physics	
PHSX 718	Mathematical Methods in Physical Sciences	
MATH 526	Applied Mathematical Statistics I	
MATH 530	Mathematical Models	
MATH 558	Introductory Modern Algebra	
MATH 581	Numerical Methods	
MATH 590	Linear Algebra	
MATH 628	Mathematical Theory of Statistics	
MATH 646	Complex Variable and Applications	
MATH 647	Applied Partial Differential Equations	
MATH 648	Calculus of Variations and Integral Equations	
MATH 660	Geometry I	
MATH 661	Geometry II	
any 700-level MATH lecture course.		
Astronomy Requirements for Major		
Majors must complete the following seven courses:		
ASTR 391	Physical Astronomy, Honors	3
ASTR 591	Stellar Astronomy	3
ASTR 592	Galactic and Extragalactic Astronomy	3
ASTR 596	Observational Astrophysics	2
ASTR 691	Astrophysics I	3
ASTR 692	Astrophysics II	3
ASTR 503	Undergraduate Research	1-4
Physics Core Knowledge and Skills		
Majors must complete courses as indicated in the following areas:		
General Physics III. Satisfied by the following:		
PHSX 313	General Physics III	3
Intermediate Physics Lab. Satisfied by the following:		
PHSX 316	Intermediate Physics Laboratory I	1
Introductory Quantum Mechanics. Satisfied by the following:		
PHSX 511	Introductory Quantum Mechanics	3
Physical Measurements or Electronic Circuit Measurement and Design. Satisfied by one of the following:		
PHSX 516	Physical Measurements	4
PHSX 536	Electronic Circuit Measurement and Design	4
Mechanics I. Satisfied by the following:		
PHSX 521	Mechanics I	3
Electricity and Magnetism. Satisfied by the following:		
PHSX 531	Electricity and Magnetism	3
Thermal Physics. Satisfied by the following:		
PHSX 671	Thermal Physics	3
Physics Elective. Satisfied by any PHSX lecture or laboratory course numbered 500 or higher (PHSX 693 recommended) (with the exception of PHSX 594), including:		3
ASTR 792	Topics in Advanced Astrophyics	
ASTR 795	Space Plasma Physics	
or PHSX 795	Space Plasma Physics	
PHSX 693	Gravitation and Cosmology (recommended)	

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 30 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 12 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 (http://clas.ku.edu/undergrad/tools/gpa/).

Below is a sample 4-year plan for students pursuing the BS 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 its equivalent, prior to the freshman year, fall semester.

Freshman

Fall	Hours	Spring	Hours
MATH 125 (Goal 1.2 Quantitative Literacy, Major Requirement)	4	ASTR 391 (Major Requirement SPRING ONLY)	3
PHSX 150 (Major Requirement)[4]	0.5	MATH 126 (Major Requirement)	4

CHEM 130 or 170 (Goal 3 Natural Science, Major Requirement)	5	PHSX 211 & PHSX 216 (Goal 1.1 Critical Thinking, Major Requirement)[5]	5
Goal 2.1 Written Communication (1 of 2)	3	EECS 138 or 168 (Major Requirement)	3-4
Goal 3 Social Science	3		
	15.5		**15-16**

Sophomore

Fall	Hours	Spring	Hours
ASTR 591 (Major Requirement)[2,4]	3	ASTR 592 (Major Requirement)[3,4]	3
PHSX 212 & PHSX 236 (Goal 3 Natural Science, Major Requirement)[6]	4	PHSX 313 (Goal 3 Natural Science, Major Requirement)	3
MATH 127 (Pre-requisite for Major Requirement)	4	PHSX 316 (Major Requirement)	1
MATH 290 (Major Requirement)	2	MATH 320 (Major Requirement)	3
Goal 2.1 Written Communication (2 of 2)	3	Goal 3 Arts and Humanities	3
		ASTR 503 (Major Requirement)	3
	16		**16**

Junior

Fall	Hours	Spring	Hours
ASTR 596 (Goal 6 Integration & Creativity, Major Requirement)[3,4]	3	ASTR 692 (Major Requirement)[3,4]	3
ASTR 691 (Major Requirement)[4]	3	PHSX 611 (Major Requirement)[4]	3
PHSX 521 (Major Requirement)[4]	3	PHSX 616 or 536 (Major Requirement)	4
PHSX Math Elective 300+ (Major Requirement)[1]	3	Goal 4.1 US Diversity	3
Goal 2.2 Communication	3		
	15		**13**

Senior

Fall	Hours	Spring	Hours
PHSX 531 (Major Requirement)[4]	3	ASTR Elective	3
PHSX 671 (Major Requirement)[4]	3	PHSX Elective 500+ (Major Requirement)[1]	3
Goal 4.2 Global Awareness	3	Goal 5 Social Responsibility and Ethics	3
ASTR Elective	3	Second Area of Study/ Elective/Degree/Junior-Senior Hours[7]	3
ASTR Elective	3	Second Area of Study/ Elective/Degree/Junior-Senior Hours[7]	3
	15		**15**

Total Hours 120.5-121.5

1 Refer to the Degree Requirements tab for a list of courses that can fulfill this major requirement.

2 Offered odd-numbered years.

3 Offered even-numbered years.

4 PHSX 150, PHSX 521, ASTR 591, ASTR 596, ASTR 691, PHSX 531, and PHSX 671 are Fall only courses.
PHSX 611, ASTR 592, and ASTR 692 are Spring only courses.

5 Majors are encouraged to take PHSX 213.

6 Majors are encouraged to take PHSX 214.

7 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.

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 minimum 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 intending 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.