Bachelor of Science in Physics

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 careers 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 program in physics and astronomy

We welcome all students curious about the universe around them. This includes not only students planning on graduate study in STEM, but also students from other disciplines where a background in foundational physical science and critical thinking can be useful – examples include teaching and medicine – and anyone seeking to include astronomy and physics as part of their general education. The department offers BA degrees in astronomy and physics and BS degrees in astronomy, physics, and engineering physics. Degrees in astronomy and physics are granted through the College of Liberal Arts and Sciences whereas engineering physics degrees are granted through the School of Engineering. The primary degree offered is a BS in Physics. In addition to this standard BS in Physics, there are also interdisciplinary, pre-medicine, and physics teacher prepration concentrations of the BS in Physics degree. The interdisciplinary concentration allows students to take elective courses in other STEM disciplines and the pre-medicine concentration is for students interested in health professions. The courses that constitute the physics teacher preparation concentration are part of the STEMTeach KU program. We also offer minors in astronomy and physics and a certificate in astrophysics of origins. We involve our undergraduate majors in cutting-edge research practically from the day they join the department; research is a requirement of both the BS Astronomy and BS Physics degrees. The breadth of our research program affords our students exposure to a number of different fields and we are justifiably proud of our undergraduate researchers who routinely publish papers, attend conferences, and/or conduct research abroad (in locales such as Antarctica, Chile, and Switzerland).

Undergraduate Admission

Admission to KU

All students applying for admission must send high school and college transcripts 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.

Requirements for the B.S. Degree in Physics

Physics Bachelor of Science (B.S.) General Education Requirements

All students pursuing the Bachelor of Science in Physics must complete the CORE 34 requirements in addition to the degree and major requirements. For details regarding the CORE 34 requirements, please see the CORE 34 section of the catalog.

Code	Title	Hours
Foundational Physics and Mathematics		
Majors must complete courses as specified in each of the following areas. Majors are advised to take honors courses when eligible. All honors equivalents are also acceptable to fulfill PHSX major requirements. These hours do not contribute to the minimum number of hours required for the major.		
Calculus I. Satisfied by:		
MATH 125	Calculus I	4
or MATH 145	Calculus I, Honors	
Calculus II. Satisfied by:		
MATH 126	Calculus II	4
or MATH 146	Calculus II, Honors	
Seminar in Physics, Astronomy, & Engineering Physics. Satisfied by:		
PHSX 150	Seminar in Physics, Astronomy and Engineering Physics	0.5
General Physics I. Satisfied by:		5
PHSX 211 & PHSX 216	General Physics I and General Physics I Laboratory	
or PHSX 213	General Physics I Honors	
General Physics II. Satisfied by:		4
PHSX 212 & PHSX 236	General Physics II and General Physics II Laboratory	
or PHSX 214	General Physics II Honors	
General Science Requirements		
Foundations of Chemistry I. Satisfied by:		
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		
Vector Calculus. Satisfied by:		
MATH 127	Calculus III	4
or MATH 147	Calculus III, Honors	

Elementary Linear Algebra. Satisfied by:		
MATH 290	Elementary Linear Algebra	2-3
or MATH 291	Elementary Linear Algebra, Honors	
or MATH 590	Linear Algebra	
Differential Equations. Satisfied by:		
MATH 320	Elementary Differential Equations	3
or MATH 220	Applied Differential Equations	
or MATH 221	Applied Differential Equations, Honors	
Advanced Physics		
Majors must complete a course in each of the following areas:		
General Physics III. Satisfied by:		
PHSX 313	General Physics III	3
Intermediate Physics Lab. Satisfied by:		
PHSX 316	Intermediate Physics Laboratory I	1
Introductory Quantum Mechanics. Satisfied by:		
PHSX 611	Introductory Quantum Mechanics	3
Mechanics I. Satisfied by:		
PHSX 521	Mechanics I	3
Electricity and Magnetism. Satisfied by:		
PHSX 531	Electricity and Magnetism	3
Thermal Physics. Satisfied by:		
PHSX 671	Thermal Physics	3
Required Electives (Majors must complete one of the following options, Standard, Interdisciplinary, or Physics Teacher Preparation)		
BS in Physics		
Computing and Programming. Satisfied by both of the following:		
EECS 138	Introduction to Computing: _____	
or EECS 168	Programming I	
or EECS 169	Programming I: Honors	
PHSX 315	Introduction to Computation for Physics and Astronomy	
Mechanics II. Satisfied by:		
PHSX 621	Mechanics II	
Electromagnetic Theory. Satisfied by:		
PHSX 631	Electromagnetic Theory	
Quantum Mechanics. Satisfied by:		
PHSX 711	Quantum Mechanics I	
Advanced Physics Labs. Satisfied by both of the following:		
PHSX 536	Electronic Circuit Measurement and Design	
PHSX 616	Physical Measurements	
Physics Elective. Satisfied by any PHSX lecture or laboratory course numbered 500 or higher and not part of the other specific requirements for the major.		
Math Elective. Satisfied by one of the following:		
PHSX 518	Mathematical Physics	
PHSX 718	Mathematical Methods in Physical Sciences	
MATH 526	Applied Mathematical Statistics I	
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		
Capstone Course		
Undergraduate Research or Honors Research. Satisfied by:		
PHSX 503	Undergraduate Research	
or PHSX 501	Honors Research	
BS in Physics, Interdisciplinary Concentration		
Computing and Programming. Satisfied by both of the following:		
EECS 138	Introduction to Computing: _____	
or EECS 168	Programming I	
or EECS 169	Programming I: Honors	
PHSX 315	Introduction to Computation for Physics and Astronomy	
Advanced Physics Labs. Satisfied by one of the following:		
PHSX 536	Electronic Circuit Measurement and Design	
PHSX 616	Physical Measurements	
Advanced Physics. Satisfied by two of the following:		
PHSX 621	Mechanics II	
PHSX 631	Electromagnetic Theory	
PHSX 711	Quantum Mechanics I	
PHSX 536	Electronic Circuit Measurement and Design [1]	
PHSX 616	Physical Measurements [1]	
Physics Elective. Satisfied by any PHSX lecture or laboratory course numbered 500 or higher and not part of the other specific requirements for the major.		
Math Elective. Satisfied by one of the following:		
PHSX 518	Mathematical Physics	
PHSX 718	Mathematical Methods in Physical Sciences	
MATH 526	Applied Mathematical Statistics I	
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		
Allied Science Fields. Satisfied by the completion of 2 advanced courses in 1 allied science field chosen from the following:		
Biology. Satisfied by two of the following:		
BIOL 400	Fundamentals of Microbiology	
BIOL 412	Evolutionary Biology	
BIOL 416	Cell Structure and Function	
BIOL 595	Human Genetics	
BIOL 600	Introductory Biochemistry, Lectures	
BIOL 636	Biochemistry I	
BIOL 638	Biochemistry II	
BIOL 546	Mammalian Physiology	
Chemistry. Satisfied by two of the following:		

CHEM 598	Research Methods (UKanTeach students only)
CHEM 330	Organic Chemistry I
CHEM 335	Organic Chemistry II
CHEM 530	Physical Chemistry I
CHEM 535	Physical Chemistry II
Geology. Satisfied by two of the following:	
GEOL 360	Field Investigation
GEOL 562	Structural Geology
Electrical Engineering and Computer Science. Satisfied by two of the following:	
EECS 622	Microwave and Radio Transmission Systems
EECS 628	Fiber Optic Communication Systems
EECS 670	Introduction to Semiconductor Processing
EECS 713	High-Speed Digital Circuit Design
EECS 721	Antennas
EECS 728	Fiber-optic Measurement and Sensors
Capstone Course	
Undergraduate Research or Honors Research. Satisfied by:	
PHSX 503	Undergraduate Research
or PHSX 501	Honors Research
BS Physics, Physics Teacher Preparation Concentration	
Computing and Programming. Satisfied by both of the following:	
EECS 138	Introduction to Computing: _____
or EECS 168	Programming I
or EECS 169	Programming I: Honors
PHSX 315	Introduction to Computation for Physics and Astronomy
Advanced Physics Laboratory. Satisfied by both of the following:	
PHSX 536	Electronic Circuit Measurement and Design
PHSX 616	Physical Measurements
Mechanics II. Satisfied by:	
PHSX 621	Mechanics II
Quantum Mechanics. Satisfied by:	
PHSX 711	Quantum Mechanics I
Undergraduate Research. Satisfied by:	
PHSX 598	Research Methods
Education Courses. Satisfied by the following:	
C&T 290	Introduction to Secondary Science and Mathematics Teaching
C&T 291	Introduction to Science and Mathematics Teaching 2 (STEM Teach 2)
C&T 360	Knowing and Learning in Mathematics and Science
C&T 366	Classroom Interactions in Mathematics and Science
C&T 448	Reading and Writing Across the Curriculum
C&T 460	Project Based Instruction in Mathematics and Science
C&T 490	Student Teaching
History of scientific and technological knowledge. Satisfied by:	
HIST 363	Perspectives on Science, Engineering and Mathematics
Capstone Course	
C&T 495	Seminar: Developing the Teaching Portfolio

[1] This course will not count as one of the two Advanced Physics Courses if it has already counted toward the one required Advanced Physics Lab.

Physics Major Hours & Major GPA

While completing all required courses, 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 (https://sis.ku.edu/gpa-calculator/).

Sample 4-year plans for the BS degree in Physics with the following concentrations can be found here: BS in Physics (https://catalog.ku.edu/liberal-arts-sciences/physics-astronomy/bs-physics/physics/) (no concentration), concentration in Interdisciplinary Physics (https://catalog.ku.edu/liberal-arts-sciences/physics-astronomy/bs-physics/interdisciplinary-physics-conc/), concentration in Physics Teacher Education (https://catalog.ku.edu/liberal-arts-sciences/physics-astronomy/bs-physics/physics-teacher-education-conc/) or by using the left-side navigation.

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 501, ASTR 503, PHSX 501 or PHSX 503. A grade of B or better must be earned in one of the following: ASTR 501, 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.