Master 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. 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.

Admission to Graduate Studies

An applicant seeking to pursue graduate study in the College may be admitted as either a degree-seeking or non-degree seeking student. Policies and procedures of Graduate Studies govern the process of Graduate admission. These may be found in the Graduate Studies (http://catalog.ku.edu/graduate-studies) section of the online catalog.

Please consult the Departments & Programs (http://catalog.ku.edu/liberal-arts-sciences) section of the online catalog for information regarding program-specific admissions criteria and requirements. Special admissions requirements pertain to Interdisciplinary Studies degrees, which may be found in the Graduate Studies section of the online catalog.

Graduate Admission

Ordinarily, admission requires an undergraduate grade-point average of at least B (3.0 on a 4.0 scale), overall and in the major. A baccalaureate degree with a major in physics is desirable but not required. Recommended preparation consists of courses in mechanics, electromagnetic theory, thermal physics, introductory quantum mechanics, advanced laboratory, and at least one course in mathematics beyond differential equations. Working knowledge of computers and of an advanced programming language is helpful. A student with less than the recommended preparation may enroll in these courses for graduate credit.

Submit your graduate application online (http://graduate.ku.edu/application-process). Send all other requested application materials to the department:

The University of Kansas
Department of Physics and Astronomy
Graduate Coordinator
1251 Wescoe Hall Dr.
1082 Malott Hall
Lawrence, KS 66045

M.S. Degree in Physics

Candidates must complete a minimum of 30 credit hours of advanced lecture courses (numbered 500 or above) in physics and related subjects within a period of 7 years. Credit toward the 30 required hours is not given to students who take courses at a lower level after having completed similar upper level courses (as determined by the department) with a grade of B- or higher.

Program requirements include

1. Within 12 months of entering the program the student must fulfill the requirements of the individualized plan of study (http://physics.ku.edu/individualized-plan-of-study) for all graduate degrees to certify an undergraduate knowledge of Physics. Visit the Department's website for more information on these requirements and the process of certification.
2. 4 basic courses:

Code	Title	Hours
PHSX 711	Quantum Mechanics I	3
PHSX 718	Mathematical Methods in Physical Sciences	3
PHSX 821	Classical Mechanics	3
PHSX 831	Electrodynamics I	3

3. 2 additional courses chosen from:

Code	Title	Hours
PHSX 721	Chaotic Dynamics	3
PHSX 731	Molecular Biophysics	3
PHSX 741	Nuclear Physics I	3
PHSX 761	Elementary Particles I	3
PHSX 781	Solid State Physics I	3
PHSX 792	Topics in Advanced Astrophysics	3
PHSX 793	Physical Cosmology	3
PHSX 795	Space Plasma Physics	3
PHSX 815	Computational Methods in Physical Sciences	3

4. A minimum of 2 hours in PHSX 899 Master's Research/Thesis is required, with a maximum of 6 hours that count toward the master's degree. No more than 3 hours will be allowed unless directed towards completion of a thesis on original research or a written report. Students must consult with the research advisor before enrolling in more than 3 credit hours.
5. The remaining 6 to 10 hours of advanced electives must be either advanced lecture courses or advanced undergraduate laboratory courses. (This proviso excludes seminars and special problems courses.)
6. All graduate students, after their first semester, will deliver at least 1 oral presentation per semester.
7. General Examination: Candidates must pass a general oral examination in physics. The examination is given shortly before completion of other work for the degree. A master's thesis is not required but may be submitted if the candidate and the director of the candidate's research believe it to be appropriate

The departmental web page with some additional information, e.g., milestones, can be found at http://www.physics.ku.edu/~physics/graduate/about.shtml

Please go to this website to see the University's policy on time limits: https://documents.ku.edu/policies/Graduate_Studies/maprogramtimeconstraints.htm

M.S. with emphasis in Computational Physics and Astronomy

This degree is a subspecialty program for students with a background in physics, astronomy, computer science, mathematics, or engineering who wish to become familiar with computer-based approaches to problems in these fields. This degree is intended as a terminal MS that can be completed in two years. Minimum preparation expected includes a year's course in general physics, mathematics through differential equations, and a knowledge of python, FORTRAN, C++ or another programming language suited to scientific applications. Students pursuing this degree with an applied mathematics emphasis may wish to consider also earning a Graduate Certificate in Applied Mathematics (http://www.math.ku.edu/news/2016/12/Graduate_Certificate_in_Applied_Mathematics.pdf).

Degree Requirements

A total of at least 33 hours of credits including 30 hours of graduate credit is required for the degree. At least 50% of these hours must be at the 700 level or above. Courses numbered 500 or above count for graduate credit. Some of the courses listed below are undergraduate level EECS courses that do not count as graduate credit. Students entering the program may have satisfied several of these requirements bul a total of 30 hours of graduate credit is still required. No more than the required 6 hours of PHSX 899 (Master's Research/Thesis) may be counted toward the degree.

1. Within 12 months of entering the program the student must fulfill the requirements of the individualized plan of study (http://physics.ku.edu/individualized-plan-of-study) for all graduate degrees to certify an undergraduate knowledge of Physics. Visit the Department's website for more information on these requirements and the process of certification.
2. Required Courses (24 credit hours)

Code	Title	Hours
PHSX/ASTR 815	Computational Methods in Physical Sciences	3
PHSX 718	Mathematical Methods in Physical Sciences	3
MATH/EECS 781	Numerical Analysis I	3
or EECS 639	Introduction to Scientific Computing	
EECS – 1 course at the 300 level or above (in addition to MATH/EECS 781) (Note: courses below the 500 level will not count towards the required 30 hours of graduate credit.)		3
EECS or MATH - 1 course at the 700 level or above in EECS or MATH (in addition to MATH/EECS 781 and the EECS 300+ requirement)		3
1 additional PHSX/ASTR lecture course at the 500 level or above		3
PHSX 899	Master's Research/Thesis	6

3. 9 or more credits from at least 3 lecture or lab courses from the following list of courses:
   Note: Double counting of courses is not allowed, e.g. a course used to fulfill a requirement under part 2. (e.g. EECS 448) may not also be counted under part 3.

Code	Title	Hours
EECS 360	Signal and System Analysis [1]	4
EECS 368	Programming Language Paradigms [1]	3
EECS 388	Embedded Systems [1]	4
EECS 448	Software Engineering I [1]	4
EECS 560	Data Structures	4
EECS 672	Introduction to Computer Graphics	3
EECS 731	Introduction to Data Science	3
EECS 738	Machine Learning	3
EECS 739	Parallel Scientific Computing	3
EECS 837	Data Mining	3
MATH 611	Time Series Analysis	3
MATH 647	Applied Partial Differential Equations	3
MATH 650	Nonlinear Dynamical Systems (cannot be counted along with PHSX 721)	3
MATH 727	Probability Theory	3
or MATH 627	Probability	
MATH 728	Statistical Theory	3
or MATH 628	Mathematical Theory of Statistics	
MATH/EECS 782	Numerical Analysis II	3
MATH 783	Applied Numerical Methods for Partial Differential Equations	3
PHSX/ASTR Courses Numbered 500 and above		

Footnote 1: Courses below the 500 level do not count towards the required 30 hours of graduate credit.

4. All graduate students, after their first semester, will deliver at least 1 oral presentation (http://physics.ku.edu/academics/graduate/requirements/#communication) per semester.
5. An important component of this degree is the completion and documentation of a successful computer project. A thesis must be presented that describes the basic physics involved in the project, the method of implementing the project, and a discussion of the results. An oral defense of the thesis is required before a committee of at least 3 members of the graduate faculty.

The departmental web page with some additional information, e.g., the Graduate Handbook and milestones, can be found at http://physics.ku.edu/graduate-studies