

Physics

College of Arts & Sciences

The Department of Physics and Astronomy offers courses and research opportunities leading to the M.S. and Ph.D. degrees in the areas of astronomy and astrophysics, atomic and molecular physics, low and intermediate energy nuclear physics, condensed matter physics, and particle physics. More detailed descriptions of each of these options is available at <https://pa.as.uky.edu/pa-faculty-research>. Opportunities exist for experimental, theoretical, and computational, and observational research. Excellent laboratory facilities and library materials are available. Major facilities located within the Department are the six-million volt Van de Graaff accelerator and the Center for Advanced Materials. Computational resources include the Lipscomb HPC cluster and access to XSEDE, NERSC, TACC, JLab and BNL. The Department is active in research at many national laboratories, including Jefferson Lab (Virginia), Oak Ridge National Lab (Tennessee), Los Alamos National Lab (New Mexico), Argonne National Lab (Illinois), Brookhaven National Lab (New York), Triangle Universities Nuclear Lab (North Carolina), National High Magnetic Field Facility (Florida), and Lawrence Berkeley Lab (California) as well as international laboratories including Paul Scherrer Institute (Switzerland), TRIUMF (Vancouver), and MAX-lab (Sweden). In astronomy our students conduct research at facilities including the National Radio Astronomy Observatory (West Virginia), Arecibo Observatory (Puerto Rico), Kitt Peak National Observatory (Arizona), McDonald Observatory (Texas), and the Hubble Space Telescope, and participate in collaborations including Sloan Digital Sky Survey-IV (SDSS-IV) and the Large Synoptic Survey Telescope (LSST). Such activities expose our graduate students to state-of-the-art instrumentation and world-class researchers.

Admission Requirements

In addition to the admissions requirements of the Graduate School, the Department of Physics & Astronomy requires graduate applicants to have a sound foundation in undergraduate physics. This foundation will normally include advanced courses in classical mechanics, electromagnetism and quantum mechanics. Applicants are encouraged to take the GRE physics subject exam. Applicants wishing to apply for financial aid in the form of a teaching assistantship, research assistantship or fellowship must supply letters of recommendation from three individuals familiar with their academic capabilities. Such applicants must also submit a written statement of their interests and background in physics.

Admissions requirements are the same for the M.S. and the Ph.D. programs except that applicants for the Ph.D. must possess an interest in carrying out original research at the advanced level.

Degree Requirements

The M.S. program can include an emphasis on basic or applied physics or physics education, and students are encouraged to take courses in related programs that satisfy the appropriate academic objectives. Before taking the M.S. oral exam, the M.S. student must have completed (with a B average) 16 (plan A with a thesis) or 20 (plan B without a thesis) credit hours in approved graduate courses.

The Ph.D. degree is a research degree granted on the basis of broad knowledge of physics and in-depth research in a specific area leading to a dissertation (and generally publications in appropriate refereed journals). Students may perform this research at the University of Kentucky or appropriate collaborating institutions. Before taking the Ph.D. qualifying exam, the student must pass the Physics GRE at the 50th percentile or higher and satisfactorily pass core courses in graduate classical mechanics, electromagnetism, quantum mechanics, and statistical mechanics, as well as electives in topical areas of modern physics.

Graduate Courses

PHY 401G	Special Topics In Physics And Astronomy For Elementary, Middle And High School Teachers	(1-4)	AST 592	Astrophysics Ii - The Galaxy (Same As PHY 592)	(3)
PHY 402G	Electronic Instrumentation And Measurements (Same As EE 402G)	(3)	AST 639	Physical Processes In Astrophysics (Same As PHY 639)	(3)
PHY 404G	Mechanics	(3)			
PHY 416G	Electricity And Magnetism	(3)			
PHY 417G	Electricity And Magnetism	(3)			
PHY 472G	Interaction Of Radiation With Matter (Same As RM 472G)	(3)			
PHY 504	Advanced Mechanics	(3)			
PHY 506	Methods Of Theoretical Physics I (Same As MA 506)	(3)			
PHY 507	Methods Of Theoretical Physics II (Same As MA 507)	(3)			
PHY 520	Introduction To Quantum Mechanics I	(3)			
PHY 521	Introduction To Quantum Mechanics II	(3)			
PHY 522	Thermodynamics And Statistical Physics	(3)			
PHY 524	Solid State Physics (Same As EE 524)	(3)			
PHY 525	Condensed Matter Physics	(3)			
PHY 535	Experimental Physics: Advanced Physics Laboratory	(2)			
PHY 545	Radiation Hazards And Protection (Same As RM/RAS 545)	(3)			
PHY 546	General Medical Radiological Physics (Same As Rm/RAS 546)	(3)			
PHY 554	Fundamentals Of Atomic Physics	(3)			
PHY 555	Fundamental Nuclear Physics	(3)			
PHY 556	Fundamental Particle Physics	(3)			
PHY 567	Introduction To Lasers And Masers (Same As EE 567)	(3)			
PHY 570	Seminar On Teaching Physics	(1)			
PHY 571	Seminar On Teaching Physics Laboratories	(1)			
PHY 591	Astrophysics I - Stars (Same As AST 591)	(3)			
PHY 592	Astrophysics II- Galaxies And Interstellar Material (Same As AST 592)	(3)			
PHY 600	Selected Topics In Advanced Physics	(2-3)			
PHY 605	Gravity	(3)			
PHY 611	Electromagnetic Theory I	(3)			
PHY 613	Electromagnetic Theory II	(3)			
PHY 614	Quantum Mechanics I	(3)			
PHY 615	Quantum Mechanics II	(3)			
PHY 616	Quantum Field Theory I	(3)			
PHY 624	Condensed Matter Theory	(3)			
PHY 630	Topics In Nuclear And Intermediate Energy Physics (Subtitle Required)	(3)			
PHY 632	Statistical Mechanics	(3)			
PHY 639	Physical Processes In Astrophysics (Same As AST 639)	(3)			
PHY 716	Quantum Field Theory II	(3)			
PHY 748	Master's Thesis Research	(0)			
PHY 749	Dissertation Research	(0)			
PHY 767	Dissertation Residency Credit	(2)			
PHY 768	Residence Credit For The Master's Degree	(1-6)			
PHY 769	Residence Credit For The Doctor's Degree	(0-12)			
PHY 770	Colloquium	(1)			
PHY 781	Independent Work In Physics	(1-9)			
PHY 790	Research In Physics	(3)			
PHY 791	Research In Physics	(5)			
AST 591	Astrophysics I – Stars (Same As PHY 591)	(3)			