PHYSICS, PHD

Students pursuing a doctor of philosophy (Ph.D.) in Physics are expected to acquire and demonstrate proficiency in the major topics of physics as well as perform original research in physics or astrophysics culminating in a dissertation. Specialties available in our department include condensed matter and materials physics, particle physics, astrophysics, astroparticle physics, and the physics of precision timing instruments.

Admissions

Applicants are expected to have, at minimum, the equivalent of an undergraduate degree in physics.

In addition to the minimum Graduate School admission requirements, to be considered for regular admission an application must include:

- A resume
- 3 letters of recommendation.

See the Admission Criteria section of this catalog for more information.

Curricular Requirements

Courses

A total of 48 hours of coursework is required, 36 of which must be in physics or astronomy.

24 hours of dissertation research is also required.

Required coursework		Hours
Core courses:		
PH 501	Classical Dynamics	3
PH 531	Electromagnetic Theory	3
PH 532 or	Electromagnetic Theory (Substitution available for astrophysics or astropartice physics)	3
AY 640	Radiation Processes Astrophys	
PH 541	Quantum Mechanics	3
PH 542 or	Quantum Mechanics (Substitution available for astrophysics)	3
AY 521	Theoretical Astrophysics	
PH 571	Statistical Physics	3
Sub-area courses:		
12 hours approved by advisor and department		12
Seminar:		
PH 597 or	Physics Seminar (Taken every semester in residence)	1
AY 597	Astrophysics Seminar	
Electives		**18**
Dissertation Research		24
Total Hours		**73**

The 12 hours of graduate courses requiring approval will be within the student's chosen sub-area and approved by both their advisor and the departmental advising committee. A further 18 hours should be determined in consultation with the student's advisor, at least 6 of which must be in physics or astronomy. Example sub-areas include condense matter, particle, astroparticle, and astrophysics, each of which may be experimental or theoretical. The applicability of core course substitutions will be consistent with the sub-area courses chosen. All full-time students in residence must take one hour of seminar (PH 597 Physics Seminar or AY 597 Astrophysics Seminar) appropriate to their sub-area each semester.

See Graduation Requirements in the general Academic Policies concerning Scholastic Requirements for limitations on the number of hours that are allowed to be pass/fail.

Precision Timing Concentration

Students are eligible for the precision timing concentration if their curriculum includes the courses below.

Precision Timing Concentration Curriculum		Hours
Choose six hours from the following:		6
PH 542	Quantum Mechanics	
PH 532	Electromagnetic Theory	
PH 534	Digtl Elect Comp Interfc	
PH 681	Adv Solid State Physics	
PH 591	Advanced Laboratory	
Electrical Engineering courses		
ECE 593	Special Topics (Control Systems Analysis)	3
ECE 579	Digital Control Systems	3
ECE 693	Special Topics (in Precision Timing Applications)	3
Statistics courses		
MATH 551	Math Stats W/Applictn I	3
MATH 554	Math Statistics I	3
Choose six hours from the following:		6
ECE 508	Communications	
ECE 509	Communications Lab	
ECE 530	Solid State Devices	
ECE 561	Quantum Well Elec & Devices	
MATH 557	Stochastic Processes I	
Courses outside the above may be used with approval from the Department Chair.		
Total Hours		**27**

Transfer Credit

Students should consult with the department graduate director before submitting transfer requests to the graduate school. Individual course transfers and block transfers for students who hold a master's degree are considered based on similarity of coverage.

See also the Transfer of Credit subsection in the general Academic Policies concerning Degree Requirements.

Doctoral Plan of Study Requirement

The student's Ph.D. Plan of Study must be approved by the student's research advisor and the department before submission to the graduate school.

See Plan of Study in the general Academic Policies concerning Degree Requirements for additional requirements, including the deadline.

Qualifying Exams

There are two separate examinations each prospective PhD candidate must pass: the (written) qualifying exam and the (oral) preliminary exam.

The physics Ph.D. qualifying exam consists of 4 separate sections of written exam on advanced undergraduate physics. Exams are administered just before the start of each Fall and Spring semester, 2 at a time, with Classical Mechanics and Electromagnetism offered in January and Quantum Mechanics and Thermal Physics offered in August. Each section need not be re-taken once passed. Beginning after the first semester (i.e. the exams offered at the beginning of the second semester enrolled), financial support may be withdrawn if a student does not pass at least one as yet un-passed section each time it is offered. Students become ineligible for a Ph.D. degree if the qualifying exam is not passed within 5 exam administrations after the first semester, corresponding to completion well before the end of the third year. (Students entering in Fall have 3 attempts at the January exams and 2 attempts at the August exams, and students entering in Spring have 3 attempts at the August exams and 2 attempts at the January exams.)

Due to disruptions from COVID-19, students who entered during the 2019-20 academic year have one more year than outlined above.

Admission to Candidacy Requirements

Passing both the (written) qualifying exam (described above) and the (oral) preliminary exam (described here) are required for admission to candidacy.

The preliminary exam is an oral exam on the student's research plan and on courses in the student's area of specialization, and corresponds to the examination mentioned in the Preliminary or Comprehensive Examination sub-section of the Academic Policies: Degree Requirements for Doctoral Degrees. The makeup of the committee administering the preliminary exam must be approved by the department. The student's research supervisor does not sit on the preliminary exam committee. Members of the committee must include faculty outside the sub-area in which the student is working and specialists in both theory and experiment. Students are required to submit a written research plan to the committee in advance of the exam.

See also general guidelines in the Admission to Candidacy sub-section and the Dissertation Proposal sub-section in the general Academic Policies: Degree Requirements for Doctoral Degrees.

Continuous Enrollment Policy

See requirements concerning Continuous Dissertation or Document Registration in the general Academic Policies section.

Dissertation Requirements

The makeup of the dissertation committee must be approved by the department. Members of the committee must include faculty outside the sub-area in which the student is working and specialists in both theory and experiment.

See also guidelines in the Dissertation sub-section in the general Academic Policies: Degree Requirements for Doctoral Degrees. Dissertation committees in the department of physics and astronomy frequently include individuals from other universities as their outside member.

Time Limits for Degree Completion Requirements

All requirements must be completed in the seven years (21 fall, spring and summer semesters) following admission to the program. Extensions up to the limit imposed by the general Academic Policies section are considered on a case-by-case basis.

See also guidelines in the Time Limits subsection of the general Academic Policies: Degree Requirements for Doctoral Degrees.

Student Progress Requirement

Progress requirements that pertain to degree completion are outlined above in the Qualifying Exams sub-section (a 2.5 year limit) and the Time Limits sub-section (a 7 year limit).

Many, but not all, students in the department of physics and astronomy receive financial support through teaching or research assistantships. These students are evaluated on a semester and annual basis by the departmental graduate advising committee and/or the faculty member(s) supervising their assistantship to ensure the student meets progress expectations before continuing support. Expectations relate to progress in qualifying exams, prompt completion of coursework, and performance of original research. Quality performance in duties specified by the assistantship itself are also expected. To maintain support, generally students should complete coursework and qualifying exams in 2 years, be admitted to candidacy no later than year 4, and complete their degree by the end of year 6. A wide variety of factors are considered for each individual and more detailed procedures for evaluating progress can be obtained by consulting the departmental graduate director or the graduate advising committee.

Academic Misconduct Information

See the information in the general Academic Policies section on Misconduct.

Withdrawals and Leave of Absence Information

See guidelines in the general Academic Policies section on Withdrawals and Leave of Absence.

Academic Grievances Information

See general section on Grievance Procedures.

Grades and Academic Standing

See general Academic Policies section on Grades and Academic Standing.

Graduate School Deadlines Information

Consult the graduate school deadlines page for relevant deadlines.

Application for Graduation Information

See guidelines concerning Application for graduation in the general Academic Policies section.