Physics, Ph.D.

Graduate study in physics and astronomy is highly individualized. The department does not offer a Ph.D. in astronomy, but students may pursue a Ph.D. in physics with a subprogram and a dissertation in astronomy.

Each entering graduate student is assigned a faculty advisor, who assists in preparing a plan of study and in guiding the student's progress. All graduate students who intend to pursue a Ph.D. in physics must pass the qualifying exam; see Requirements [p. 1] in this section of the Catalog.

Requirements

The Doctor of Philosophy program in physics requires a minimum of 72 s.h. of graduate credit. For students interested in doing doctoral work in astronomy, the department offers an optional astronomy subprogram, including dissertation, within the Ph.D. program in physics.

Graduate students who wish to pursue a Ph.D. in physics must pass a qualifying examination in all principal areas of physics at the level of advanced undergraduate work. The examination, which may be repeated only once, is given each year before the beginning of the spring semester. Students must pass the qualifying examination before the beginning of their fourth semester of graduate work at the University of Iowa. Students with high scores on the Graduate Record Exam (GRE) subject test in physics may be exempt from this requirement.

The program of study for the Ph.D. includes thorough coursework in both classical and quantum physics for all students, whether their specialized research is in an experimental or a theoretical area.

All students must earn at least 24 s.h. in departmental courses numbered 5000 or above. They may not count credit earned in PHYS:7990 Research: Physics, PHYS:7992 Individual Critical Study, ASTR:7991 Research: Astronomy, or seminars.

All students must take comprehensive examinations; participate in advanced seminars; do original research in experimental physics, theoretical physics, or astrophysics; and prepare and defend a written dissertation based on this work.

Ph.D. students in physics without the astronomy subprogram must complete the following two lists.

### Code | Title | Hours
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PHYS:4761-4762 | Mathematical Methods of Physics I-II (students who pass a written examination are exempt from this requirement) | 6
PHYS:5710 | Classical Mechanics | 3
PHYS:5730 | Statistical Mechanics I | 3
PHYS:5741-5742 | Quantum Mechanics I-II | 6
PHYS:5811-5812 | Classical Electrodynamics I-II | 6

These courses freely use advanced mathematics (e.g., complex variables, tensor analysis). An introduction is provided in PHYS:4761 Mathematical Methods of Physics I and PHYS:4762 Mathematical Methods of Physics II. The selection of more advanced and specialized courses depends on the direction in which their interests develop.

Ph.D. students in physics with the optional astronomy subprogram must complete a total of six courses from the following two lists.

### Code | Title | Hours
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Four of these:
ASTR:6782 | Extragalactic Astronomy | 3
ASTR:6785 | The Interstellar Medium | 3
ASTR:6790 | Stellar Astrophysics | 3
ASTR:6870 | Radiative Processes in Astrophysics | 3
ASTR:6880 | High Energy Astrophysics | 3
ASTR:7830 | Space and Astrophysical Plasma Physics | 3
PHYS:7760 | General Relativity and Cosmology | 3
Two of these:
PHYS:5710 | Classical Mechanics | 3
PHYS:5730 | Statistical Mechanics I | 3
PHYS:5741-5742 | Quantum Mechanics I-II | 6
PHYS:5811-5812 | Classical Electrodynamics I-II | 6

After a student has chosen a research specialty, the student must submit a formal thesis proposal and defend the proposal in an oral comprehensive exam. The appropriate thesis advisor then becomes the candidate’s general advisor and the chair of the comprehensive and final examination committee. The comprehensive exam must be taken before the beginning of the fourth year of graduate study.

Admission

Applicants must meet the admission requirements of the Graduate College; see the Manual of Rules and Regulations of the Graduate College on the Graduate College website.

Financial Support

Students qualified for graduate study are encouraged to apply for fellowships and assistantships. Contact the Department of Physics and Astronomy chair.

Career Advancement

Graduates have opportunities for employment in universities, colleges, and research laboratories in government and industry. Physics graduates have mastered skills that are readily transferable to a number of fields. They might choose to work in engineering, software development, finance, or consulting.

The Pomerantz Career Center offers multiple resources to help students find internships and jobs.