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 an astronomy 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.

**Learning Outcomes**

Graduates will:

- understand the foundational principles that transcend many distinct areas, and learn the technical language, problem-solving skills, and training in technical listening and discussion;
- learn, practice, and discover advanced discourse in mathematical aspects that translate to physics;
- become familiar with the state-of-the-art experimental tools and equipment in the field;
- develop skills for creativity and originality in the field and promote communication of new discoveries;
- learn and practice advanced discourse in experimental and observational aspects, including data and information mining, translating experimental observations to physical principles and vice versa; and
- learn analysis of data and computational skills as well as become familiar with state-of-the-art techniques for data processing.

**Requirements**

The Doctor of Philosophy program in physics requires a minimum of 72 s.h. of graduate credit. At least 39 s.h. must be earned at the University of Iowa to complete the residency requirement. For students interested in doing doctoral work in astronomy, the department offers an astronomy subprogram, including a dissertation, within the Ph.D. program in physics. All students must maintain a program g.p.a. of at least 3.00.

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 courses.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>PHYS:4761- PHYS:4762</td>
<td>Mathematical Methods of Physics I-II (students who pass a written examination are exempt from this requirement)</td>
<td>6</td>
</tr>
<tr>
<td>PHYS:5710</td>
<td>Classical Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:5730</td>
<td>Statistical Mechanics I</td>
<td>3</td>
</tr>
<tr>
<td>PHYS:5741- PHYS:5742</td>
<td>Quantum Mechanics I-II</td>
<td>6</td>
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Phys.D. students in physics with the astronomy subprogram must complete a total of six courses from the following.

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<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>PHYS:5811- PHYS:5812</td>
<td>Classical Electrodynamics I-II</td>
<td>6</td>
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</table>

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 less advanced coursework depends on the adequacy of a student's preparation for graduate work; students' choice of more advanced and specialized courses depends on the direction in which their interests develop.

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 on the Graduate College website.

**Financial Support**

Students qualified for graduate study are considered for assistantships and encouraged to apply for fellowships and assistantships.

**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.