PHYSICS

http://physics.illinois.edu

Head of the Department: Dale Van Harlingen
Associate Head for Graduate Programs: Lance Cooper
227 Loomis Laboratory
1110 West Green Street
Urbana, IL 61801-3080
Contact: Wendy R. Wimmer
(217) 333-3645
E-mail: grad@physics.illinois.edu

Major: Physics
Degrees offered: M.S. and Ph.D.

Major: Teaching of Physics
Degrees offered: M.S.

Medical Scholars Program: Doctor of Philosophy in Physics (Ph.D.) and Doctor of Medicine (M.D.) through the Medical Scholars Program (https://www.med.illinois.edu/mdphd)

Graduate Degree Programs

The Department of Physics is actively developing a new paradigm for graduate physics education and research for the 21st century, aimed at enhancing interdisciplinary interactions and creating an integrated approach to educational and research training. Advanced degrees offered in physics are the Master of Science and the Doctor of Philosophy. Outstanding graduate research opportunities are available in many subdisciplines of physics, including:

- condensed matter physics
- high energy and nuclear physics
- astrophysics
- atomic
- molecular and optical physics
- complex systems
- quantum information
- biological physics
- physics education research

Students may select experimental, theoretical, or computational thesis projects. Multidisciplinary projects are especially encouraged, and, with the consent of other departments, students may earn master's degrees in areas such as materials science and engineering, or computer science, simultaneously with their Ph.D. degrees in physics. Opportunity also exists for specializing in:

1. computational science and engineering and
2. energy and sustainability engineering within the department's graduate programs via the Computational Science and Engineering (CSE) Option (https://www.ece.illinois.edu/academics/grad/overview/cosc.asp) and the Energy and Sustainability Engineering (EaSE) Option (http://ease.illinois.edu).

The Medical Scholars Program (https://www.med.illinois.edu/mdphd) permits highly qualified students to integrate the study of medicine with study for a graduate degree in a second discipline, including Physics.

Admission

Admission to the physics graduate program requires an outstanding record of accomplishment in an undergraduate physics program and clear evidence of considerable academic promise, as judged by test scores, letters of recommendation, and strong intellectual achievements. A bachelor's degree or its equivalent from an accredited college or university in the U.S. or an approved institution of higher learning abroad, with at least 20 semester hours (30 quarter hours) of intermediate and advanced undergraduate physics course work, is required for admission. Course preparation in electricity and magnetism, optics, mechanics, atomic and nuclear physics, quantum mechanics, mathematical physics, differential equations, and analysis is essential. Any deficiency in these areas may delay degree completion by as much as a year. (Students are expected to make up deficiencies during the first graduate year.)

A minimum GPA of 3.00 (A = 4.00) for the last two years of undergraduate work is required; however, because of space limitations, applicants with GPAs below 3.50 are rarely admitted. Students with prior graduate course work must have a minimum GPA of 3.50 for those courses. All applicants must provide test scores from both the general and the physics tests of the Graduate Record Examination (GRE) (http://www.ets.org).

Graduates of curricula in the physical and biological sciences, mathematics, or computer science may be admitted with limited standing if they are judged to have the necessary aptitudes to profit from graduate work in physics. Such students are admitted to full standing after completing course work to remove deficiencies in physics preparation.

All applicants whose native language is not English must submit a minimum TOEFL (http://www.toefl.org) score of 79 (iBT), 213 (CBT), or 550 (PBT), or minimum International English Language Testing System (IELTS) (http://www.ielts.org) academic exam scores of 6.5 overall and 6.0 in all subsections. Applicants may be exempt from the TOEFL if certain criteria (http://grad.illinois.edu/admissions/instructions/04c) are met. For those taking the TOEFL or IELTS, full admission status (http://grad.illinois.edu/admissions/instructions/04c) is granted for scores greater than 102 (TOEFL iBT), 253 (TOEFL CBT), 610 (TOEFL PBT), or 6.5 (IELTS). Limited status (http://grad.illinois.edu/admissions/instructions/04c) is granted for lesser scores and requires enrollment in English as a Second Language (ESL) courses (http://linguistics.illinois.edu/students/esl/guidelines) based on an ESL Placement Test (EPT) taken upon arrival to campus.

A few applicants may be admitted for the spring semester, in addition to the customary fall semester admissions. See the Physics graduate admissions Web site (http://physics.illinois.edu/grad/apply.asp) for lists of deadlines and application materials.

Students may apply to the Medical Scholars Program prior to beginning graduate school or while in the graduate program. Applicants to the Medical Scholars Program must meet the admissions standards for and be accepted into both Physics and the College of Medicine. An application to the Medical Scholars Program will also serve as the application to the Physics graduate program. Further information on this program is available by contacting the Medical Scholars Program (125 Medical Sciences Building, (217) 333-8146, mspho@illinois.edu).

Medical Scholars Program

Please note applications are not being accepted at this time.

Students in the Medical Scholars program must meet the specific requirements for both the medical (https://www.med.illinois.edu/
necessary for their research, which may include advanced courses in: Ph.D. core curriculum, all candidates are expected to complete courses performance on the qualifying examination. Although there is no formal competence as evidenced by grades and class ranks, and satisfactory a student's potential to carry out independent research, scholastic Admission to Ph.D. candidacy is based on the faculty's evaluation of Doctor of Philosophy in Physics ta_train.html) conducted prior to the start of the semester. Academy for College Teaching (http://cte.illinois.edu/programs/teaching assistants are required to participate in the Graduate testing/oral_eng/epi_overview.html), offered on campus. All new minimum score of 4CP is required on the EPI test (http://cte.illinois.edu/taengprof.htm) by achieving a minimum score of 24 on the speaking English language proficiency (http://grad.illinois.edu/admissions/english/entering_masters.html). All applicants, regardless of U.S. citizenship, whose native language is not English and who wish to be considered for teaching assistantships must demonstrate spoken English language proficiency (http://grad.illinois.edu/admissions/taengprof.htm) by achieving a minimum score of 24 on the speaking subsection of the TOEFL iBT or 8 on the speaking subsection of the IELTS. For students who are unable to take the iBT or IELTS, a subsection of the TOEFL iBT or 8 on the speaking subsection of the IELTS. For students who are unable to take the iBT or IELTS, a minimum score of 4CP is required on the EPI test (http://cte.illinois.edu/testing/oral_eng/epi_overview.html), offered on campus. All new teaching assistants are required to participate in the Graduate Academy for College Teaching (http://cte.illinois.edu/programs/ta_train.html) conducted prior to the start of the semester.

- Master of Science in Physics (http://catalog.illinois.edu/graduate/graduate-majors/physics/physics-ms)
- Master of Science in Teaching of Physics (http://catalog.illinois.edu/graduate/graduate-majors/physics/physics-teaching-ms)

Doctor of Philosophy in Physics

Admission to Ph.D. candidacy is based on the faculty's evaluation of a student's potential to carry out independent research, scholastic competence as evidenced by grades and class ranks, and satisfactory performance on the qualifying examination. Although there is no formal Ph.D. core curriculum, all candidates are expected to complete courses necessary for their research, which may include advanced courses in:

- mechanics
- electromagnetic
- light
- atomic physics and quantum mechanics
- nuclear and particle physics
- condensed matter physics
- mathematical or computational methods for physics

In addition to the required course work for the Ph.D., a candidate must also:

1. pass the qualifying examination, an in-depth test of classical mechanics, electricity and magnetism, statistical physics, and quantum mechanics (in recent years, the overall success rate on the qualifying examination has averaged 98 percent);
2. pass a preliminary examination, which consists of a brief paper on the proposed thesis topic and an oral examination that tests familiarity with the background literature and understanding of the physics underlying the thesis project;
3. complete a thesis that demonstrates the capability to produce independent research on an original topic; and
4. pass a final oral examination by a faculty committee on the results of the research project. Proficiency in a language other than English is not required.

Frequently, PHYS 597, taken prior to the preliminary exam, marks the beginning of a research relationship with a faculty member which can be formally continued as PHYS 599.

Entering with approved M.S. degree

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 599</td>
<td>Thesis Research (min applied toward the degree)</td>
<td>6</td>
</tr>
</tbody>
</table>

Select two of the following breadth courses: 8

- PHYS 513 Quantum Optics & Information
- PHYS 569 Modern Atomic Physics

- PHYS 540 Astrophysics
- PHYS 550 Biomolecular Physics
- PHYS 560 Condensed Matter Physics I
- PHYS 570 Subatomic Physics

- PHYS 597 Individual Study (prior to the preliminary exam) 1-16

Elective courses – chosen in consultation with advisor (subject to Other Requirements and Conditions below) 49 max

Total Hours 64

Other Requirements and Conditions

Other Requirements and Conditions may overlap

Recommended elective courses:

- PHYS 504, 505, 508 & 509, 580 & 581 (& denotes sequence)

PHYS 599 (thesis research) cannot be taken until after the preliminary exam is passed.

Ph.D. exam and dissertation requirements:

- Qualifying exam
- Preliminary exam
- Final exam or dissertation defense
- Dissertation deposit

Minimum GPA: 2.75
Information listed in this catalog is current as of 10/2017

For additional details and requirements refer to the department’s Degree Requirements (http://physics.illinois.edu/grad/degree-requirements.asp) and the Graduate College Handbook (http://grad.illinois.edu/gradhandbook).

Qualifying Exam Information (http://physics.illinois.edu/grad/qual.asp)

### Entering with approved B.S. degree

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 599</td>
<td>Thesis Research (min applied toward the degree)</td>
<td>6</td>
</tr>
</tbody>
</table>

Select two of the following breadth courses: 8

- PHYS 513 Quantum Optics & Information
- PHYS 514 Modern Atomic Physics
- PHYS 540 Astrophysics
- PHYS 550 Biomolecular Physics
- PHYS 560 Condensed Matter Physics I
- PHYS 569 Emergent States of Matter
- PHYS 570 Subatomic Physics
- PHYS 597 Individual Study (prior to the preliminary exam) 1-16

Elective courses – chosen in consultation with advisor 81 max
(subject to Other Requirements and Conditions below)

Total Hours 96

### Other Requirements and Conditions

Other Requirements and Conditions may overlap

Recommended elective courses:

PHYS 504, 505, 508 & 509, 580 & 581 (& denotes sequence)

A minimum of 12 500-level credit hours applied toward the degree.

A minimum of 16 PHYS credit hours, with 8 at the 500 level.

PHYS 599 (thesis research) cannot be taken until after the preliminary exam is passed.

An additional maximum of 8 hours of PHYS 597 (or other individual study) may be applied toward the elective course work requirement.

These students may earn a Master of Science degree during the Ph.D. program

Ph.D. exam and dissertation requirements:

Qualifying exam

Preliminary exam

Final exam or dissertation defense

Dissertation deposit

Minimum GPA: 2.75

For additional details and requirements refer to the department’s Degree Requirements (http://physics.illinois.edu/grad/degree-requirements.asp) and the Graduate College Handbook (http://grad.illinois.edu/gradhandbook).