Physics, PhD—Advanced Entry (Boston)

The Department of Physics offers a Doctor of Philosophy in Physics with specializations in different subfields that reflect the forefront of research activities of the department including biological physics, condensed matter physics, elementary particle physics, nanomedicine, and network science. The program for the PhD degree consists of the required coursework, a proficiency examination, a preliminary research seminar, the completion of a dissertation based upon original research performed by the student, and a dissertation defense upon completion of the dissertation. Based on these measures, students are expected to obtain a graduate-level understanding of basic physics concepts and demonstrate the ability to formulate a research plan, communicate orally a research plan, and conduct and present independent research.

Coursework

Students entering with a master's degree from a U.S. institution in physics or a related area approved by the department will be required to take 10 semester hours of courses. The courses will be determined by the graduate director based on the student's transcripts. Students entering with a MS degree awarded by an institution outside the United States will need to consult the graduate director for a transcript evaluation to determine required coursework and course waivers.

Grade Requirements

The minimum grade required is a B (3.000) average. A student who does not maintain a 3.000 cumulative average for two consecutive semesters, or is otherwise not making satisfactory progress toward the PhD degree requirements, may be recommended for termination at the discretion of the graduate committee.

Proficiency Exam Requirement

All students registered in the PhD program are required to pass a written proficiency exam, unless they are granted a waiver (see below). Students who enter with a master's degree from a U.S. institution may take any/all parts of the exam, at the first opportunity upon entering the program in the fall. In this case, the exam will count as a first attempt only if the student submits the exam to the examiner.

The proficiency exam consists of four parts, which are based on the first-year courses. A waiver for each part is granted if a B, or higher, is earned in the corresponding course (listed below in parentheses). Exam waivers are only granted based on courses taken at Northeastern University.

- Classical Mechanics/Math Methods (PHYS 7301)
- Electromagnetic Theory (PHYS 7302)
- Statistical Physics (PHYS 7305)
- Quantum Theory 2 (PHYS 7316)

The proficiency exam is given twice yearly: once prior to the start of the fall semester and again within the first two weeks of the start of the spring semester. Each part consists of a three-hour written exam, and no student will be required to take multiple parts on the same day.

All students enrolled in the PhD program must take the fall proficiency exam after completing their first-year course of study with the required grade-point average unless they are granted a waiver. Unless waived, students taking the exam for the first time must take all parts. A student who does not pass the exam on their first attempt must pass the exam the next time it is given in order to continue in the PhD program. Any part passed on the first attempt does not need to be repeated.

PhD Candidacy

Degree candidacy is established when the student has passed the proficiency examination and completed 10 semester hours of courses. PhD degree candidacy is certified by the college. A maximum of five years after the establishment of doctoral degree candidacy is allowed for the completion of degree requirements.

PhD Dissertation Requirement

All PhD students are required to complete a dissertation based upon new and original research in one of the three following options:

- In one of the current theoretical or experimental research programs in the department, under direct supervision of an advisor from the Department of Physics. A dissertation committee will be formed consisting of the advisor; two full-time members of the department; and an additional member, either from within the department or from an outside department or institution.
- In a recognized interdisciplinary field involving another research area of the university, under the direct supervision of a faculty member in that field. In this case, an interdisciplinary committee is formed under the approval of the graduate committee, consisting of the direct supervisor, a departmental advisor, one other member of the department, and an additional member of either the department or the external department.
- In an area of applied research in one of the industrial or high-technology laboratories associated with the department's industrial PhD program. The direct supervisor is associated with the institution where the research is performed. In this case, a dissertation advisory committee is established by the graduate committee, consisting of the direct supervisor, the departmental advisor, and two other members of the department.

PhD students must select their departmental advisor no later than the end of the spring semester of their second year or their second semester after having passed the proficiency examination, whichever comes first. This process should start as soon as the student has identified a field of research or has passed the proficiency exam.

PhD Dissertation Committee, Preliminary Thesis Proposal, and Preliminary Research Seminar

By the end of the spring semester of the third year or the second semester in which the student is enrolled for PhD dissertation, whichever comes first, each PhD student must have an approved dissertation committee and thesis proposal.

The student (with the aid and approval of their thesis advisor) will submit a PhD thesis proposal to the graduate committee clearly outlining a plan to carry out new and original research in the context of previously published research in the scientific literature and also describe the methodologies to be employed. The thesis proposal is limited to 15 pages or less, including references. A proposed makeup of the dissertation committee will be submitted at the same time.

The graduate committee will evaluate the merit of the proposal and make recommendations for improvements when necessary, including any changes to the composition of the dissertation committee. No more than two submissions for a particular proposal may be made. In the case where a revised proposal does not meet a minimum academic standard that provides a basis for making such improvements, the graduate committee may instruct the student to select a different thesis topic or advisor.

After approval by the graduate committee, the proposal is circulated to the general faculty for comments. If the graduate coordinator receives any objections, the proposal will be referred back to the graduate committee for final resolution.

After the proposal and dissertation committee have been approved, the student will make a public presentation of the material in the preliminary research seminar before the dissertation committee in a format open to the full department and advertised one week in advance. The dissertation committee will then meet in closed session to evaluate the seminar. The preliminary research seminar must take place no later than the semester after the thesis proposal is approved and, normally, in the same semester.

In the event that the dissertation advisor is changed, a new committee must be formed, with the approval of the graduate committee, and a new preliminary research seminar given.

PhD Dissertation Defense

The dissertation defense consists of a public presentation, followed by a question period conducted by the dissertation committee and limited to them and the department faculty. The date of the dissertation presentation must be publicized and a copy of the thesis deposited with the graduate program coordinator at least one week prior to the defense. If during this posting period or in the two business days following the defense a written objection to the thesis is lodged with the department chair by a member of the faculty, the chair may appoint an ad hoc postdefense review committee to provide advice on the scientific issues raised by the objection. Students should note that they must be registered for Dissertation or Dissertation Continuation during the semester in which they defend their dissertation and that they should schedule their defenses well in advance of the end of the semester in order to accommodate the review/waiting period and the time required to deposit the thesis.

The final dissertation defense is held in accordance with the College of Science regulations.

Residence Requirement

The residence requirement is satisfied by at least one year of full-time graduate work (i.e., enrollment in PhD Dissertation, for two consecutive semesters). Students must be continually enrolled throughout the pursuit of the dissertation.

Internship Option

A PhD candidate may spend one year in a participating high-technology, industrial, or government laboratory immediately after passing the PhD proficiency examination. In this program, the student is expected to remain in touch with the university by taking one course per semester at the university and by frequent contact with a faculty advisor. After the one-year paid internship, the student returns to the university to do the dissertation. Eligibility for this program is contingent on acceptance both by the department and by the external laboratory.

Program Requirements

Complete all courses and requirements listed below unless otherwise indicated.

Milestones

Coursework
Proficiency examinations (completed or waived)
Annual review
Candidacy
Preliminary research seminar proposal with proposed dissertation committee
Preliminary research seminar talk
Dissertation defense

Core Requirements

Code	Title	Hours
Complete 10 semester hours of coursework. The courses required will be determined by the graduate program director based on the student's transcripts. [1]		10

Dissertation

Code	Title	Hours
PHYS 9990	Dissertation Term 1	
PHYS 9991	Dissertation Term 2	
Complete the following (repeatable) course until graduation:		
PHYS 9996	Dissertation Continuation	

Program Credit/GPA Requirements

10 total semester hours required

Minimum 3.000 GPA required

[1] Methods for Teaching in the Introductory Physics Laboratory 1 (PHYS 7220) is required for students awarded a teaching assistantship.