

PHYSICS - DOCTOR OF PHILOSOPHY (PHD)

Graduate study and opportunities for basic research are offered in experimental and theoretical physics in the following subfields: atomic and molecular physics, biophysics, chemical physics, condensed matter physics, elementary particle physics, geophysics, laser and optical physics, nuclear physics, physics education research, plasma and space physics, quantum information science and renewable energy.

Doctoral programs in chemical physics (<https://catalog.colorado.edu/graduate/colleges-schools/arts-sciences/programs-study/chemistry-biochemistry/chemical-physics-doctor-philosophy-phd/>) and geophysics (<https://catalog.colorado.edu/graduate/colleges-schools/arts-sciences/programs-study/geological-sciences/geophysics-doctor-philosophy-phd/>) are offered jointly with the Department of Chemistry and with the other departments that participate in the interdepartmental geophysics program.

Requirements

Prerequisites

Entering graduate students must have a thorough undergraduate preparation in physics, equivalent to an undergraduate physics major at a recognized college or university. This preparation includes courses in general physics, analytical mechanics, electricity and magnetism, thermodynamics, quantum mechanics, atomic physics and mathematics through differential equations and complex variables.

Students wishing to pursue graduate work in physics leading to candidacy for an advanced degree should carefully read the Doctoral Degree Requirements (<https://catalog.colorado.edu/graduate/degree-requirements/doctoral-degree-requirements/>) section of this catalog.

Qualifying Examination

The Graduate Record Examination aptitude tests and advanced test in physics are normally used in place of a qualifying examination, and this examination is normally taken before the time of entry into the Graduate School.

Course Requirements

To earn a PhD, candidates must complete 30 credit hours of graduate courses and 30 hours of dissertation credit. At least 27 of the 30 credit hours of coursework must be physics courses at the 5000 level or above; exceptions may be granted with the discretion of the associate chair of graduate studies. All courses, required or otherwise, must be passed with a grade of B- or better, and a course may be repeated only once.

Comprehensive Examination

The comprehensive examination is divided into three parts. Part I consists of passing any five of the following six courses with a B- or better:

Code	Title	Credit Hours
PHYS 5210	Theoretical Mechanics	3
PHYS 7230	Statistical Mechanics	3
PHYS 5250 & PHYS 5260	Introduction to Quantum Mechanics 1 and Introduction to Quantum Mechanics 2	6

PHYS 7310 & PHYS 7320	Electromagnetic Theory 1 and Electromagnetic Theory 2	6
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The associate chair may waive courses for students with graduate-level equivalents. Students who are enrolled in Applied Physics Tracks have different course requirements than listed above. See the Applied Physics Tracks Requirements page (<https://www.colorado.edu/physics/academics/graduate-students/graduate-program-requirements-phd/graduate-tracks-applied-physics-and/>) on the Department of Physics website for more information. Part II is a three-section examination that includes a formal research review paper and a formal presentation, followed by a question-and-answer oral session. Part III consists of a thesis prospectus presented to the thesis committee.

Part II of the comprehensive examination must be taken after successful completion of Part I, but no later than the student's sixth enrolled regular semester. Part III must be completed prior to the completion of the student's fourth year. Parts II and III of the comprehensive examination may be taken a second time, no more than one semester after the first attempt.

Language Requirement

The department has no requirement in foreign languages.

Learning Outcomes

By the completion of the program, students will be able to: