

Physics Department Degree Requirements Graduate Field of Study Information - Physics

General Information

The Department of Physics offers two graduate degrees: Master of Science (MS) and Doctor of Philosophy (PhD). The MS degree is aimed at students pursuing careers in industry, state or federal government or science/physics education. The MS in Physics may be either a completely coursework-based degree or it may have a thesis component as described later. The PhD in Physics prepares students for research and teaching careers in physics and engineering disciplines, including research and leadership positions with non-profit organizations, industry, universities, private foundations, and state or federal government agencies.

MS in Physics

Per graduate school rules MS in Physics requires a total of 30 credits. The students require a minimum GPA of 3.0 in all courses in the plan of study for matriculation with MS in physics. There are two tracks:

Non-Thesis MS: 4 courses from the core list (below), plus 6 others either from the core list or advanced courses at discretion of the major advisor.

Thesis MS: 4 courses from the core list (below), plus 3 others either from the core list or advanced courses at the discretion of the major advisor. 9 credits of MS level research classes (GRAD 5950, GRAD 5960) must be included, plus a written and orally defended MS thesis.

PhD in Physics

Per graduate school rules, the students who enter the program with BS degree, the PhD plan of study requires 30 credits, and, the students who enter the program with MS degree, the PhD plan of study requires 15 credits.

Coursework: Four courses from the core list (below), plus six others either from the core list or advanced (5000 or higher level) physics courses (including from other Departments, such as Polymer Physics, Chemistry, School of Engineering) at the discretion of the major advisor. Students must obtain a grade of B or better in each of at least four of the core courses, by the end of their fifth semester. Exceptions may be made for students with an MS in Physics who have already taken equivalent courses (and obtained transfer credit for these courses) at other institutions, obtaining a grade of B or better. The Graduate Affairs committee makes these decisions, at the request of the advisor. First year students are required to take 2 semesters of the one-credit Graduate Seminar course (PHYS 5094). The students require a minimum GPA of 3.0 in all courses in the plan of study for matriculation with PhD in physics.

PhD General Examination: Oral examination: short (~30 minutes) oral presentation on a research topic chosen in consultation between the student and their advisory committee, followed by an oral exam probing the student's physics knowledge underlying their presentation. Students must satisfy the core coursework requirement before taking the PhD General Examination (i.e. obtain a grade of B or better in four courses from the core course list). The general exam committee consists of the student's three-person advisory committee, plus two other faculty members from a different research field. The General Examination should be completed before the end of the student's fifth semester.

3. Dissertation Proposal: By the end of their third year, all PhD students must have an Advisory Committee and work on their Dissertation Proposal (details and form at the Graduate School website): the written proposal must be approved by the student's Advisory Committee, including an oral defense of the proposal before a committee composed of their Advisory Committee and two other Faculty examiners.

4. Graduate School Research Credits: In addition to the Physics PhD course requirements listed above in item 1, the student's PhD degree must include at least 15 credits of dissertation credits: GRAD 6950 or GRAD 6960.

Additional General Requirements

In addition, the following requirements apply to all students entering the Physics graduate program.

1. Progress Form: each year, each student must complete, in consultation with their faculty advisor, a Physics Graduate student progress form.

2. Plan of Study: to be completed for MS students no later than the beginning of the final semester, and for PhD students no later than when 18 credits of course-work have been completed. (These are also Graduate School requirements).

3. Colloquium and Seminars: All Physics Graduate Students are expected to attend the Departmental Colloquium, and, to participate in the regular research seminars in the department.

4. A Safety exam is required of all graduate students; a Shop Course is required for use of the Physics Machine Shop, and Laser Safety Training for students using lasers. All beginning graduate students are required to attend the computer information workshop and orientation on computer use and security.

5. There is no foreign language requirement for the Physics MS and PhD degrees.

Core course list: 5101 Methods of Theoretical Physics

5201 Theoretical Mechanics

5301 Electrodynamics I

5302 Electrodynamics II

5350 Computational Physics (existing course to be renamed)

5401 Quantum Mechanics I

5402 Quantum Mechanics II

5403 Quantum Mechanics III

5500 Statistical Mechanics

6730 General Relativity

Illustrative examples of a possible course curriculum for various groups: these can be adjusted

example PAN student course curriculum:

semester 1: 5101 Math Methods + 5201 Mechanics + 5094 (Grad Seminar)

semester 2: 5401 QM I + 5301 E&M I + 5094 (Grad Seminar)

semester 3: 5402 QM II + 5500 Stat Mech

semester 4: two of: Comp. Phys., Gen. Relativity, QMIII, E&M II, QFT I, Nuclei & Particles

example AMO student course curriculum:

semester 1: 5101 Math Methods + 5201 Mechanics + 5094 (Grad Seminar)

semester 2: 5401 QM I + 5301 E&M I + 5094 (Grad Seminar)

semester 3: 5402 QM II + 5500 Stat Mech

semester 4: two of: Comp. Phys., atomic, molecular, QMIII, E&M II, quantum optics, lasers, semiconductor optical devices

example CMP student course curriculum:

semester 1: 5101 Math Methods + 5201 Mechanics + 5094 (Grad Seminar)

semester 2: 5401 QM I + 5301 E&M I + 5094 (Grad Seminar)

semester 3: 5402 QM II + 5500 Stat Mech

semester 4: two of: Comp. Phys., QMIII, E&M II, solid state, CMP I, polymers, NMR

example ASTRO student course curriculum:

semester 1: 5201 Mechanics + 6710 (Stars) + 5094 (Grad Seminar)

semester 2: 5401 QM I + 6720 (Galaxies) + 5094 (Grad Seminar)

semester 3: 5500 Stat Mech + 6740 (Observational Astrophysics)

semester 4: 5301 E&M I + 6730 (General Relativity and Cosmology)

example GEO student course curriculum:

semester 1: 5101 Math Methods + 5201 Mechanics + 5094 (Grad Seminar)

semester 2: 5401 QM I + 5301 E&M I + 5094 (Grad Seminar)

semester 3: 5402 QM II + 5500 Stat Mech

semester 4: two of: Comp. Phys., E&M II, or from geosciences courses

Existing graduate courses in the catalog:

5010. Independent Study

5020. Research in Physics

5094. Physics Seminar

5101. Methods of Theoretical Physics I

5102. Methods of Theoretical Physics II

5201. Theoretical Mechanics I

5301. Electrodynamics I

5302. Electrodynamics II

5350. Computerized Modeling in Science [**to be renamed & modified**]

5401. Quantum Mechanics I

5402. Quantum Mechanics II

5403. Quantum Mechanics III

5500. Statistical Mechanics

5621. Polymer Physics, Advanced Topics in Physics I

5622. Advanced Topics in Physics II

6110. Atomic Physics

6120. Molecular Physics

6130. Quantum Optics

6140. Principles of Lasers

6150. Semiconductor Optical Devices

6201. Fundamentals of Solid State Physics I

6211. Condensed Matter Physics I

6212. Condensed Matter Physics II

6244. The Electrical Properties of Polymers

6247. Nuclear Magnetic Resonance II

6264. Semiconductor Physics

6310. Relativity

6320. Nuclei and Particles

6331. Nuclear Physics I

6332. Nuclear Physics II

6341. Quantum Theory of Fields I

6342. Quantum Theory of Fields II

6710. Stars and Compact Objects

6720. Galaxies and the Interstellar Medium

6730. General Relativity and Cosmology

6740. Observational Astrophysics