

# PHYSICS, MS

**Degree:** Master of Science (MS)

**Field of Study:** Physics

## Program Overview

The graduate student in physics has two primary responsibilities: to broaden and deepen their own understanding of physics, and to contribute in a significant way to the progress of physics as a research discipline. Neither of these efforts can be completely separated from the other. Your understanding of physics is necessarily reflected in your research, and your research will help to deepen your understanding of physics.

The department also has an Entrepreneurship Track for the MS in Physics. This program is designed for students who have a background in physics and a passion for innovation, entrepreneurship, and working for small companies and startups. Students study graduate-level physics, practical business, and technology innovation while working on a real-world entrepreneurial project with an existing company or their own startup. The Entrepreneurship Track helps connect students with mentors, advisors, partners, funding sources and job opportunities. The requirements for this master's track are outlined in the relevant section below.

## Requirements for Graduation

Requirements for the master's degree include course work and either a comprehensive examination or a thesis.

Requirements for the master's degree with the Entrepreneurship Track, include coursework and a thesis.

## Additional Courses for Cultural Purposes

The university permits graduate students to enroll in up to eight "fellowship" courses that are not counted toward the degree requirements for no additional charge. These may include courses in foreign language, history, philosophy, business and management, music, engineering, etc. These courses will be graded, and a grade will appear on the student's transcript.

## Master's Comprehensive Examination

A normally prepared student will be expected to take the qualifying examination in May at the end of the first year of graduate study. Students who fail the first time will speak with the chair of the qualifying committee and Director of Graduate Studies to ascertain if there is a disconnect between knowledge and performance on the exam. They will discuss with the student how best to maximize the chance of passing on the student's second attempt, generally in mid to late August. For students not passing the second time, the chair of the qualifying committee and Director of Graduate Studies will discuss the student's future plans, or the unusual possibility of a third exam.

Program candidates for the master's degree (without the Entrepreneurship Track) must complete a comprehensive examination. This examination is identical to, and offered the same time as, the PhD qualifying examination. The passing grade for the master's exam is set lower than the passing grade for the PhD qualifying examination. Students who fail the first time will be allowed a second

opportunity in August. Under special circumstances, students may be given an oral examination instead of a written exam.

The master's comprehensive examination consists of a written two-day examination. Several months in advance of the date for the qualifying examination, a written announcement is made which gives more specific details about the forthcoming examination. Previous examinations are on file and available to students.

## Advising

Upon entry to graduate school, the master's student's academic advisor will be the department's Director of Graduate Studies. Eventually, each successful student will acquire a research advisor and dissertation committee. At that time, the responsibility of the Director of Graduate Studies will greatly diminish, but not vanish entirely. It will remain the Director's responsibility to assist the research advisor in academic matters. The Director of Graduate Studies, as well as the research advisor, will countersign the student's course program. It is the responsibility of the Director of Graduate Studies to follow the career of the student and see that all requirements for the degree are fulfilled.

The director of the Physics Entrepreneurship Program will be the academic advisor for students in the Entrepreneurship Track of the master's program. Each successful student will also acquire a research advisor and thesis committee, which will meet with the student at least once per semester. It is the responsibility of the director of the Physics Entrepreneurship Program to follow the career of the students in this track and see that all requirements for the degree are fulfilled.

## Colloquia and Seminars

In addition to course work and individualized direction in research, the physics department provides a third medium of teaching, colloquia and seminars, which are shared by students and faculty alike.

Colloquia are talks of a general nature, given at a level that all graduate students in all areas of physics should be able to follow. They are usually held on Thursdays. Notices (and, whenever possible, brief introductions to the subject) will be distributed well in advance of each colloquium. Graduate students are urged and expected to attend all of these colloquia. (All graduate students are required to register each semester for the zero-credit-hour course PHYS 666, which consists of attendance at colloquia.)

Seminars tend to deal with more specific topics and often require some expertise in the field. Some groups hold weekly luncheon seminars; others meet whenever a speaker is available. Advanced students are expected not only to attend, but also to participate in the seminars in their fields. Students who have not yet chosen a field of research may find the seminars a valuable means of sampling the types of research available. Students in the Entrepreneurship Track are expected to attend all of that program's seminars, and are encouraged to attend other relevant seminars.

## Policy on Working Outside the Department

The teaching and research assistantships represent a rich and exciting experience and a total time commitment on the part of both the graduate student and his or her advisor. It is generally not advisable for a student to accept other employment or non-family responsibilities, inside or outside of the department or university. If a student nevertheless desires an additional position, written approval must first be obtained from the

student's advisor, and a petition then made to the Graduate Committee. Prior approval of the committee is required in order to avoid a possible reduction or termination in assistantship financial support.

The program is typically completed in two years.

A variety of special circumstances may arise in the case of students in the Entrepreneurship Track. Oversight will be provided by the Physics Entrepreneurship Committee, and approval of the director of the Physics Entrepreneurship Program is required.

## Graduate Policies

For graduate policies and procedures, please review the School of Graduate Studies section of the General Bulletin.

## Program Requirements

The requirements for the MS degree depend on whether or not the candidate completes the research and writing for a master's thesis. A total of 30 credit hours of graduate course work must be completed. The two options corresponding to Program A (with thesis) and Program B (without thesis) are as follows:

### ***Program A: MS with Thesis***

- PHYS 413 Classical and Statistical Mechanics I (3 hours)
- PHYS 423 Classical Electromagnetism (3 hours)
- PHYS 651 Thesis M.S. (6 to 9 hours)
- Other graduate courses (18 to 15 hours, of which at least 6 must be in physics)
- Thesis and oral defense

### ***Program B: MS without Thesis***

- PHYS 413 Classical and Statistical Mechanics I (3 hours)
- PHYS 423 Classical Electromagnetism (3 hours)
- Other graduate courses (24 hours, of which at least 9 must be in physics)
- Comprehensive examination (Given in May and August)

The 30 hours of required courses can generally be completed in three semesters, though thesis research and writing may take longer. Candidates must be in residence (paying tuition) during the semester in which they complete requirements and receive the degree; applications for degree should be filed early in the third semester. Candidates for the PhD degree may apply for and receive the MS degree on the basis of work completed toward the PhD.

## Concentration Requirements

### Entrepreneurship Track

The requirements for the master's degree, Entrepreneurship Track, are 30 credit hours as follows:

- PHYS 491 Modern Physics for Innovation I (3 hours)
- PHYS 492 Modern Physics for Innovation II (3 hours)
- LAWS 5341 Commercialization and Intellectual Property Management (3 hours)
- LAWS 5366 Venture Finance & Transactions (2 hours)
- 400-level Physics Elective (6 hours)
- Restricted Elective (4 - 7 hours)
- Thesis work (PHYS 651) (6 - 9 hours)