

PROGRAM REQUIREMENTS FOR THE M.S. DEGREE IN THE DEPARTMENT OF PHYSICS

Each student who wishes to pursue the M.S. degree in physics will be advised by a faculty member who has graduate faculty status in the Department of Physics. The advisor will assist in planning a program appropriate for the student's needs and interests. For the M.S. degree, the Graduate School requires 45 credits with a 3.00 grade point average (minimum) and no grades below C on the program. If the student chooses a minor, approximately 1/3 of credits should be in the minor, and 2/3 of the credits in the major. If the minor is outside the physics department, the student must meet the minor requirements from that department and have a professor from the minor department on the examining committee. No more than 50% of courses used for the M.S. graduate program of study may be the 500-level component of a dual-listed 4xx/5xx course. The M.S. degree requires a Capstone experience, which can be satisfied by either the Thesis Option or the Project Option, as detailed below.

Program Requirements

1. Completion of a minimum of 24 credits (Thesis option) or 30 credits (Project option) from the classes in Lists A, B, or C. At least 4 classes must be from List A (core graduate-level physics classes).
2. Completion of no more than 9 credits of "blanket" courses:
 - PH 501 Research (only for Thesis option)
 - PH 505 Reading and Conference
 - PH 507 Seminars
3. Capstone requirement:
 - A) Thesis option: Completion of PH 503 (Thesis, 6 credits minimum, 12 credits maximum) and completion of a M.S. Thesis. (See notes below concerning the thesis.)
 - B) Project option: Completion of PH 501 (Research, 3 credits minimum, 6 credits maximum) and completion of a M.S. Project. (See notes below concerning the project.)
4. Each term, all students shall register for and attend the weekly departmental colloquium (PH 507, sec 1) presented by faculty members and visiting speakers on a wide range of topics of current interest.
5. Self-evaluation: Twice in the program (before the first program-of-study meeting and before the final oral examination) the advisor will write an evaluation of the student, and the student will write a self-evaluation. The evaluations are a list of things the student has done, with emphasis on what was done since the last annual meeting, to make progress towards the learning outcomes.
6. Training in the responsible conduct of research (details below), including the Research Seminar (PH 607-4 in Winter term of the first year).
7. Inclusion training: The core-advising committee will meet with students at the beginning of Year 1 to help students identify appropriate inclusion training.
8. The Graduate School requires a two-hour M.S. final oral examination on the major and minor subjects. This is ordinarily taken during the final term of study toward the M.S. degree. Not more than half of the examination period should be devoted to a presentation and defense of the thesis or presentation of the research project; the remaining time can be spent on questions relating to the student's knowledge of the major field, and minor field if one is included in the program.

List A: Physics core courses. MS students are required to pass at least 4 courses in this list. The 4 courses from list A must cover at least 2 physics core subjects, where the core subjects are dynamics, statistical thermophysics, electromagnetic theory and quantum mechanics. Retaking a course should be discussed with the Core-Advising Committee. If a student retakes a course, the second grade will count (this is OSU's policy for retaking classes). The appropriate courses must be chosen in consultation with the student's advisor.

Dynamics	PH 621: Dynamics, 3 credits.
Statistical Thermophysics	PH 541: Capstone: Thermal and Statistical Physics, 3 credits. PH 641, 642: Statistical Thermophysics, 3 credits each.
Electromagnetic Theory	PH 531: Capstone: Electromagnetism, 3 credits. PH 631, 632: Electromagnetic Theory, 3 credits each.
Quantum Mechanics	PH 551: Capstone: Quantum Mechanics, 3 credits. PH 651, 652, 653: Quantum Mechanics, 3 credits each.
Mathematical Physics	PH 562: Mathematical Physics, 3 credits.

List B: Other Physics courses

PH 511: Electronics, 3 credits.
 PH 515: Computer Interfacing, 3 credits.
 PH 564: Scientific Computing II, 3 credits.
 PH 575: Introduction Solid State Physics, 3 credits.
 PH 581, 582, 583: Optics, 4 credits each
 PH 585: Atomic, Molecular, and Optical Physics, 3 credits.
 PH 591: Biological Physics, 3 credits.
 PH 555: Astrophysics, 3 credits.
 PH 595: Introduction Particle, Nuclear Physics, 3 credits.
 PH 654: Advanced Quantum Theory, 3 credits.
 PH 671/2/3: Solid State Physics, 3 credits each.
 PH 681/2/3: Atomic, Molecular, & Optical, 3 credits each.

List C: Specialty courses with emphases in other subfields (materials science, computational physics, physics education, radiation and health physics). Courses from this list must be chosen with advisor approval; they should provide the student with a coherent degree. This list is not complete, other courses or other subfields (with approval) can be used. Note that some of these subfields can alternatively be studied within a minor program outside of physics.

Materials Science	MATS 581/2, 587, 659, 671, CH 511, 512, 513, 540, 541, 542
Computational Physics:	CS 523, 561, 562, 575, 579, 582, ECE 572, 576
Physics Education:	SED 584
Radiation Physics:	CH 516, 518

Notes concerning the M.S. Thesis

The experimental, theoretical, or computational M.S. thesis is designed to be of limited scope, but of a useful character. Past theses have occasionally been accepted for publication.

There are several steps that are designed to aid the student and the thesis advisor in reaching their common goal.

1. Upon arrival, each graduate student will be advised by the Graduate Program Director.
2. At the time of the choice of M.S. thesis option, the student will select a faculty member who agrees to be the thesis director, and who will also serve as the advisor. The student's committee is then selected (two additional faculty members plus a Graduate Council representative) by mutual consent of student and advisor, and at the first committee meeting, the student's program is formally approved and submitted to the Graduate School in accordance with Graduate School requirements. This procedure is normally completed by the end of the student's first year of graduate study.
3. When the feasibility of the thesis is established, the physics members of the committee shall meet to consider the proposal. If approved, this work shall constitute an acceptable M.S. thesis. A rough timetable should be established, for protection of both student and project advisor. It is strongly recommended that the thesis be completed by the end of the second year of graduate study.
4. The full committee will examine the student in a final oral exam, partly on the thesis and partly on general physics.
5. A favorable recommendation by the committee concerning the thesis and the examination will constitute satisfaction of the departmental requirements of the M.S. program.

Notes concerning the M.S. Project

The experimental, theoretical, or computational M.S. project is designed to give the student experience using the physics tools learned in the classroom. The project is necessarily of a limited scope, such that it can be completed by the end of the second year of graduate study. The general procedure describing the M.S. thesis given above applies here as well. It is the responsibility of the student to choose a project advisor. This should be done within the first year of graduate study. The full committee (advisor plus two other members) must approve the planned project. A clear timetable must be established, showing that the project can be completed by the end of the second year of graduate study. Projects building upon work done in a class, a term paper, or a senior thesis are acceptable. A report on the project must be submitted to the committee for its approval and a final oral exam is required. The report need not be submitted to the university (as is the case for the M.S. thesis). A report with approximately 3000-5000 words is considered to be sufficient.

Minimum credit requirement for graduate assistants:

Graduate students with full-time assistantships (teaching or research) are required by the Graduate School to take no fewer than 12 nor more than 16 credit hours per quarter. These credits need not all be in graduate level courses (500 and 600 level).

Training in the responsible conduct of research:

All graduate students are required to take training in the responsible conduct of research (RCR). In our department, RCR training has 3 parts:

- Online CITI training: see the OSU Responsible Conduct of Research Training page: <http://research.oregonstate.edu/ori/responsible-conduct-research>.

- Individual PI training: Principal Investigators will integrate Research Responsibility into their group activities.
- The Research Seminar (PH 607-4)

Graduate students need to complete the CITI training as part of the Research Seminar. Completion is documented by printing out the final results page from the CITI training and by attendance at the Research Seminar. The printouts go to Kelly Carter in the Department office.

Inclusion and diversity training:

The core-advising committee will meet with students at the beginning of Year 1 to help students identify appropriate inclusion and diversity training. For example, it may be a course or workshop about inclusion and diversity. The student must participate in and pass the training.

Example Program

Below is an example program that satisfies the departmental course requirements over 6 quarters. Many variations are possible and are sometimes necessitated by the course schedules.

	Fall	Winter	Spring
1st year	PH 562 (3) PH 651 (3) PH 501 (4) Research PH 507-1 (1) Colloquium PH 507-3 (1) TA seminar	PH 652 (3) Elective1 (3) Elective2 (3) PH 501 (1) Research PH 607-1 (1) Colloquium PH 607-4 (1) Intro Rsrch.	PH 653 (3) Elective1 (3) Elective2 (3) PH 501 (1) Research PH 607-1 (1) Colloquium PH 507-4 (1) Comm Sem
2nd year	PH 621 (3) PH 607-1 (1) Colloquium PH 607-301 (1) SSO sem PH 501 (7) Research	Elective (3) PH 507-1 (1) Colloquium PH 507-301 (1) SSO sem PH 501 (7) Research	PH 507-1 (1) Colloquium PH 503 (11) Thesis

Other notes

- An MS student with a GPA of 3.0 or more in 6 out of 9 core courses of the PhD program is eligible to be considered for transition to the PhD program. The student should write a letter to the Chair of the Physics Department to initiate the process. The letter should briefly describe the student's plan for PhD research and identify a potential PhD advisor. Admission to the PhD program is not automatic. The Graduate Admissions Committee makes the final decision on such requests.
- Undergraduate students wishing to complete a B.S. in physics and then an M.S. in physics within one additional year may do so via the Accelerated Master's Platform (AMP), which allows current OSU undergraduate students to take graduate classes and apply those credits to their current undergraduate degree and transfer them to a participating OSU graduate program. Up to 15 credits of 500/600 level courses taken as an undergraduate can be reserved for use in a graduate program. These reserved credits must be in addition to the undergraduate degree requirements and must be selected

before (not after) taking the course. After receiving the B.S., the student must then enroll as a graduate student for the final year of this program and complete the remaining M.S. requirements.

For students choosing this AMP option, it is advisable to take one of the core course sequences during the last year of the B.S. Interested students should meet with the Undergraduate Program Director and the Graduate Program Director as soon as possible to discuss the details of this option.

- The Graduate School requires that the M.S. program of study be submitted 15 weeks before the final exam.
- A M.S. student in another department who wishes to obtain a minor in Physics must complete at least 15 credit hours of graduate courses. The student must consult with the head graduate advisor in Physics to determine the specific program.