

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 in the Physics Department. The faculty 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. Each student may choose a minor (approximately 2/3 of the credit in the major and the remaining 1/3 in a minor), which can be in Physics or another department. A minor outside the physics department requires that the student meet the minor requirements from that department and have a professor from the minor department on the examining committee.

The M.S. degree requires a Capstone experience, which can be satisfied by either the Thesis option or the Project option, as detailed below. 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.

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.
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. Training in the responsible conduct of research (details below), including the Research Seminar (PH 607-4 in Winter term of the first year).
6. 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. The appropriate courses must be chosen in consultation with the student's advisor. At most 9 credits in each subject area can be applied toward the M.S. degree requirements.

Dynamics PH 535: Capstone: Classical Mechanics, 3 credits.
 PH 621: Dynamics, 3 credits.

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| 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, 633: 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 561, 562: Mathematical Physics, 3 credits each. |

List B: Other Physics courses

PH 511, 512: Electronics Laboratory, 3 credits each.
PH 515: Computer Interfacing, 3 credits.
PH 564: Scientific Computing II, 3 credits.
PH 575: Introduction Solid State Physics, 3 credits.
PH 585: Atomic, Molecular, and Optical Physics, 3 credits.
PH 595: Introduction Particle, Nuclear Physics, 3 credits.
PH 654: Advanced Quantum Theory, 3 credits.
PH 671, 672, 673, 674: Solid State Physics, 2 credits each.
PH 681, 682, 683, 684: Atomic, Molecular, & Optical, 2 credits ea.

List C: Specialty courses with emphases in other subfields (optics, 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.

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| Optical Physics: | PH 581, 582, 583 ECE 592, ATS 512 |
| Materials Science | PH 575 ME 581, 582 CH 511, 512, 513, 540, 541, 542, 545 |
| Computational Physics: | CS 515, 523, 561, 562, 575, 579, 582 ECE 572, 576 |
| Physics Education: | SED 580, 581, 588, 592, 596, 597 |
| Radiation & Health Physics: | RHP 531, 535, 536, 583, 584 CH 516, 518, 519 |

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 under Section 3(a) 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.
- Modules in the Research Seminar Module 1, Module 2. The modules can be downloaded from <http://www.physics.oregonstate.edu/research-ethics>.

Graduate students need to complete the CITI training and the modules in their first year 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. Students who missed the research seminar should review the two modules and note that on the CITI printout. The printouts go to Kelly Carter in the Department office.

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 |
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| 1st year | PH 562 (3) PH 631 (3) PH 651 (3) PH 507-1 (1) Colloquium PH 507-3 (1) TA seminar PH 507-301 (1) SSO sem | PH 621 (3) PH 632 (3) PH 652 (3) PH 507-1 (1) Colloquium PH 507-4 (1) Intro Resrch PH 501 (1) Research | PH 641 (3) PH 653 (3) PH 575 or 585 (3) PH 507-1 (1) Colloquium PH 501 (2) Research |
| 2nd year | PH 642 (3) PH 507-1 (1) Colloquium PH 507-301 (1) SSO sem PH 501 (7) Research | PH 507-1 (1) Colloquium PH 507-301 (1) SSO sem PH 501 (10) Research | PH 507-1 (1) Colloquium PH 507-4 (1) Comm Sem PH 501 (10) Research |

Other notes

- M.S. students who have been admitted to the M.S. program may apply for admission to the Ph.D. program. To do so, a student must submit a letter of application to the Graduate Program director. As soon as possible thereafter, the student must take the written comprehensive exam set by the department. A detailed description of the requirement is given in a bulletin entitled "Comprehensive Examinations". After the student has received a score for the written comprehensive exam, a decision will be made on the student's admission to the Ph.D. program. The student need not pass this written comprehensive exam at the Ph.D. level, but the result will be one of the factors used in the decision. The taking of the exam will be considered a "practice try" should the student be admitted to the Ph.D. program.
- Undergraduate students wishing to complete a B.S. in physics and then an M.S. in physics within one additional year may do so by completing some of the M.S. requirements while still enrolled as an undergraduate. 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 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