

UNIVERSITY POLICIES & PROCEDURES

For all other **University Policies & Procedures**, please visit: <http://www.montana.edu/policy/>
Here you will find MSU policies relating to everything from Academic Affairs to Technology Transfer. You are advised to pay particular attention to all policies listed under Student Affairs, and otherwise familiarize yourself with all other policies that are available to you here.

GRADUATE PROGRAMS IN PHYSICS

The Department of Physics grants the degrees Master of Science and Doctor of Philosophy. The general requirements for these degrees as outlined at <http://www.montana.edu/gradschool/>, the Graduate School's webpage, apply. Every student should examine this site and be familiar with its requirements.

The following supplements the Graduate School's requirements and policies which apply specifically to degrees granted by the Department of Physics. In exceptional cases, departmental requirements, prerequisites, and time limits may be adjusted. Such exceptions require consent of the student's Graduate Committee and the Department Head in advance.

First year graduate students are required to register for a Fall Semester 1-credit teaching seminar (PHSX 594-01), and a 1-credit research seminar (PHSX 594-15) in Spring term designed to acquaint the students with the various research areas in the department. These seminars will be presented by persons active in those areas and are designed to aid a student in identifying the particular area or areas he/she would like to pursue. Students are urged to enroll in other seminars of their choice to obtain more in-depth knowledge of particular areas.

Graduate students who are not Montana residents should take steps to become legal residents of the State of Montana, to avoid paying nonresident fees in subsequent years. These students should register for a maximum of 6 credits per semester in the year (probably, their 3rd or 4th year) that they plan to establish residency.

MASTER'S DEGREES

The Department of Physics grants the Master of Science Degree under two options: Plan A (thesis required), and Plan B (without thesis).

PLAN A REQUIREMENTS

1. Course Requirements

A minimum of 20 credits of acceptable course work is required, which shall include the following:

Physics 594	Teaching Seminar (see above)	1 credit
Physics 594	Research Introduction Seminar (see above)	1 credit
Physics 501	Advanced Classical Mechanics	3 credits
Physics 506	Quantum Mechanics I	3 credits
Physics 519	Electromagnetic Theory I	3 credits
Physics 566	Mathematical Physics	3 credits
Electives	see comment below	<u>6 credits</u>
		20 credits

2. Thesis Requirements

An acceptable thesis and at least 10 credits of Physics 590 are required.

3. Examinations

Qualifying and Comprehensive Examinations are required. A Final Oral Defense of the thesis is also required.

PLAN B REQUIREMENTS

1. Course Requirements

A minimum of 30 credits of acceptable course work is required, which shall be distributed as follows:

Physics 594	Teaching Seminar (see above)	1 credit
Physics 594	Research Introduction Seminar (see above)	1 credit
Physics 501	Advanced Classical Mechanics	3 credits
Physics 506 & 507	Quantum Mechanics I & II	6 credits
Physics 519 & 520	Electromagnetic Theory I & II	6 credits
Physics 566	Mathematical Physics	3 credits
Electives	see comment below	<u>10 credits</u>
		30 credits

2. Thesis Requirements – None

3. Examinations

Qualifying and Comprehensive Examinations are required.

DOCTORAL DEGREE

Course Requirements

A minimum of 40 credits of acceptable course work is required, which shall include the following:

Physics 594	Teaching Seminar (see above)	1 credit
Physics 594	Research Introduction Seminar (see above)	1 credit
Physics 501	Advanced Classical Mechanics	3 credits
Physics 506 & 507	Quantum Mechanics I & II	6 credits
Physics 519 & 520	Electromagnetic Theory I & II	6 credits
Physics 535	Statistical Mechanics	3 credits
Physics 566 & 567	Mathematical Physics I & II	6 credits
Electives	see comment below	<u>14 credits</u>
		40 credits

1. Thesis Requirement

An acceptable thesis is required. A minimum of 20 credits of Physics 690 is required in addition to the courses listed above.

2. Examinations

Qualifying and Comprehensive Examinations are required as is a Final Oral Defense of the thesis.

ELECTIVES

All elective courses must be approved by the student's Graduate Committee and the Physics Department Head. This approval will ensure that the electives represent a coherent block of study of substantial relevance to Physics.

The following limitations normally apply to Elective Courses which may be listed on the Graduate Program for the M.S. or Ph.D. degree in Physics:

- A. No more than half of the Elective credits in the above Course Requirements may be at the 400 level in a student's Graduate Program for any graduate degree in Physics. The remaining Elective credits must be at the 500 level.
- B. The Electives will include courses in Physics and minor or supporting fields. At least half of the elective credits must be in Physics.
- C. Physics 461, 490, 492, 494, 589, 590, 689, 690 cannot be used as Electives in any Physics Graduate Program.
- D. Physics 592 (Individual Problems) is allowed as an Elective to a maximum of 3 credits for an M.S. Program and 6 credits for a Ph.D. Program. These credits must be letter graded.
- E. No more than 1 credit of non-required, pass/fail seminar courses are applicable as Electives in any Physics Graduate Program.
- F. No more than 3 pass/fail credits can be included in any Physics Graduate Program.
- G. Only 10 course-work credits must be taken beyond a M.S. *en route* or continuing M.S., toward the Ph.D.

GRADUATE EXAMINATIONS

Graduate instruction and research are blended with a sequence of assessment tools:

1. Qualifying Exam (all degrees): a written exam that assesses proficiency in Physics at the undergraduate level and preparedness for graduate study
2. Graduate Coursework (all degrees): grade-based assessment of proficiency in advanced techniques and concepts in Physics at the graduate level
3. Comprehensive Exam (all M.S. degrees): a holistic assessment of the student's mastery of the Physics discipline
4. Comprehensive Exam (Ph.D.): an oral exam that assesses preparedness for graduate Ph.D. research
5. Written Thesis and Oral Defense (Ph.D. and Plan A M.S. degrees): assessment of original and substantive contributions to an area of research.

QUALIFYING EXAMINATION:

The Qualifying Exam for all degree-seeking students is a written test on the general principles of physics at the upper-undergraduate level. The Qualifying Exam tests knowledge and comprehension of the general principles of physics through their application in solving a carefully chosen set of problems. Passing the Qualifying Exam in the allotted timeframe is part of making satisfactory progress toward a degree.

FORMAT: The Qualifying Exam consists of problems drawn from upper-level undergraduate course work in four subject areas: quantum mechanics, electricity and magnetism, classical mechanics, and statistical mechanics and thermodynamics.

TIMELINE: The Qualifying Exam is given twice a year: once in August and once in January before the starts of the Fall and Spring semesters. It is expected that students make use of each opportunity to take the exam.

DEADLINE: Graduate students can first take the Qualifying Exam at the beginning of their first year and are required to pass the Qualifying Exam by January of their second year for all graduate degrees.

GRADING: Subjects will be graded individually. Graduate students can pass individual subjects on each attempt and culminate a complete pass over four attempts. To pass the Qualifying Exam at the PhD level, a student must receive a passing grade in all four subjects. To pass the Qualifying Exam at the Masters level, a student must receive a passing grade in at least three subjects. The Exam Committee is solely responsible for the administration and grading of the Qualifying Exam.

GRADUATE COURSEWORK:

Graduate Coursework for all graduate degree-seeking students will assess proficiency in advanced topics, techniques, and concepts in Physics. Graduate students are required to receive a minimum grade of B- in all courses that are listed on the Program of Study and maintain a minimum average GPA of 3.0 to fulfill the coursework requirement for their degrees. Note that the Physics Department minimum grade requirement is more stringent than the requirement set by the Graduate School.

M.S. COMPREHENSIVE EXAMINATION:

The Comprehensive Exam for M.S. degree-seeking graduate students is based on the student's aggregate performance in the six core physics courses. Passing this Comprehensive Exam fulfills the Comprehensive Examination requirement of the Graduate School for a master's degree and is subject to all conditions and requirements set forth by the official policies of the Graduate School.

FORMAT: The degree committee for the student will review that student's coursework performance in the six core physics courses (Advanced Mechanics, Thermodynamics & Statistical Mechanics, Electromagnetic Theory I & II, Quantum Physics I & II).

GRADUATE EXAMINATIONS

TIMELINE: Students must pass the Qualifying Exam at the Masters level before being considered for the Comprehensive Exam.

GRADING: A student who has achieved a B average or higher in the standard first-year graduate courses, and no lower than a B- in any individual course, will be deemed to have passed the M.S. Comprehensive Examination.

DEADLINE: The conditions for a passing grade for the Comprehensive Exam for M.S. degrees must be met by the end of the second year of graduate studies.

Ph.D. COMPREHENSIVE EXAMINATION:

The Comprehensive Exam for Ph.D. degree-seeking graduate students is a written and oral exam that requires the student to present and defend a thesis research plan to their Ph.D. committee. The passing of this Comprehensive Exam fulfills the Comprehensive Examination requirement of the Graduate School for a doctoral degree and is subject to all conditions and requirements set forth by the official policies of the Graduate School.

FORMAT: The Comprehensive Exam consists of a written research proposal and an oral defense. The research proposal describes, in five pages or less, the student's research progress and proposes future work towards the completion of the written thesis requirement. It is appropriate and expected that the research proposal will be developed collaboratively by the student and the student's advisor. The research proposal must be submitted at least one week prior to the oral defense. In the oral part of the exam, the graduate student must present a defense of the research proposal before the student's Ph.D. committee. The committee will probe the student's understanding of the fundamental physics and intellectual context of the research topic.

TIMELINE: Students must pass the Qualifying Exam before taking the Comprehensive Exam.

DEADLINE: The Comprehensive Exam can be scheduled any time after passing the Qualifying Exam, with the first attempt occurring no later than the Spring semester of the second academic year. Postponement of the Comprehensive Examination beyond this time is granted only in exceptional cases. Requests for postponement must be submitted to the student's Ph.D. committee by the student's advisor at least two months before the deadline. The Comprehensive Examination may be repeated once, six to nine months after the first attempt.

GRADING: Through the written research proposal and oral presentation of the research proposal, the graduate student must demonstrate a comprehensive knowledge base that is suitable to conduct the proposed research as judged by the Ph.D. committee. Passing or failing grades are determined by the majority vote of the Ph.D. committee.

EXPIRATION: According to the Degree Requirements of the Graduate School, the results of any department's comprehensive examination "[are] valid for five (5)* years from the term of successful completion." When the successful results of a student's Physics comprehensive exam are deemed to have lapsed, the student's graduate committee will administer an ad hoc re-examination. This will take the form of an oral exam by the entire committee and will serve to re-validate the results of the entire Physics comprehensive examination. The content of the exam will be set by the committee and may focus on topics relevant to the student's thesis research. The oral exam may be counted as the annual meeting of the student's committee required by the Physics Department. If it occurs, it must occur before the student schedules a thesis defense, and a passing result in the re-examination is required prior to scheduling the

* The Physics Department has an exception to this policy which allows validation for six (6) years from the term of successful completion (per Dr. Karlene Hoo, Graduate School, 2/13/15).

thesis defense.

WRITTEN THESIS AND ORAL THESIS DEFENSE:

For both the Ph.D. and Plan A M.S. degrees, a final oral examination is conducted by the student's Graduate Committee to assess the research contributions of the student. The passing of this Thesis Defense fulfills the Defense of Thesis requirement of the Graduate School for a doctoral or master's degree (as applicable) and is subject to all conditions and requirements set forth by the official policies of the Graduate School.

FORMAT: A written thesis is submitted no later than two weeks before the oral defense. The graduate student must present and defend the doctoral or master's thesis to the committee in a manner that demonstrates the student's original contributions to the work and expertise in the area of research. The oral defense will consist of a public presentation that is followed by a closed-door examination that is conducted by the graduate student's Ph.D. committee.

TIMELINE: This examination takes place after the thesis has been submitted.

DEADLINE: There is no deadline for this examination.

GRADING: Through the written thesis and oral presentation, the graduate student must demonstrate original research contributions as judged by the Ph.D. committee. Passing or failing grades are determined by the majority vote of the Ph.D. committee.

PHYSICS DEPARTMENT FINANCIAL AID GUIDELINES

Most students admitted to advanced degree programs in the Physics Department are awarded financial aid, in the form of research or teaching assistantships, fellowships, and fee waivers. To receive financial aid, a student must satisfy the requirements of the Graduate School as listed on their webpage, as well as requirements of the Physics Department given below. Satisfaction of these requirements does not guarantee financial aid, although it is the policy of the Physics Department to support as many qualified graduate students as permitted by the available resources. Limited financial assistance is offered in the summer. For foreign students, continuation of financial aid beyond the first year is contingent upon satisfactory performance in spoken English as well.

CREDIT REQUIREMENTS

Students receiving financial aid must be registered for a minimum of 9 credits during the academic year, unless instructed otherwise by the Department Head. Exception: during the year in which a student plans to establish residency, domestic students may register for 6 credits in order to earn state residency. This will typically occur during a student's 3rd or 4th academic year.

GRADE REQUIREMENTS

Financial aid may be revoked if a student's cumulative grade point average (GPA) falls below 3.0; graduate standing may also be removed in this case (see webpage that follows).

http://www.montana.edu/gradschool/policy/grades_academicstanding.html

The Department of Physics defines a passing grade for required graduate level classes to be a B- or better. A student receiving a C+ or lower is considered to have failed the required class and must retake the class when it is next offered. Questions regarding this policy should be brought to the Department Head. (Revised 11/15)

M.S. CANDIDATES

Candidates for the degree of M.S. in Physics will generally be granted a maximum of two years of financial aid including summers. Note that all specific course requirements for this degree can be satisfied in one year. Exception: students selecting the Plan A (thesis) option may apply for research assistantships for up to one academic year beyond the second year of study; generally, teaching assistantships will not be awarded after the second year.

Ph.D. CANDIDATES

Financial aid will be continued beyond three years only if the written Ph.D. Comprehensive Exam is passed by the second attempt.

MANDATORY ANNUAL MEETINGS WITH THE GRADUATE COMMITTEE The Department of Physics requires senior graduate students to hold annual meetings with their graduate committee to discuss progress and plans for completing their Ph.D. thesis. These meetings are not intended to test the student's knowledge, but are simply intended to be a meeting (generally not more than one hour) to have the student and committee discuss progress on and plans for the thesis project. The meetings will also serve as a regular source of input from other members of the committee. The annual meetings are encouraged once a student joins a research group and has formed a Ph.D. committee, but become mandatory beginning with the Spring term of the student's fourth year in the program, that is prior to the student starting his/her 5th year. The student is responsible for scheduling the committee meeting. Attendance at the meeting for the two nonreaders on the committee is desired but not required. The three readers are required to attend the meeting, or an appropriate substitute found in rare conflicted cases. The graduate student will discuss the planned timeline and progress on the thesis at the meeting. After the meeting, the thesis advisor will submit a summary letter to the Department Head, with copies to the student and other members of the committee, prior to the end of that spring semester. Failure to do this will delay initiation of the GTA or GRA appointment for the following Fall term. Questions regarding this policy should be brought to the Department Head.

TIME RESTRICTION FOR GTA SUPPORT This time restriction would apply to the ninth year after the student enters the program. For example, if a student enters the program in fall 2012, a time restriction would apply to GTA support for the fall semester of 2020. The department will normally not give GTA support to students beyond their eighth year in the graduate program. To request GTA support for semesters after the eighth year would require a letter from the graduate advisor to the Department Head describing the circumstances that justify the continued GTA support for the student. Moreover, the student could continue on GRA support or personal funds. Our hope is that the mandated annual meetings of the student and his/her committee will mean that the restriction on GTA support rarely comes into play. Questions regarding this policy should be brought to the Department Head.

Disclaimer: To the best of our knowledge, the information included herein is correct and up to date (7/9/21). Should you reference it in the future, please be sure to check our webpage at: www.physics.montana.edu for updates, changes, and additions. This document can be found in its entirety on the webpage and will note the date that any changes are made in the future.