Qualifying Exam Policy

COMPETENCE AND REMEDIATION:

All M.S. and Ph.D students are required to demonstrate competence in fundamental physics at the advanced-undergraduate level. Normally, competence is shown by passing the Qualifying Exam; see below. Subjects not passed on the Qualifying Exam can be addressed by taking appropriate undergraduate remedial courses; see section on Remediation.

QUALIFYING EXAMINATION:

The Qualifying Exam assesses a student's competence in fundamental physics. The exam is used to identify areas of weakness the student should address. The Qualifying Exam provides a formative experience for solidifying a student's command of fundamental physics.

The Qualifying Exam is at the upper-division undergraduate level. The exam tests four subjects: 1) classical mechanics, 2) quantum mechanics, 3) electricity and magnetism, and, 4) statistical/thermal physics. *Each subject must be passed for M.S. and Ph.D students.*

The Qualifying Exam is in two parts:

- Part A: classical mechanics and quantum mechanics, given in Fall.
- Part B: electricity and magnetism, and statistical/thermal physics, given in January.

The timing of the Qualifying Exam coincides with the availability of undergraduate remedial courses; see below.

GRADING: 3 problems are given in each subject area, of which 2 must be passed.

TIMELINE: A student will have two opportunities to take each part of the Qualifying Exam before Spring semester of the student's second year.

STUDY RECOMMENDATIONS: It is recommended that students study each subject area full-time for at least one week.

More information about the Qualifying Exam can be found at
physics.montana.edu/grad/qualifyingexam.html

REMEDIATION:

Subject areas not passed on the Qualifying Examination can be addressed by taking the appropriate undergraduate course and obtaining a grade of B or higher. Acceptable remedial courses are:

- PHSX 320 (classical mechanics), offered every Fall.
- PHSX 461 (quantum mechanics I), offered every Fall.
- PHSX 423 (electricity and magnetism I), offered every Spring.
- PHSX 446 (thermodynamics & statistical mechanics), offered every Spring.

Remedial courses can be taken multiple times if necessary, but all remediation must be completed by the end of the student's third year. *N.B.*: *Courses taken before arrival at MSU, and MSU graduate courses, do not count toward remediation.*

Until a student passes all subject areas of the Qualifying Exam, or has received remediation, the student will be required to take the Qualifier Study Seminar; see below.

RECOMMENDATIONS: ordinarily, competence should be shown by passing all subjects on the Qualifying Exam. In some cases, it could be preferable for the student to proceed directly to remediation in some Qualifying Exam subject areas if the student lacks adequate undergraduate preparation. For example, if the student did not take a class in thermodynamics & and thermal physics at the advanced-undergraduate level before coming to MSU, that student might want to take PHSX 446.

Generally, a student should pass each subject area of the Qualifying Exam, or receive remediation in that area, before attempting the corresponding graduate course. Students should work closely with their advisors to ascertain the best path.

While a student might elect to bypass the Qualifying Exam by going directly to the remedial undergraduate classes in each subject area and obtaining a grade of B or higher in each class, this approach is time-consuming and not recommended. It is recommended that the student begin remediation only if they cannot pass the Qualifying Exam.

MINIMUM COURSE OF STUDY FOR THE FIRST TWO YEARS:

1. **2 courses/semester**, graduate or undergraduate.
2. **1 credit of research**. Students are encouraged to make steps toward initiating research upon arrival at MSU. Research involvement is at the discretion of a student's advisor, and could include, e.g., attending group meetings, doing background reading, presenting in journal clubs, setting up lab equipment, a small project, and analyzing data.
3. **1 credit of a required Qualifier Study Seminar** for students who have not passed all qual subjects. This seminar consists of problem-solving sessions run by senior graduate students.
4. **Teaching seminar** in Fall of Year 1.

SECOND-YEAR REVIEW:

In Spring of Year 2, the student's committee will convene to assess progress toward degree. The committee will consider: 1) course grades, 2) performance on the Qualifying Exams and in remedial classes (if any), and, 3) research. By this time, it is expected that the student will have:

- maintained a GPA of at least 3.0 in coursework, graduate or undergraduate, with passing grades (B-) in any core graduate courses that have been taken.
- passed all Qualifying Exam subject areas (via the exam or through remedial courses). If the student has not passed all Qualifying Exam subject areas, remediation in those areas becomes mandatory.
- made a satisfactory start in research.

The committee makes recommendations and can impose requirements for the student to proceed in the program. In following annual reviews, the committee will determine if the student has fulfilled requirements put in place in the Second-year Review. A student who is not making satisfactory progress toward degree (as determined in the Second-year and subsequent reviews) could be suspended from the program.

EXCEPTIONS:

Exceptions to the timelines for the Qualifier Exam and Second-year Review might be permitted for health reasons upon petition by the student.

Transition

- Policy is effective immediately.
- Current first-year students can take both Qual Part A and Qual Part B 2 more times, having up to 4 attempts in each subject. Remedial undergraduate courses can be taken anytime. Mandatory remediation imposed in Spring, Year 3 (rather than Year 2), if necessary.
- Current second-year students who have not passed all qual subjects can start mandatory remediation now if the student's committee determines that progress is otherwise satisfactory.
- Undergraduate coursework taken at MSU prior to the start of the new policy cannot count toward remediation.