

## Updated Compromise Proposal

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### I. SUMMARY

This proposal replaces our current qualifying exam with the final exams in four of our core classes, whose level and grading are overseen by the Exam Committee to ensure uniformity and anonymity. At the same time, the Qualifying Exam Review Committee is replaced by a Master's Review Committee, which makes decisions based on a more global view of students' accomplishments. We propose that:

1. The Qualifying Exam Review Committee (QERC) be replaced with a *Masters Review Committee (MRC)*, which would consist of 6 or 7 members, and represent the department more broadly than the current QERC.
2. The MRC will meet twice a year, the main meeting being just before the beginning of the Autumn quarter, with the second meeting at the beginning of Spring quarter.
3. Like the present QERC, the MRC will judge whether students are to be granted an MS degree and to proceed to a Ph.D.. (In the following we refer to this as “passing” or “qualifying”.) In doing so, however, the MRC will consider a broader range of information than the QERC, and have more flexibility in the decisions it could make. Guidelines are given in Section III.
4. The present qualifying exam (qual) will be replaced by the requirement to take qual-like final exams in four courses: Statistical Mechanics I (524—offered in the Autumn), Quantum Mechanics II (518—offered in the Winter), Electricity and Magnetism II (514—offered in the Winter), and Classical Mechanics (505—offered in the Winter). The “super-basic” question will be discontinued. These exams would be drafted by the course instructors, but then finalized in collaboration with the Exam Committee. The Exam Committee will ensure uniformity of level and length.
5. The exams will be administered in a similar manner to our present qual, and graded anonymously by the instructor. The instructor will then meet with the Exam Committee, and a collective determination would be made of the letter grade (A, B or C) to assign to each test for the purposes of qualifying. This meeting might occur after finals week, in which case the instructors initial numerical grade would be used as input into the determination of grades for the class.<sup>1</sup> It will be possible to fail the corresponding section of the qual while still passing the class (based on homework and midterm performance), and vice versa. All qual-like final exams will be scanned and saved for future use by the MRC.
6. The level of the exams should be set by the material in the classes they follow. For the QM and EM exams, only material from the first two quarters of the sequences can be included. It may be appropriate to reorganize the syllabi of the QM and EM sequences if it is felt that important topics are not being covered on the QM2 and EM2 final exams. More detailed guidelines on topics are given separately.
7. All students are expected to take the SM, QM and EM exams in their first year, with the possible exception of students with poor preparation in one or more subjects, who would take the undergraduate classes instead, and then take the exams in their second year.
8. We expect a substantial fraction of students will not take the CM class until their second year (taking PHYS 600 instead during year 1), at which time they would take the CM exam.
9. Students who pass three exams and have a strong research record will be deemed to have qualified. Thus students who pass the SM, EM and QM exams in their first year, but opt to do research rather than take the CM course, can pass before the beginning of their second year. They would still be required to pass the CM course before their general exam.

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<sup>1</sup> If this occurs, then the instructor would know the identities of the students when meeting with the Exam Committee, but they would remain unknown to the members of that Committee.

10. A class similar to the recently offered qualifying exam preparation class will be created as a standard course to be offered in the Autumn quarter. This will be aimed at building the core competence of second year students who did not qualify after their first year, in preparation for re-taking exams. The instructor of this course, in collaboration with the Exam Committee, could create from the archive *ad hoc* qual questions which would be given to students as a final exam in this course, and which could count as a qualifier exam if the student chooses not to wait until the winter quarter exam period.<sup>2</sup> This class could evolve into a comprehensive physics class, i.e. a class aimed more at teaching connections between different subjects, or new material outside our core canon.
11. A final decision on each student will be made by the Autumn meeting of the MRC just before the beginning of the student's third year, barring exceptional circumstances. It is envisaged, however, that most decisions will be made during the student's second year.
12. Students presently in their first year (2010-11 academic year) will take the qualifying exam at the standard time, i.e. before the start of the Autumn quarter 2011. There will, however, be only four questions, with super-basic dropped. The MRC will meet for the first time after this autumn qual.
13. The GPC and GPA will provide the instructors with a list of students who will take their exam without being registered for the class (e.g., first year students with advanced preparation or second year students retaking the exam).
14. Qual-like final exam questions will be added to the archive of past questions by the Exam Committee.

## II. GRADUATE PROGRAM AND FIRST YEAR RESEARCH

First-year students are encouraged to enter research sooner than at present, particularly those interested in experimental topics. The standard pathway for students (except those with advanced or very weak backgrounds) would be

- *First quarter:* Take QM1, EM1 (a.k.a. Mathematical Methods) and SM1, along with *Introduction to Research* (PHYS 528);
- *Second quarter:* Take QM2 and EM2 in their second quarter, and either CM plus (at least) 1 credit of PHYS 600, or 4+ credits of PHYS 600;
- *Third quarter:* Choose from a menu of possibilities, based on research interests, with at least one credit of PHYS 600.

All students would eventually need to complete all the required classes, which include the above-listed as well as QM3, EM3, SM2 and (possibly) 511 (Topics in Contemporary Physics), as well as two breadth classes.

It is important to document all PHYS 600s, and all RAships, in the first two years. We propose the use of a standard sheet, with space for a plan, to be agreed upon by student and faculty member before the quarter, and for a paragraph-long report from both student and faculty member to be written at the end of the quarter. These would be put in the student's file for use by the MRC.

## III. MASTERS REVIEW COMMITTEE

The present "Qualifying Examination Review Committee" (QERC, sometimes called the "Übercommittee") is replaced by the MRC, whose role will be to assess whether students have reached the level at which they can be given an MS degree, and proceed to the Ph.D.. The MRC consists of 6 or 7 voting members, as follows:

- Department Chair (who also serves as Chair of the MRC, and has the deciding vote if the committee has an even number of members and is evenly split).
- Chair of the Exam Committee.

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<sup>2</sup> This would only be necessary for the QM, EM and CM questions, since the SM exam already falls at the end of the Autumn quarter.

- Graduate Program Coordinator.
- Chair of the Graduate Committee/Associate Department Chair for Graduate Affairs (often the same person; if not, then one or both could be on the committee).
- Two other faculty members chosen to give broad representation.
- Graduate Program Assistant (non-voting observer).

At the **Fall Meeting** (occurring before the start of classes in the Autumn quarter) the MRC reviews every PhD student about to start their second year, as well as any students about to start their third year who have not yet passed. At the **Spring Meeting** (occurring around the start of classes in the Spring quarter), the MRC reviews any second year student who did not pass at the beginning of their second year.

The MRC make take the following actions:

- The student passes, receives the Masters degree (after Graduate School requirements are met as well), and is encouraged to proceed towards the General Exam and a PhD. This pass may be contingent on taking and passing certain classes.
- The student does not pass yet and will be reviewed again at the next MRC meeting. The MRC specifies individual recommendations and requirements (as discussed in more detail below).
- The student is placed on probation, and given explicit requirements that must be met by the next MRC meeting.
- The student fails, and is asked to leave the PhD program, typically with an MS degree obtained during the subsequent quarter. Such decisions will be made no later than the beginning of a student's third year, except in rare special circumstances (e.g. time off due to childbirth or illness).

All actions will be communicated to students in writing. All decisions can be appealed within a set period of 1-2 weeks. After appeal, the MRC's decisions are final.

The MRC reviews students' full records, as documented in their permanent files. It is the responsibility of each student to make sure her/his file is complete, including documentation for any special circumstances. The GPC and GPA will also check files for completeness before each MRC review. The main inputs into the discussion of each student are:

1. Performance on the qual-like final exams.
2. Performance in classes.
3. Research performance, as documented by quarterly PHYS 600 and RA one-page reports, and letter(s) from students' research and/or academic advisors.<sup>3</sup>

The file will also include annual report(s), augmented by a statement from the student and/or his/her academic or research advisor, as appropriate. For example, this could include responses to a previous negative MRC review.

The following guidelines are suggested for determining passing and other actions. We imagine that they will evolve as the new system is put into practice, and there should in any case be flexibility in their implementation.

- In all cases, for a student to qualify they must have completed at least 7 core classes (or had those classes waived by the GPC).
- Generally, it will be expected that, in order to qualify, a student must pass at least 3 of the qual-like final exams. Qualification with only 3 passes will require either a strong research record or other indicators of strong performance, or will be contingent. The contingencies might be to take and pass the qual prep class, or to take and pass specific advanced classes in the area of weakness (possibly attaining specific grades).
- Students with 2 or fewer passes in qual-like final exams, and who have only had one try at the exams, will usually be required to retake the remaining exam or exams during their second year, after first taking the qual-prep class.

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<sup>3</sup> Additional letters may be included—these can be solicited by the student or the GPC.

- For students with 2 or fewer exam passes after two tries, enough information should be available to either suggest an alternative method for assessing competence, or for asking the student to take a terminal Masters. In the former case students would be placed on probation, with specific requirements that must be met by the next meeting of the MRC in order for the student to continue in the program.

In the proposed system, we do not envisage that any student will have more than two tries at each qual-like final exam.

#### IV. GUIDELINES FOR EXAMS

Following the recommendations of the Graduate Committee (document dated 2/28/11), we propose the following guidelines for the four qual-like final exams (each running for two hours):

1. The intent is to test broad competency rather than sophisticated problem-solving ability. A well prepared student who has attained the minimal level of competence should pass.
2. The exam should be written such that time-pressure is not an issue for a prepared student. The formulation proposed by the Exam Committee is that “an average student should be able to complete all parts in one hour.” Present exams typically have two sub-questions on different topics, and adjusting the length might require dropping to a single question. If so, students should be offered a choice of doing 1 out of 2 questions.

A related suggestion (from Larry Yaffe, after his experience with teaching the qualifying exam preparation class in Winter 2011) is to revert to questions having a single part, rather than multiple steps.

#### V. QUALIFYING EXAM PREPARATION CLASS

In Winter 2011 an experimental qual prep class was offered, and taken by about a dozen students. Most of these were either (a) second-year students who had delayed taking the qual because of poor performance in the first year classes and/or having not taken all the core graduate classes, or (b) third-year students who had taken the qual previously and need to retake a substantial number of questions (3, 4 or 5). These students are largely from the roughly one-third of the class that struggles in the core classes. The qual prep class was specifically suggested to help such students study for the qual, and (most importantly) to gain a better and more integrated understanding of core physics.

We sent a survey to the 9 students who took the qual prep class and then subsequently took the exam, and received 5 responses. Asked to rate the helpfulness of the class on a scale of 0 (unhelpful) to 4 (very helpful) the responses were 2, 3, 3, 4 & 4. The students all felt that such a class should be a regular offering.

Further evidence of the effectiveness of the qual prep class is the relatively good performance of these students on the Spring 2011 qualifying exam. All but one of the students were deemed to have passed, although four had “contingent passes” in which they were required to take one or two advanced classes or to write papers.

We propose that the qual prep class be made into a permanent offering, offered in the Autumn quarter. We imagine that it will be taken mainly by second-year students who have not qualified after their first year.