

Department of Mathematics and Statistics

Ph.D. in Mathematical Sciences Supplemental Rules

Note: These rules supplement the PSU Bulletin

June 2007

I. Supplemental Admission and Advising Rules

Admission. Besides the university requirements for admission the department requires two letters of recommendation, GRE scores (both the general and the subject one on math), and a statement explaining the applicant background in an allied area.

The allied area statement is very important since the program is designed around the principle that the student should be sufficiently proficient in an allied discipline to effectively interact with scientists in that field. The student will be expected to take graduate level courses in an allied area. For this purpose the applicant is expected to have some minimal background at the undergraduate level.

Applicants whose allied area statement is not compelling, but who are otherwise strong candidates for graduate work will be considered for admission to the MS program. If admitted, the student, with the help of an advisor, will arrange a program of study that would position him/her well to re-apply to the Ph.D. program at a later time.

Admissions are handled by the Ph.D. Committee in Mathematical Sciences (the *Program Committee*). The Program Committee consists of three members, each serving a minimum of two years for continuity. The chair of the committee is the Program Director.

Each application will be reviewed by at least three faculty members. Their recommendations are then forwarded to the Program Committee which then makes the final decision. This decision is subject to fulfillment of general university requirements for admission.

Advising. Upon admission, a temporary advisor will be assigned to the student by the Program Committee. As soon as possible after starting studies two permanent advisors will be assigned: one in mathematics and one in the allied area. These advisors will help prepare a study plan leading to the comprehensive exams and will be part of the Comprehensive Examination Committee with the departmental advisor acting as chair. After the comprehensive exams are passed a dissertation committee will be formed and a

dissertation proposal prepared. In general it is expected that the two original advisors stay with the student during the whole study at PSU. However, advisors may be changed with approval of the Program Committee as long as progress towards the completion of the degree is maintained.

II. Supplemental Enrollment Rules

Continuous Enrollment. Students are expected to enroll each term after they are admitted until all requirements for the degree are completed. If a student is unable to do so, approval for a leave of absence must be obtained from the program committee. A written request to the Program Director stating the number of terms of expected absence and the reasons for the leave must be submitted. University admission is cancelled after an absence of two years. In any term in which the student uses University facilities, services, or staff, the student must enroll for an appropriate number of credit hours (normally, at least 3).

Residency Requirement. General University requirements dictate that at some time during the doctoral program, the student must have been in residence (i.e., taking at least nine hours) for three consecutive terms. This requirement can be fulfilled by thesis credits (MTH 603) after the student is advanced to candidacy.

Time Limitations. As the backgrounds and programs of students vary widely, so does the time required to complete Ph.D. requirements and graduate from the Program. A student with an appropriate undergraduate background, with no prior graduate work and enrolled full time as a student, might expect to graduate in approximately five years. This includes about two and a half to three and a half years of coursework; a term to a year or more to complete the language, Comprehensive Exams, and the thesis proposal; and, after the proposal is accepted and the student is advanced to Candidacy, a year or more for research and completing the dissertation.

The Comprehensive Examinations must be taken no later than five (5) years after admission to the Program. The student may petition the Departmental Graduate Committee through the Program Director for a maximum of one-year extension of this requirement. If the examinations are not taken by the stipulated time the student will be dropped from the Program.

The student is expected to prepare a dissertation research proposal, submit it for acceptance by a proposed Dissertation Committee, and be advanced to Candidacy within one year of passing the Comprehensive Examinations. A student may petition the Departmental Graduate Committee through the Program Director for an extension, but the maximum period allowed is two years from passing the Comprehensive Examinations. If the student is not advanced to Candidacy by the end of the one year limit (or, up to two years, if a petition is approved by the Graduate Committee), the student will be dropped from the Program.

Students must complete the dissertation within five years of the date of advancement to candidacy. Should a student require longer than five years to complete the dissertation, and if an extension is granted by the Vice Provost for Graduate Studies and Research, the Department of Mathematics and Statistics may require that a special Comprehensive Examination be taken.

Grade Requirements. A student with regular admission status must maintain a GPA of 3.25 or better for all graduate courses taken related to the student's program. The student has the first 12 hrs to attain this GPA. A student whose grades fall below this level will be placed on academic probation the term following the term in which the unacceptable GPA was earned. (This is probation in the Program, not University probation.) Regular students who fall below a 3.25 GPA have one term to raise their GPA to 3.25 or above. If this is not accomplished, the student will be dropped from the program.

A student with conditional admission status must maintain a GPA of 3.25 or better for the first 12 hours of program-related graduate courses taken. If the student's GPA falls below 3.25, the student will be dropped from the Program (with no extra probationary period allowed).

Language Requirement. The student is required to demonstrate competency in a language approved by the Program Committee, for example, French, German, Russian, Japanese, or Spanish. The language exam is administered by a faculty member of the department of Mathematics and Statistics. The exam consists of a written and an oral part. For the written part the student will work for two hours to translate two to four journal pages with the aid of a dictionary. For the oral part the student will be given an article or book in advance and would then explain the mathematical content in English to the examiner.

After satisfactorily completing the requirement, the examiner will notify the Program Director.

III. Supplemental Comprehensive Examinations Rules

1. Nature and Frequency. Comprehensive examinations are written and oral exams covering the subject matter in the student's graduate coursework, and are taken after this coursework is completed. The Comprehensive Examinations are normally given twice a year, in the fall and spring terms. The language exam requirement must be completed prior to the Comprehensive Examinations.

The written portion of the Comprehensive Examination consists normally of a total of 4 three-hour exams. The written exams are followed within 10 days by an oral (two-hour) exam.

Comprehensive exams are typically taken in four areas. Three of the exams will be based on Mathematics or Statistics courses. The fourth exam will be on courses from an allied

area approved by the Program Committee. Exemptions must be approved by the Program Committee. Overall, the exams must be based on the content of a minimum of 20 graduate courses. Each mathematics/statistics exam must be supported by a minimum of 4 graduate courses which shall include a 600-level sequence. The allied area exam must include 4 courses at the 500 or 600 level.

2. The Comprehensive Examination Proposal. The student must prepare a statement showing that he/she has satisfied all Ph.D. course requirements including the foreign language exam. The statement must define four topic areas over which the student will be examined. This information will enable the Comprehensive Examination Committee (CEC) to assess the appropriateness of the student’s coursework as preparation for the intended future work, and, more immediately, for the dissertation research.

The student proposes (with the assistance of his/her advisors) four or more faculty members to serve as the Comprehensive Examination Committee. The student and the individual examiners agree upon proposed examination descriptions. Examiners may solicit questions from other faculty members, who would then grade those questions. These additional faculty members should also be identified in the proposal. Prior to the date of the examination, the potential examiners meet as a group to review the overall definition of the proposed examination and to assess the appropriateness of the proposed examination topics as preparation for the student’s proposed research area.

The overall examination definition (subject areas and examiners) is subject to approval by the Program Committee. The Chair of the Comprehensive Examination Committee then becomes the student principal advisor and serves in this capacity until the Dissertation Committee is appointed.

3. Grading. Each Exam is graded by the examiner(s) as Pass (P), Fail (F), or Marginal (M). The Comprehensive Examination Chair is responsible for collecting the results of the written examinations from each Committee member. The following is the procedure to be followed for integrating the grades of the written exams, when the usual practice of 4 three-hour exams is followed.

<u>Grades received</u>	<u>Outcome</u>
A. i. Four P ii. Three P, one M	Student takes the oral exam
B. i. Two P, two M ii. Three P, one F	Student must retake written exams not passed, and then take oral exam
C. Worse than above	Student must retake all written exams, and then take oral exam

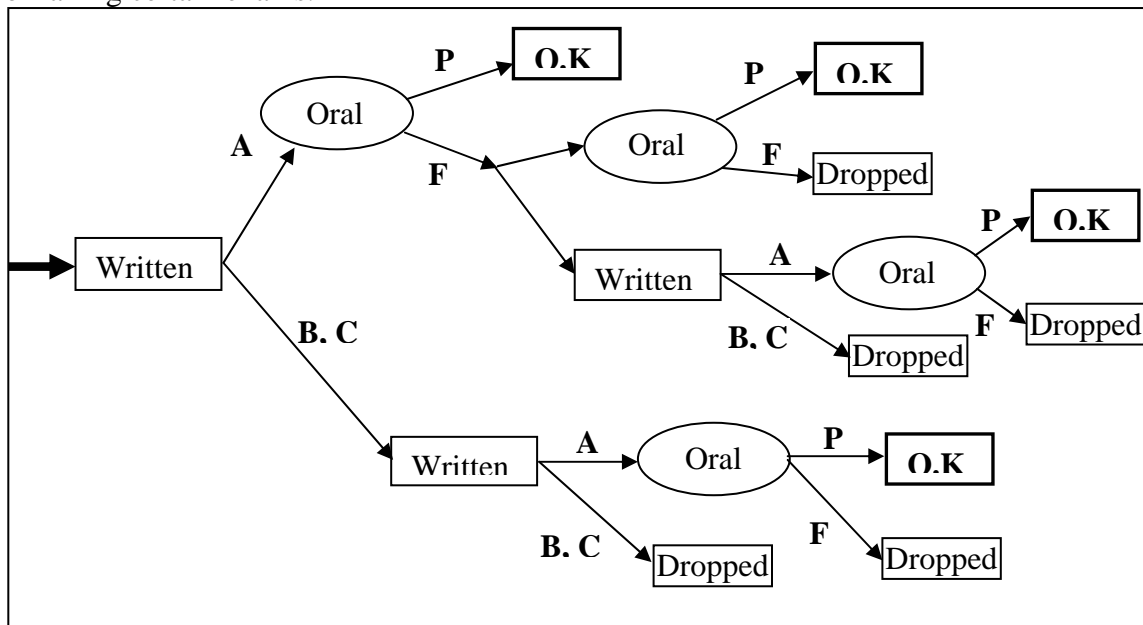
If retaking of written exams is required, they must be retaken within a year during one of the normally scheduled comprehensive exam periods. Under no circumstances can written exams be taken more than twice. If **B** or **C** above pertains on the second taking of the written exams, the student is automatically dropped from the program.

The Committee Chair will be responsible for notifying a student of the results of the examination and the next steps the student must take. Upon the examiner's approval, the student may discuss the written exam prior to the oral examination.

Following the completion of the oral examination, each Committee member is called upon to render a judgment, based on *all* information available to him/her, of the student's indicated ability, preparation, and promise for pursuing doctoral-level research and professional work. The assessment will be made using a number from 1 to 5 for each area, using the scale indicated below, via secret ballot. In case there is more than one examiner in one of the areas those examiners must reach a consensus on a single score from 1 to 5. The scores from all the areas will be then totaled and averaged. **To pass, the student must have a score larger than or equal to 3.7.** In case the student fails the oral exam the CEC determines whether retaking the written exams is warranted or whether just retaking the oral is sufficient.

<u>Scoring guide</u>	
5	Exceptional student
4	Satisfies our norm of a solid Ph.D. caliber graduate student
3	In some ways satisfied the above mentioned norm, but only at the low end of the spectrum (call this "marginal")
2	Is too weak to be classified as marginal, but stronger than for the next category
1	In the committee's opinion, the student has no business in this program

The following flow chart summarizes the possible paths to be followed based on passing or failing certain exams.



Announcement of the pass or fail for each student comes from the Chairman of the student's CEC, who will also notify the Program Committee of the results, and place a memo concerning the results in the student's file.

IV. Supplemental Advancement to Candidacy Rules

1 Course Requirements.

A. Students whose highest degree in mathematics or related fields is a bachelor's degree must complete a minimum of **99 credit hours** beyond a bachelor's degree distributed as follows:

- Approved graduate level courses **63 credits**
 - Out of these:
 - 45 credits (minimum): Mathematics and Statistics courses of which at least 10 courses are at the 600 level
 - 15 credits (minimum): Allied area (4 course minimum at the 500 and 600 level)
- Doctoral Seminar/Internship (Mth/Stat 607/604) **9 credits**
- Dissertation (Mth/Stat 603) **27 credits**

B. Students entering with a master's degree in mathematics or related fields must complete a minimum of **72 credit hours** distributed as follows:

- Approved graduate level courses **36 credits**
 - Out of these:
 - 18 credits (minimum): Mathematics and Statistics courses at the 600 level.
 - 15 credits (minimum): Allied area (4 course minimum at the 500 and 600 level)
- Doctoral Seminar/Internship (Mth/Stat 607/604) **9 credits**
- Dissertation (Mth/Stat 603) **27 credits**

To be advanced to candidacy, students must complete the course requirements, hold a dissertation proposal meeting, and have a committee approved dissertation proposal.

2. Doctoral Seminar/Internship (Mth/Stat 607/604). Students should register for an appropriate number of Mth/Stat 607/604 credits approved by the Ph.D. Committee upon recommendation of the student's advisor during the term when the seminar/internship activity is performed. These credits are intended to provide a cross-disciplinary

experience in the student's area of research and should be considered only after a substantial coursework has been completed, preferably after the comprehensive examinations. Credits may be earned through an active involvement in multidisciplinary activities that may include presenting seminar talks, colloquium/conference presentations, workshops. Students participating in internships within the industrial or governmental research centers are required to provide a scientific report of their internship activities.

3. Dissertation Proposal. The major program-related objective of the student following the Comprehensive Examinations is to submit an acceptable dissertation. The process leading to this objective includes definition of a research topic, identification of appropriate faculty to serve as the Dissertation Committee, preparation and presentation of an acceptable research proposal (which leads to advancement to Candidacy), carrying out the research, writing the dissertation, and successfully presenting and defending the dissertation at an oral examination.

The Chair of the student's Comprehensive Examination Committee assists the student during the process leading to advancement to Candidacy and to the appointment of a Dissertation Committee for the student. The student decides on an appropriate dissertation topic, and develops it sufficiently by discussion with prospective members of the Dissertation Committee (including the representative of the Office of the Vice Provost for Graduate Studies). When the student is forming his/her dissertation committee, a **GO-16 form** needs to be completed (by the Department staff) and submitted to Graduate Studies, to officially appoint the dissertation committee. This form requires the following information:

- 1) dissertation topic;
- 2) will human subjects be used, yes or no (if yes, a draft of the human subjects application must also be submitted to Graduate Studies);
- 3) names of the four regular committee members; and
- 4) two suggested names for the graduate studies representative, in priority order.

When the student is ready, the CEC Chair convenes a meeting of the prospective committee members to pass on the Proposal. (In many cases, the CEC Chair becomes the Dissertation Committee Chair. Alternatively, the student may begin working intensively with another faculty member who will become the Dissertation Committee Chair, but this role does not become official until the Graduate Office approves the constitution of the Dissertation Committee.) Each Committee member will be given a copy of the proposal (at the student's expense) at least ten days prior to the meeting. At this meeting, the student makes a formal presentation and answers questions from the Committee regarding the proposed research. It is possible that the student will be required to make changes in the proposal, per recommendations by the (prospective) Committee members. The student must convince prospective committee members that the proposed research problem is appropriate for a Ph.D. in Mathematical Sciences and meets University requirements. Students should obtain a copy of the Office of Graduate Studies' requirements for a dissertation (available from the Graduate Studies Office). The proposal is expected to include the following:

- 1) Background and general status of knowledge in the problem area.
- 2) Theoretical and empirical framework within which the proposed problem exists,

- beginning with a concise statement of the problem.
- 3) Significance of the proposed research and its likely contributions.
 - 4) Research methodology to be used. If the research is empirical, this section should give evidence of careful planning of the research design.

When the prospective Committee members are satisfied that the student's proposal meets the above requirements and are willing to serve on the Committee, they sign the cover sheet of the proposal. Following this, the Chairman of the student's Comprehensive Examination Committee forwards a letter of Recommendation for Advancement to Candidacy and a copy of the cover page of the research proposal to the Vice Provost for Graduate Studies.

The letter of recommendation must be signed by the Comprehensive Examination Committee Chairman and the Program Director. The Vice Provost for Graduate Studies approves the dissertation problem, appoints the Dissertation Committee, and advances the student to Candidacy for the degree.

Students must be advanced to Candidacy within one year after passing their Comprehensive Exams, or within two years, if a petition for a time extension has been approved by the Ph.D. Committee.

4. Composition of the Dissertation Committee. The dissertation committee consists of four (or more) members recruited by the student plus a Graduate Studies representative. The principal dissertation advisor must be a regular, full-time faculty member at PSU. Of the remaining three (or more) members recruited by the student, at least two must be (or must have been) on the PSU Faculty. Each member of the committee must hold a doctorate and be a recognized researcher in a field appropriate to support the student's research.

V. Supplemental Dissertation Rules

1. Registration. Students must complete a minimum of 27 hours of Mth/Stat 603, Dissertation Research, **after** advancement to Candidacy. Enrollment in Mth/Stat 603 is not allowed until the student is advanced. Students will enroll in Mth/Stat 601 (non-dissertation) Research after passing the Comprehensive Examination while preparing the Dissertation Research Proposal. Up to nine 601 credits taken in the quarter in which the student is advanced to candidacy may be changed by the Program Director into 603 credits. It is the student's responsibility to schedule the dissertation proposal meeting early in the quarter, as follow-up meetings may be needed before the proposal is approved. It also is the student's responsibility to schedule the follow-up meetings in a timely fashion during the quarter.

A student may register for not more than 12 credits of mth 603 in any given term. During the term in which the Dissertation defense occurs, the student must be enrolled for a minimum of one credit hour. The student must have filed with the Office of Graduate Studies an "Application for the Degree" form (the deadline to apply for graduation is the first Friday of the term in which the student hopes to graduate). The Abstract of the

Dissertation should be submitted to the Department of Mathematics and Statistics three weeks prior to the oral defense to allow time for its approval and distribution.

Any term, in which the student makes use of University facilities, services, or staff, the student is expected to enroll for the appropriate credit hours, even after 27 hours of Mth/Stat 603 have been taken. (See University policy on continuous enrollment in a current bulletin.)

2. Progress in Dissertation. Minor deviations from the original proposal may be permitted, at the discretion of the student's Committee. Major modifications of the Dissertation Proposal, however, may require a change in the student's Dissertation Committee, additional coursework, and further comprehensive examinations. The principal dissertation advisor will keep the Dissertation Committee abreast of the student's progress, and, as appropriate, schedule meeting(s) for the Committee with the student for discussion, evaluation, and suggested modifications of work in progress. Students are encouraged to plan their schedules realistically, as it is easy to underestimate the amount of time it takes for this phase of the Ph.D. program. This is especially true for the "final stage" of writing up the results of the dissertation research, as the writing process may reveal that a substantial amount of unanticipated and additional research work is actually required before the dissertation can be properly completed.

When the student thinks the dissertation is in its final form, a copy will be given to each of the Committee members, who will be allowed a minimum of four (4) weeks to read and evaluate it. After this review, the Committee will meet with the student and decide if the dissertation is ready for public presentation and final defense, and if so, will schedule the final Oral Examination (dissertation defense). An Abstract of the dissertation may be approved at the same meeting. The Abstract must be published and distributed at least two (2) weeks before the date of the Oral Examination. All expenses involved in preparing copies of the dissertation (and before that, the proposal) are to be borne by the student.

3. Defense of the Dissertation. Upon tentative approval of the dissertation, the candidate's Dissertation Committee (including the representative of the Vice Provost for Graduate Studies) shall conduct a final oral examination. The student is required to provide a copy of the latest draft version of the tentatively approved dissertation for each member of the examining committee per the schedule given in the previous section. The examination, which is open to the public, culminates the doctoral studies. The candidate is expected to prepare and present orally a formal statement on the research methodology and results. The oral presentation should not exceed 45 minutes. Following this presentation, the candidate must defend the dissertation as a worthy contribution to knowledge in its field and must demonstrate mastery of the field of specialization as it is related to the dissertation. The purpose of the questioning and discussion is to: (1) further illuminate, for the candidate and the committee, the significance and limitations of the research, and (2) demonstrate that the candidate has met the high standards of the University for the award of the doctoral degree.

As noted in the PSU Bulletin, all committee members, or alternates approved by the Vice

Provost for Graduate Studies, must be present for the final oral examination. Each appointed member has a vote. For dissertation approval, there can be no more than one dissenting vote on the final examination. The Graduate Studies representative participates in conducting the final oral exam and in the vote for pass or no-pass. The role of the Graduate Studies representative is defined by documents given to the representative by the Graduate Studies Office. The Committee and the student should be aware that the representative's vote influences the Vice Provost's approval/disapproval of the dissertation.

The Committee may pass the student subject to the completion of specified minor modifications to the dissertation. If the final oral examination is not satisfactory, the advisory committee may recommend that the Vice Provost for Graduate Studies permit the candidate to take another oral examination after a period of further work.

4. Regulations & Time Limitations. The final oral examination shall not be given until the general University residency requirements have been met. The final oral examination must be taken not later than five calendar years after advancement to candidacy. Failure to complete all requirements for the degree within the five years will invalidate the candidate's passing of the comprehensive examination. Re-advancement to candidacy requires the passing of the regular, or a special, Comprehensive Exam. Approvals for re-advancement are required by the Director of the Program and the Vice Provost for Graduate Studies.

The Dissertation must conform to the regulations specified in the "Information Regarding Thesis and Dissertation Approval" document, available from the Office of Graduate Studies. Also students must obtain the microfilming packet from Graduate Studies about two weeks before graduation.

APPENDICES

1. Plan of study form
2. Comprehensive Examination signature page
3. Language Exam form
4. GO-16D. Appointment of Doctoral Dissertation committee. From the Graduate Studies office website. <http://www.gsr.pdx.edu/forms/go-16d.pdf>