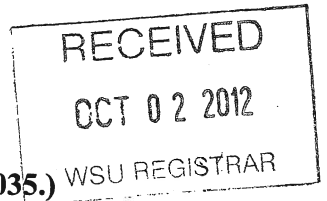


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Washington State University
MAJOR CHANGE FORM -- REQUIREMENTS

(Submit original signed form and **TEN** copies to the Registrar's Office, zip 1035.)
See <https://www.ronet.wsu.edu/ROPubs/Apps/HomePage.ASP> for this form.

*Submit an additional copy to the Faculty Senate Office, French Administration 338, zip 1038.

Department Name Mathematics

1. CHECK PROPOSED CHANGES.

- * Change department/program name from _____ to _____
- * New degree or program in _____
- * Change name of degree from PhD in Mathematics with Teaching Emphasis to PhD in Mathematics with Education Emphasis a
- * Drop degree or program in _____
- * Extend existing degree or program to _____ campus
- New Major in _____
- Change name of Major from _____ to _____
- Revise Major requirements in _____
- Drop Major in _____
- Revise certification requirements for the Major in _____
- New Option in _____
- Revise requirements for the Option in PhD in Mathematics with Teaching Emphasis b
- Drop Option in _____
- New Minor in _____
- Revise Minor requirements in _____
- Drop Minor in _____
- New Undergraduate Certificate in _____
- Revise Undergraduate Certificate requirements in _____
- Drop Undergraduate Certificate in _____
- Other _____

Effective term/year Fall 2013

Libby Knott	(509) 335-4122	lknot@wsu.edu
Contact Person	Contact Phone No.	Contact email

2. GIVE REASONS FOR EACH REQUEST MARKED ABOVE. (Attach additional paper if necessary; see reverse side.) See attached reasons

4. SIGN AND DATE APPROVALS.

9/10/2012 9-25-12 _____
 Chair Signature/date Dean Signature/date General Education Com/date

_____ _____ _____ _____
 Catalog Subcom/date Academic Affairs Com/date Graduate Studies Com/date Senate/Date

Rationale for changes in PhD in Mathematics with Teaching Emphasis

We are proposing a change to this option in our PhD in Mathematics program to more accurately reflect the goals of the program. At one time, this option was viewed as a means of assisting two-year and teaching college faculty develop a background in the teaching of mathematics. Most graduates of the program were going on to teaching positions, with none to few research expectations.

Today, the climate is very different. Most research universities have recognized the need for specialists in mathematics education who are housed in and cognizant of the content (mathematics) discipline at the graduate level. We have **redesigned** and **renamed** the option in our program, added two new courses that will provide the needed background in both learning theories and research paradigms in mathematics education for graduate students in the program. It is expected that graduates from this program will seek positions in mathematics departments with a research expectation, and that they will conduct research in mathematics education as a part of their position. There is a huge and continuing national demand for graduate students prepared in this way. For the past 10 or more years, the demand has far outpaced the supply, and continues to do so.

Resource implications/impact of the changes

For the PhD in Mathematics with emphasis in Education we have added two new courses, MATH 534 and 535. These courses will each be taught on a biannual basis, so there will be one new course that needs to be taught each year. We have two faculty (Dr. Knott and Dr. Cooper) who can teach these courses, and so it will be part of the 3 course load for each of them every other year.

No new equipment will be needed.

Math Graduate Handbook Description

The Requirements for the PhD in Mathematics with Education Emphasis

The degree of PhD in Mathematics with Education Emphasis is awarded in recognition of scholarship and original contributions to the teaching and learning of mathematics. The main difference from the other PhD choices is in the research focus. The requirements for this PhD include competence in core mathematics as well as study in the research methodologies applicable to research in mathematics education.

Departmental requirements and regulations for the PhD in Mathematics with Education Emphasis are specified below. The regulations of the Graduate School for doctoral programs are available in the Graduate School Policies and Procedures Manual (<http://www.gradsch.wsu.edu/policiesprocedures.html>). Appeals requesting waiver or modification of any rule of departmental origin may be submitted to the Mathematics Graduate Studies Committee.

13.1 Prerequisites

All graduate students are expected to have a background in mathematics equivalent to that provided by our undergraduate degree. Ideally, this would include familiarity with the material covered in Math 401 and 402, and Math 420 and 421, and some experience with computer programming. Students with a decent background are expected to make up these deficiencies at the earliest opportunity.

13.2 Courses and Hours

The course work for the PhD in Mathematics with Education Emphasis shall be as follows. A candidate must successfully complete 72 hours of approved coursework. At least 34 semester hours must be graded coursework and numbered 500 or above (except for up to 9 hours of 400- level graded course work). All doctoral students are required to take one hour of Math 500, Proseminar, and teaching assistants are required to take three semesters of Math 533, Teaching College Mathematics.

The rest of the course work must include the following courses:

Core: Math 501, Math 511, Math 531, and Math 532.

Foundation in Mathematics (5 courses from the following): 502, 503, 504, 505, 507, 512, 525, 543, 544, 553, 555 and 564. Alternative courses may be selected in consultation with your advisor. The intent here is to provide breadth of background in mathematics.

Educational Foundations, Research Methodologies, and Statistical Analysis: Math 534 (Learning Theories in Mathematics), Math 535 (Research Paradigms in Math Education), Ed Res 564 (Qualitative Research), and either Stat 520 (Statistical Analysis of Qualitative Data) or Stat 530 (Applied Linear Models).

It is also recommended that the student participate in the joint WSU/UI Mathematics Education Seminar each semester and take two or more additional graded math courses numbered 500 or above to strengthen the mathematical foundations.

13.3 Transfer Credit

Graduate credit earned elsewhere (excluding extension work, special problems, workshops, etc.) may be applied as part of the program if the work is of "A" or "B" quality. Transfer credit is requested by listing the courses on the Program of Study (see ? 12.4.2); approval of the Program of Study implies approval of transfer of credit.

13.4 Examinations

The doctoral examination structure consists of four examinations: Graduate Qualifying Examination, Doctoral Qualifying Examination, Preliminary Doctoral Examination, and Final Doctoral Examination. The Graduate School Policy requires that all the students can have 2 (two) attempts to pass each examination. These examinations and the Program of Study are described below.

13.4.1 The Graduate Qualifying Examination (GQE)

The Graduate Qualifying Examination (GQE) is a single four-hour written examination based on undergraduate material covering advanced calculus (including vector calculus) and linear algebra. The GQE will be at the level of difficulty of upper division WSU mathematics courses. It will be 50% advanced calculus, 50% linear algebra. (Appendix A gives the list of topics.) The GQE will be prepared and graded by a committee of four faculty members chosen by the Chair of the Department. Rules concerning the GQE are:

- (a) Students will have at most two attempts to pass the GQE.
- (b) Students with a previous mathematics degree must pass the GQE by the end of their third semester in the Program (not counting summer semesters). All other students must pass the GQE by the end of their fourth semester in our Program (not counting summer semesters).
- (c) The GQE will consist of ten problems and the student will be required to respond to all the problems.
- (d) The GQE are typically given on the second day of the Fall and Spring semesters each year. See ?2 for specific dates.

13.4.2 The Program of Study

Soon after completion of the GQE a PhD candidate should choose an appropriate faculty member to chair his/her Doctoral Committee. The Doctoral Committee, in consultation with the candidate, will decide upon a Program of Study and tentatively set a time for the Doctoral Qualifying Examination (see ?12.4.3).

13.4.3 The Doctoral Qualifying Examination (DQE)

The Doctoral Qualifying Examination (DQE) is a written examination of approximately two hours in length and covers the candidate's area of specialization with the focus on appropriate mathematics graduate course work. The student's Doctoral Committee will define the material to be covered on the DQE, compose and grade this examination.

Rules concerning the DQE are:

- (a) Students will have at most two attempts to pass the DQE.
- (b) Students are expected to pass the DQE by the end of their third semester (excluding summer sessions) after passing the GQE.
- (c) The DQE will be given at a time suitable for the student and the committee.

13.4.4 The Preliminary Doctoral Examination (PDE)

The Preliminary Doctoral Examination (PDE) is an oral examination which follows the Graduate School rules for Preliminary Doctoral Examinations except for the following procedures. The PDE will begin with a presentation by the student to his/her doctoral committee on a thesis research problem and a plan of research to be followed toward its solution. The examination will include questions and feedback from members of the doctoral committee on the student's presentation.

Rules concerning the PDE are:

- (a) Students will have at most two attempts to pass the PDE.
- (b) Students must pass the PDE by the end of their second semester after passing the DQE.
- (c) The PDE will be given at a time suitable for the student and the committee.

13.4.5 The Final Doctoral Examination

The Final Doctoral Examination (FDE) will occur after the student has completed the thesis (see ?11.5 or x13.5 as appropriate), and the thesis has been approved by the student's Doctoral Committee. It will be an oral examination following the rules of the Graduate School. The FDE is devoted mainly to a presentation of the content of the thesis by the student and includes questions from members of the doctoral committee.

13.5 The Thesis

Once one has passed the Preliminary Examination (see ?11.4.4), one becomes technically a candidate for the PhD. This means that most of one's time should be given to specific preparation for, and writing of a doctoral thesis. The manner in which this is done must be left up to the student and the Doctoral Committee, especially the thesis advisor. In general, however, the thesis should include work, which, in originality, importance, and correctness, is good enough to appear in a research journal.

A paper will be prepared by the PhD candidate and submitted to a refereed journal, approved by the student's Doctoral Committee. The paper should ordinarily be based on portions of the candidate's PhD thesis. Acceptance of the paper is not a precondition for the completion of the degree work. A 2/3 majority of the candidate's Doctoral Committee can waive the requirement of a journal submission of a paper based on the thesis.

13.6 Teaching Experience

Most holders of graduate degrees in mathematics eventually teach in one way or another. Moreover, some experience with classroom teaching is useful in almost any mathematical career. The Department accordingly requires that each PhD student be responsible, under supervision, for teaching at least one undergraduate class for a semester. Since this responsibility may be preceded by teaching experience of a less autonomous kind (grading papers, assisting teachers in other ways, conducting help sessions, etc.), every graduate student should have at least one year of teaching experience in the broad sense. The total experience may be considered an apprenticeship in teaching and should be treated as seriously and responsibly as any other part of the student's program.

The terms of many fellowships, traineeships, and other forms of graduate student support permit participation in teaching programs where required. If a student holds a grant which does not permit such participation, then the student will need to combine the period of the grant with at least a year on terms permitting teaching, e.g., as a teaching assistant. This may mean holding the grant for less than the normal period.

The week before the student's first Fall semester in the graduate program, the student should enroll for one hour of Math 500. This will represent participation in a pro-seminar, meeting under the direction of an experienced faculty member and devoted to the teaching of mathematics.

There are two additional requirements.

First, most students graduating with this degree will be expected to teach the equivalent of Math 251 and 252 when they are hired as faculty members. Thus, students earning this degree are required to do an internship with a Math 251 or 252 instructor during which they will become familiar with the manipulatives used to teach these courses and gain experience teaching and assessing pre-service elementary teachers in an activity-based environment.

Second, they will teach a 200-300 level mathematics course with serious mentoring by their advisor or another faculty member approved by the advisor. The intent here is to help candidates develop all aspects of their teaching skills in a more autonomous environment than calculus..

13.7 Minor

There is no minor requirement.

13.8 Residence

The period of study for doctoral degrees is at least three years (six semesters) beyond the baccalaureate degree. For students entering a doctoral program without a master's degree, at least two of these three years must be in residence at WSU (enrolled full time and present on campus). For students entering a doctoral program with a master's degree, at least one of these three years must be in residence at WSU (enrolled full time and present on campus).

13.9 The Application for Degree

An Application for Degree must be filed with the Graduate School by the deadlines in ?3. An approved Program of Study must be on file in the Graduate School before the Application for Degree may be filed. Candidates may not schedule a final examination until an Application for Degree has been filed.