

Graduate Student Handbook of the Mathematics
Department

Department of Mathematics
North Dakota State University
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1 General Information

The Department of Mathematics offers graduate study leading to the Masters of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees. To obtain a graduate degree a student must fulfill requirements of both the Graduate School and the Mathematics Department. Departmental requirements are described below. Information about Graduate School requirements can be found at

<http://www.ndsu.nodak.edu/gradschool/bulletin/policies.html>

2 Master's Degree Programs

The Master of Science degree is offered in two options: the Thesis Option or the Comprehensive Study Option. The Thesis Option emphasizes research and preparation of a scholarly thesis, whereas the Comprehensive Study Option emphasizes a broader understanding of a major area of mathematics.

2.1 Departmental Requirements

1. A total of 30 credit hours in approved graduate-level mathematics course work, depending on the degree option.

Thesis Option: A total of 6 to 10 credit hours of Math 798 (Master's Thesis), in addition to 18 credit hours in courses numbered 700-789. These 18 credit hours must include the two semester sequences in Algebra (Math 720-721) and Analysis (Math 750-751).

Comprehensive Study Option: A total of 2 to 4 credit hours of Math 797 (Master's Paper), in addition to 24 credit hours in courses numbered 700-789. These 24 credit hours must include the two semester sequences in Algebra (Math 720-721) and Analysis (Math 750-751).

- Subject to the approval of the Supervisory Committee, at most 6 of the required 30 credits may be earned in 600-level mathematics courses (excluding 620, 621, 650, and 651) or in courses outside the Mathematics Department.
2. A grade of Master's Pass in two of the three written preliminary examinations offered by the department. These examinations are offered in three areas: Algebra, Analysis, and Applied Mathematics.
 3. Demonstrated proficiency in a computer programming language.
 4. A thesis or expository paper written under the supervision of a faculty member and defended at an oral examination administered by the student's supervisory committee.

2.2 Timelines

A candidate has three calendar years from the time of enrollment in the Graduate School to complete the Master's degree. Extensions may be granted after review and approval by the Graduate Committee, subject to Graduate School Policy.

3 Doctoral Degree Program

The Doctor of Philosophy degree is awarded in recognition of high scholarly attainment as evidenced by a period of successful advanced study, the satisfactory completion of prescribed examinations, and the development of an acceptable dissertation covering a significant, original aspect of mathematics.

3.1 Departmental Requirements

1. A total of 90 credit hours in approved graduate-level mathematics course work, including:
 - (a) At least 42 credit hours in courses numbered 700-789 or as approved by the Graduate Program Director. These 42 credit hours must include the two semester sequences in Algebra (Math 720-721) and Analysis (Math 750-751). The advisor should in consultation with the graduate chair ensure that the 42 credit hours contain a broad spectrum of courses (at least 12 credit hours) outside the student's area of emphasis as well as depth in a specific area of mathematics.
 - (b) At least 3 credit hours of Math 790 (Graduate Seminar).
 - (c) At least 6 credit hours of Math 799 (Doctoral Dissertation).
 - Subject to the approval of the supervisory committee, at most 12 of the required 42 credit hours may be earned in 600-level mathematics courses (excluding 620, 621, 650, and 651) or in courses outside the Mathematics Department.
 - Credits used to satisfy the requirements of a Master's degree at NDSU may be included in the 90 credits hours required for the Ph. D.
 - A student entering the Doctoral program with a Master's degree from another institution need only complete 60 credit hours to complete the Ph.D. degree. Half of these 60 credits must be in courses numbered 700-789 excluding those courses numbered 720, 721, 750, and 751.
2. A grade of Ph.D. Pass in two of the three written preliminary examinations offered by the department. These examinations are offered in three areas: Algebra, Analysis, and Applied Mathematics.
3. Demonstrated reading proficiency of mathematical writing in French, German, or Russian. A student's supervisory committee may require a second foreign language.
4. Demonstrated proficiency in a computer programming language.
5. A passing grade in a preliminary oral examination administered by the student's supervisory committee after completion of the Preliminary Examinations and language requirements.
6. A dissertation consisting of a written presentation of original and significant research completed by the student under the supervision of a faculty member and defended at a final oral examination administered by the candidate's supervisory committee.

3.2 Timelines

Ph.D. students have 3 years from first enrolling in a 700 level Mathematics course as a graduate student to complete the Preliminary Examination requirement.

A student advances to candidacy after completion of the preliminary oral examination. All students must advance to candidacy no later than the start of their fourth year in the graduate

program of the Department of Mathematics. Extensions may be granted after review and approval by the Graduate Committee, subject to Graduate School Policy.

4 Policies on Graduate Degrees

4.1 Supervisory Committee

The Graduate Committee will advise most entering graduate students in mathematics for the first two semesters of their program. Prior to completing or immediately following completion of the written portion of the preliminary examinations the student will take on a major advisor who will supervise the student's research and preparation of a disquisition (thesis, expository paper, or dissertation). The student in consultation with the major advisor, and the Graduate Committee, will appoint a supervisory committee consisting of faculty and other qualified experts in the field. The committee must include at least one faculty member (not counting the major advisor) from the department, an NDSU faculty member from outside the department who is appointed by the Graduate School, and at least one other faculty (NDSU or otherwise) in the cognizant field must serve on the committee.

4.2 Plan of Study

A plan of study will be prepared by the student and major advisor no later than the semester immediately following the appointment of the Supervisory Committee. The plan of study must be approved by the student's committee, the Graduate Program Director, the Department Chair, the Dean of the College of Science and Mathematics, and the Dean of the Graduate Studies.

In preparing the plan of study the student should include courses which they plan to take in the future. The date in the plan of study for these courses should read "pending".

The Graduate Program Director, the Chair, and the supervisory committee must be promptly informed of any changes in the student's program.

4.3 Language Requirement

Doctoral students must demonstrate, in a written examination, their proficiency in a foreign language commonly used in the mathematical literature. Acceptable languages are French, German, and Russian. The written exam is administered by the Graduate Program Director. The student's advisor selects three mathematical papers that are written in the language chosen by the student. The Graduate Program Director then selects one of these papers and gives the student 3 hours to translate a portion of the paper with the aid of one dictionary. A faculty member other than the student's advisor will be asked to verify the student's translation and provide a short written report to the Graduate Program Director indicating whether the student should pass the examination or not. If the recommendation is against passing the student, the Graduate Program Director may ask another faculty member for their recommendation or make the student retake the language examination at another time, at least one month following the first attempt.

Additionally, students must demonstrate their proficiency in a general mathematical software system with programming capabilities. This can be accomplished by either passing Math 660 or an equivalent course with a grade of B or higher, or by passing a programming examination administered by the Graduate Program Director.

4.4 Graduate Writing

Graduate students must be able to communicate effectively. An important aspect of effective communication is clear and grammatically correct writing. To help graduate students achieve this goal the following are required of faculty and students.

- A portion of grades for assignments in courses should focus on the written exposition. Instructors should provide feedback to the students concerning the writing in the graded assignments.
- In reading disquisitions all committee members shall ensure that the exposition is clear and grammatically correct.
- Advisors shall encourage students to take advantage of writing resources available to graduate students, including the Center for Writers, and meetings with the Disquisitions Editor.

4.5 Preliminary Examinations

The written preliminary examinations are offered at least two times a year. Examinations are given in Algebra, Analysis, and Applied Mathematics. Scores on the exams are given as Fail, Master's Pass, and Ph.D. Pass. Copies of previous examinations as well as lists of topics covered on the exams are made available on the Mathematics Graduate Program website.

The oral examination is administered by the student's supervisory committee after completion of the written preliminary examinations and the language requirements. At the oral examination the student describes plans for their dissertation. The student is also asked questions based on the material from four graduate courses selected by the student in consultation with the student's supervisory committee.

After successful completion of the Preliminary Examinations a student is advanced to candidacy for the Ph.D.

4.6 Disquisitions

Writing a disquisition is considered the capstone experience of a student's graduate career. At the Master's level the disquisition is either a Thesis or an expository paper. A Master's thesis emphasizes original research and the ability to analyze mathematical data. An expository paper emphasizes a broad understanding of a general area of mathematics. At the Ph.D. level the disquisition is called a dissertation. A dissertation must show originality and demonstrate the student's capacity for independent research; it must embody results of research which constitute a contribution to mathematical knowledge.

Disquisitions reflect not only on the student but also on the Graduate Program. As such they should be mathematically correct, utilize proper grammar and syntax, and adhere to the style format accepted by the Graduate School. The approved style for disquisitions is described in the booklet *Guidelines for the Preparation of Disquisitions* available from the Graduate School. Students are strongly encouraged to use LaTeX for preparation of their dissertation.

Any student wishing to write a disquisition under the direction of someone who is not a regular faculty member of the Mathematics Department must first obtain written approval from the Graduate Program Director and the Graduate School. The student must have passed the written preliminary examination requirements as well as the language requirements before requesting approval. To support the request for approval, the student must provide to the Graduate Program Director a written statement describing the proposed disquisition areas and the reasons for: (i) working with someone from outside the department and (ii) not working with someone

in the department. The proposed disquisition advisor must also provide a current curriculum vitae. In the event that approval is given at least three members of the supervisory committee must be from the Department of Mathematics.

4.7 Colloquia

The Mathematics Department regards colloquium lectures to be an integral part of graduate education, and graduate students are expected to attend these lectures.

5 Teaching Assistants

Most of the graduate students in the department are supported during the academic year through Graduate Assistantships or Graduate Teaching Fellowships. Often there is some money available for graduate students to teach in the summer to supplement their income. Descriptions of the various types of support follow.

5.1 Teaching Assistantships: Description and Responsibilities

A teaching assistantship is a 9-month appointment available to graduate students. Graduate assistants are given teaching duties consonant with their experience. A stipend, as well as a tuition waiver, is provided to compensate the student for their work.

The typical duties of a teaching assistant may include:

- Tutoring in the Math Tutor Room.
- Grading for courses in the department.
- Leading recitation sections of calculus.
- Teaching courses in the department.

While the individual teaching duties will vary it is expected that a graduate assistant will spend no more than 20 hours a week on their teaching duties. If teaching duties exceed 20 hours per week the graduate student should meet with the Graduate Program Director to resolve this problem.

Teaching assistantships are renewable provided that progress in the graduate program and that a progression toward quality teaching is ongoing.

5.2 Teaching Fellowships: Description and Responsibilities

Teaching fellowships are 9-month appointment available to graduate students. Teaching fellows are given increased teaching duties and a larger stipend. Teaching fellows are generally more advanced graduate students with significant teaching experience. As with a teaching assistantship, teaching fellows must demonstrate progress in the graduate program and that a progression toward quality teaching is ongoing.

To be eligible for a teaching fellowship a graduate student must have completed their written preliminary examinations and taught at least one course in which they were the primary instructor. Teaching assistants may apply to be teaching fellows when they have satisfied the eligibility requirements. However this designation is not guaranteed. Selection of an applicant as a teaching fellow is based on

- letters of support,
- excellence in teaching,
- excellence as a graduate student, and
- the needs of the department.

Selection is done by the Mathematics Department Graduate Committee based on the needs of the department, in consultation with the Executive Committee. The designation of teaching fellows may be removed from a graduate student if the performance as a graduate teaching fellow is not satisfactory.

5.3 Summer Teaching

Summer teaching duties are often available for graduate students. These duties will often be in courses that are normally taught only by faculty in the regular semester. Summer teaching is seen as a way to expand a graduate student's experience in the classroom. Summer teaching assignments are based on the needs of the department and the needs of the graduate students involved.

6 Policies on Graduate Student Teaching

6.1 Enrollment

Teaching assistants are expected to be enrolled at a full time level in the semester for which they are teaching. For students who have not passed their preliminary examinations it is expected that teaching assistants will enroll in three graduate courses (excluding seminars) each semester. Exceptions to this three-course rule can be granted by the Chair. Graduate students teaching in the summer are expected to enroll in a graduate level course in the session for which they are teaching.

6.2 Supervision

Whether teaching a course on their own, or leading a recitation it is expected that graduate students will be supervised in their teaching. Graduate students who are teaching are expected to provide a copy of their syllabus to their supervisor at least three days before classes begin. Teaching assistants and fellows should also provide copies of their examinations to their supervisor at least one week before the examination is scheduled. Prior to submitting final grades graduate students should discuss them with the supervisor. Any irreconcilable conflicts between graduate students and supervisors should be referred to the Chair.

6.3 Intensive English Language Program

Foreign graduate students who do not attend the entire Intensive English Language Program class and who do not pass the Test of Spoken English (TSE) are not eligible for teaching assistantships.

7 General Policies

7.1 Academic Honesty

Each graduate student in the Mathematics Department is expected to conform to the highest standards of academic honesty in all classwork, homework, examinations, research, and writing. They must also conform to the highest standards of professional behavior in teaching. Any violation of this policy will result in penalties such as lowered grades, loss of financial support, and/or expulsion from the graduate program. A letter to the Department describing the violation and the penalty assigned must document each punitive action taken. A copy of the letter must be sent to the affected student. Each punitive action may be appealed through the following channels, in order: the Graduate Program Director, the Department Chair, the Dean of the College of Science and Mathematics, and the Dean of the Graduate School.