The general requirements for advanced degrees are in the Graduate Studies Bulletin, which may be found online at [http://bulletin.unl.edu](http://bulletin.unl.edu). This document describes some (but not all) of these general requirements, but the main focus is on additional requirements imposed by the Department of Mathematics (hereafter called “the Department”). Inquiries may be directed to the Graduate Chair.

All new graduate students are initially assigned a faculty advisor from the Graduate Advisory Committee (GAC). Students may change advisors at any time during their program, and if they do so they should notify the Graduate Chair and all affected parties of the change.

Requirements for a degree in the graduate program in Mathematics include both coursework and exams, described below. Graduate exams are given during two examination periods per year—in January and June. Specific dates are announced by the Graduate Exam Coordinator.

Specific Mathematics Department recommendations for courses are listed on Form ε, which may be found on the Department website at [http://www.math.unl.edu/graduate/](http://www.math.unl.edu/graduate/).

**Graduate Faculty Members:** *Professors*: Avalos, Avramov, Deng, Dunbar, Erbe, Fowler\(^1\), Harbourne, Hermiller, Iyengar, Lewis, Logan, Manderscheid, Marley, Meakin (Department Chair), Orr (Department Vice Chair), Peterson, Pitts, Papick, Rammaha, Rebarber, Skoug, J. Walker (Graduate Chair), M. Walker, R. Wiegand, S. Wiegand, Woodward; *Associate Professors*: Brittenham, Chouinard, Cohn, Donsig, Foss (Graduate Recruiting Chair), Hines, Ledder, Radcliffe; *Assistant Professors*: Curto, Hartke, Itskov, Kelley, Radu, Tenhumberg, Touandykov; *Emeritus Faculty*: Johnson, Shores.

**Graduate Faculty Associates:** *Research Assistant Professors*: Bociu, Cooper, Hariharan, Homp, Veliz-Cuba.

**MASTER’S DEGREES**

**Master of Science & Master of Arts:** The Department offers Master’s Degrees (MS or MA) in Mathematics. The requirements for the two degrees are identical.

**Master of Science (Arts) for Teachers:** The MScT and MAT programs are designed for persons who are or will be teaching secondary mathematics. The possession of a valid

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\(^1\)David Fowler is a professor in the Department of Teaching, Learning and Teacher Education at UNL and has a courtesy appointment in the Department.
secondary mathematics teaching certificate is a prerequisite to the award of the degree. For
details on the program contact the Chair of the MAT-MScT Committee (David Fowler,
dfowler@unlserve.unl.edu).

Master’s Degree Options

There are three options for the Master’s Degree. Each option requires a total of 36 hours of
coursework. Some of this coursework must be in graduate-only courses, which are defined
to be 900-level courses or 800-level courses without a 400-level counterpart. (Generally, these
courses are marked with asterisks in the Graduate Studies Bulletin.) All three options allow a minor, and Option 2 requires a minor. The choice of minor area must be approved by the student’s advisor.

Option 1 requires a thesis. The program must include 6–10 hours of Math 899 and at least
8 hours of graduate-only coursework. A member of the Graduate Faculty must act as
thesis advisor.

Option 2 requires a minor. Students may take a minor in any area offering the Master’s
Degree outside the Department. Of the 36 hours required, at least 18 must be in Mathematics and at least 9 must be in the minor. The program must include at least 12 hours of graduate-only coursework. Option 2 is not intended for students who expect to pursue a Ph.D.

Option 3 may be taken with an area of specialization in Pure Mathematics or Applied
Mathematics. The program must include at least 18 hours of graduate-only coursework.

The Master’s Exam

The Master’s Exam (called the “Master’s Comprehensive Exam” in the Graduate Studies
Bulletin) is required by the Graduate College. The Master’s Exam is designed to ensure a
breadth of knowledge in mathematics. Students satisfy the requirements for the Master’s Exam by completing one of options (A), (B), or (C) described below. In addition, students following the plan for an Option 2 MA/MS may be required by the minor department to take a Master’s Exam in the minor area (but in practice this third exam is often waived). Students pursuing a Master’s in Teaching (MAT) are required to use option (C). A student who writes and successfully defends a Master’s thesis for an Option 1 Master’s (described in the Graduate Studies Bulletin) will automatically satisfy all requirements of option (C) below.

(A) Receive a grade of ‘P’ on at least two components of the Ph.D. qualifying exam. One of the components must be either: the analysis (825-826), the algebra (817-818) or the applied mathematics (842-843) exam.
Pass the final exam and earn a grade of at least ‘B’ in each of four courses chosen by the student from the following list of core courses: Math 817, 818, 825, 826, 842, 843, 847, 850, 852, 871, 872. The last day of the semester in which the student receives the fourth ‘B’ will be the date on which the student passes the Master’s Comprehensive Exam.

Take a two-part exam administered by a faculty committee consisting of at least three faculty members. (The committee is the MAT committee for MAT students; for Master’s students not in the MAT program, the committee consists of a chair selected by the student and two other faculty members selected by the student and the chair.)

**Part I** is a take-home written exam, which itself has two parts. In Part IA) the committee will select three questions from at least two different courses the candidate has taken. Part IB) is an expository paper on a mathematical topic, including proofs or examples as appropriate. As general guidelines, the responses to the questions in Part IA) might be between 5 and 10 pages in length, while the paper in Part IB) should be at least 8-10 pages.

**Part II** is an oral presentation of about 20 minutes based on the work in Part IB) to his/her committee. Following the presentation, the committee will ask questions designed to probe the candidate’s depth of understanding of the topic. The committee may also ask questions related to Part IA) if the committee feels this is appropriate. Passing is determined by the committee.

### Administrative Procedures for the Master’s Degree

1. The Memorandum of Courses must be filed with the Math Department (who will file it with Graduate Studies on the student’s behalf) before completion of eighteen hours of graduate credit. The form is required for candidacy and should be completed in consultation with the student’s advisor.

2. Application for a Master’s Degree must be filed directly with Graduate Studies at the outset of the semester or session in which graduation is planned.

3. The Master’s Exam cannot be completed more than 24 months prior to receipt of the degree. The student and the advisor should jointly determine the appropriate time to take the written exam.

4. The Final Exam Report must be filed with the Math Department (who will file it with Graduate Studies on the student’s behalf) four weeks prior to the deadline for filing the final report for the degree.

### Course Requirements

There are no specific course requirements for the Master’s Degree.
THE PH.D. DEGREE

The Mathematics Department offers both a major and minor in mathematics for Ph.D. students. The term “Ph.D. program” used below refers to the major. Also, the Mathematics Department, together with the Department of Computer Science and Engineering, offers a joint Mathematics/Computer Science Ph.D. The joint Math-Computer Science program is not described in this document; details are available by writing to the Graduate Chair at gc@math.unl.edu.

Ph.D. Minor: Ph.D. students from disciplines other than mathematics who wish to obtain a minor in mathematics must have a Mathematics faculty member on their Supervisory Committee and must take at least 16 credit hours of courses in the mathematics department, with at least 6 hours in courses only open to graduate students. Students obtaining a minor in mathematics are strongly encouraged, but not required, to include at least two courses from the following list of core courses: Math 817, 818, 825, 826, 842, 843, 847, 850, 852, 871, 872.

Ph.D. Major: The Ph.D. program requires a Qualifying Exam, a Ph.D. Comprehensive Exam and a Final Oral Exam. The Ph.D. requires 90 hours of graduate credit, including a dissertation. At least 45 hours must be completed at UNL after the filing of the program of studies. The Ph.D. program will normally include at least 12 hours and at most 55 hours of dissertation research. (In Mathematics, 20–25 hours is typical.) In addition, there is a Language Requirement; see below.

The Ph.D. Qualifying Exam

Entrance into the Department’s Ph.D. program is determined by the Ph.D. Qualifying Exam. The Qualifying Exam consists of two subject exams. The same subject exams serve as parts of both the Master’s Exam and the Ph.D. Qualifying exam, though qualifying for the Ph.D. program requires a higher level of performance than passing at the Master’s level.

The areas for the two subject exams must be approved by the Graduate Advisory Committee (GAC). Normally each subject exam should be over the material covered in two courses that form a single coherent body of work. Examples of such course pairs are: algebra (817-818), analysis (825-826), differential equations (830-831), applied mathematics (842-843), discrete mathematics (850-852) and topology (871-872). One of the subject exams must be over the Math 825-826 sequence. If a student expresses interest in pursuing a Ph.D. in an area that will require a substantial body of knowledge in another discipline, the GAC may approve taking the second subject exam in a discipline outside the department.

General Policies for the Ph.D. Qualifying exam

1. During any examination period the student may take one or more subject exams.

2. Scores on individual subject exams are valid for two years; a student need not retake a
subject exam on which he or she earned a qualifying (Q) score, subject to the two-year limitation.

3. A student must complete the Ph.D. Qualifying Exam within two years of entering the Mathematics graduate program. Exceptions to this timeline may be granted by approval of the GAC.

4. Students taking the Master’s Exam need not retake subject exams on which they received a “Q” but may count such exams towards the Ph.D. Qualifying Exam requirement.

5. The decision on whether a student has qualified for the Ph.D. program rests with the GAC. These decisions, along with each student’s scores (Q – qualify, P – pass or F – fail) on individual subject exams will be reported to the full Graduate Faculty at the end of each examination period.

   (a) If a student has earned a “Q” on two subject exams, one of which is Math 825-826, then the student shall qualify for the Ph.D. program.

   (b) The GAC will make every effort to inform the candidate, within a period of three weeks from the last day of each subject exam, of its decision.

6. Each subject exam is designed to be completed in three hours, though students are permitted four hours to work it.

7. For students transferring to UNL from other graduate programs, the GAC has the authority to accept exams taken at other universities.

PH.D. COMPREHENSIVE EXAM

The student’s Ph.D. Supervisory Committee will determine the timing and the content of the Ph.D. Comprehensive Exam. The Supervisory Committee is required to follow Graduate College rules regarding the Comprehensive Exam, which may be found online at http://bulletin.unl.edu/graduate/Doctoral_Degree_Requirements#Comprehensive_Examination_and_Admission_to_Candidacy. In particular, the Comprehensive Exam must include a written portion and may, at the discretion of the Supervisory Committee, include an oral portion.

Typical Comprehensive Exams in the Mathematics Department consist of two parts: a four-hour written exam on a standard two-course sequence at the 900-level (often Algebra 901-902 or Analysis 921-922) and a second exam, either oral or written, that is more specialized toward the student’s research area.

The decision as to whether the student has passed the Comprehensive Exam, and if not, which part(s) of the exam must be repeated, rests with the Supervisory Committee.
Additional Ph.D. Requirements

Course Requirements for the Ph.D. Degree: The Mathematics Department does not have specific course requirements beyond those imposed by the Graduate College. However, each student is required to consult with his or her advisor and to complete Form $\varepsilon$ each semester until a supervisory committee is formed.

Ph.D. Language Requirement: The language requirement for students in Mathematics is reading ability of one foreign language, selected from French, German, or Russian. Competence may be demonstrated in one of the following three ways:

A. Passing an exam in the language administered by the Foreign Language Committee of the Mathematics Department.

B. Completion of at least one advanced course (at the level of French 202, German 202, or Russian 202 or beyond) in the language with a grade of B or above. (See the section “Language Research Tool Requirement” in the Graduate Studies Bulletin.)

C. Passing the Educational Testing Service exam as administered at the University of Nebraska or as administered at another university (with a grade of 500 or more).

The Language Requirement can be waived upon the recommendation of the Supervisory Committee, with the approval of the Graduate Chair. The recommendation from the Supervisory Committee must include justification for the request, typically in the form of a recommended substitute, e.g., a graduate-level course in another department on a topic that is directly related to the student’s research area. Each semester, the Graduate Chair will report any waivers granted to the Graduate Faculty.

The Language Requirement must be completed (or waived) at least seven months before the date of the Final Oral Exam (described below).

Seminar Participation: Seminars and colloquia are a valuable part of a student’s training. Regular participation in all departmental colloquia and seminars in the student’s area of interest is expected of all Ph.D. candidates. The student’s advisor will help direct the seminar participation.

Final Oral Exam: After a student completes a Ph.D. dissertation there is a final oral exam. This exam, often called a “thesis defense”, is open to the public. Complete details of the final examination procedure are in the Graduate Studies Bulletin.

Administrative Procedures for the Ph.D.

1. Before a student has earned 45 credit hours, the student forms a Ph.D. Supervisory Committee. The student must choose an Advisor, who will chair the Supervisory Committee and direct the dissertation. A form listing the Ph.D. Supervisory Committee must be filed with the Math Department (who will file it with Graduate Studies on the student’s behalf).
2. A Program of Studies form must be filed with the Math Department (who will file it with Graduate Studies on the student’s behalf) before the student has earned 45 credit hours; this form is completed with the advice and consent of the student’s Supervisory Committee.

3. Once a student has passed the Ph.D. Comprehensive Exam and satisfied the language requirement, the student must file the Admission to Candidacy form with the Math Department (who will file it with Graduate Studies on the student’s behalf). This form must be filed no later than seven months prior to graduation.

4. The GAC has the authority to grant waivers of graduate degree requirements for transfer students and in other exceptional cases.

5. At the end of each academic year GAC will report to the Graduate Faculty on all actions taken by the GAC, and, in particular, on any waivers granted.