EMORY UNIVERSITY | Department of Mathematics

Mathematics PhD Program Graduate Handbook

2025–26

Contents

1 Introduction

This handbook serves as the official academic guide to the mathematics PhD program at Emory University. It complements the Laney Graduate School (LGS) Handbook, which contains general degree requirements and graduate school policies, such as

- University policies
- Honor code
- Minimum degree requirements
- Professional development support
- Withdrawals and leaves of absences
- Parental accommodations and leaves
- Degree completion and graduation

Both handbooks are updated annually, so students should check that they have the latest versions (dated by school year). If unsure about some policy or rule, students should consult with their advisor, the Graduate Program Coordinator, or the Director of Graduate Studies (DGS).

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2 Degree requirements

The Emory Mathematics PhD program offers two possible academic tracks, pure and computational, with different sets of degree requirements. The choice of track is usually dictated by the field of the thesis advisor. The pure track includes the faculty research groups in algebra and number theory, analysis and partial differential equations, and discrete mathematics. A separate academic track is associated to the computational mathematics group.

The PhD program is designed so that students may complete the basic course and exam requirements during the first two years. During this period, students are also encouraged to establish relationships with individual faculty members and begin the process of selecting an advisor. Thesis research with the PhD advisor usually begins in the second or third year.

This section covers the full set of program requirements, which supplement the minimum set of requirements set by the LGS Handbook.

2.1 Summary of PhD requirements

There are two sets of program requirements, corresponding to the pure and computational academic tracks.

Pure Mathematics Track	
Core courses	• Math 511–512: Analysis • Math 521–522: Algebra
Additional coursework	• Four additional courses in at least three different areas. The distribution of these electives is subject to approval by the DGS
Advanced coursework	• At least two advanced courses or seminars in the student's research area
Qualifying exams	• Two subject exams based on the core sequences in analysis and algebra • Research area exam, as described in §2.2.2
Teaching	• Math 590: two semesters • TATTO 600 • TATTO 605 and 610: at least four semesters, including teaching at least two courses as instructor of record
Ethics training	• JPE 600: Scholarly integrity workshop • JPE 610: a minimum of four workshops • In-program ethics training included in Math 590
Thesis proposal	• Oral presentation to the dissertation committee
Dissertation	• Public defense and acceptance of the thesis by the dissertation committee

Computational Mathematics Track	
Core courses	• Math 511–512: Analysis • Math 515–516: Numerical analysis • Two of the following: Math 517: Iterative methods Math 550: Functional analysis Math 561: Matrix analysis CS 523, 526, 534, 551, 555, 557
Additional coursework	• One sequence from below, not counting courses taken for the core requirement: Math 557–558: PDE Math 571–572: Numerical PDE and optimization CS 551 & 555 CS 534 & 557 CS 523 & 526
Advanced coursework	• At least two advanced courses or seminars in the student's research area
Qualifying exams	• Two subject exams based on the core sequences in analysis and numerical analysis • Research area exam, as described in §2.2.2
Teaching	• Math 590: two semesters • TATTO 600 • TATTO 605 and 610: at least four semesters, including teaching at least two courses as instructor of record
Ethics training	• JPE 600: Scholarly integrity workshop • JPE 610: a minimum of four workshops • In-program ethics training included in Math 590
Thesis proposal	• Oral presentation to the dissertation committee
Dissertation	• Public defense and acceptance of the thesis by the dissertation committee

2.2 Remarks on the program requirements

2.2.1 Coursework

The requirements listed in §2.1 represent a minimum set. Depending on the student's research interests, more courses may be required by the PhD advisor.

- **Core courses.** In most cases, the two required full-year core course sequences should be taken in the student's first year.
- **Additional coursework.** Most of the additional coursework should be completed by the end of the second year.
- **Advanced courses.** These courses should be in an area related to the student's thesis research. The student must consult with and obtain approval from their research advisor regarding the fulfillment of this requirement.

All coursework must be completed by the candidacy deadline, as described in §3.1.5.

2.2.2 Qualifying exams

- **Schedule.** The two core qualifying exams must be attempted by the summer following the first academic year. Since the research area exam depends on the selection of a thesis advisor, the third exam is typically taken in the second or third year. Deadlines for the exams are described in §3.
- **Structure.** Coursework exams can be either oral or written, at the discretion of the instructor of the course. Oral exams will be supervised by a committee of at least two faculty members. The student must have identified and consulted with an advisor before undertaking the research area exam. The format and content of the research area exam is proposed by the advisor and subject to the approval of the DGS.
- **Results.** Each qualifying exam is evaluated as either pass or fail. The DGS must approve absence from a scheduled exam; an unapproved absence of a scheduled exam will be considered a fail. If a student receives a fail on an exam, then the student will have one opportunity to repeat the exam, within one year of the first attempt.
- **Appeal.** Failing a qualifying exam on the second attempt is normally considered grounds for dismissal from the PhD program. This will trigger an automatic appeal to the Graduate Committee. The committee will review the case to determine the appropriate action, which might include allowing the student to finish with an MS degree.

2.2.3 Teaching and ethics training

- **Teaching.** The LGS Handbook describes a minimum set of teaching requirements for all Emory graduate programs. These are implemented through the LGS Teaching Assistant and Teaching Opportunity (TATTO) program. The Mathematics program imposes additional teaching requirements, which go beyond the LGS minimums. The full set of program teaching requirements is described in §4.

- **Ethics.** Ethics training for Emory graduate students is offered through the Jones Program in Ethics (JPE). The scholarly integrity workshop (JPE 600) is a one-day graduate school workshop, typically scheduled one week prior to the start of the fall semester during the student's first year of study. Program-based ethics training, required as part of the JPE program, is incorporated into the teaching seminar, Math 590. The graduate school ethics seminars (JPE 610) are offered on a variety of topics throughout the academic year, as listed on the JPE website.

2.2.4 Dissertation

- **Committee.** The dissertation committee must include the student's advisor, and at least 2 other Emory graduate faculty. Experts from outside the department or university may be added to the committee when appropriate. See the LGS Handbook for further details regarding the addition of committee members from outside the university.

  All students must file a dissertation committee form to obtain LGS approval for their committee, no later than March 15 of their 4th year.

- **Proposal defense.** Each student is required to make a preliminary presentation to the committee regarding the progress of their thesis research. This presentation should be done at least one semester prior to the dissertation defense.

- **Defense.** The dissertation committee is responsible for reading the student's dissertation and attending the oral defense. The committee must give final approval of an acceptable dissertation and an acceptable oral defense. The defense is open to all, and must be advertised in advance.

3 Academic progress

Both the LGS and the department set certain standards for sufficient academic progress within the PhD program. These milestones and deadlines are outlined below. Failure to meet these deadlines will normally trigger academic probation in the following semester, with consequences as described in the LGS Handbook. If a student resolves the issue during the probationary period, then the probation will be lifted in the following semester. If the issue remains unresolved, then the DGS and Graduate Committee will review the case and the student may eventually be required to leave the program, as described in §3.2.

3.1 Milestones and deadlines

3.1.1 Annual survey and activity report

Students are required to complete an online survey and activity report by June 1 in each academic year preceding graduation. Students who do not complete the activity report will receive a grade of U in the research course (597R or 799R), for the summer term.

3.1.2 Core course sequences (first year)

Students are expected to complete the two core course sequences for either the pure or computational track during the first year (unless these course requirements have been waived by the DGS). The first attempt of the two core preliminary exams must occur by the start of the

second year. Failure to attempt the exam by this point will trigger academic probation in the Fall of the second year.

Note that the requirement is to make a first attempt by this point, not necessarily to pass. Exceptions may be granted for students with valid academic reasons for delaying the core course sequences, subject to approval from the Graduate Committee.

3.1.3 Core qualifying exams (second year)

Students must have passed both core preliminary exams before the beginning of the third year. Failure to complete the core exams by this point will trigger academic probation in the Fall of the third year. Delays in the exams may be permitted under exceptional circumstances, subject to approval from the Graduate Committee.

3.1.4 Advisor and research area exam (third year)

By the end of the third year, students need to have selected a research advisor and taken the research area exam (with topic and format determined by the advisor). Course requirements for the appropriate track must also be completed during the third year, so that the student is eligible to apply for candidacy. Failure to complete the research area exam by the end of the summer of the third year will trigger academic probation in the Fall of the fourth year.

3.1.5 Candidacy (start of fourth year)

The requirements for PhD candidacy are laid out in the the LGS Handbook:

1. Complete the coursework requirements as outlined in §2, including Math 590
2. Complete TATTO 600, TATTO 605, and JPE 600
3. Complete qualifying examinations as outlined in §2
4. Resolve any incomplete (I) or in progress (IP) grades
5. Have a minimum cumulative 2.70 GPA
6. Have earned at least 54 credit hours at the 500 level or above

Other degree requirements, including TATTO 610, JPE 610, and the proposal defense, may be completed after entering candidacy. See the LGS Handbook for additional details.

Students should enter candidacy as soon as all requirements have been completed. The LGS mandates that PhD students must reach candidacy by September 15 of their fourth year. Failure to meet the deadline will trigger academic probation, as described in the LGS Handbook.

3.1.6 Dissertation committee (fourth year)

Students are required to submit the dissertation committee form to the LGS by March 15 of the 4th year. Failure to meet the deadline will trigger academic probation, as described in the LGS Handbook.

3.1.7 Proposal defense

The dissertation proposal defense must be completed by the end of the semester proceeding the thesis defense.

3.1.8 JPE seminars

To avoid scheduling issues that might delay graduation, students should arrange to complete the four ethics seminars (JPE 610) at least one semester before graduating.

3.2 Grounds for dismissal

The specific conditions under which the program may recommend to the LGS that a student be dismissed from the program are:

1. Failure to pass a qualifying exam after two attempts. (Note that the automatic appeal process described in §2.2.2 takes place before dismissal is considered.)
2. Two consecutive semesters under academic probation, for probations triggered either by failing to meet LGS academic standards or by the conditions described above in §3.1.1, §3.1.2, or §3.1.3.
3. Failure to resolve an academic probation related to candidacy (as described in §3.1.4 and §3.1.5) by the start of the second semester of the 4th year.

In addition to these points, the LGS Handbook outlines various conduct issues which might result in a forced withdrawal from the graduate program, including violations of the LGS Honor Code.

4 Teaching requirements

This section provides more detailed information about aspects of the program related to teaching. Before teaching in the classroom, PhD students must complete the summer workshop (TATTO 600) and 2 semesters of the departmental teaching seminar (Math 590). Once these requirements have been completed, the program requires at least 4 semesters as either teaching assistant or teaching associate, with at least 2 as instructor of record. These requirements are described in detail below.

> **Professional Conduct:** Graduate students involved in any form of undergraduate instruction (e.g., classroom instructor, TA, lab assistant, grader) are expected to behave as dedicated professionals and representatives of the University. Reports of unprofessional conduct will be investigated by the DUS and the Chair. Substantiated cases will be referred to LGS as possible violations of the Conduct Code.

4.1 Teacher training

4.1.1 Summer workshop (TATTO 600)

Before graduate students are allowed to teach at Emory, in any capacity, they must first take the LGS summer workshop TATTO 600. This is a 2-day course taken in August before the beginning of the student's first year.

4.1.2 Pedagogy and professional development (Math 590)

In the first year, Math students will take 2 semesters of Math 590, a one-credit hour seminar on teaching and professional ethics issues, in both fall and spring. The seminar will meet weekly and be attended by all first year Mathematics PhD students, all PhD students in later years whose first teaching responsibility has been delayed beyond the normal schedule, and any advanced students who have been asked to participate or have a wish to attend. The 590 seminars include the following elements:

(a) **Instruction in teaching methods.** This includes advice on how to run a course (development of fair and explicit grading practices, adherence to a fixed and workable syllabus, timely evaluation of students' progress, how to encourage and conduct office meetings, setting exams), how to run a classroom (encouraging and handling questions, coping with disruption), as well as ways to lecture well (importance of preparation, understanding of how much an hour lecture can hold, use of examples and pictures).

(b) **Lecture observations.** Students sit in on the lectures of faculty members or experienced graduate students 3–4 times per semester to observe a variety of styles and methods.

(c) **Student mini-lectures.** Students in the seminar present short lectures (10–15 minutes) to seminar participants on topics from an elementary course syllabus. Normally each student gives two or three such lectures. The other seminar participants, DUS, and possibly other participating faculty, will critique these presentations and offer positive suggestions for improvement.

(d) **Grading and help sessions.** First-year students participate in grading and weekly help sessions for undergraduate classes to gain experience in developing and applying grading schemes, answering questions, and dealing with students.

(e) **Mathematics-specific instruction on ethics.** This coverage of the ethics of teaching, publication, mentoring and public scholarship in mathematics is part of the Jones Program in Ethics (JPE) requirements for all PhD students.

4.1.3 ESL training

PhD students who are non-native English speakers take a screening exam administered by the English as a Second Language Program (ESLP) at the beginning of their first year. Based on this exam, some students may be required to take ESLP training courses as part of the PhD program. These should be completed before the student takes TATTO 605 or 610. Normally the ESLP courses would be taken in the first year, alongside Math 590.

4.2 Teaching assistantship (TATTO 605)

After completing Math 590 in their first year, students will spend 2 semesters as a Teaching Assistant, which is credited as TATTO 605. Possible teaching assistant duties include coverage of lab and problem sections, staffing calculus review sessions, and grading. The expected time commitment for a TA is 10-12 hours per week. (Students who have demonstrated ability and commitment in Math 590 may request to waive one or both semesters of TATTO 605 in exchange for extra semesters of TATTO 610, as described in Section 2.4.6 below.) Teaching assistant assignments are determined by the DUS, and will be provided to students at least one month prior to the start of the semester.

4.3 Teaching associate (TATTO 610)

The final phase consists of spending 2 semesters as instructor of record for an elementary class such as Math 111 or 112. This experience is credited as TATTO 610. Teaching assignments are determined by the DUS, and will be provided to graduate students in October for the spring semester and by the end of May for the fall semester. Graduate student instructors will be responsible for preparing lectures, designing assignments and exams, grading, and holding regular office hours. Instructors are provided with supervision and support as follows:

- A faculty member is assigned as a section leader to a cohort of student instructors teaching 100-level courses. The section leader tracks the progress of the course throughout the semester and makes sure all the sections are taught at the same level and pace. Weekly meetings are held to discuss upcoming topics and course-specific teaching matters. Section leaders supervise content issues, including the syllabus, tests, quizzes and final exam, as well as concerns or complaints from students.
- A faculty teaching mentor is assigned to each graduate student each semester, as an additional resource and source of support. Mentors discuss teaching issues and give advice on how to manage students, schedules, and classrooms. Teaching mentors sit in on their instructor's class twice each term and complete an observation report that details strengths and areas in need of improvement.
- During the term, the instructor will distribute midterm evaluation forms to their class. The instructor and teaching mentor review the evaluations and discuss adjustments to teaching methods suggested by the evaluations. The Emory College course evaluation form is used at the end of the semester to help gauge the overall success of the course and instructor.

4.4 Additional teaching experience

For students who are pursuing careers in academia, additional classroom experience beyond the 4 required semesters is strongly recommended. And for students who seek jobs primarily based on teaching, this extra experience is absolutely essential. There are two avenues available for extra teaching experience:

- In extraordinary circumstances, students who have demonstrated ability and commitment in Math 590 and who have demonstrated success in previous intensive teaching experiences may request to start teaching as instructor of record during their second year, effectively replacing TATTO 605 credits with TATTO 610. (Note that the waiver of the TATTO 605 requirement does not affect the requirement for at least 4 total semesters of teaching.) Such arrangements are subject to approval from the DUS.
- Advanced students may request additional teaching assignments in more advanced courses beyond the 100 level, after completing the required 4 semesters. These opportunities are reserved for the most committed and effective teachers, and subject to approval from the DUS. Compensation for teaching at this level will be offered in the form of a stipend supplement.

5 MS by candidacy

PhD students traditionally earn a Master's degree as part of their progress towards the dissertation. Emory mathematics students may elect one of the following options:

5.1 MS in Mathematics by candidacy

Mathematics PhD students qualify for a Master's degree in Mathematics after satisfying the coursework and qualifying exam requirements for the appropriate track and being admitted to candidacy as described in §3.1.5.

5.2 MS in CS by candidacy

Mathematics PhD students at Emory have the option of earning a Master's in CS. To qualify, students must fulfill the candidacy requirements listed for the MS in Mathematics, and also the CS coursework and thesis/project requirements for the the CS track of the MS program, as listed in the current CS Handbook. Note: Students choosing the CS option may not also receive the MS in Mathematics by candidacy.

Because the requirements the CS Master's degree were changed in 2021, students admitted prior to 2021 may opt to complete the CS/MS degree under the under the Computational Science track described in the 2020 version of the CS Handbook.

The BMI track for the CS Master's program is not available by candidacy to Mathematics PhD students. Students who desire an MS in the BMI track would need to apply separately to the CS Master's program, be admitted, and complete the program requirements as listed in the CS Handbook. Students who elect this option will be liable for tuition and fees for the CS Master's program. Pursuit of such an MS degree should occur during a leave of absence from the Mathematics PhD program.

6 Grievance policy

Students who have a grievance related to aspects of their program in the Department of Mathematics should describe the grievance and relevant details in a letter addressed to the DGS. The DGS will try to resolve the grievance in conversations with the student and relevant parties. If this is unsuccessful, the DGS will appoint a committee of three program faculty members or use an existing standing committee, who will review the grievance and propose an appropriate response. If it is not possible to resolve the grievance within this committee or the framework of the program's administrative structure, the DGS will forward the grievance to the Office of the Senior Associate Dean of the LGS. At that time, the grievance will be handled according to the grievance procedure described in the LGS Handbook. If the grievance is with the DGS, the student submits the grievance directly to the Senior Associate Dean of the LGS.