USC Dornsife
Department of Mathematics

PhD Student Handbook

2024-2025

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Faculty Leaders and Staff Members

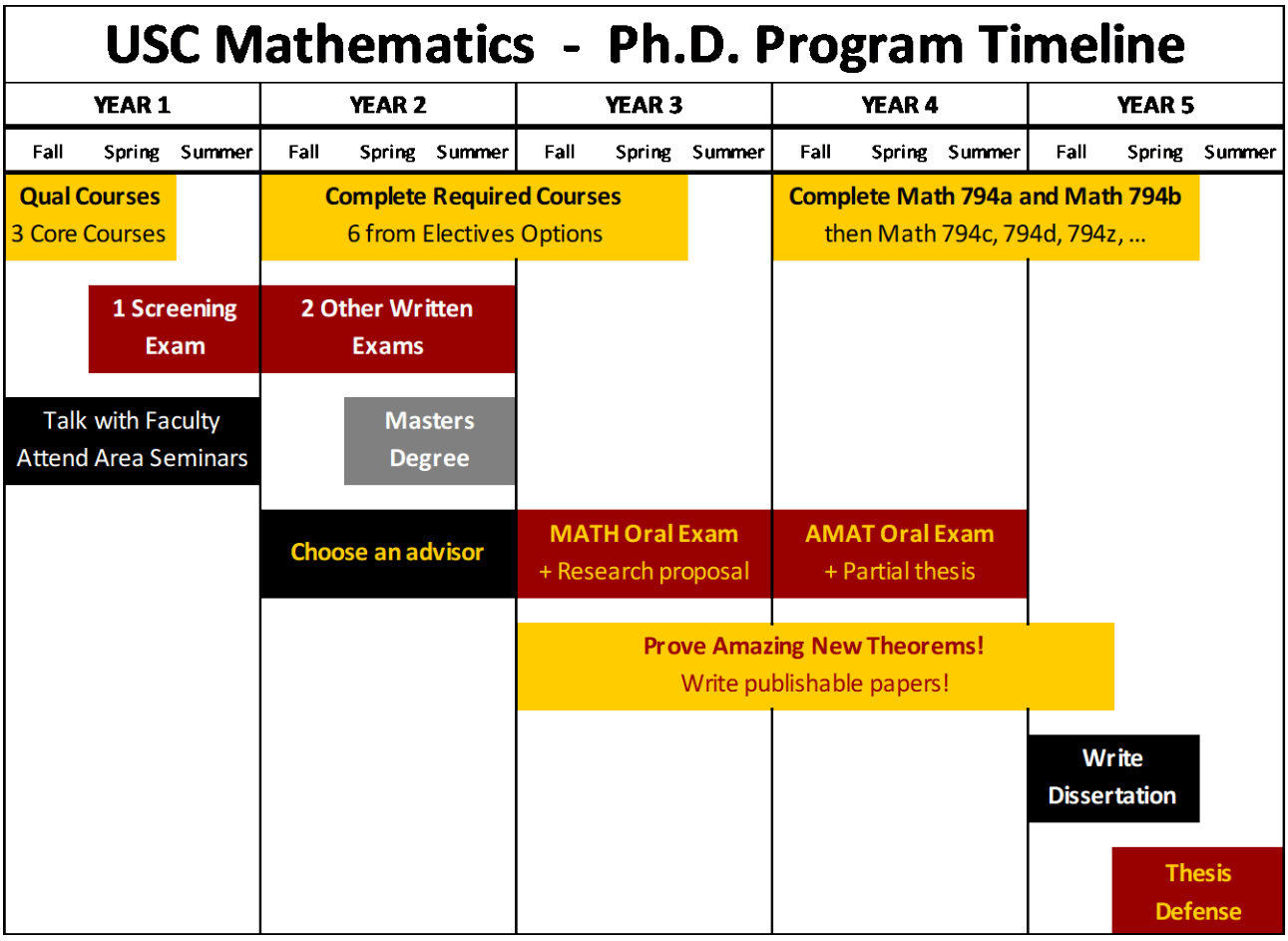
Sami Assaf Director of Graduate Studies (DGS) shassaf@usc.edu	*Contact Prof. Assaf for questions about exceptions to degree requirements (course waivers or substitutions), travel awards, suggestions for program improvement, or concerns about your T.A. experience.*
Susan Sath Vaswani Staff Graduate Advisor (SGA) sath@usc.edu	*Contact Susan for questions about registration, degree requirements, assistantship activation, campus resources, or other academic matters.*
Ligaya Lee Office Manager ligayale@usc.edu	*Contact Ligaya to check out and return your office keys or if you are uncertain whom to contact about an issue.*
Jonah Cano Student Services Assistant jonahcan@usc.edu	*Contact Jonah for printing requests, general classroom reservations, picking up exams or homework, issues with the building facilities, or checking out/returning textbooks for courses you are a TA for.*
Adriana Del Villar Administrative Assistant adrianac@usc.edu	*Contact Adriana for reimbursements you were approved to receive.*
Chaunté Williams Administrative Assistant cwill@usc.edu	*Contact Chaunté to reserve one of the Department's rooms for events, your oral qualifying exam, or dissertation defense.*
Michael Shields Computer Consultant Specialist mshields@usc.edu	*Contact Michael (or Jonah) if you are experiencing technical issues with the Grad Lounge Printers.*
Cymra Haskell Director of Math Center chaskell@usc.edu	*Prof. Haskell manages the Math Center where Teaching Assistants (TA's) hold their office hours.*
Paul Tokorcheck Director of Undergraduate Studies tokorche@usc.edu	*If your students ask about their undergraduate requirements, please refer them to their academic advisors who work closely with Prof. Tokorcheck.*
Aaron Lauda Department Chair lauda@usc.edu	*Contact Prof. Lauda for department level concerns.*

Ph.D. Requirements

The Math Department offers two doctoral programs: Mathematics Ph.D. (MATH) and Applied Mathematics Ph.D. (AMAT). While the overall structure of the programs is the same, the specific requirements differ in places as noted. The major milestones for the programs are:

- Written Screening Exams
- Required Courses
- Advisor Selection
- Oral Qualifying Exam
- Thesis Defense

The expected timelines for these milestones are illustrated in the graphic below.



Written Exams

Our comprehensive written exams cover material often taught in one of our foundational courses. Each instance of the associated course(s) covers a subset of the exam topics, so students generally must study additional topics independently to prepare for the exams.

Exams are offered twice per year, in August and in January the week before classes begin.

All Ph.D. students must pass, at the Ph.D. level, exams in THREE core subject areas. Requirements differ by program.

Mathematics (MATH)	Applied Mathematics (AMAT)
Choose THREE of the following: • **Algebra**: based on Math 510ab • **Analysis**: based on Math 525a • **Partial Differential Equations**: based on Math 555a • **Probability**: based on Math 505a • **Topology**: based on Math 540	Must do all THREE of the following: • **Analysis**: based on Math 525a • **Partial Differential Equations**: based on Math 555a • **Probability**: based on Math 505a

The 6 companion classes listed above are commonly referred to as “qual courses”.

Screening Procedure

To complete the screening procedure, all Ph.D. students must pass, at the Ph.D. level:

- One exam by August after their 1st year
- ALL three subject exams by August after their 2nd year

Students may be given additional time to complete exams if they are otherwise in good standing and are making steady progress toward completing the exam requirements.

Advisors

All students are assigned a temporary advisor in their first year in the general area of their interests. Students should find a regular advisor by the end of their 2nd year, and certainly by December of their 3rd year. There is no one way to find an advisor. We suggest students:

- Attend classes taught by various faculty in their field(s) of interest
- Regularly attend area seminars
- Discuss advisors with more senior Ph. D. students
- Speak with faculty in office hours or at departmental tea
- Request a reading course (Math 590) with a faculty member on a special topic

The student-advisor relationship is much like an apprenticeship, so a good fit between student and advisor is important. We recommend students keep an open mind about their research area in order to find the best advisor.

Qualifying Exam and Committees

After completion of the screening procedure, the student must form a qualifying exam committee. The committee must consist of

- Committee chairperson who must be the advisor
- Three additional faculty in Mathematics
- One faculty member at USC outside of Mathematics ("outside member")

The qualifying exam consists of written and oral components. Requirements for the written component differ by program.

Mathematics (MATH)	Applied Mathematics (AMAT)
The student prepares a research proposal • Expository summary of the background of the research area • Precise statement of the problem on which the student proposes to work • Approximately 8-10 pages in length • Including relevant references Partial results are not required.	The student prepares a partial thesis with • Expository summary of the background of the research area • Precise statements and proofs of preliminary results • Outline for proposed new work • Approximately 8-10 pages in length • Including relevant references

The written component must be submitted to the qualifying exam committee ***at least one week before the oral component***.

The oral component consists of a presentation by the student defending/discussing this proposal and an examination by the committee.

The deadline for completing the Oral Qualifying Exam differs by program.

Mathematics (MATH)	Applied Mathematics (AMAT)
Completed within 6 months after completion of the written screening exams, and *no later than the end of the 3rd year*.	Completed within 3 semesters after completion of the written screening exams, and *no later than the end of the 4th year*.

Steps to complete the qualifying exam:

1. In addition to your advisor, find four other faculty members for your qualifying exam committee. One of your committee members must come from outside the Math department, but still in USC.
2. Set a date and time for your oral qualifying exam that works for all committee members. The oral qualifying exam can be completed remotely via Zoom. If it's done in person, email the SGA (sath@usc.edu) to schedule a room.
3. *At least 2 weeks before your oral exam date*, email the list of your committee members and their USC email addresses to the SGA, who will use Docusign to obtain electronic signatures required on the "Appointment or Change of Qualifying Exam" form.
4. *At least 1 week before your oral exam date*, email the written proposal to your committee.
5. Defend/discuss your proposal on the oral exam date with your committee.
6. Your committee will complete and sign the "Report on PhD Qualifying Exam" form to indicate if you passed. A copy of the completed form will be given to you. Please save it for your records.
7. After passing the Ph.D. Qualifying Exam, you must register in Math 794a if you pass before the add/drop deadline of the semester. If you pass after the semester's add/drop deadline, you must register in Math 794a the following semester.
8. Registration in Doctoral Dissertation courses (Math 794a, 794b, 794c, 794d, 794z) is required until the dissertation is submitted and processed by USC's Thesis Center.

Dissertation and Defense

Following completion of the screening procedure and approval of a dissertation topic by the chair of the student's qualifying exam committee, the student proceeds with research towards the dissertation. The student must form a dissertation committee. The Ph.D. thesis, based on a substantial amount of original research conducted by the student, must be defended, and approved by the dissertation committee.

The dissertation committee must have at least three, but no more than 5, members. The committee must consist of

- Committee Chair who must be the advisor
- One to three additional faculty in Mathematics
- One faculty member at USC outside of Mathematics ("outside member")

Steps to defend and submit your dissertation:

1. After forming your dissertation committee, set a date and time for your dissertation defense that works for all committee members.
    a. The dissertation chair must attend in person, but other members can join remotely. If the dissertation chair must attend remotely, email the SGA

(sath@usc.edu) at least 2 weeks before the defense date. The SGA will submit a petition to The Graduate School to request approval for the Chair to attend remotely.

   b. Email the SGA a list of your committee members and their USC email addresses. The SGA will use Docusign to obtain all signatures required for the Appointment of Dissertation Committee form

2. Create a profile in USC's Thesis Center and upload the completed *Appointment of Dissertation Committee* form
3. On the morning of your defense, go to the Checklist page in the Thesis Center to generate the electronic *Approval to Submit* form. Your action will prompt the Thesis Center to send an email containing a link to the form to all your committee members.
4. Defend your thesis. Make any changes to your manuscript that your committee requires. Monitor the progress of the electronic *Approval to Submit* form through the Checklist page of your Thesis Center Profile to check if all signatures from the committee have been submitted.
5. Upload a PDF of the completion certificate from the Survey of Earned Doctorates (SED)
6. Submit your manuscript.
7. Make any formatting changes requested by the thesis coordinator.
8. Monitor your email for a message from the USC Digital Library. You must respond to the email to finalize publishing information with the USC Digital Library. The deadline for finalizing publishing information is the degree conferral date of the given term. This is the final step required for degree conferral.

NOTE:
Although not a hard rule, it is recommended to ask faculty members who are active in research (Tenured or Tenure track) to serve on your committee. As you review the faculty directory:

- Professors and Associate Professors are tenured faculty
- Assistant Professors are tenure-track
- RTPC, Lecturer, or Teaching Faculty are non-tenured

Course Requirements

The course requirement includes required and elective courses. The student must complete, with no grade lower than B, a minimum of 60 units of courses carrying graduate credit.

Required Courses

We recommend students complete course requirements by the end of the 2nd year in the program. Requirements must be met by the end of the 3rd year. Specific course requirements vary by program.

Mathematics (MATH)	Applied Mathematics (AMAT)
The following must be completed: • MATH 510a Algebra • MATH 525a Real Analysis • MATH 540 Topology • MATH 794a Doctoral Dissertation • MATH 794b Doctoral Dissertation	**The following must be completed**: • MATH 505a Applied Probability • MATH 525a Real Analysis • MATH 555a Partial Differential Equations • MATH 794a Doctoral Dissertation • MATH 794b Doctoral Dissertation
Five additional courses from the following list must also be completed: • MATH 502a Numerical Analysis • MATH 505b Applied Probability • MATH 507a Theory of Probability • MATH 510b Algebra • MATH 520 Complex Analysis • MATH 525b Real Analysis • MATH 532 Combinatorial Analysis • MATH 533 Algebraic Combinatorics • MATH 535a Differential Geometry • MATH 535b Differential Geometry • MATH 541a Introduction to Mathematical Statistics • MATH 555b Partial Differential Equations • MATH 565a Ordinary Differential Equations	**Six additional courses from the following list must also be completed**: • MATH 502b Numerical Analysis • MATH 505b Applied Probability • MATH 507b Theory of Probability • MATH 509 Stochastic Differential Equations • MATH 520 Complex Analysis • MATH 525b Real Analysis • MATH 530b Stochastic Calculus and Mathematical Finance • MATH 532 Combinatorial Analysis • MATH 541b Introduction to Mathematical Statistics • MATH 542 Analysis of Variance and Design • MATH 545 Introduction to Time Series • MATH 547 Mathematical Foundations of Statistical Learning Theory • MATH 550 Statistical Consulting and Data Analysis • MATH 555b Partial Differential Equations • MATH 565a Ordinary Differential Equations • MATH 574 Applied Matrix Analysis • MATH 580 Introduction to Functional Analysis

Any of the three core required courses for each program (510a, 525a, 540 for MATH; 505a, 525a, 555a for AMAT) can be waived if the student earns a PhD pass on the corresponding written exam.

NOTE: Due to the interdisciplinary nature of the program, Applied Mathematics Ph.D. students may wish to take courses outside of the Mathematics department. Students may request approval to take ONE course per academic year outside of the Math department.

Prior to registration for the external course, students must:

- Ask their academic advisor to submit a statement to the DGS detailing how the external course is essential for the student's research program
- Submit the "External Course Approval" form

If a student registers in an unapproved course outside of Math, they are subject to the full responsibility of paying the tuition costs and associated fees for this course.

Students must take all courses for a letter grade or Credit/No Credit. Courses cannot be audited or taken for Pass/No Pass. Audited or Pass/No Pass courses will not be covered by assistantship or fellowship awards. Students are responsible for all tuition costs for audited or Pass/No Pass courses.

Transfer of Credit

No transfer of credit will be considered until the screening examination is passed. A maximum of 30 units of graduate coursework at another institution may be applied toward the course requirements for the Ph.D. A grade lower than B will not be accepted.

Conferring a Master's degree

Students can add and confer ONE Master's degree within the Department of Mathematics.

To earn a Master of Arts in MATH or AMAT, 24 units total are required with specific courses listed below.

Mathematics (MATH)	Applied Mathematics (AMAT)
MATH 510a MATH 525a One option (2 courses) from A, B, or C: A) MATH 535a and MATH 540 B) MATH 555a and MATH 565a C) MATH 505a and MATH 541a	MATH 525a At least 3 courses from: Math 502a Math 502b Math 505a Math 505b Math 541a Math 541b Math 555a Math 565a

UNIVERSITY POLICIES YOU NEED TO KNOW

A complete record of university policies can be found in USC's Catalogue.

This PhD Student handbook highlights a few policies we recommend reviewing every semester.

TA Duties and Expectations

A complete record of policies related to your employment as a Teaching Assistant can be found in the Graduate School's handbook for TAs, RAs, and ALs. We will highlight some policies specific to TAs in the Math Department:

- Students who receive a 50% Teaching Assistantship should devote no more than **20 hours per week** to their teaching duties. If you believe you are spending an excessive amount of time on teaching duties, please consult with the Director of Graduate Studies.
- At the beginning of the semester, the supervising faculty member should discuss with their TAs the scope of their duties and responsibilities, clarifying their expectations for:
    - attendance in lecture
    - leading discussion sections
    - photocopying or posting materials online
    - writing and posting solutions
    - administering quizzes and other course assignments
    - grading quizzes, exams, and other course assignments
    - recording and sharing records of grades
    - deadlines and timelines for completing grading and posting records
    - upholding academic integrity
    - proctoring exams
    - overall purpose of the teaching assistant (TA) in the course
    - frequency and mode of communication
- **TAs must hold 3 hours of office hours at the Math Center**. Their office hours are scheduled during designated days and times by the Math Center Director, Prof. Cymra Haskell. If a TA needs to change their office hours temporarily during a given week or permanently for the rest of the semester, they MUST coordinate with Prof. Haskell for approval. Similarly, if TAs want to hold office hours via Zoom or need to cancel one of their office hours on a given day due to unforeseen circumstances, they MUST contact Prof. Haskell at least ***24 hours in advance***
- **TAs may not cancel their discussion sections**. TAs should never miss teaching their sections. However, if it is necessary for a TA to miss a class, TAs must notify their supervising faculty member and the SGA (sath@usc.edu) at least 7 business days in advance. TAs are responsible for coordinating an appropriate substitute.
- To remain in good academic standing, all PhD students are expected to treat their TA duties seriously and to perform with professionalism and in compliance with all University policies. **Repeated failure to perform TA duties satisfactorily may result in dismissal from the PhD program.**
- Students who wish to obtain temporary employment (an hourly paid position) in addition to their 50% Teaching Assistantship must submit a petition to The Graduate School
    - The temporary employment cannot exceed 5 hours per week

- The department will not support the petition for students in their 1st year of the program as we believe students should focus on their studies and TA duties
- After the 1st year, the department may support the petition if the student is on track of completing degree requirements on time (courses, exams, GPA)

Academic Standards

At no time should the overall GPA drop below 3.0. A minimum grade of B is required in a course to receive degree credit. An overall GPA of at least 3.0 on all units attempted at USC is required for graduation.

If a student's overall GPA drops below 3.0, the student will be contacted by the Math department to formulate an academic remediation plan moving forward. Failure to meet the expectations outlined in the plan may result in dismissal from the program.

Continuous Enrollment and Leave of Absences

Students admitted to a graduate degree program are required to be enrolled at USC for fall and spring semesters each year until all degree requirements have been satisfactorily completed within the time limit. Graduate students who fail to register in a fall or spring semester are no longer considered to be enrolled in a graduate degree program. After an unauthorized absence, formal readmission is required.

Students who have been granted a leave of absence do not need to apply for readmission when they return from the approved leave. Students must request a leave of absence by the last day to drop or add courses. The request should include a plan for academic progress upon return. If granted, the period of leave is not counted in the time allowed for the completion of degree requirements. A leave of absence may be allowed for one semester at a time, up to a maximum of four semesters. International students considering a leave of absence should be aware of their visa status implications. For more information, contact USC's Office of International Services.

A doctoral candidate who is writing a thesis and has completed all course work for the degree must enroll in the appropriate thesis registration (Math 794) until the thesis has been approved. Please note that some courses with no academic credit require payment of tuition. Most classes with course numbers ending in z (e.g., 594z) require payment of 2 units of tuition.

For International Students

International students should contact USC's Office of International Services on all matters related to their international status. Important reminders:

New incoming international students must complete Immigration Status Verification before they can register for classes.

To maintain their visa status, international students must be registered for a full course of study in classes that meet their degree requirements during the fall and spring semesters. A full course of study for doctoral students is 6 units or more. In certain situations, students can apply for a Reduced Course Load (RCL) and register in fewer than 6 units if the RCL application is approved.

International students must be aware of the expiration date on their I-20/DS-2019. If students cannot complete their degree by the expiration date on their I-20/DS-2019, students must request a program extension before the expiration date on the I-20/DS-2019. Students who do not file a program extension on time will be considered out of status. Passports must be valid at all times. If the passport will expire soon, students must renew it through the embassy or consulate of their home country.

CAMPUS RESOURCES

Career Services

- USC Career Center

Student Organizations

- Mathematics Graduate Student Association
- USC Women in Math: Charlotte's Web
- List of all student clubs on campus

Student Wellness

- Recreational activities
- Counseling services and crisis intervention
- Trojans Care 4 Trojans
- Office of Religious Life
- Office of Student Accessibility Services
- USC LGBTQ+ Center