

The logo for USC Dornsife Department of Mathematics is located in the top left corner. It consists of the text "USC Dornsife" in a dark red serif font, with "Department of Mathematics" in a smaller, italicized red serif font below it. The logo is set against a white rectangular background.

**USC Dornsife**  
*Department of Mathematics*

The background of the cover is an abstract geometric design. It features several overlapping, diagonal bands of color: a large red band, a yellow band, and a light gray band. The bands are arranged in a way that creates a sense of depth and movement, with some bands appearing to be in front of others. The overall composition is dynamic and modern.

***PhD Student  
Handbook***  
2023-2024

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# Mathematics PhD Requirements

## Written Exams

The Math Department offers written exams covering core mathematics content. These exams are offered twice a year, at the end of summer and at the beginning of the spring semester.

Mathematics (PhD) students must pass exams for THREE of the following five core subjects, one of which must be either Algebra or Analysis:

- **Algebra:** a single 3-hour exam based on material covered in Math 510a and Math 510b
- **Analysis:** two 90-minute exams, one based on material covered in Math 525a and another based on material covered in Math 520
- **Ordinary and Partial Differential Equations:** two 90-minute exams, one based on material covered in Math 555a and another based on material covered in Math 565
- **Geometry and Topology:** a single 3-hour exam based on material covered in Math 535a and Math 540
- **Probability and Statistics:** two 90-minute exams, one based on material covered in Math 507a and another based on material covered in Math 541a

All 10 classes listed above are commonly referred to as a “qual class.”

## Screening Procedure

To complete the screening procedure, Mathematics (PhD) students must pass:

1. Algebra OR Analysis before January of their 2<sup>nd</sup> year
2. ALL three subject exams within 5 semesters (before January of their 3<sup>rd</sup> year)

**NOTE: Students may attempt each of the exams at most three times.**

## Advisors

All students are assigned a temporary advisor, in the general area of their interests. You should try to find a regular advisor by the end of your 2<sup>nd</sup> year, and certainly by December of your 3<sup>rd</sup> year. To find an advisor, you should go to classes taught by various faculty, attend the area seminars, or discuss their advisor with older PhD students. You can also go to a faculty member and ask to do a reading course on a topic not covered in a scheduled class. Officially this is Math 590 Directed Research. There is no one way to find an advisor.

## Qualifying Exam and Committees

After completion of the screening procedure, the student must form a qualifying exam committee. The committee must consist of an adviser and four other faculty members, including at least one from another department (“outside member”).

**The qualifying exam consists of written and oral components.** The written part consists of a 10-page research proposal that should be submitted to the qualifying exam committee at least one week before the oral part. The oral part consists of a presentation by the student defending/discussing this proposal and an examination by the committee. The qualifying exam should be taken within 6 months after finishing the written exams. It must be taken by the end of the 7<sup>th</sup> semester at the latest.

*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.
2. Download the “[Appointment or Change of Qualifying Exam](#)” form. Request signatures from all committee members who agree to be on your committee.
3. Send the completed form to Ligaya Lee ([ligayale@usc.edu](mailto:ligayale@usc.edu)). They will help obtain signatures from the Program Director and Dean, then return the completed form to you. Please save the copy.
4. Send the written proposal to your committee at least one week before the oral exam date.
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.
7. The Committee Chair sends the “Report on PhD Qualifying Exam” form to Ligaya Lee, who will help obtain signatures from the Dean and Program Director. A copy of the completed form will be given to you. Please save it for your records.
8. 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.
9. 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.

*Steps to defend and submit your dissertation:*

1. After passing the qualifying exam, complete the [Appointment of Dissertation Committee form](#) to reflect the dissertation committee
  - a. The committee must have at least three but no more than 5 members. The Committee Chair is your thesis advisor, and you must have one member outside of the Mathematics department
  - b. Obtain signatures from all committee members before sending the form to Ligaya Lee. Ligaya will help obtain signatures from the Program Director and Dean, then return the completed form to you.
2. Confirm and schedule the date for your dissertation defense.
3. Create a profile in [USC's Thesis Center](#) and upload the completed *Appointment of Dissertation Committee* form
4. 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.
5. 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.
6. Upload a PDF of the completion certificate from the [Survey of Earned Doctorates](#) (SED)
7. Submit your manuscript.
8. Make any formatting changes requested by the thesis coordinator.
9. 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.

## Course Requirements

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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. Courses outside of the Mathematics Department must be approved by the Graduate Committee.

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## Required Courses

**The following courses must be completed:**

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- [MATH 510a Algebra](#) Units: 3
- [MATH 525a Real Analysis](#) Units: 3
- [MATH 535a Differential Geometry](#) or [MATH 540 Topology](#) Units: 3
- [MATH 794a Doctoral Dissertation](#) Units: 2
- [MATH 794b Doctoral Dissertation](#) Units: 2

**Five additional courses from the following list must also be completed:**

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- [MATH 502a Numerical Analysis](#) Units: 3
- [MATH 502b Numerical Analysis](#) Units: 3
- [MATH 507a Theory of Probability](#) Units: 3
- [MATH 510b Algebra](#) Units: 3
- [MATH 520 Complex Analysis](#) Units: 3
- [MATH 525b Real Analysis](#) Units: 3
- [MATH 532 Combinatorial Analysis](#) Units: 3
- [MATH 535a Differential Geometry](#) Units: 3
- [MATH 540 Topology](#) Units: 3
- [MATH 541a Introduction to Mathematical Statistics](#) Units: 3
- [MATH 555a Partial Differential Equations](#) Units: 3
- [MATH 565a Ordinary Differential Equations](#) Units: 3

## Additional Requirements

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### Transfer of Credit

No transfer of credit will be considered until the screening examination is passed. A maximum of 30 units of graduate work at another institution may be applied toward the course requirements for the PhD. A grade lower than B will not be accepted and at most two grades of B will be accepted.

### Foreign Language Requirement

The student must demonstrate a reading comprehension of mathematics in one language (other than English) in which there is a significant body of research mathematics (such as Chinese, French, German, Japanese and Russian) by passing a written examination, administered by the Mathematics Department, in translation of mathematical content.

# Applied Mathematics PhD Requirements

## Written Exams

The Math Department offers written exams covering core mathematics content. These exams are offered twice a year, at the end of summer and at the beginning of the spring semester.

Applied Mathematics (PhD) students must pass 90-minute exams for FOUR of the following options:

- **Real Analysis**: based on material covered in Math 525a
- **Statistics**: based on material covered in Math 541a
- **Applied Probability** or **Probability** (select one): based on material covered in Math 505a or Math 507a
- **Numerical Analysis** or **Partial Differential Equations** (select one): based on material covered in Math 502a or Math 555a

All 6 classes listed above are commonly referred to as a “qual class.”

## Screening Procedure

To complete the screening procedure, Applied Mathematics (PhD) students must pass:

1. TWO of the required exams before January of their 2<sup>nd</sup> year
2. ALL four exams within 4 semesters (before January of their 3<sup>rd</sup> year)

**NOTE: Students may attempt each of the exams at most three times.**

## Advisors

All students are assigned a temporary advisor, in the general area of their interests. You should try to find a regular advisor by the end of your 2<sup>nd</sup> year, and certainly by December of your 3<sup>rd</sup> year. To find an advisor, you should go to classes taught by various faculty, attend the area seminars, or discuss their advisor with older PhD students. You can also go to a faculty member and ask to do a reading course on a topic not covered in a scheduled class. Officially this is Math 590 Directed Research. There is no one way to find an advisor.

## Qualifying Exam and Committees

After completion of the screening procedure, the student must form a qualifying exam committee. The committee must consist of an adviser and four other faculty members, including at least one from another department (“outside member”).

## Qualifying Exam and Committees

After completion of the screening procedure, the student must form a qualifying exam committee. The committee must consist of an adviser and four other faculty members, including at least one from another department (“outside member”).

**The qualifying exam consists of written and oral components.** The student must complete enough research for a partial thesis. They should present their work and their proposal for the rest of their research within 3 semesters of finishing the written exams, or by the end of their 4<sup>th</sup> year at the latest.

### *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.
2. Download the “[Appointment or Change of Qualifying Exam](#)” form. Request signatures from all committee members who agree to be on your committee.
3. Send the completed form to Ligaya Lee ([ligayale@usc.edu](mailto:ligayale@usc.edu)). They will help obtain signatures from the Program Director and Dean, then return the completed form to you. Please save the copy.
4. Send your research and proposal to your committee at least one week before the oral exam date.
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.
7. The Committee Chair sends the “Report on PhD Qualifying Exam” form to Ligaya Lee, who will help obtain signatures from the Dean and Program Director. A copy of the completed form will be given to you. Please save it for your records.
8. 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.
9. 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. *See Page 5 for details.*



## Course Requirements

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The student must complete, **with no grade lower than B**, a minimum of 60 units of courses carrying graduate credit and approved by the qualifying exam committee.

- These must include
- [MATH 794a Doctoral Dissertation](#) Units: 2
- [MATH 794b Doctoral Dissertation](#) Units: 2

**And six courses from the following:**

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- [MATH 502b Numerical Analysis](#) Units: 3
- [MATH 504a Numerical Solution of Ordinary and Partial Differential Equations](#) Units: 3
- [MATH 504b Numerical Solution of Ordinary and Partial Differential Equations](#) Units: 3
- [MATH 505b Applied Probability](#) Units: 3
- [MATH 507b Theory of Probability](#) Units: 3
- [MATH 509 Stochastic Differential Equations](#) Units: 3
- [MATH 520 Complex Analysis](#) Units: 3
- [MATH 525b Real Analysis](#) Units: 3
- [MATH 530b Stochastic Calculus and Mathematical Finance](#) Units: 3
- [MATH 532 Combinatorial Analysis](#) Units: 3
- [MATH 541b Introduction to Mathematical Statistics](#) Units: 3
- [MATH 542 Analysis of Variance and Design](#) Units: 3
- [MATH 545 Introduction to Time Series](#) Units: 3
- [MATH 555a Partial Differential Equations](#) Units: 3
- [MATH 565a Ordinary Differential Equations](#) Units: 3
- [MATH 574 Applied Matrix Analysis](#) Units: 3
- [MATH 576 Applied Complex Analysis and Integral Transforms](#) Units: 3
- [MATH 580 Introduction to Functional Analysis](#) Units: 3
- [MATH 585 Mathematical Theory of Optimal Control](#) Units: 3

## Additional Requirements

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### Transfer of Credit

No transfer of credit will be considered until the screening examination is passed. A maximum of 30 units of graduate work at another institution may be applied toward the course requirements for the PhD. A grade of B (A = 4.0) or lower will not be accepted and, at most, two grades of B will be accepted. A PhD candidate may petition the department for transfer of additional credit, after he or she passes the qualifying examination.

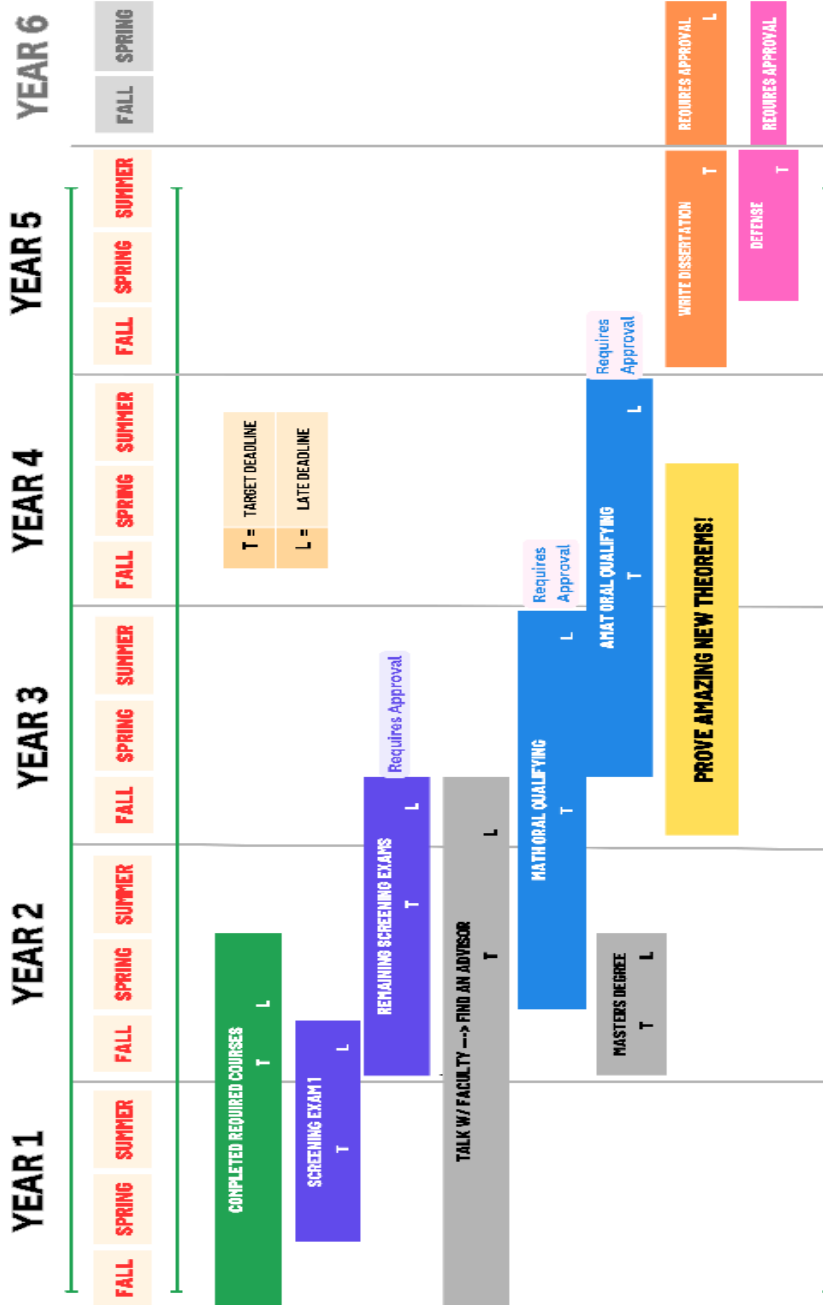
### Foreign Language Requirement

The student must demonstrate a reading comprehension of mathematics in one language (other than English) in which there is a significant body of research mathematics (such as Chinese, French, German, Japanese and Russian) by passing a written examination, administered by the Mathematics Department, in translation of mathematical content.

# The PhD Timeline

## PH.D. PROGRAM TIMELINE

USC Department of Mathematics



	Screening Exam 1	Screening Exams	Oral Qual	Required Courses
<b>MATH</b>	1 Double	3 Doubles	Expository	3 Specific & 5 Choices
<b>AMAT</b>	2 Singles	4 Singles	Prelim Results	6 Choices

# UNIVERSITY POLICIES YOU NEED TO KNOW

A complete record of university policies can be found in [USC's Catalogue](#). This handbook highlights a few policies we recommend reviewing every semester.

## 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, they will be contacted by the Math department to discuss an academic plan moving forward. Failure to meet the expectations outlined in the plan may result in dismissal.

## 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](#)