Guidebook — PhD at Courant/Math+AOS

The following is a collection of recommendations, best practices, and links to resources for Mathematics and AOS PhD students at the Courant Institute. The document also provides important external links to program requirements and university policies (we avoid duplicating this information in this document). It was assembled by faculty and PhD students who will try to keep it up to date. It is meant to guide PhD students through the program rather than being a legal document, i.e., in case of conflicting information, the official policy is the one published on the graduate school’s pages. [Last update, April 22, 2024]

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First steps at Courant

Offices
Upon arrival at the Institute, you will be assigned a desk in an office typically shared by 3-5 students, and provided with a desktop computer. Offices are reassigned yearly, and in future years, the administrator taking care of office assignments will take into account your preferences, whenever possible. Our goal is to make your workspace feel comfortable, safe, and productive.

Email lists
The Institute has a large number of research seminars, some being particularly tailored to students and postdocs, and research group meetings. Most of these seminars have mailing lists for communication, and you should subscribe to the lists you are interested in. You can find an overview of all mailing lists here: https://cims.nyu.edu/webapps/bulletin. If you do not find the mailing list, email the seminar organizers and they will point you in the right direction.

A weekly summary of all seminar talks is also available in the bulletin, and you can subscribe to the mailing list here: https://cims.nyu.edu/webapps/bulletin

Of particular interest for incoming students are the following student-oriented seminars:
- [Graduate Student and Postdoc seminar](https://cims.nyu.edu/webapps/bulletin)
- [Modeling and Simulation group meeting](https://cims.nyu.edu/webapps/bulletin) (vertically integrated, i.e., for UG and GA students, postdocs and faculty)
- [Student probability seminar](https://cims.nyu.edu/webapps/bulletin)
- [Atmosphere Ocean Science student seminar](https://cims.nyu.edu/webapps/bulletin)
Computer resources

It is worth spending some time to get familiar with the computer environment at the Institute as documented here. This includes, but is not limited to, information about managing your CIMS account, how to host a webpage, available computing storage, how to print at Courant, the computer servers, and more.

Here you also find how to request computer support. Please be deliberate regarding the support staff’s time and try to find answers to your questions on the internal Courant IT pages or on the web before you email Courant’s support team or drop by their office (room 1006). Even if you are not planning to do computational research, setting up a professional work environment is important. As you can see from the documentation, the Institute has internal computer resources.

Additionally, NYU has very substantial Research Computing resources — including a large High Performance Computing cluster with both CPUs and GPUs — that are available to you for research purposes.

Main contacts at the Institute

Your initial main points of contact

Upon joining the program, these are your main contacts:

- The Director of Graduate Studies (DGS) oversees the PhD program, and is your primary point of contact for questions and issues in the PhD program. For AY 2024/25, the DGSs are Esteban Tabak in Mathematics and Shafer Smith in AOS.
- The Assistant Director of Graduate Programs (Gehan Abreu De Colon), manages all administrative issues regarding the program, and can answer questions about your fellowship, first-year housing, course enrollment, progress toward your degree, and more.
- Upon entering the program, you will additionally be assigned a faculty mentor. Your mentor will reach out to you at the beginning of the semester and regularly throughout the first semester or year. Faculty mentors are an additional resource if you need help with choosing courses, have questions about choosing an advisor, or other issues.
- Upon entering the program, you will also be paired with a group of PhD students, who can provide advice about all aspects of student life, and help you get to know other Courant PhD students. More senior students in your office can offer the same type of support more informally. Try to get to know them!
Courant Student Organization

The PhD students at Courant run a student organization (CSO) which hosts a number of fun activities, such as weekly bagel breakfasts in the 13th floor lounge and the sale of the popular Courant t-shirts every spring. In addition, CSO hosts a student-faculty forum each spring, attended by students, interested faculty, and Courant Institute leadership, during which student questions and concerns are raised for discussion and action.

Resources for office-related issues

- Hilary Sachar is the Manager of Facilities at Courant and should be your primary contact for facilities questions or concerns.
- If you lock yourself out of your office, contact Yasmin Garcia in room 815 during business hours (8am-5pm) or the security guard on the 1st floor.
- Office supplies and printer paper are available from Yasmin Garcia in room 815.
- For help with your desktop computer or for adapters and cables, contact Courant IT support in room 1006.

Contacts outside Courant

- The Graduate School of Arts and Sciences (GSAS) has a substantial staff that handles all university-wide issues regarding PhD students at NYU.
- The Office of Equal Opportunity coordinates NYU’s programs to improve diversity, equity, and inclusion, and handles issues of discrimination.
- The Title IX Coordinator is responsible for handling reports of sexual harassment and misconduct as well as discrimination on the basis of sex.
- The Moses Center for Student Accessibility is a resource for students with disabilities and/or students who need academic accommodations.

PhD program requirements

Program description

The GSAS website lists the official requirements for the Mathematics and AOS PhD programs. Both share the following fundamental requirements:

- 72 credits by the end of the 4th year
- Written Comprehensive Examination with a grade of A
- Oral Preliminary Examination
- Oral Defense of Dissertation
- Doctoral Dissertation
Written Qualifying Examinations

The written exams consist of three three-hour exams offered on consecutive days each August and January. The topics are Advanced Calculus, Linear Algebra, and (for Mathematics students) Complex Analysis or (for AOS students) Geophysical Fluid Dynamics. The exams cover undergraduate-level material (with the exception of GFD which is often taken in the first semester at Courant) and are intended to be passed before beginning research. The exams can be taken up to two times, with an additional ‘free’ attempt in August before the start of their first semester. At the discretion of the faculty, students may be asked to retake all three exams if they fail one or more of them, or they may only be required to retake those that they did not pass. Results are released by email within a few weeks.

The amount of preparation needed for the written exams differs depending on students’ undergraduate training. Some students suggest trying a variety of practice problems to decide if a few weeks of review would be enough for them to pass the test. If yes, taking classes on the subject of the written exams may be unnecessary. Some students still find that the Linear Algebra and Complex Variables classes (which typically go beyond what is needed for the written exams) make them more confident and are thus helpful.

Students with sufficient preparation are encouraged to attempt the written exams before their first semester. Questions from previous years are available upon request from Gehan Abreu De Colon. Student-written solutions can be found on the Graduate Student Resources (requires a CIMS account login). Please note that these solutions are unofficial and may contain errors. The department also organizes exam preparation workshops, run by students, that take place in the weeks leading up to the exams.

Oral Qualifying Examinations

The oral preliminary exams consist of two one-hour sessions, the general and the special exam, in which a committee of three faculty members will ask questions that the student will answer on the blackboard. Before the exam, the student will submit a proposal to the DGS consisting of five general exam topics and a special topics outline. The general exam topics typically correspond to courses the student has taken at Courant, and the special exam outline should consist of one or more topics that relate directly to the student’s intended research, to be assessed at a more advanced level. The DGS will choose appropriate faculty based on the choice of general and special exam topics; the two groups will have no overlapping faculty. The exam committees will not be known to the student prior to the exam, except for the student's advisor who will serve as head of the special topics committee. For AOS students, the special exam typically consists instead of a presentation intended to demonstrate a thorough understanding of the student’s proposed research problem. The PhD program requirements website explains in more detail what is intended to be assessed by the oral exams.
Students report that preparation for the oral exams takes 2-3 months of dedicated effort, usually requiring a lightened course load. The exams test materials from the graduate courses taken at Courant. Investments into learning the materials well over the first two years of coursework decrease the burden of dedicated preparation. It is useful to practice by doing dry runs with faculty members and more senior students. The Graduate Student Resources page provides a student-compiled list of questions that have been asked in past oral exams.

The exams can be taken twice, or three times with the permission of the DGS. It is rare for students not to pass either the written or the oral exams within the number of attempts allowed, though substantial preparation is required.

Coursework Requirements

All students in the Ph.D. program must complete 72 credits. It is possible, with departmental permission, to take courses relevant to a student's course of study in other departments at NYU or at other universities. In order to obtain permission to take a course outside of the department, students should contact Courant's Assistant Director of Graduate Programs who will check whether the course is sufficiently related to the student's research. If it is, students need to contact the department offering the course to obtain a permission/access code to register. Departments typically inquire if students obtained permission from their home department to take the course. A minimum of 32 credits must be completed at the Department of Mathematics. The maximum credit transfer allowed is 40 credits. All requests for transfer credit are reviewed on a case by case basis.

Research Credits

After completion of the preliminary oral examination, PhD students may register for PhD Research (3 credits) to fulfill up to 15 credits towards the Ph.D. program. Prior to passing the orals, students can contact the department in order to see if they can register for Independent Study.

Good academic standing

GSAS requires students to maintain a GPA of 3.0 or higher and successfully complete at least two thirds of credit points attempted at NYU, excluding the current semester. In order to remain in good academic standing, doctoral students must complete the written exam and oral exam requirements on time and should be making satisfactory progress in their research following successful completion of the exams. Students who fall below the criteria for good academic standing may be put on probation.
Expectations

The PhD students at the Courant Institute are chosen from many hundreds of applicants. The members of the Institute (faculty and staff) are committed to supporting your journey as graduate students and creating a welcoming, supportive, inclusive and inspiring research and learning environment. Training successful PhD students is crucial for the future of the Institute, and the Courant Institute members hold themselves to the highest academic standards. Below is a list of expectations and tips for PhD students.

PhD Year by Year

Year I: Students are expected to do well in their studies, attempt the written examinations by January of their first year and pass them by the beginning of their second year, choose a research area, and find a potential advisor. Students should be enrolled in four courses each semester.

Year II: Students are expected to do well in their studies and pass the oral exams either in April of their second year or October of their third year. Students should make progress towards the completion of the required credits. In Year II, this typically entails taking 3-4 courses per semester, or 2-3 while preparing for oral exams. Consult with your advisor to determine the appropriate course load.

Year III: Students are expected to pass the orals in October (if they have not done so in April of the previous academic year), and to progress well in their research.

Year IV: Students are expected to have completed 72 credit points by the end of their 4th year and conduct research.

Year V+: Students are expected to conduct research, write their dissertations and graduate. Most of our PhD students graduate in five years.

Attendance

We recommend you focus a substantial amount of your time during the first 1-2 years on class work and your written and oral requirements. Additionally, make use of the large number of research seminar talks and other department seminar activities and group meetings to explore various areas of Mathematics and find what you find most exciting. As a rule of thumb, the time to invest in your graduate studies should be similar to the time you would invest in any other full-time job.

We also encourage you to attend student meetings and other non-academic events. Student engagement is essential to creating a positive community of PhD students at Courant. The department funds student-led initiatives such as the Student Probability Seminar and the DEI Reading Group, and we encourage you to contact the DGS and Gehan Abreu De Colon for funding if you wish to organize a new group.
Code of conduct

All members of the Mathematics community—including students, faculty, fellows, graders, and administrators—are expected to uphold the highest standards of the GSAS Statement of Academic Integrity. In the event that an infraction occurs, all disciplinary actions must be taken in accordance with the policies of GSAS. Students must also be made aware of their right to appeal the decision as outlined in the GSAS Policy and Procedures.

In addition to academic integrity, students are expected to abide by NYU’s non-discrimination and anti-harassment policy. If you wish to report an incident of bias, sexual misconduct, student misconduct, or another type of campus safety concern, you may do so via NYU’s “report an incident” webpage here.

Diversity, Equity and Inclusion (DEI)

The Courant Institute is home to people from different cultural, religious and socioeconomic backgrounds. All its members contribute to making it a safe place where people interact with each other with respect. The faculty and staff fully support NYU’s DEI statement.

PhD students at the Institute organize a DEI reading group, open to all faculty, staff, and students. Sign up for the mailing list and attend the bi-weekly meetings here to learn about and discuss how DEI issues affect the Courant and broader mathematics communities.

A group of students and faculty organizes a PhD student survey each fall to assess the general atmosphere at the department and identify possible problems. The results of this anonymous survey are summarized and shared amongst PhD students and faculty.

Coursework

During your first two years you will take a substantial number of classes. If you are not sure what classes to take, please talk to the DGS or your faculty mentor. The website also provides sample course schedules for students with different research interests. A few general suggestions:

- Even if you’ve already taken a similar course during your undergraduate studies, it may make sense to take the graduate version of the course again. Some reinforcement of material is useful, and can give you a better foundation for your research.
- Some classes are offered in a single or two-semester variant. The single-semester variants of Linear Algebra and Complex Variables are targeted to PhD students, while the two-semester variants target MS students. Meanwhile, the two-part Numerical Methods I and II courses are aimed toward PhD students,
while Scientific Computing is aimed toward MS students. If in doubt, discuss with the DGS or one of your mentors.

- Courses are crucial to your development, but keep in mind that the ultimate goal of a PhD program is to train you to become a researcher. When you choose your workload, be realistic about how much you want to take on and what allows you to balance course work with attending research seminars.
- During the first weeks of the semester you are invited to shop around for courses — it is okay to attend multiple courses before deciding which courses you want to take for credit. You are also welcome to audit courses (i.e., attend without being signed up), but please let the instructor know.

Choosing an advisor and starting research

Learning about research done at the Institute

There are several ways to learn about what research is done at the Institute:

- Attend research seminar talks (see mailing lists above). Engage with the speaker and with faculty before and after the talks. Some seminars also provide lunch, which offers a way to interact more with the speaker and faculty in the same research area.
- Talk to other PhD students about their research.
- Attend the Graduate Student and Postdoc Seminar, where Courant faculty and talk about their current research at a level accessible to all students.
- Join research group meetings: many faculty groups hold regular research group meetings. Ask them to join to get an idea about the research being discussed there!

How to approach a potential advisor

Talk to faculty whose research you are interested in after talks or classes, or email them to set up an appointment. Faculty members typically enjoy talking about their work. You can ask them to point you to some papers or books to read. Often, students engage in some summer research after their first year to better get to know a faculty and their research, and find out if they want to work together.

What you can expect from an advisor

Successful advisor-student relationships differ widely. Generally, you can expect your advisor to be supportive, treat you with respect and be honest with you. Your advisor should make time for you and offer regular meetings (regular may between weekly and monthly). Ask for more or for less regular meetings if you think that would help you.
Recommendations

Try to find a research topic you are excited about. Be honest about what you know and do not know, both to yourself and to your advisor/mentor. Work professionally (e.g., type careful notes, write documented code, set up a good work environment, ask yourself dumb questions to aid your understanding etc). Try to not get frustrated if you are stuck and ask for help after you have tried for some time. Not always knowing how to proceed is part of doing research. Much useful general advice for PhD students in the Mathematical Sciences is available online, e.g. Terence Tao’s advice, Fan Graham’s or Christos Kozyrakis’. For advice on establishing a good mentoring relationship with your advisor and what to do if it breaks down, see the Mentoring and Grievance Policy.

Fellowships and Financial support

Your MacCracken fellowships

The funding for your MacCracken fellowships comes from a variety of sources, including funds from the graduate school and research assistantships (RAs) from faculty research grants. We additionally encourage and support students to apply for external graduate fellowships. For any further questions about your financial support, please contact Gehan Abreu De Colon.

For 2023-24, this website provides details about disbursement plans for students receiving fellowship stipends and research assistantships, including the disbursement schedule, how to obtain funds, setting up direct deposit, tax questions, and where to go with further questions.

External fellowships

External fellowships will be incorporated in your NYU MacCracken fellowships and thus they help the Institute pay for our PhD students and maintain a healthy class size. If the monthly stipend from the external fellowship is lower than the MacCracken amount, Courant will pay you the difference to ensure that you still receive the full MacCracken award. To encourage you to apply for external fellowships, the Institute will increase your MacCracken fellowship funding by $5,000/year, disbursed during the summer of each year in which you are supported by an external fellowship. Having your own external funding also looks great on your CVs and will help your future fellowship applications (e.g., NSF’s postdoc fellowship).

Such external student funding helps the Institute pay for your salaries and tuition, and helps increase the number of PhD students at Courant. External fellowships are also recognitions not only for you but also for the Institute. They help our ranking and reputation.
We highly encourage you to apply to the NSF GRFP – beyond the boost to your CV and additional $5k each year of the fellowship, the application is also good practice in scientific writing. The requirements include a 2-page research proposal, a personal statement, and reference letters, the last of which you likely already have. The research proposal does not have to be what you will actually work on in your PhD; moreso, it is a writing exercise, to convince the selection panel that you are able to propose a creative, feasible plan of research (which is important to your success as a researcher).

To help you with your application, we typically organize an information session in the fall with students who currently have external fellowships.

Besides the NSF fellowship, there are other prestigious fellowships; most of them are for US citizens (as the NSF fellowship or the DOE CSGF), but not all have a citizenship requirement. Below is a list of some of these fellowships. The deadlines for most of these fellowships are between October and December.

For U.S. citizens and permanent residents:
- NSF Graduate Fellowship
- DOE CSGF (Dept. of Energy Computational Science Graduate Fellowship)
- NDSEG (National Defense Science and Engineering Graduate Fellowship)
- Hertz Fellowship
- Ford Foundation Fellowship

For international students:
- MIT's list

Summer funding
The MacCracken fellowship only covers the 9 months of the academic year and does not require teaching (you are welcome to teach and get paid extra, see below). In general, neither the department nor the graduate school has funds allocated during the summer months (June, July and August). However, there are ways to additionally get (partially) paid during the summer:
- If your faculty advisor has research grants, they can (partially) pay you from these grants during the summer if you are working on research related to these grants. Ask your advisor (or in your first year, any faculty member you would like to work with) if they have summer research funds which can cover you for part of the summer.
- The department encourages students to pursue one or more summer internships in an area that is (broadly) related to your research. Foreign students are allowed to do summer internships through the CPT/OPT programs—see the corresponding section. Students need to organize these internships themselves, and examples of internships students have done in the past can be found in the
next section. More senior students in the program may have additional tips on internships.

- The department also encourages students to pursue academic summer opportunities, such as summer schools or workshops in your research area. An example is the SIAM Graduate Student Mathematical Modeling Camp. Offerings for such opportunities change yearly, so keep an eye on various mailing lists as well as research institutes and stations such as BIRS, IPAM, and others.
- The department needs help with teaching also in the summer. Talk to the program administrator about summer teaching opportunities. Note that these opportunities are limited.

**Summer internships**

In the past, students have done internships at national labs, technology companies or other industries over the summer. For instance:

- National Laboratories (NLs) offer a large number of well-funded typically 10-week long summer research internships. Examples of these programs include the Cody or Givens Associates at Argonne NL, or similar programs at Sandia or Los Alamos NLs.
- Tech companies (Meta, Google, Etsy, Adobe, Baidu etc) offer summer internships for Mathematics and CS PhD students.
- Finance companies and hedge funds often offer relevant summer internships.

**GSAS travel fellowships**

The Department of Mathematics encourages students to attend conferences during their studies. Students are encouraged to pursue the following opportunities:

- The Graduate School of Arts and Science (GSAS) has a Dean’s Conference Fund and students are encouraged to apply through GSAS for funds.
- The Math Department can also reimburse PhD students for travel related expenses. The department can provide $600/year in travel funds per student per academic year. Students should contact Gehan Abreu De Colon about travel expenses and reimbursement.
- If your research is (partially) covered by your advisor’s grant, they can typically cover travel expenses through these grants. Please talk to your advisor.

**Taxes**

Tax policies vary quite a bit depending on your fellowship and whether you are an international or domestic student, but here are some general guidelines:

- For most domestic students, taxes are not withheld from fellowship stipends, such as the one you will receive in your first year, and you will not be given a W2
form. You will still owe taxes and be expected to file a tax return in April. Students supported by a Research Assistantship (RA) in later years typically have taxes withheld automatically from their paychecks during the time they are assigned as a RA.

- Many fellowship-supported domestic students pay quarterly estimated taxes throughout the year to avoid fines when filing taxes—older students are a good resource here. The first US estimated tax deadline of the academic year is in January, so find out whether this might apply to you before then.

**Resources for international students**

**Curricular Practical Training (CPT)**

CPT can be utilized by students who wish to intern during the semester or summer. Those using CPT during the summer can be employed full-time, while those using CPT during the semester will only be allowed to be employed part-time. CPT will allow international students to obtain employment or fieldwork experience that their advisor/department approves.

CPT is authorized for employment experience in the major area of study that is a mandatory part of a course that the student is taking for the degree credit. For PhD students that would be, MATH-GA 3775.001 Advanced Practical Training.

PhD Students are allowed to register for the course up to two (2) times during their PhD career. Once students have secured an internship, you will register for MATH-GA 3775 Advanced Practical Training (APT) for the semester that they wish to intern and apply online through a form. For instructions on how to apply, click HERE.

**CPT for Thesis or Dissertation**

If your internship activity is necessary for your graduate level thesis or dissertation, and the experience and/or data from it will be directly and clearly used in your dissertation or thesis work, you may submit an additional departmental letter, asking the OGS to approve CPT for thesis or dissertation. However, if your CPT experience and/or data from the internship will not be directly and clearly used in your dissertation or thesis work, you should instead register for any appropriate internship course and seek CPT authorization based on that.

Please list Gehan Abreu De Colon under “Academic Advisor” to verify the information provided and approve your OGS OPT form.

**Post-Completion OPT (Post-Completion Optional Practical Training)**

Post-completion OPT is OPT used by students after finishing the program. OPT is directly related to our major field of study and is only for students on F-1 status. The earliest one can apply is 90 days prior to completion date. The latest one can apply is 4 weeks after one completes their degree requirements. For more instructions and more
Visas

Students must be full-time in order to be in good standing with their visa. Full-time typically means taking nine (9) to twelve (12) credits per semester. Those who need to take less than the minimum nine (9) credits must contact Gehan Abreu De Colon to obtain full-time equivalency (FT).

For all things related to a student's visa, please make sure to be in contact with the Office of Global Services (OGS).

For newly admitted students at NYU and you have immigration questions. You can find information you need HERE.

For current students enrolled at NYU and you have immigration questions. You can find information you need HERE.

Teaching and grading

Teaching/grading during the semester

NYU's PhD fellowship does not require students to teach or grade, in contrast to many other programs. However, there is typically a large need for teaching assistants and graders during the semesters (and sometimes even during the summer), and students get paid extra for grading and recitations. To allow students to focus on their classwork during the first years, PhD students are typically allowed to grade after their first year, and allowed to hold recitations as teaching assistants (TA) after their second year. As of fall 2023, teaching is $4-5k per section per semester, and grading varies between $2-5k per semester. Note that when you are assigned as a TA, you are eligible for union benefits as a member of GSOC-UAW, including childcare subsidies, an out-of-pocket healthcare fund, free access to Stu-Dent dental services, yearly raises of total compensation, and more.

Recitation usually starts the second full week of instruction. Depending on the class, TAs could be expected to proctor and grade quizzes, provide and solve practice problems, hold office hours, and answer questions from the students.
Resources for mental and physical health

NYU Health Services

The Courant Institute values the mental and physical wellbeing of its students, and there are multiple resources available to support your health. As a MacCracken fellow, you will be automatically enrolled in NYU's Comprehensive Student Health Insurance Plan, which allows you access to the Student Health Center. The health center offers many basic medical services and can refer you to local providers for other needs. As part of your insurance, you will also have access to NYU's Counseling and Wellness Services, which offer short-term, urgent, and group counseling, workshops, and referrals for longer-term counseling. As a GSAS student you can also make use of any of NYU's athletic facilities.

We hope that the Institute and its community will be a supportive environment for you, but if you find yourself in an unwelcoming or difficult environment, refer to the Mentoring and Grievance Policy for advice on first steps in addressing the situation. If you encounter difficulty proceeding with your degree, please discuss this with your advisor and the DGS as early as possible so that we can help support you.

Requesting an Academic Leave of Absence

A student who is obliged to withdraw temporarily for national service, serious illness, or compelling personal reasons may request an academic leave of absence, which, if approved by the GSAS Office of Academic and Student Affairs, maintains the student's enrolled status. An academic leave of absence will be allowed for maternal and paternal leave for childbirth and care for the newborn. Maternal or paternal leave is considered a compelling personal reason. Meet with Gehan Abreu De Colon and the Director of Graduate Studies to talk about your options and reasons for taking an academic leave of absence.