



PRINCETON
UNIVERSITY

GRADUATE STUDENT GUIDELINES

Program in Applied & Computational Mathematics
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Table of Contents

Important PACM Contacts.....	2
Program Overview/Requirements.....	3
First Year of Graduate Study.....	3
Second Year of Graduate Study.....	3
Suggested Examiners for Topics in the Six Basic Areas of Applied Mathematics	4
Master of Arts.....	4
Doctoral Dissertation.....	5
Reenrollment.....	5
Final Public Oral Examination.....	6
Business Travel Reimbursements.....	7
Contacts	13

Important PACM Contacts

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Program Overview/Requirements

First Year of Graduate Study

After the arriving student has his/her feet on the ground, it will be the student's responsibility to choose three areas in which to be examined out of the six possibilities specified below. This decision should be made by the end of October. The Director of Graduate Studies, in consultation with the student, will then appoint a set of three advisors from among the faculty/associated faculty. The advisor in each topic will meet regularly with the student, monitor progress, and assign additional reading material. (They can be any member of the University faculty, but normally would be either program or associated faculty.) The six applied mathematics categories are:

- Asymptotics, analysis, numerical analysis, and signal processing
- Discrete mathematics, combinatorics, algorithms, computational geometry and graphics
- Mechanics and field theories (including computational physics / chemistry / biology)
- Optimization (including linear and nonlinear programming and control theory)
- Partial differential equations and ordinary differential equations (including dynamical systems)
- Stochastic modeling, probability, statistics, information theory

Other topics as special exceptions might be possible, provided they are approved in advance by the Director of Graduate Studies. Typically, students take regular or reading courses with their advisors in each of the three areas, completing the regular exams and course work for these courses.

At the end of the first year, students will take a **Preliminary Exam**, consisting of a joint interview by their three first-year advisors. Each student should discuss with their first-year advisors which of these courses are relevant for their areas. In order to assess whether they have sufficient preparation, or whether it would be good to take a particular course, it is a good idea to obtain some typical homework or a final exam from a previous year. If the student fails the preliminary examination or a part thereof the first time, they may take it a second time.

Second Year of Graduate Study and General Examination

Students who pass the preliminary exam after the first year will be readmitted for the second year of graduate study. Students who did not achieve a Ph.D. level pass on their first-year preliminary exam will be re-admitted for the Fall semester of the second year, and retake the necessary part(s) of the exam during this semester. Students who are admitted to the second year will continue working with at least one faculty member with the goal of achieving competence to begin Ph.D. research. This faculty member should be a potential Ph.D. advisor. Before being admitted to a third year of study, students must pass the **General Examination**. The general examination, or generals, is designed as a sequence of interviews with assigned professors that covers three areas of applied mathematics. The generals culminate in a seminar on a research topic, usually delivered toward the end of the fourth term. A student who completes all program requirements (coursework, preliminary exams, with no incompletes) but fails the general examination may take it a second time. If the student fails the general examination a second time, then Ph.D. candidacy is automatically terminated.

Suggested Examiners for Topics in the Six Basic Areas of Applied Mathematics

Asymptotics, analysis, numerical analysis, and signal processing

Ryan Adams
Luigi Martinelli
Clarence Rowley
Howard Stone
Amit Singer
Romain Teyssier

Discrete mathematics, combinatorics, algorithms, computational geometry and graphics

Noga Alon
Bernard Chazelle
Maria Chudnovsky
Paul Seymour

Mechanics and field theories (including computational physics / chemistry / biology)

Roberto Car
Emily Carter
Simon Levin
Howard Stone
Corina Tarnita

Optimization (including linear and nonlinear programming and control theory)

Amir Ali Ahmadi
Elad Hazan
Naomi Leonard

Partial differential equations and ordinary differential equations (including dynamical systems)

Emily Carter
Peter Constantin
Sergiu Klainerman
Clarence Rowley
Howard Stone

Stochastic modeling, probability, statistics, information theory

Michael Aizenman
Mark Braverman
Rene Carmona
Vincent Poor
Allan Sly
Ramon van Handel

Master of Arts

The [Master of Arts degree](#) is normally an incidental degree on the way to full Ph.D. candidacy, but may also be awarded to students who for various reasons leave the Ph.D. program. Students who have satisfactorily passed required coursework including the resolution of any incompletes and have passed the general exam, may be awarded an M.A. degree. Students must complete the required “Advanced Degree Application form” upon learning the Program’s determination of their candidacy in order to receive the M.A.

Doctoral Dissertation

The doctoral dissertation may consist of a mathematical contribution to some field of science or engineering, or the development or analysis of mathematical or computational methods useful for, inspired by, or relevant to science or engineering. Satisfactory completion of the requirements leads to the degree of Doctor of Philosophy in applied and computational mathematics.

Reenrollment

Reenrollment is the annual process (which takes place towards the end of the Spring semester) in which PACM and the Graduate School evaluate the academic progress of graduate degree candidates. Students are encouraged to participate actively in the annual readmission process by preparing their own written statement of academic progress during the current year and goals and objectives for the coming year. All students eligible for reenrollment, including those writing dissertations, must make formal application each year through their departments. Students who have satisfied all academic requirements within their departments and have demonstrated their readiness for continuing graduate work will be offered reenrollment no later than June; others will be notified about reenrollment when a basis for judgment is available.

Satisfactory academic progress is measured by the department. For students who have not yet taken the general examination, this includes completing high-quality work in courses and seminars, satisfying the residence and language requirements, and performing effectively in any assistantship or research position the student may hold. For students who have sustained the general examination, significant progress toward the completion of the dissertation is the central criterion. The Graduate School holds that academic programs should be completed quickly, compatible with good training, and therefore does not usually approve requests for reenrollment to a year of study beyond a department’s normal program length.

Recommendation for readmission for the following year of those students who have demonstrated their capacity for graduate work is made in March or April. Those who do not attain the standard expected will be so informed at this time. If the student does not wish to reenroll, he or she should discuss the decision with his or her advisor and the Director of Graduate Studies. The Ph.D. committee should also be consulted if it has been formed.

If all looks good, readmission decisions regarding students taking generals in spring will be deferred until after the examination. Others, whose performance is in doubt, may also be deferred, for example first-year students whose progress on their research project is inadequate.

When notified to reenroll, usually in late March, students should log on to the Princeton University [TigerHub](#) website, click through to the Graduate Reenrollment section, fill in the online form, and submit. This information will then be transmitted to the Advisor who will review the application, make any comments, and submit to the Department. The Department will review the application, enter department support recommendation and submit to the Graduate School. Students will receive their reenrollment contract from the Graduate School at the end of spring.

Final Public Oral Examination (FPO)

At the end of your tenure at PACM, you will need to pass the Final Public Oral examination (FPO) in order to graduate. The FPO is a final examination in the student's field of study as well as a defense of the dissertation.

The department holds the final public oral examination after the Graduate School reviews and accepts the readers' reports and is satisfied that all other requirements have been met. The department is required to post prominently the date, time and place of the examination for a minimum of three days (including Saturday) between the dean's authorization and the date of the examination, in order to assure the open, public character of the oral. **There are at least three principal examiners, all of them normally members of the PACM faculty at the rank of assistant professor or higher, at least two of whom have not been principal readers of the dissertation.** The department determines whether or not the candidate has passed the examination.

In case the examination is not sustained, the candidate may stand for it a second time after at least one year has passed. If unsuccessful a second time, the candidate is not permitted another opportunity to retake the examination, and Ph.D. candidacy is terminated. In cases where an appearance for the final public oral examination would constitute a substantial financial hardship for the candidate, the director of graduate studies may recommend to the dean of the Graduate School that the examination be waived.

Starting the Process

You must inform the program coordinator of your committee members and desired date and time of FPO as soon as possible (a minimum of one month in advance). The program coordinator will book a room for the FPO, send your readers/advisor the paperwork they need to complete, and go over the necessary documents you will need to submit in order to get approval from the Graduate School. Checklist for guidance and [Graduate School Website](#) for any updates.

When the dissertation has been formally presented, the department takes action on the positive recommendation of **at least two principal readers** to request that the dissertation advance to the final public oral examination. Qualified principal readers are those who are authorized to supervise

doctoral dissertations in the University (such as, regular faculty at the rank of assistant professor or higher, and certain others in senior research ranks). External readers must be of comparable standing in another university or in the non-academic research community. Each principal reader submits a written and signed dissertation reader's report to the department. One copy of the dissertation must be available for interested readers in the department prior to the final public oral examination. During the FPO, there are at least three principal examiners, all of them normally members of the Princeton faculty at the rank of assistant professor or higher, at least two of whom have not been principal readers of the dissertation.

Business Travel Policy and Reimbursements

Postdocs/Students may require reimbursement from the department before and upon returning from research-related travel (presenting a talk/poster at conferences, collaborating with other universities, etc.).

The travel expense policy:

- ✓ Assures that the University and the traveler are in compliance with the Internal Revenue Service regulations that define the types of expenses that can be reimbursed without being counted as taxable income.
- ✓ Assures that travel charged to sponsored projects conforms to the regulations and restrictions placed on the use of the funds by the sponsor.
- ✓ Enables the University to protect its reputation by avoiding excessive or inappropriate spending.

General Requirements

Travel charged to sponsored awards is subject to specific limitations and restrictions set by the sponsor(s) and, if applicable, federal regulations. Travel restriction may vary between federal and non-federal sponsors. Certain expenditures (i.e. alcohol) are “unallowable” in accordance with federal cost principles and cannot be charged to a federal award or non-federal award.

Before traveling, students/postdocs will need to:

- ⇒ Confirm financial support via email from their advisors. The email confirmation from students/post-docs advisor should be included with a budget approval/chart string request.
 - The budget approval and chart string request that you will use to request your reimbursement in concur must be sent to Lisa Giblin, lgiblin@princeton.edu, PACM Grants Manager for approval (copy Katherine Lamos klamos@princeton.edu and Bernadeta Wysocka bwysocka@princeton.edu to your email to Lisa). The following details of your trip must be included:
1. **Requestor's name and Title:** (____ year PACM Graduate student)
 2. **Business purpose:** _____(Business Travel is for the purpose of conducting business for the sole benefit of the University. Business purpose must be specific. “Travel to Boston, MA to speak or present at AMS conference” is an appropriate documented business purpose. “Travel to Boston

for conference” is not. The business purpose of an expense may be obvious to the traveler, but not to a third part reviewer).

3. **Advisor/Sponsor/Grant (Which ever applies):** _____
4. **Conference name:** _____
5. **Dates of Travel:** _____
6. **Conference dates:** _____
7. **Attendance dates:** _____
8. **In person or Online:** _____
9. **Location:** _____
10. **Workshop/Conference/Seminar website:** _____
11. **Tentative Budget:** \$ _____ (Flight tickets, hotel, meals, transportation etc approved by your advisor)

Please consider videoconferencing or web conferencing as an alternative to travel. The University provides a variety of options, including desktop videoconferencing, videoconference rooms, and portable videoconferencing. For more information on video and web conferencing, including available locations and instructions, visit the [videoconferencing website](#).

Postdoc/Student Travelers should be aware of the overall University Policy General Considerations:

- Reservations should be booked through [Concur](#), the University’s on-line booking tool, or through the University's designated travel management company, [World Travel Inc](#). The University’s negotiated rates, and other benefits are only available by booking via one of these methods.
- The use of these services eliminates the need for independent documentation of comparison fares, as the services captures the required documentation automatically. In the event the traveler opts to book air travel outside of Concur or world travel, the traveler is still responsible for documenting their selection of air travel within the basic least expensive, unrestricted accommodations class offered by commercial airlines. To do so, the traveler is expected to include in the expense report airfare comparisons from a service (i.e. Travelocity, Orbitz, Expedia) contemporaneous with the booking that includes:
 1. Documentation showing the flight details and pricing for the selected flight; and
 2. Documentation showing the flight details and pricing for the comparison flights
- Students/post-docs must travel **economy class** regardless of the duration of the flight.
- Travelers should neither gain nor lose personal funds as a result of business travel on behalf of Princeton University
- Be sure to have necessary approvals and travel documents in order prior to travel.
- Book airline ticket as far in advance as possible (**at least 14 days**) in order to obtain advance purchase discounts and optimal travel times.
- Use University contracted travel suppliers and booking and expense management tools.
- Follow the terms of sponsored research agreements for travel.

Hotels/Airbnb Usage

- For safety and privacy reasons, it is strongly recommended that travelers book lodging with one of the University preferred vendors or with the conference/workshop venue.
- Travelers are expected to stay in standard, single-occupancy rooms and exercise fiscal responsibility when choosing hotels.
- Travelers should stay at a conference hotel using the conference rate.

The Concur System

Travel planning and booking, business expense tracking, and expense reporting all are handled through integrated online technology called [Concur](#). Before booking travel, read through the [University's Travel Policy](#).

Setting up a Concur profile

Information on how to set up your profile, create and submit an expense report [can be found here](#). Contact Katherine Lamos klamos@princeton.edu if you need help. Add Katherine Lamos as your **Expense Delegate** in your Concur Profile Settings, who will review your report, and Bernadeta Wysocka (bwysocka@princeton.edu) as your **Expense Approver**.

A trip is considered sponsored by the University if any one of the statements below are applicable:

1. The trip is organized on behalf of academic or administrative departments;
2. A University account contributes funds, or money is held and disbursed through a university account;
3. The trip is organized by a University faculty or staff member; or,
4. The work will be considered for academic credit.

Concur will allow you to:

1. Plan, estimate, and book your travel online;
2. Create and maintain online profile to store information such as frequent flyer numbers and other preferences;
3. Upload electronic copies of your receipts;
4. Create an automated expense reports for reimbursement; and,
5. Create non-travel reimbursement requests.

Please keep in mind that in order to be considered **allowable, travel costs** must:

- ✓ Be necessary and reasonable, and allocable;

- ✓ Conform to any limitations or exclusions set forth in the cost principles of the grant/award by which it is funded;
- ✓ Be consistent with the policies and procedures afforded all activities of the organization;
- ✓ Not be against the law; and,
- ✓ Be adequately documented.

University Travel Policies

The [Travel Policy](#) include information and requirements on the following topics:

1. Pre and Post Trip Planning
 - i. Funding Sources
 - ii. Alternative to Travel
 - iii. Receipt Requirements
 - iv. Cash Advances
 - v. Submission and Approval of Expenses
 - vi. Pre-Trip Approval
 - vii. Federally Funded or Non-Federally Funded Sponsored Projects or Programs
 - viii. Tax
 - ix. Passports and Visas
 - x. Vaccinations
 - xi. Emergency Contacts
 - xii. Accidents, Thefts, and Other Safety Issues
 - xiii. Exceptions to Travel Policy
 - xiv. Travel Reimbursed by an Outside Entity
 - xv. Personal Travel
 - xvi. “In Lieu of” and “Tradeoff” Expenditures
2. Booking a Reservation
 - i. Reservation Timing
 - ii. Frequent Flyer/Guest/Reward Points
 - iii. Itinerary Changes
3. Air Travel
 - i. Booking Airfare
 - ii. Airline Requirements for Federally Funded Sponsored Research Projects
 - iii. Fares/Ticket Types
 - iv. Trip Insurance
 - v. Class of service
4. Baggage
5. Private Plane
6. Hotels
 - i. Reservations
 - ii. Hotel Class and Rooms
 - iii. Rate Guidelines by Location
 - iv. Upgrades
 - v. Hotel Exercise Facility/Gym
 - vi. In-Room Movies
 - vii. Laundry and Dry Cleaning
 - viii. Lodging at Private Residences
7. Car Rental
 - i. When to Use
 - ii. Reservations

- iii. Car Class
- iv. Insurance
- v. Gasoline
- vi. Incidental Expenses
- 8. Taxis
 - i. When to Use
 - ii. Tips
 - iii. Payment
- 9. Limousine & Shuttle Service
 - i. When to Use
 - ii. Reservations & Preferred Service Providers
 - iii. Tips
- 10. Personal Automobile
 - i. Acceptable Usage
 - ii. Mileage Reimbursement
 - iii. Intercampus Travel
 - iv. Gasoline
 - v. Tolls
 - vi. Parking
 - vii. Maintenance/Repairs/Fines
- 11. Other Transportation
 - i. Use of Government Auto
 - ii. Use of Princeton University Owned Vehicles
 - iii. Rail
- 12. Meals & Entertainment
 - i. Individual Meals & Incidentals
 - ii. Group Meals and Entertainment
 - iii. Alcohol
 - iv. Documentation
- 13. Communications
 - i. Telephone Usage While Traveling
 - ii. Mobile Communication Device
 - iii. Internet Access
- 14. Miscellaneous
 - i. Business Travel Accident Insurance
 - ii. Examples of Unallowable Expenses
 - iii. Tip Guideline
 - iv. Spousal and Dependent Travel

Travel Restrictions on Federally-Funded Projects

Travelers on University business funded by a federal award must comply with the requirements of 2 CFR Part 200 and are required by 49 U.S.C 40018, commonly referred to as the “Fly America Act”. Under the Fly America Act (FAA), government regulations require the use of a U.S. air carrier when traveling outside the U.S. In some instances, a non-U.S. air carrier may be used if it meets one or more of the exception criteria listed in the Federal Travel Regulation (FTR) guidelines section 301-10.135-138. Some federal agencies consider Canada, Mexico and/or U.S. Territories as constituting “foreign travel”. When foreign travel reimbursement is being requested, postdocs/students are required to provide an explanation as to why a foreign carrier was selected.

Please note that before planning foreign travel, all postdocs/students should review information for country-specific alerts and warnings posted by the U.S. State Department, see [Graduate Students International Travel Resources](#)

Smart Traveler – U.S. Department of State Smart Traveler Enrollment Program (STEP)

International travelers are required to register their international travel with the U.S Department of [State Smart Traveler Enrollment Program](#) (STEP). STEP is a free service to allow U.S. citizens and nationals traveling or living abroad to enroll their trip with the nearest U.S Embassy or Consulate.

Laptop Travel Restrictions for Encryption Software

International travelers should aim to “travel light”, meaning that they should limit the amount of sensitive information that is stored on or accessible via any mobile device taken on the trip, and travelers should avoid contact with the Princeton University network in general, specifically when traveling to high risk countries.

Traveling internationally can pose significant risks to information stored on or accessible through the computers, tablets and smartphones that postdocs/students take with them. Some of the risk is associated with increased amount of direct physical handling of the equipment by individuals, and just merely the distraction of traveling. Additionally, devices are put at risk because they will use networks that may be managed by entities that monitor and capture network traffic for competitive or malicious purposes.

If you will be traveling outside the U.S. with a laptop or other mobile computing device that has encryption software installed (whether the computer belongs to the University or is your personal property), you should be aware that this type of technology may be subject to the number of controls by the U.S. and other countries. All travelers who will be carrying or shipping encryption technology of the U.S. are strongly encouraged to refer to University regulations at: <http://www.princeton.edu/itsecurity/intltravel/>.

Unallowable Expenses on Federal Sponsored Projects – Federally funded contracts and grants carry a specific list of rules and prohibited costs that cannot be directly charged to a sponsored account. An abbreviated listing of restrictions and prohibitions is shown below. For complete list of allowable and unallowable expenses go [here](#).

1. Advertisements – except those advertisements for recruitment, procurement of goods or disposal of scrap or surplus materials are allowable;
2. Airfare costs in excess of the lowest available commercial discount airfare;
3. Air travel by aircraft other than commercial carrier shall not exceed the costs of allowable commercial air travel;

4. Alcoholic beverages;
5. Alumni activities;
6. Entertainment costs;
7. Housing and personal living expenses;
8. Medical liability (malpractice) insurance – except for research programs involving human subjects;
9. Memberships in civic, community, country club, social or dining club; and,
10. Rare books – museum type.
11. Travel costs of lodging and subsistence exceeding normal institutional policy

If you have any questions regarding policies and procedures related to sponsor research funding, allowable and unallowable expenses, please feel free to contact Lisa Giblin lgiblin@princeton.edu.

How to Request Reimbursement

1. Please note in order for expenses to be recorded in a timely basis you have **30 days from the day you incurred the travel expense** to request reimbursement. This includes all expenses incurred in advance of a trip, conference, or event (e.g. airfare, conference fees, registration, advance deposits, etc.). **For expenses incurred while traveling (lodging, ground transportation, meals, etc.) the traveler will have 60 days upon returning from travel** to submit expenses. For expenses that are submitted in excess of 60 days after the expenses were incurred, the expense reimbursement request must include an explanation for the delay. At the discretion of the Dean of Faculty or the Vice President for Finance and Treasurer, late submissions may be approved, and the reimbursement will be reported to the IRS as taxable income paid to the individual. Please note reimbursements can take up to 4 weeks for approvals and processing. **Submitting expenses in a timely manner is in agreement with Princeton University’s best practices. Please do not keep your expenses to submit at a later date. Payment of expenses months after traveling can be considered a “red flag” during audits by government sponsors.**
2. Receipts must be provided for all travel related expenses.
3. Meals need an itemized receipt (not just a credit card receipt). If attending a conference where meals are provided, please indicate that on the report.

Whom to Contact:

Travel Approval	Your advisor
To request budget approval and chart string for Concur	Lisa Giblin (lgiblin@princeton.edu)

Questions related to travel on sponsored research	Lisa Giblin (lgiblin@princeton.edu)
Reimbursement and Concur profile set-up, create and submit expense reports	Katherine Lamos (klamos@princeton.edu) (for graduate students); Victoria Beltra (vb2984@princeton.edu) (for post-docs)
Any other travel funding related questions and reimbursement	Bernadeta Wysocka (bwysocka@princeton.edu)