PRINCETON UNIVERSITY

GRADUATE STUDENT GUIDELINES

Program in Applied & Computational Mathematics

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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

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
Luigi Martinelli
Clarence Rowley
Howard Stone

Discrete mathematics, combinatorics, algorithms, computational geometry and graphics
Bernard Chazelle
Paul Seymour

Mechanics and field theories (including computational physics / chemistry / biology)
Emily Carter
Simon Levin
Howard Stone

Optimization (including linear and nonlinear programming and control theory)
Naomi Leonard
Robert Vanderbei

Partial differential equations and ordinary differential equations (including dynamical systems)
Emily Carter
Peter Constantin
Clarence Rowley
Howard Stone

Stochastic modeling, probability, statistics, information theory
Michael Aizenman
Rene Carmona
Vincent Poor
Yakov Sinai

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 preliminary 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 Reimbursements

General Requirements

Postdocs/Students may require reimbursement from the department upon returning from research-related travel (presenting a talk/poster at conferences, collaborating with other universities, etc.). Before traveling, students will need to confirm financial support from their advisors, and indicate which grant will be charged for reimbursement.

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

- 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.

The Concur System

Travel planning and booking, business expense tracking, and expense reporting all are handled through integrated online technology called **Concur**. 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.

Graduate students are required to register all University-sponsored international travel in Concur. More information on the process to request University sponsored travel and related policies are contained in the university's Graduate Travel Checklist

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 Graduate Travel Policies 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
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. 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

Government regulations require the use of a United States based Air Carrier when traveling outside of the United States. 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, go here.

1. Advertisements – except that 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.

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.
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.
4. Please contact Audrey Mainzer, (amainzer@princeton.edu) and Victoria Beltra (vb2984@princeton.edu) regarding business travel reimbursement requests.