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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 also 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 make take it a second time.

Second Year of 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 takes place during the first year and 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 departmental 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**

- Weinan E
- P. Holmes
- L. Martinelli
- J. Stone
- C.W. Rowley
- H. Stone

**Discrete mathematics, combinatorics, algorithms, computational geometry and graphics**

- B. Chazelle
- D. Dobkin
- P. Seymour

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

- E. Carter
- Weinan E
- P. Holmes
- S. Levin
- J. Stone
- H. Stone
- I. Kevrekidis

**Optimization (including linear and nonlinear programming and control theory)**

- B. Dickinson
- N. Leonard
- R. Vanderbei
Partial differential equations and ordinary differential equations (including dynamical systems)

E. Carter  
Weinan E  
P. Holmes  
I. Kevrekidis

J. Stone  
C.W. Rowley  
H. Stone  
P. Constantin

Stochastic modeling, probability, statistics, information theory

E. Abbe  
M. Aizenman  
R. Carmona  
E. Çinlar

V. Poor  
Y. Sinai  
S. Verdú

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 Department’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 DGS. The Ph.D. committee should also be consulted if it has been formed.

If all looks good, reenrollment 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 SCORE website (http://www.princeton.edu/score), 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

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 department graduate coordinator of your committee members and desired date of FPO as soon as possible (a minimum of one month in advance). She 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 in order to get approval from the Graduate School. Please see the attached FPO checklist for guidance. Also, please see the Mudd Library guidelines for formatting/binding your thesis here.

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, 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.
CHECKLIST PREPARATION FOR PH.D DEFENSE

1. A completed electronic ADVANCED DEGREE APPLICATION must be submitted to the Office of Academic Affairs, 111 Clio Hall, 2 weeks prior to the proposed Ph.D. defense date. This new online ADVANCED DEGREE APPLICATION should contain:
   - TITLE PAGE OF THE DISSERTATION (The correct degree award date, as on the Degree Application Form, Trustees’ Meeting date, month and year only, must appear at the bottom of the title page.)
   - DISSERTATION ABSTRACT (Strongly recommended not to exceed 350 words)
   - PRIOR PRESENTATION AND PUBLICATION FORM (Signed by Candidate’s Advisor)
   - READERS’ REPORTS (Given to the Committee of Examiners - 2 Reader’s Reports, at least one from faculty member in candidate’s home department. Additional readers may be assigned by department. Outside reader: someone outside the candidate’s department or outside Princeton University.)
   - DISSERTATION – ONE BOUND AND/OR FINAL COPY (Due in your department at least two full weeks before defense date.)

2. Authorization memo approving Final Public Oral Examination (Will be sent electronically to department after Graduate School deans have approved FPOE. Must be posted in department at least three full working days, including Saturdays, prior to the defense.)

3. Submission of dissertation to Mudd Manuscript Library, to be completed normally by the end of the day of the student’s successful completion of the Final Public Oral Exam (If the advisor and examining committee recommend that minor, non-substantive changes be made in the text, the student must submit the corrected final copies within two weeks of successfully completing the FPOE):


   - Complete online submission of dissertation to ProQuest at [www.etdadmin.com/princeton](http://www.etdadmin.com/princeton). Candidates will upload a PDF of dissertation, choose a publishing option, register copyright (optional) and pay relevant fees.*
   - Bring to Mudd Manuscript Library
     - Print-out of email confirming successful submission to ProQuest
     - 1 bound copy of dissertation
     - 1 dissertation maintenance fee of $15, payable by check made out to “Princeton University Library” or exact cash
     - 1 original and 1 copy of FPO form signed by Chair of FPO or Committee or DGS

*ProQuest fees (paid online): Traditional publishing is free; Open Access publishing is $95. Copyright registration (optional) is $55. Note: the dissertation maintenance fee of $15 must be paid separately to the Mudd Library in cash or check.

4. Due to Dean Redman, Office of Academic Affairs, 111 Clio Hall immediately following Mudd Library submission (see #3 above):

   - FINAL PUBLIC ORAL EXAMINATION REPORT (In hard copy, signed by Chair of FPO Committee or DGS and Mudd librarian)
   - SURVEY OF EARNED DOCTORATES Hard copy of the “Certificate of Completion” page of the SED. (To complete the SED, go to [https://sed.norc.org/survey](https://sed.norc.org/survey))
   - EXIT QUESTIONNAIRE Hard copy of “Confirmation of Completion” page must be submitted. (To be completed online by candidate)

The Trustees will not award the Ph.D. degree until these documents are received. Any delay in submitting these documents may jeopardize the award of your degree!

- The End of Enrollment Form must be completed if you are currently enrolled. The form should be submitted to the department within one week of the termination date indicated on the form.

Revised 9/02/11 – Retain copies of all documents above.
Handling Travel Reimbursements

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.

Travel planning and booking, business expense tracking, and expense reporting all are part of an integrated online technology called Concur. You can read more about this application at http://travel.princeton.edu/.

Use Concur to book travel, to store your frequent flyer numbers and travel preferences, to enter business expenses by scanning or photographing receipts, and to create an automated expense report. You can log in to Concur directly at http://www.princeton.edu/concur.

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 is contained in the university’s Graduate Travel Checklist: http://travel.princeton.edu/graduate-students/checklist

Travel Restrictions on Federally-Funded Projects

Government regulations require the use of a U.S. Air Carrier when traveling outside of the United States. Some federal agencies consider Canada, Mexico and/or U.S. Territories as “foreign.” When foreign travel reimbursement is being requested please provide an explanation as to why a foreign carrier was selected.

Unallowable Expenses on Federal Sponsored Projects – Federal funded contracts and grants carry a specific list of rules and prohibited costs that cannot be directly charged to a sponsored account. This is just an abbreviated listing. For complete list go to http://finance.princeton.edu

1. Advertisements – except that advertisements for recruitment, procurement of goods or disposal of scrap or surplus materials are allowable
2. Airfare for commercial carriers that is more expensive than lowest available discount or standard
3. Air travel by aircraft other than commercial carrier shall not exceed the costs of allowable commercial air travel
4. Alcoholic beverages
5. Entertainment costs
6. Housing and personal living expenses
7. Alumni activities
8. Medical liability (malpractice) insurance – except for research programs involving human subjects
9. Memberships in civic, community, country club, social or dining club
10. Rare books – museum type

**Automotive Travel**

**Auto Rental**

Reservations for automobile rentals can be made through the University Business Travel Services Portal, a travel agency, or directly from the auto leasing company. Midsize or smaller cars should be selected for rental unless there are three or more employees traveling together, or the traveler is transporting sizable equipment. Within this size range, the traveler is free to select the specific make/model available. Travelers should decline Collision Damage Waiver (CDW) or personal liability insurance offered through the rental company to cover deductible amounts while on domestic University business. When renting vehicles in a foreign country, collision auto liability insurance options should be accepted.

**Personal Automobile**

Travel by personal auto in lieu of public transportation or auto rental is an allowable business travel expense, and may be reimbursed at the current allowable per mile vehicle rate, mileage will be computed for the actual distance traveled. Actual toll charges and parking fees, if itemized is also allowable. Any questions regarding allowable and unallowable expenses please feel free to contact Lisa Giblin at lgiblin@princeton.edu.