The Department of Geosciences

Graduate Student Handbook

Table of Contents / How this Guide Works

This guide is meant to give comprehensive coverage of the academic requirements in GEO for attaining a PhD. It focuses on the first and second years, as these have the most requirements. Years 3-5+ focus on dissertation research and career services. The first part is laid out as schedule for quick reference, with the page numbers given for more details on each item. The second part condenses a series of miscellaneous requirements that do not fit on the schedule.

1. Schedule of Requirements and Due Dates

1. Schedule of Requirements and Due Dates

Advisory Committee

Each graduate student has an Advisory Committee consisting of at least three but commonly four faculty members (at least two must be Geosciences faculty). Normally, the advisory committee Chair is the student's principal research advisor. The principal advisor may be a member of the Geosciences faculty or (rarely) a faculty member in another Princeton department. Members of the Advisory Committee are selected by the student in consultation with the advisor. Initial selection takes place in September or October of the first year and may be changed after a student has settled on a research topic and. Some continuity of membership is desirable, and often the same committee serves throughout the graduate student's career.

For the purposes of the General Examination, students may need to add members to the advisory committee to form the General Exam Committee. The current rule is that a Generals Exam Committee must have two members of the Graduate Work Committee, and if that brings the total number of members to more than four, then one GWC member will be an observer only.

The advisory committee of post-General Exam students will normally include the prospective readers of the thesis.

An Advisory Committee meeting must occur each semester even if the primary advisor is on sabbatical, with another faculty member serving temporarily on the committee. Note that students will not be permitted to reenroll in the graduate school without at least one committee meeting in the preceding academic year.

We urge each student to make maximum use of the advisory committee. The student should feel free to meet with the committee members at any time. The advisory committee is responsible for the student’s welfare in case of absence of the advisor and is expected to mediate in case of conflict between student and advisor.

The major duties and responsibilities of the Advisory Committee are:

1) To plan an academic and research program in consultation with the student. Research plans, coursework, and independent study related to that research are discussed and reviewed in advisory meetings once a semester. A committee meeting worksheet must be filled out at each meeting, signed by the chair of the committee and archived in the Graduate Administrator’s office.

2) To help guide and evaluate the student’s research proposal, research update, and research paper during the first and second years. These items are purposely due a few weeks before the committee meetings; committee members are expected to provide written and/or oral feedback at the committee meeting.

3) To determine, together with the student, the student’s readiness to take the General Examination, to agree upon the two areas of concentration for the exam, and to arrange an appropriate group of examiners, typically in the fall or winter of the second year.

4) To approve the thesis topic at the generals examination. This topic will be refined and guided by the committee over the subsequent years.

5) To evaluate the thesis and to conduct the final public oral examination. About three months before the dissertation is submitted, the student will convene a meeting of his/her committee to ensure that the dissertation is in order. The committee will determine if the completed research is sufficient for the Ph.D. The committee will also assist in scheduling the readers' reports and defense.

Advisory Committee Meetings (one per semester)

In the first two years, Advisory Committee meetings will help guide the students towards a compelling scientific problem, identify difficulties the student may encounter, and recommend research tools and approaches. At the meetings, committee members will give feedback on the required documents submitted prior to the meetings and also help prepare the student for their General Examination. After the General Exam, the committee will help guide the student's research progress and identify new questions and problems. It is often helpful to get feedback from faculty who are outside your direct research area as they may bring different perspectives and provide sound advice on how to present your material to a broad audience. The nature of committee meetings varies widely. Some advisors or committees will expect a formal or informal presentation of the student's research with slides, results, etc., while others will prefer an informal conversation. For students in years 3-5, it is encouraged to begin discussions about career goals and professional development. *Discuss the format of the Advisory Committee meeting with the student's advisor and other committee members in advance.*

First-Year Research Proposal (Due Tuesday before Thanksgiving)

The first-year research proposal is a summary of the student's research plans for the following year. It should outline a scientific problem of interest, demonstrate a proficient understanding of the relevant literature and state of the field, and identify what tools will be used to tackle this problem (e.g., field work, lab work, computational strategies, etc.). The proposal will outline the project that has been discussed with the student's current advisor, and may be read and commented on by others prior to submission. It is generally 1-2 pages single-spaced, not including figures, initial data or results, and references. *Specific expectations for the research proposal should be discussed with the student's advisor and/or Advisory Committee*. The student will receive feedback on this proposal from their advisory committee at the meeting that will occur before winter break.

First-Year Progress Report (Due first week of May)

The progress report summarizes the student's research activities of the first year. The amount of progress will vary widely between students. For example, students whose research involves fieldwork may have not collected any samples by the time of the progress report, but presumably will have done extensive background research and initial analysis, modeling, etc. *Expectations for the first-year progress report should be discussed with the advisor and Advisory Committee.* As a rough guideline, the progress report should be two to four pages single-spaced, not including figures or references. The main purpose for this report to encourage the student to make progress on research and to serve as a means of generating discussion and getting guidance from the Advisory Committee. The Advisory Committee should have written and/or verbal feedback for the student at the spring Advisory Committee meeting.

Research activity in the second year may be a continuation of the first year's research or it may be a new project, possibly with a new research advisor, if the first year's project is essentially complete or if a student's scientific direction has changed. Although changing advisors may be difficult, the department is committed to ensuring each student is matched with the most suitable advisor before thesis research begins in earnest. Typically, the first-year project leads directly to the second year research and then to thesis research, but there is flexibility to change direction, if needed.

Reenrollment

Reenrollment, which occurs toward the end of the spring term each year, is the annual formal process in which departments and the Graduate School evaluate the academic progress of graduate students. All students eligible for reenrollment, including those writing dissertations, must make a formal application each year.

Requirements for satisfactory progress are listed in the timeline in the beginning of this document. A student's advisor, in consultation with the advisory committee, is responsible for determining whether the student has performed satisfactorily to be reenrolled. For students who have not yet taken the general examination, this includes completing high-quality work in courses and seminars, and performing effectively in assistantship or research positions. For students who have passed the general examination, significant progress toward the completion of the dissertation is the central criterion.

Recommendations for reenrollment are made in March or April. Those who do not meet the requirements will be informed at this time. If a student does not wish to reenroll, he or she should discuss the decision with the Advisory Committee. If the advisor wishes to recommend that the student be denied reenrollment, the advisor will make a recommendation to the Advisory Committee. The advisor and committee then confer with the DGS and a vote must be taken by the full Geosciences faculty if the recommendation is to deny readmission.

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. For example, it is possible to suggest a trial period until the end of the summer to reach a decision about readmission.

When notified to reenroll (typically 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 DGS. The DGS will review the application, enter department support recommendation and submit to the student for review. The student reviews the application, makes comments, and submits the application to the DGS who then submits the final copy to the Graduate School.

Second-Year Research Paper (Due 2nd or 3rd Monday of October)

In the fall semester of the second year, each student is required to submit a research paper that summarizes their research progress thus far. This second-year research paper typically builds on the first-year proposal and progress report. Typically, this report involves a 5-8 page single spaced (though double spaced is encouraged for submission) report not including figures and

references. It should take the format of a formal scientific manuscript, but is not expected to reflect a completed project. This report will serve as a discussion piece for the advisory committee during the fall advisory committee meeting. The committee will come to the meeting prepared to give feedback on the report. This paper serves as good practice for writing the generals exam research paper.

Second-Year Presentation (four days after the due date of the research paper)

The second year presentation is a formal "AGU-style" presentation (twelve minute presentation, with three minutes for questions) that summarizes the student's research progress. The student should explain why the problem they are working on is important, outline the methods and results, and discuss the implications and next steps. The audience is the entire department, and so the presentation should appeal to a relatively broad scientific audience. Students are strongly encouraged to give practice talks to their peers both inside and outside their research group. More senior students are particularly good at giving feedback on these talks, so take advantage of their expertise!

Generals Exam (late April to mid-May of second year)

Students must pass a General Exam to become a PhD candidate. The examination may be taken earlier by well-prepared students. It can be delayed with the approval of the GWC under special circumstances such as serious illness or fieldwork schedule conflicts. In every case, it is the student's responsibility to schedule the date, time, and place of the generals exam so that all Examination Committee members can attend.

The committee for the General Examination consists of four faculty members including the student's primary advisor. The committee may include a faculty member from another department of the University. Members of the student's Advisory Committee during the first two years may be members of the Examination Committee, but it is not required. The chair of the Examination Committee, who organizes the question period and insures that the exam proceeds according to the guidelines below, must not be the student's primary advisor. With the goal of consistency and continuity between exams, at least two GWC members should be part of the examination committee. If having a second GWC member brings the total number of examiners to five, then one of the GWC members may not ask questions.

The exam is typically between two and a half to three hours, and consists of the following requirements: 1) a research paper summarizing a single research project conducted over the first two years, 2) a PhD thesis proposal, 3) an ~20 minute presentation at the beginning of the exam summarizing the research paper, and 4) an oral examination by the student's generals exam committee. More details on these requirements are given below.

1) The research paper. A research paper summarizing the first two years of research must be turned in at least one week prior to the General Exam. *If a student does not turn in the paper a week before the exam, they will fail the exam and it may be rescheduled.* The paper should be turned into the graduate administrator (Sheryl Robas), and also sent via email to the Examination Committee. The paper does not need to be ready for publication in a peer-reviewed journal but should be of comparable quality. The research accomplishments should indicate a reasonable level of productivity, and the interpretation should indicate deep

knowledge of the literature and excellent critical thinking. The research paper should not exceed 20 pages (double spaced) with figures and references. *Students are encouraged to get feedback from their advisor on drafts of the paper and proposal.*

2) The thesis proposal must outline what the student will pursue for his/her dissertation. If it is a continuation of the first two years of research, it should show that the student has identified the next steps of the project towards a suitable dissertation. In addition to a discussion of methodology, goals, and research objectives, the proposal should include an explanation of why the research is important and how the research will be performed in a timely fashion. This proposal should be mostly his/her own work and should outline a plan of research for the next two or three years. It is typically short – about two pages single spaced - and serves the purpose of generating discussion among the committee and student.

3) The presentation should focus on the student's research thus far, and take the format of a talk at a scientific meeting. It may contain a few slides about the thesis proposal, especially if the proposed topic is new. It should not be longer than 20 minutes. Students are encouraged to give practice talks to their advisor and/or other students.

4) The oral examination is split into two parts. Following the student's presentation, the first hour of the exam covers the research paper and the thesis proposal. Generally, the committee will take turns asking questions of the student. The questions may be very specific, e.g., about details of the methodology presented in the paper, but they may also be broader about the motivation for the project or about the literature cited. The student should assume that anything discussed in the paper and presentation may be questioned, but also that the committee members may venture beyond those topics to related research topics, problems, or methodologies. After a short break, the second part of the exam covers two chosen topics of expertise, or areas of concentration, and lasts between an hour and an hour and a half. *The student should choose these areas of concentration based on their expertise and their research and discuss these areas with the Examination Committee prior to the exam, ideally in the winter meeting of the Advisory Committee.* The areas of concentration can be narrow (e.g. stable isotope geochemistry) or wide (i.e., paleoceanography). Students choosing narrow topics will be examined in greater depth, whereas broader topics are less likely to go into the detailed methodologies applied to that topic. Areas of concentration can be based on GEO or the non-GEO courses (e.g., inorganic chemistry, statistics), but are generally related to one's research interests.

<u>Information about Passing and Failing the General Exam</u>

The outcome of the general exam is decided by the Examination Committee at the end of the exam, with two possible outcomes: Pass and Fail. If the Committee decides that the student has satisfied the requirements for all parts of the exam, they will pass and move on to their PhD dissertation research. If the student does not pass one or more parts of the exam, it is considered a fail. If it is the first failure, the student has the option of retaking the exam according to the rules of the Graduate School and the Examination Committee. The Committee can require the student to retake one or all parts of the exam, and will recommend when the exam should be retaken. It must be retaken within a year, but more typically it is within six months. If a student fails twice, the student is required to leave the program.

If a student passes, they are awarded a Master's Degree in addition to being permitted to continue on to PhD research. If the student fails twice or decides to leave the program after a first failure, the committee can decide whether a terminal Master's degree is appropriate.

Preparing for the General Examination: Some Suggestions

Several months before the examination period….

Student's being examined should meet with students who have passed the general exam.

Students should begin to work with his/her advisor on the report and the proposal in order to have drafts ready for review well in advance of the exam. The advisor should read these drafts carefully; making suggestions as to how they can be strengthened, and helping the student identify areas where their knowledge of the subject matter should be improved.

Students should meet individually with members of the Examination Committee to discuss the topics to be covered during the examination, to identify readings as part of the preparation, and to ask for any help in understanding the Science.

Students should begin reviewing all relevant course material in depth. There is no reason students should be unable to answer questions involving basic information and concepts covered in courses they have taken.

In the weeks leading up to the exam….

Students should convene a group of post-generals graduate students to serve as the examining committee in a "mock exam".

Students should make finishing touches on their proposals and reports in order to have them submitted to the committee *at least one week prior to the exam.*

Dissertation and Final Public Oral Examination

The primary purpose of the dissertation for the student to demonstrate their ability to conduct high-quality, independent, and original scientific research. From the graduate school website: "The dissertation shows that the candidate has technical mastery in the chosen field and is capable of independent research. It is expected to be a positive contribution to knowledge, which may consist of a new scientific generalization, a new body of integrated facts that carries scientific implications that extended beyond itself, or a substantial improvement in technique or procedure."

Format of Dissertation

Most dissertations consist primarily of research that has been or will be submitted to professional journals as multiple stand-alone research papers. Such theses should be preceded an introductory chapter that defines the overall problem, and serves to draw the various papers into a coherent narrative. While there is no formal rule for the number of chapters, a typical thesis contains at least three chapters that are publishable as stand-alone manuscripts (so the dissertation would be at least four chapters including the introduction). If any part of a thesis has

been or will be submitted to a journal as a multiple-author paper, this should be clearly indicated, and the student's role in the collaboration should be described on a page preceding the chapter. Multiple authored papers that have been written substantially by another author may not be included in the thesis, although they may be appended to it.

Approval of the Dissertation prior to the Final Public Oral Examination

Prior to completion of the thesis, two dissertation readers are chosen by the student in consultation with the advisory committee. At least one of the principal readers of the dissertation must be from the student's home department. 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 at another university or in the research community. External readers must be approved by the Graduate School prior to dissertation submission.

The completed dissertation must be submitted to the readers at least two weeks before the date of the Final Public Oral (FPO). At the same time, the dissertation must be made available to the entire faculty by depositing a copy in the Graduate Administrator's office. The readers' reports are presented at a faculty meeting no less than one week later. The faculty votes on the readers' reports and may impose requirements for changes that must be made before the dissertation is approved. If changes are required, new readers' reports, or amendments, will also be required. If the readers' reports and the dissertation are approved by a vote of the faculty, the final oral examination will be scheduled at least one week later. Normally the final oral examination will be given only during the academic year.

A candidate for the Ph.D. degree in the Department of Geosciences is required to submit one copy of their thesis - the original which goes to MUDD Library.

Final Public Oral Examination (FPOE)

The final public oral examination (FPOE) is a final examination in the student's field of study as well as a defense of the dissertation, and is open to the public. FPOs are scheduled 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 the date, time, and location 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.

FPOs include at least three principal examiners, all of them typically 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. In other words, it is possible that one or more of the readers is not present at the FPO, but normally both are present, thus requiring at least four members of the examination committee. At least one of the examiners must be from the student's home department. The examination committee may be the same that has served as the advisory committee after the General Exam, or may be reconstituted at the discretion of the student in consultation with the advisor and advisory committee. The student and the examiners should be present in person. In extraordinary circumstances, a department may request that the Graduate School approve virtual, video-conferenced participation of an examiner, but in no case may there be fewer than two examiners who participate in person. Acting on the advice of the

examiners, the department determines whether or not the candidate has passed the examination.

In general, the FPO starts with the candidate giving a presentation of about 40 minutes length on his or her dissertation research. Next, members of the audience who are not members of the examining committee may ask questions, after which there is generally then a short break during which audience members may choose to leave. Following the break, members of the examining committee ask their questions. The questioning is still public, but only the examiners and the candidate are permitted to speak. After this round of questioning is concluded, the Chair of the committee will ask everyone to leave except for the committee members, who will discuss the outcome of the exam.

More specific details provided by the Princeton University Graduate School

The University maintains webpages with general info about the dissertation:

http://gradschool.princeton.edu/academics/degree-requirements/phd-requirements/dissertation-and-fpo

and the degree application and completion process: including links to checklist for Ph.D. defense and all necessary forms

http://gradschool.princeton.edu/academics/degree-requirements/phd-requirements/dissertation-and-fpo/advanced-degree-application

2. Miscellaneous requirements and FAQs

Coursework Requirements

PhD students are required to take eight (8) courses, each lasting one semester, within their first two years. Two courses that are required for all GEO students are GEO505 and GEO506. Two additional of the eight courses are also required to be outside the student's area of specialization; whether a course fits this requirement is determined by the student's advisory committee. The makeup of the rest of a student's coursework is flexible and determined with consultation between the student, his/her advisor, and the Advisory Committee.

For advanced students (e.g. those coming in with a MSc or a degree from a foreign university), up to two courses may be waived if similar courses have been completed elsewhere. Waivers should be proposed by the student's Advisory Committee for approval by the GWC.

Post-Generals students are encouraged to continue to take occasional courses as a useful means of filling gaps in knowledge appropriate to their research and other professional interests. Active participation in departmental seminars is considered especially important as these provide exposure to a broad range of research at the forefront of Earth Sciences.

Undergraduate Courses

Students coming into GEO have very different academic backgrounds and training, and as a result may benefit from taking undergraduate courses. Students are permitted to enroll in and receive credit (towards their 8 required courses) for undergraduate courses 300 level and above, with the approval of their advisory committee.

Grade Requirements

Graduate students must maintain a B average in their pre-generals exam coursework to continue in the PhD program.

Financial Support

PhD students are not expected to fund their education and/or research. The first year of the PhD program is funded by the University. The remaining years are funded through fellowships and grants awarded to individual faculty members from outside agencies, or through an Assistantship in Instruction. Students who are U.S. citizens are urged to apply for National Science Foundation, Department of Defense, NASA, or Hertz fellowships. There are also opportunities to obtain small amounts funding (thousands of dollars) for graduate research in the department and at other organizations such as GSA and USGS. These change from time to time so asking around is a good way to find out about them.

Summer Research and Fieldwork

PhD students are expected to work on research over the summer, and will be given summer stipend in order to do so. Project grants normally defray minimum living expenses and transportation associated with fieldwork. Each student whose summer research is not supported by a project grant should attempt to secure funds from an outside agency (e.g., the Geological Society of America or Sigma Xi). It is not uncommon for graduate students to do summer

internships or summer-schools outside the University. These can be good ways to explore post-PhD options outside of academics, to gain experience in a different type of research, or to interact with an academic community outside Princeton in depth. Interested students should speak with their advisors and advisory committees well in advance about this option so that logistical issues such as funding and PhD research progress can be discussed.

Assistants-in-Instruction (AIs)

Princeton refers to teaching assistantships (TAs) as "AIs," and graduate students in GEO are required to be an AI for a course for one full semester credit, either one full time course or two half-time courses. Students serve as AIs more than the required minimum, either because they desire more teaching experience, or for financial support.

The responsibilities of an AI are quite variable depending on the needs of the course, the number of students, whether there is a lab period and/or field trip, etc. Typical duties include leading precept meetings, grading homework assignments and papers, lecturing, assisting or leading laboratory instruction, and planning logistics and academic programs for field trips.

Information on AI preparation and training is available at the McGraw Center for Learning and Teaching (https://mcgraw.princeton.edu/). Graduate students are required to take AI training through McGraw prior to serving as an AI.

Foreign Language Requirement

There is no foreign language requirement.

Attendance at Scientific Meetings

The department encourages attendance of graduate students at scientific meetings. Department vehicles can be made available whenever possible for transportation of student groups to meetings close to Princeton.

Funding for attendance at scientific meetings comes either from their advisor's sponsored awards, or other faculty funds. Additionally, each GEO graduate student is entitled to a maximum of $1,500 from Departmental funds to attend a scientific meeting of their choice. Submit a request to the graduate administrator with the student's principle advisor cc'd in order to establish their approval.

Career Services and Professional Development

Graduate students are strongly encouraged to take advantage of professional development and career services opportunities at Princeton during their studies. These include opportunities within the Department of Geosciences, like presenting in the graduate student seminar or writing a proposal with your advisor. Examples of broader campus resources include the writing, speaking, presentation and career exploration workshops offered regularly by the Graduate School and Career Services (https://gradschool.princeton.edu/professional-development), the teaching certificate program offered by the McGraw Center for Teaching and Learning, the University Administrative Fellowships facilitated by the Graduate School, and the science outreach and activism opportunities available in

several graduate student organizations. To ensure that students are exposed to and prepared for their desired career path, it is recommended that graduate students discuss their professional goals and broader skill development goals with their advisor and their advisory committee at least once a year. Additionally, the Office of Career Services offers one-on-one career consultations, which are especially valuable after generals when students begin to focus full-time on their dissertation research.

3. GWC and Contacts

Graduate Work Committee (GWC)

The GWC comprises a group of four to five faculty members, broadly representative of the main academic and research areas within the Department. The Chair and other members of this Committee are appointed on a yearly basis by the Department Chair. The Chair of the Graduate Work Committee is the Department Director of Graduate Studies (DGS). Their general duties are to oversee all aspects of the graduate program in GEO, i.e., everything described in this handbook.

Contacts:

Current members of the GWC are:

John Higgins (member; and DGS): jahiggin@princeton.edu
Jie Deng (member): jie.deng@princeton.edu
Jeroen Tromp (member): tromp@princeton.edu
Bess Ward (member): bbw@Princeton.edu

Graduate program administrator:

Sheryl Robas: srobas@princeton.edu