Graduate School of Arts and Sciences Handbook
DEPARTMENT OF EARTH AND PLANETARY SCIENCES

Academic Advising

The Graduate Studies Committee (GSC) is appointed by the department chair each year and includes the director of graduate studies, and three to four additional faculty members. The GSC reviews any graduate program related issue raised by faculty or students. A student can reach out to any GSC member regarding any issue, and request confidentiality when needed. The GSC members are listed on the EPS website on the graduate program page. The GSC meets with all new students and confirms a preliminary advisor during the first week of the fall term. (Normally, it will be clear from the admissions process which faculty member should be the preliminary advisor.) After meeting with the GSC, students meet with their preliminary advisor during the beginning of the fall term to discuss a plan of study.

Unless students have an outside fellowship, the first year of funding derives from the Graduate School of Arts and Sciences (GSAS). This system is set up so the student can explore the scientific possibilities within the department before deciding upon a dissertation topic and PhD advisor. Toward this aim, first-year students are required to attend weekly tutorials during fall term given by Earth and Planetary Sciences (EPS) faculty to learn about their research and laboratories. By the end of the spring term, first-year students submit their Plan of Study, which includes their proposed PhD advisor and advisory committee.

Normally, the advisory committee consists of a principal advisor and two to three other faculty members. Members of the advisory committee are selected by the students in consultation with their advisor. Two of the members, not including the advisor, must be members of the Faculty of Arts and Sciences. One or more external faculty members may be on the committee. External members must be approved by the GSC prior to adding them to the committee. As students' research interests evolve, the composition of their advisory committee can be adjusted. Students who change their principal advisor to a non-EPS advisor should consult the EPS Co-Advisor Guidelines available on the EPS website. The director of graduate studies mediates issues between graduate students and advisors should they arise.

Plan of Study and Course Requirements

All first-year graduate students are required to file a Plan of Study form toward the end of their second term. The form asks students to specify which courses they intend to use to satisfy each component of the course requirements, to name a PhD advisor, and to list members to serve on their advisory committee. The students' principal advisor and the director of the GSC will review and approve the Plan of Study. Students are encouraged to check with the GSC at the beginning of their first year to make sure the courses they plan to take are consistent with the course requirements.

All students are required to take at least eight letter-graded graduate-level four-credit courses in fulfillment of the PhD degree. Four of these four-credit courses must be at the 200 level in Earth and Planetary Sciences or related courses at a suitable level in other disciplines such as Applied Mathematics, Applied Physics, Astronomy, Biology, Chemistry, Engineering Sciences, Mathematics, or Physics. These courses should provide the student with the basis of knowledge required to pursue research.

Two courses are required in math, applied math, data science, statistics or allied fields. The aim of this requirement is to provide students with a set of mathematical, statistical, and/or computational tools required for their research. Most commonly, students in geophysics, climate, ocean and atmospheric dynamics take Applied Math 201, 202, 205 or Statistics 230. Similarly, students in other research areas often take Applied Math 104, 105, 111, 115 or Statistics 110, 111, 139, or 149. Courses in Data Science (for instance EPS 102, 109, 236) or Computational methods that meet a sufficient standard with respect to rigor and complexity can also be considered. If a student has not taken the equivalent to Math 21a and 21b, they will be required to do so in addition to the above requirements; incoming students should be aware that this represents a significant additional commitment. Students should consult their research advisor and may also consult with the GSC to select the most appropriate set of classes to fulfill this component of their course requirements.

Our graduate curriculum is aimed at educating students to be broadly knowledgeable in the Earth sciences. As such, students are required to gain exposure to areas of Earth sciences outside of their specific field of study. Students are required to take two courses in EPS or ESE that develop skills and understanding of allied areas of Earth science.

The requirements outlined above are a minimum standard and students will usually take additional courses in their selected fields and in other fields. Students normally satisfy the course requirements in the first two years of graduate study in preparation for their qualifying oral examination; however, students need not fulfill these requirements before beginning research and should not put off research on this account.

Students must earn a grade of C or better in courses taken to satisfy the EPS course requirements. All degree candidates must maintain an average equivalent to B or better to continue in the program. Satisfactory progress is reviewed annually and students who fall below the grade minimum will normally be given one term to improve their grades.

Field Trip

All graduate students are encouraged to participate in at least one department-sponsored field research trip during their time at EPS. These annual trips are organized by EPS graduate students and are approved by the GSC. Students learn about the relevant earth science in a particular area and gain experience in planning field trips—

from developing an itinerary to preparing a budget to executing and reporting on the trip. Alternatively, students may be a leader on one of the undergraduate field trips, as appropriate, or may carry out other department-sponsored fieldwork. Students who are unable to take part in a trip should complete a waiver form by the end of their fifth year.

Students with any concerns or difficulties in participating, are encouraged to discuss this with their faculty advisor or any member of the Graduate Studies Committee. It is our intention to be responsive to such concerns up to and including a waiver of the participation requirement.

Teaching Requirements

All PhD students are required to serve as teaching fellows for at least two sections during their time at Harvard. The two sections should be for two different courses or for the same course in two different years. This requirement ensures that all students have at least some exposure to classroom or laboratory interactions with undergraduates, as teaching will likely be an important aspect of any future career. First-year students may not teach in their first term, but may serve as teaching fellows in the second term when the course material is useful for their own professional training (generally not General Education or introductory classes). Many students teach more than the minimum requirement. In some cases, this additional teaching provides necessary financial support for their research if research grants or fellowships are not available. However, to ensure that teaching does not prohibit satisfactory progress, students are required to petition the GSC if they wish to teach more than two sections in a single academic year.

If a student has received an outside fellowship that permits additional support, he or she may keep the stipend from teaching in addition to the fellowship—even if it is while teaching the two required sections.

Students are required to consult with their faculty advisor regarding when and which courses they should teach, in order to maximize the benefit to their education and training and make sure teaching does not interfere with their dissertation work. Students are also required to attend teacher training such as an EPS micro-teaching workshop or a Bok Center Teaching Conference (offered at the start of each term) prior to teaching their first class. Students for whom English is their second language may want also to contact the Bok Center to discuss which resources (available year-round) would help them become effective teachers.

Students should obtain their faculty advisor's approval before undertaking outside work.

Qualifying Oral Examination

The purpose of the oral examination is to determine a student's depth and breadth of scholarship in a chosen area of specialization. The exam will assess the student's originality, capacity for synthesis and critical examination, intensity of intellectual curiosity, and clarity of communication.

Research Proposal

- In consultation with their principal advisor, students are required to prepare and submit a proposal on their research topic.
- The proposal should include an introduction explaining the rational, background, context, and hypotheses underlying the proposed study; methodological details of their work plan; and implications for neighboring branches of the Earth sciences.
- The paper should be up to fifteen pages, including figures but not including references, in 12 pt. font with 1.5" margins.
- The research paper should be distributed to the committee with a copy to the graduate coordinator at least two weeks prior to the date of the orals. Failure to do so may result in rescheduling of the exam.

Oral Exam

All candidates for the PhD degree are expected to take the oral examination by the end of their fourth term in the program. It is the student's responsibility to file the Request for the Oral Examination form or petition for postponement. The form requests the student and principal advisor each to nominate a member of the examining committee for the oral examination. Normally, these will be the other members of the student's advisory committee. At a minimum, the examining committee will consist of the principal advisor, the nominee of the principal advisor, the nominee of the student, together with a fourth member from the GSC who will be appointed by the GSC. This fourth member will act as convener (i.e., chair) at the examination and will report the outcome of the examination to the graduate coordinator. The Request for the Oral Examination form or a petition to postpone is due by the course registration deadline in the student's fourth term in the program. Request for permission to postpone the examination is by written petition to the GSC and should include statements by both the student and their principal advisor outlining the reasons for postponement.

Oral examinations are in principle open to all faculty members of the department, but only the examining committee members will evaluate the student. It is the student's responsibility to ensure that the necessary room reservation is arranged, and the audio-visual equipment is set up. The examination begins with a presentation of the student's proposal, lasting approximately twenty to twenty-five minutes if uninterrupted (approximately 20-25 slides). The presentation should cover the full scope of the proposal. The student's presentation will be followed by questions from the examining committee members and other faculty members present.

Questions will focus on the ability of the student to carry out dissertation research in their chosen area but will not be limited to a narrow field of specialization or to the proposed project. Questions that are broad in nature and are intended to test general knowledge of Earth sciences will be included. The duration of the examination is variable, often lasting two to three hours.

Students who do not pass the qualifying oral examination are normally given another chance with specific guidelines for improvement on their weakness(es). The examination committee may stipulate further requirements such as further course work.

Progress Reports

In the third and subsequent years of study, students are required to file an annual Progress Report consisting of a one-page research summary and a form signed by all committee members. Students should meet with each member of their advisory committee and any issues should be noted on the form. The Progress Report is intended to keep the student, advisors, and the GSC aware of the student's progress toward the degree.

Third year students should include the subject and general objectives of their proposed dissertation research. Details may be modified as the dissertation progresses, but any major change in the subject and scope of the dissertation must be approved by the advisory committee.

Final Examination/Dissertation Defense

The object of the dissertation is to show that candidates have technical mastery of the field in which they present themselves and that they are capable of independent research. The subject should be distinct and limited, and the writer should be able to formulate conclusions modifying or enlarging some aspects of present knowledge. Candidates must submit the dissertation not more than five years after having passed the Qualifying Oral Examination. When students have completed writing the dissertation, they meet with their final examination committee for a private defense of their dissertation. This private defense generally takes between one and two hours. An unbound copy of the dissertation is distributed to the final examination committee members at least two weeks prior to the private defense. An electronic copy is also given to the graduate coordinator and is available to the department community if requested.

PhD candidates are required to file the form Request for Appointment of Final Examiners and Scheduling of Final Examination. This form requests that the student and the principal advisor each nominate a member of the final examining committee for the final examination. The final examining committee is approved by the GSC and normally will consist of the principal advisor, the nominee of the principal advisor, the nominee of the student, together with a fourth member appointed by the GSC. This form is provided to request scheduling of the final private examination and the public presentation. At the private defense, PhD candidates can expect recommendations for changes to their dissertation and/or a decision on whether or not the final examination committee feels the candidates are ready to go forward with a public defense.

It is expected that the dissertation will conform to the requirements described online in *Dissertations*.

Parental Support
Following the birth or adoption of a child, EPS graduate students are eligible for the Parental Accommodation and Financial Support program (PAFS) offered by GSAS. EPS will supplement the financial component of this program to equal a total of up to six months of a graduate student's stipend at the standard EPS rate and corresponding tuition and health fees. The student and advisor should establish research expectations during this time. Students should coordinate support with the EPS Graduate Coordinator and GSAS.

Master of Arts for non-EPS students
PhD candidates in another FAS department who wish to be candidates for the AM degree in EPS may petition the GSC upon satisfactory completion of the required eight four-credit courses as outlined in the PhD course requirements section of the graduate student handbook. The four depth courses must be 200-level EPS courses. The two breadth courses must be EPS courses at the 100- or 200-level. Under special circumstances the GSC may approve the breadth courses to be Earth-science related courses from other departments, provided they are at the 100- or 200-level. Depending on the student's area of specialization, the two math courses can be either at the 100- or 200-level. Students are required to meet with a member of the GSC with respect to satisfying all course requirements. Courses with grades lower than B- cannot be used for the AM degree and an overall grade average of B or better is required. Candidates should petition the GSC six weeks before the appropriate Application for Degree deadline and with the knowledge and written consent of the director of graduate studies in their parent department. Other aspects of the student's graduate career at Harvard remain the province of the parent department.

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