

Graduate Student Guide

Department of Earth Sciences

University of Maine

Orono, ME

Updated August, 2011

1 Introduction

Welcome to the Department of Earth Sciences! We award both Master's (M.S.) and Doctoral (Ph.D.) degrees. Student applicants to our graduate program commonly have a Bachelor's degree in Earth Sciences or closely related discipline, but the multidisciplinary nature of our program allows for entry from other backgrounds as well. Students entering the graduate program in Earth Sciences typically have completed at least one year of chemistry, physics, and calculus, as well as several courses in the Earth/environmental sciences beyond the introductory level. Students who have not completed these basic requirements may be admitted, but may be required to complete specific courses to fulfill deficiencies. Students who wish to be considered for teaching assistantships should have a complete application submitted by the end of the first week in February. Research assistantships may also be available and prospective graduate students should contact faculty members working in the student's area of interest to inquire about the availability of funds.

2 General Information

The laboratories and offices of the Department of Earth Sciences are housed in the Bryand Global Sciences Center (BGSC) and Sawyer Environmental Research Center. The departmental office is in room 111 BGSC. Incoming mail is found in the mail cabinet located in the office adjacent to Room 111. Outgoing mail may be posted here and stamps for non-departmental mail may be purchased at the Post Office in the Memorial Union Building.

On arrival, keys may be obtained from the departmental administrative assistant. Students will need a magnetic card for the outside doors and room 107 (the photocopier/mail room), and a key or keys for office and laboratories. A deposit is required for each key. Upon departure from the department, card and keys must be left with the departmental administrative assistant and your deposit will be returned to you. Student use of the photocopying facilities should be limited to instructional purposes during normal office hours. Contact the departmental administrative assistant to arrange for a copying account.

Students who are serving as Teaching Assistants must leave schedule cards with the departmental administrative assistant at the beginning of each semester. We also request that you provide a photograph of yourself or let us take one for our annual departmental poster.

A permit is required to park automobiles on campus. Parking information and permits can be obtained from the Student Services Center in the Memorial Union

Building. Students should obtain a Maine Card from the Student Services Center, which allows use of the library and other services.

3 Facilities

Departmental research facilities are extensive and modern. Facilities available for solid-earth research include a Cameca SX-100 electron microprobe, Tescan Vega XMU scanning electron microscope (with integrated energy-dispersive spectrometry, electron backscatter diffraction and full-color cathodoluminescence systems), inductively coupled plasma mass spectrometry, powder x-ray diffraction, stable isotope laboratory, computational geodynamics facility, mineral separation, rock preparation, polishing and thin section laboratories, and high resolution photomicroscopy.

Marine Geology equipment and facilities include a suite of digital electronic geophysical equipment for sidescan sonar, seismic reflection and single and multibeam bathymetry, current meters and tide gauges and ground penetrating radar. We have a marine electric vibrocorer, a portable coastal vibrocorer and hand-operated corers as well as an underwater videocamera. The sedimentology laboratory is fully equipped for core analysis, photography, microscopy, weighing, centrifuging, drying, muffle furnace, sieving, and automated textural analysis with a settling tube for sand and an X-Ray sedigraph for mud. GIS capability is supported with computer workstations mounting ArcView and ArcInfo software.

The glacial and surficial geology group maintains laboratories in the Sawyer Environmental Building. Facilities include preparation areas (including a clean room) for radiocarbon, uranium-thorium, and cosmogenic isotope dating. We also have facilities and equipment for satellite and air photo interpretation and sediment-core analysis.

Facilities and instrumentation in the Sawyer Environmental Chemistry Research Laboratory (SECRL) include an inductively coupled plasma atomic emission spectrometer, a low level cold vapor atomic fluorescence mercury analyzer system, a direct mercury analyzer, a flow injection mercury system, a graphite furnace/flame atomic absorption spectrometer, a total organic carbon analyzer, a flow solution auto analyzer, several ion chromatographs, an auto titrator, and extensive facilities for sample preparation (e.g., microwave digestion and clean room space).

The environmental geology group maintains a wet chemistry laboratory and a hydrogeology laboratory. The wet chemistry laboratory includes a shaking water bath, pH meters, stirring hot plates, water filtration system and DI water dishwasher, visible light spectrophotometer, as well as other supplies for sample preparation equipment. The hydrogeology laboratory houses a computer workstation, a borehole geophysics winch and downhole tools (caliper, gamma, heat-pulse flow meter), Darcy tube, function generator with voltage potential data loggers (for laboratory experiments), and two Ashtech Z-surveyor GPS Units. These labs also store extensive field sampling equipment including soil augers (hand and 'little beaver' power auger), several submersible pumps, peristaltic pump, field portable pH and conductance meters, field spectrophotometer, field filters, Hach digital titrator, several water-level indicators, data-logging pressure transducers, and dedicated field laptop. Computer modeling and data analysis is supported with computer workstations utilizing Geochemist's Workbench, GPS processing software (GAMIT/GLOBK), and various open source software (Modflow, FiPy, Python, Octave).

4 Information on the Completion of Graduate Degrees

The general requirements for graduate degrees are described in the Graduate School Catalog (see the Graduate School Website). Students should review the general policies and regulations in this manual. A summary of these and additional departmental policies follow. Students are individually responsible for meeting these requirements.

4.1 Master of Science Degree Requirements

Financial aid in the form of Teaching Assistantships, Research Assistantships, Fellowships, and Scholarships is awarded on the basis of a student's academic record (scholarship). Awards to both new students and students in residence are announced as early as possible during each spring semester. Financial aid is normally terminated after two years of residence. Students receiving financial aid should consult with their academic advisor to determine if they are eligible for a tuition waiver during the summer. Incoming graduate students should meet with their advisor to identify courses that best fulfill their program of study. A student is formally advised by the Department's Graduate Committee until an advisor is identified. If the student does not yet have an advisor, then the graduate coordinator will approve course registration and changes until an academic advisor is identified.

M.S. students must select an academic advisor from the department by the end of the first semester. A thesis Advisory Committee must be established, and thesis topic identified by the end of their second semester. The Advisory Committee will consist of three or more members of the graduate faculty, the committee must meet at least once per year with the student, and it is the student's responsibility to arrange these meetings. It is the student's responsibility to ensure that committee members are members of the Graduate Faculty and to submit Records of Qualification to the Graduate School if they are not. A Program of Study Form approved by the student's Advisory Committee must be filed with the Graduate School by the end of the second semester of residence. A copy of the form can be found at the Graduate School's website. Financial aid may be withheld if the Program of Study has not been filed on time. Changes to the Program of Study must be made using the appropriate form (available at the Graduate School's website), approved by the Advisory Committee and forwarded to the Graduate School.

M.S. Students must complete at least 30 credit hours of study in order to graduate. At least 18 of these credits must be course work, and at least 6 must be thesis credits. Of the minimum 18 credits of course work, at least 12 credits must be completed in 500- or 600-level courses. The additional mix of coursework and/or thesis credits required to reach the 30-credit minimum for graduation will be determined by the Advisory Committee depending on the student's background preparation and the thesis topic. To obtain graduate credit for courses, an A or B grade must be earned. Receiving a C, D, or E grade in courses taken as a graduate student triggers a formal letter of inquiry from the Graduate School to the student's advisor, and may result in a recommendation to withdraw from the graduate program.

A proposal describing the significance, objectives, methodology and expected outcome for thesis research must be completed and submitted to the student's Advisory Committee and the Graduate Coordinator by the second semester of residence. The Advisory Committee must approve the proposal. If the Advisory Committee does not

approve of the proposal, they must inform the student in writing within one month after receiving the proposal. Students should consult with their academic advisor regarding formatting and organization of the proposal. As a suggestion, the proposal could follow the format of a professional funding organization such as NSF, EPA, NASA, USGS, NOAA, but the details are to be determined by the student and Advisory Committee. The thesis proposal is a requirement, and failure to complete an approved proposal may result in a recommendation to withdraw from the graduate program.

During each year of residence, students will give an oral presentation on their proposed research and/or preliminary results during a departmental seminar. Presentations will be at least 15-20 minutes in duration and will be followed by questions. Students will typically make this presentation during the Spring semester of each academic year. All students are required to enroll in the Department's 1-Credit seminar class during one semester while at the University of Maine. Students are encouraged to attend weekly seminars whenever possible.

4.2 Doctor of Philosophy Degree Requirements

Ph.D. students are generally not accepted into the department unless a departmental faculty member has agreed to act as advisor. Financial aid in the form of Teaching Assistantships, Research Assistantships, Fellowships, and Scholarships is awarded on the basis of scholarship, but no student may receive more than two years of support from a Teaching Assistantship. Awards to both new students and students in residence are announced as early as possible during each spring semester. Students receiving financial aid should consult with their academic advisor to determine if they are eligible for a tuition waiver during the summer.

A thesis Advisory Committee must be established, and thesis topic identified, by the end of the student's second semester. The Advisory Committee will consist of five or more members of the graduate faculty, at least one of whom is outside the student's specialty area and one of whom is from outside the Department of Earth Sciences. The Chairperson of the committee should be a member of the Department of Earth Sciences, except in special cases. The committee must meet at least once per year with the student, and it is the student's responsibility to arrange these meetings. It is the student's responsibility to ensure that committee members are members of the Graduate Faculty and to submit Records of Qualification to the Graduate School if they are not. It is the responsibility of the Advisory Committee to approve a course of study and thesis proposal, participate in the comprehensive examinations, conduct the defense, and evaluate the dissertation. A program of study approved by the student's Advisory Committee must be filed with the Graduate School by the end of the second semester of residence. A copy of the form can be found at the Graduate School's website. Financial aid may be withheld if the Program of Study has not been filed on time. Changes to the Program of Study must be made using the appropriate form (available at the Graduate School's website), approved by the Advisory Committee and forwarded to the Graduate School.

Although most of our Ph.D. candidates enter the program with a Master's degree, we also accept well-prepared students with Bachelor's degrees. Students entering our Ph.D. program with a Bachelor's degree are admitted on a "provisional" basis. After one year of full-time residence as a graduate student, the student's advisor must notify the

Graduate Coordinator as to whether or not the student will continue on as a Ph.D. student. Alternatively, the student may wish to first obtain a Master's degree prior to pursuing a Ph.D. Entering a Ph.D. program directly out of an undergraduate degree is challenging, and this policy is designed to give both the student and advisor a year to determine whether or not it was the right decision. Ph.D. students must complete at least 15 credits of course work beyond the M.S. degree. Of the minimum 15 credits of course work, at least 9 must be completed in 500- or 600-level courses. Students who enter our Ph.D. program with a Bachelor's degree must complete at least 33 credits of course work. Of these 33 credits at least 15 must be completed in 500- or 600-level courses. All Ph.D. students are required to complete at least 9 thesis credits.

During each year of residence, students will give an oral presentation on their proposed research and/or preliminary results during a Departmental seminar. Presentations will be approximately 15-20 minutes in duration and will be followed by questions. Students will typically make this presentation during the Spring semester of each academic year. All students are required to enroll in the Department's 1-Credit seminar class during one semester while at the University of Maine. Students are encouraged to attend weekly seminars whenever possible.

A proposal describing the significance, objectives, methodology and expected outcome for thesis research should be completed and submitted to the student's Advisory Committee in the second or third semester of residence. The primary academic advisor must approve inform the student within one month after receiving the proposal whether or not it is satisfactory. Students should consult with their academic advisor regarding formatting and organization of the proposal. In general, the proposal should follow the format of a professional funding organization such as NSF, EPA, NASA, USGS, NOAA, but the details are to be determined by the student and their Advisory Committee. Ph.D. students are required to defend their thesis proposal in an open seminar, as described below.

Ph.D. students will complete a three-part evaluation during their tenure at the department: (1) thesis proposal defense, (2) comprehensive examination, and (3) thesis defense. Ph.D. students will defend their thesis proposal in an open forum at the time that it is submitted to the Advisory Committee. The Ph.D. student will provide all members of the Advisory Committee with a copy of the thesis proposal at least two weeks before the thesis proposal defense. During the thesis proposal defense, the Ph.D. student will give a presentation lasting approximately 30 minutes describing the proposed work plan, preliminary results, and objectives of the dissertation in an open seminar. Following the presentation, the student will answer general questions from the audience, and will then be questioned in a closed session by the Advisory Committee. A three-hour time limit will be imposed on the presentation and questioning. By consensus, the Advisory Committee will decide whether the proposal is acceptable. To be acceptable, a proposal and defense must convince the advisory committee that: (1) the intended research is appropriate for doctoral-level work; and (2) the student has the background, skills and motivation necessary to accomplish the proposed research plan. If a student's proposal defense is unacceptable, the student will be given the option of defending a revised proposal between two and five months later. If the student's proposal or defense is unacceptable on this second occasion, the Departmental Graduate Committee will recommend that the student withdraw from the doctoral program.

Ph.D. students will complete a comprehensive exam typically before the end of their fourth semester of residence. This exam: (1) is prepared and administered by the Advisory Committee, (2) will cover broad aspects of earth and ancillary science knowledge related to the student's area of interest as defined by the thesis proposal, and (3) will be composed of a written exam, followed by an oral exam held within two weeks of the written exam. The Advisory Committee will determine the content and structure of the comprehensive examination. The student should consult with her/his adviser regarding the nature of the examination process. The written portion of the comprehensive examination can be done in several different ways, including a sit-down exam for a specified time period (typically 6 hours) within the Department, or a take-home exam completed over a specified time period (typically 24-48 hours). The structure of this take-home exam is determined by the Advisory Committee, and the student should seek clarification on the structure well in advance. The oral examination will be completed within a 4-hour period. After completing the oral examination, the Advisory Committee will determine the outcome for the overall examination. A student may be awarded a pass, conditional pass, or failure. Conditional pass may require the satisfactory completion of course work, preparation of written reports, or other academic tasks. In the event of a failed examination, the student has one opportunity to retake the examination within 3 months after a failure. If the student fails the comprehensive examination on a second time, the graduate committee will recommend that the student withdraw from the doctoral program. If the student passes the comprehensive examination, the academic adviser will write a brief letter to the Dean of the Graduate School, copied to the student's file indicating that the student has completed the qualifying exam and is now a Ph.D. Candidate.

4.3 M.S. and Ph.D. Thesis (Dissertation)

A complete, edited draft of the thesis should be submitted to the Advisory Committee approximately 1 month prior to the anticipated date for the thesis defense (no later than April 1 for May graduation, or November 1 for December graduation). Failure to meet this deadline will result in a delay in receiving the graduate degree. The student and the Advisory Committee, in consultation with the Department and Graduate School, must schedule a thesis defense no later than two weeks prior to the examination date. The original copy of the thesis must be delivered, unbound, in a manila clasp envelope with an additional title page pasted on the outside of the envelope, to the Office of the Graduate School no later than 24 hours prior to the defense. The thesis must be accompanied by a Tentative Thesis Acceptance Form signed by the student's Advisory Committee. Students are expected to provide all members (faculty and students) of the Department with a written summary (abstract) of the thesis, and one copy of the tentatively-accepted thesis shall be available in the Department's main office for reading at least one week prior to the defense. Additional copies should be available to each member of the Advisory Committee.

The defense itself shall be restricted to the thesis and closely related material. The defense of the thesis is oral and consists of three parts, as follows. (1) The defense will consist of a presentation by the graduate student lasting approximately 30 minutes that summarizes the problem, the scientific design, and the results of the investigation. (2)

Following this formal presentation, there will be a 20 minute opportunity for questions from the audience relating to the thesis. (3) At the close of this part of the defense, only faculty members or other University personnel holding a Masters degree or above will remain. There will then be a period of questioning by the advisory committee and qualified personnel about the thesis material and closely related material.

At the end of the above period, the candidate will be excused from the room and the Advisory Committee will then come to a decision about the acceptability or non-acceptability of the thesis and the defense of it. One of three categories of decisions will be made, as follows. (1) Outright acceptance of the thesis and the defense. At that point the student is judged to have completed all of the requirements for the Doctoral degree in Earth Sciences. (2) There may be a general acceptance of the thesis and defense with minor revisions of text or figures or other items. Acceptance on this level may also be contingent upon slight additional research such as visiting a critical outcrop, rerunning a critical experiment, or something of this nature. It would be reasonable to expect that acceptance under this provision would delay the student by no more than a few weeks in the successful completion of all requirements for the degree. (3) The thesis and/or defense may be rejected. A re-test or reexamination of the thesis and defense of the thesis is possible after a period of not less than two months. This length of time is thought necessary for the student to make appropriate changes to the thesis, or his or her state of knowledge of the material contained in the thesis or material peripherally related to the thesis. If the student fails on this second attempt, they will be considered to have failed in their attempt to attain the degree. Thus, no student will be irrevocably rejected on the first thesis defense. However, a second failure does constitute failure in the entire program.

A successful defense of the Thesis is signified by the signing of section 1 on the Final Thesis Acceptance Form by all members of the student's Advisory Committee. Once all revisions to the thesis have been made, the Committee chair will sign section 2 of the Final Thesis Acceptance Form for the entire committee. The student shall submit the thesis to the Graduate School after section 2 of the Final Thesis Acceptance Form has been signed. Final copies of the Thesis should be delivered to the Graduate School, the Department, and members of the Thesis Advisory Committee.

5 Checklist of Items to Complete for Graduate Degree

PROGRAM REQUIREMENTS

- Program of Study (to be filed by the end of the second semester of residence)
- Ensure that committee members have completed Record of Qualification
- Thesis proposal completed and approved by end of 2nd semester
- Student meets with advisory committee at least once per year
- Minimum course work completed (18 credits for M.S., 15 for Ph.D. with Master's, 33 for Ph.D. with Bachelor's)
- Minimum thesis credits completed (6 credits for M.S., 9 for Ph.D.)
- Presentation of research to Department (annually for Ph.D.)
- Residency requirement satisfied (See UMaine Graduate Catalog)
- Dissertation proposal defense completed (typically) by end of 2nd semester (Ph.D.)
- Comprehensive examination completed (typically) by end of 4th semester (Ph.D.)
- Schedule oral defense at least two weeks (M.S. or Ph.D.) prior to the defense (form available at the Graduate School)
- Copies of thesis delivered to Committee members and Department at least one week prior to defense
- Typed draft of thesis/dissertation (guidelines available) on file at the Graduate School Office at least 24 hours prior to oral defense, accompanied by a signed Tentative Thesis/Dissertation Acceptance Form. (Submitted in a manila envelope with a title page attached)
- Check with Graduate School after your oral defense for format corrections to thesis/dissertation draft, and pick up tentative copy.
- Defense passed and final copy of thesis/dissertation along with signed Final Thesis/Dissertation Acceptance Form submitted to the Graduate School Office
- Copies of final thesis to Department and all members of the Thesis Committee
- Notify Graduate Coordinator that final thesis has been approved by graduate committee
- Completion of Requirements form completed by student, and checked and submitted by Graduate Coordinator

MATERIALS SUBMITTED TO THE GRADUATE SCHOOL OFFICE

- Notice of Oral Examination Form (for thesis defense)
- Tentative Thesis/Dissertation Acceptance Form
- One unbound original (on at least 25% Cotton Fiber Bond) of the thesis/dissertation in a manila envelope with a copy of the title page attached to the front
- Two copies of the abstract on bond paper (three copies in the case of a Ph.D. student)
- One signed Library Rights Statement (see sample in Thesis Guidelines)
- One signed Final Thesis/Dissertation Acceptance Form
- Completion of Requirements Form

DOCTORAL CANDIDATES

- A letter from committee Chair indicating results of comprehensive exam
- Microfilming Agreement with copy of title page with check for appropriate amount
- Survey of Earned Doctorates form
- (Optional) Copyright Section of Microfilming Agreement and check for appropriate amount

Essential Checklist for M.S. students and their advisors in the Department of Earth Sciences

(see Graduate Student Guide and Graduate School Website for details and complete requirements)

By end of second semester, the student must:

- Form a thesis committee.
- Have first full committee meeting (plus or minus external committee member).
- Complete and submit a Program of Study form to the Graduate School.
- Deliver a written thesis proposal to committee for approval (it is strongly recommended that this be done by the end of the second semester, but delays can occur for a variety of reasons).

In preparation for thesis defense:

- Review Graduate School deadlines for graduation.
- Schedule defense at least 2 weeks in advance.
- Copies of thesis delivered to Committee members and Department at least one week prior to defense.
- Deliver a Tentative Thesis Acceptance Form accompanied by an original copy of the thesis to the Graduate School no less than 24 hours before the defense.

If/when thesis defense is successful:

- Complete Section 1 of the Final Thesis Acceptance Form.

When all revisions have been made:

- Committee Chair completes Section 2 of the Final Thesis Acceptance Form.
- Student submits Final Thesis Acceptance Form and final copy of thesis to Graduate School for format review.

After Graduate School approval of thesis:

- Student submits final copies of thesis for the Graduate School, Department and Thesis Advisory Committee. Graduate School requires special paper.
- Student also submits identically formatted pdf versions of final thesis to Departmental Administrative Assistant and Graduate School. The Graduate School also need a completed and signed ETD form.
- Student helps Graduate Coordinator complete the Completion of Requirements Form, and Graduate Coordinator submits to Graduate School.
- Student returns all keys and magnetic cards to Departmental Administrative Assistant.

Essential Checklist for Ph.D. students and their advisors in the Department of Earth Sciences

(see Graduate Student Guide and Graduate School Website for details and complete requirements)

By end of second semester:

- Form a thesis committee.
- Have first full committee meeting (plus or minus external committee member).
- Complete and submit a Program of Study form to the Graduate School.
- Deliver a written thesis proposal to committee for approval and defend it in an open forum (this may be extended, particularly for a Ph.D. student entering with a Bachelor's degree).

By the end of the 4th semester:

- Complete comprehensive examinations (this may be extended, particularly for a Ph.D. student entering with a Bachelor's degree). Submit appropriate documents to the Graduate School – a letter from committee Chair indicating results of comprehensive exam.

In preparation for thesis defense:

- Review Graduate School deadlines for graduation.
- Schedule defense at least 2 weeks in advance.
- Copies of thesis delivered to Committee members and Department at least one week prior to defense.
- Deliver a Tentative Thesis Acceptance Form accompanied by an original copy of the thesis to the Graduate School no later than 24 hours before the defense.

If/when thesis defense is successful:

- Complete Section 1 of the Final Thesis Acceptance Form.

When all revisions have been made:

- Committee Chair completes Section 2 of the Final Thesis Acceptance Form. Student submits Final Thesis Acceptance Form and final copy of thesis to Graduate School for format review.

After Graduate School approval of thesis:

- Make sure that you have the Thesis Acceptance Statement in your thesis. See the Graduate School's guidelines for exact language.
- Student submits final copies of thesis for the Graduate School, Department and Thesis Advisory Committee. Graduate School requires special paper.

- Student also submits identically formatted pdf (electronic) versions of final thesis to Departmental Administrative Assistant and Graduate School. The Graduate School also need a completed and signed ETD form.
- Student helps Graduate Coordinator complete the Completion of Requirements Form, and Graduate Coordinator submits to Graduate School.
- Student returns all keys and magnetic cards to Departmental Administrative Assistant.