



Graduate Handbook

2017-2018

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About the Department

You have joined an active research community. Being part of this community is a thrilling and rewarding experience. It helps you grow intellectually and leads to career opportunities. We are privileged to have you spend a few years with us while you become a recognized scholar. The Department of Earth and Atmospheric Sciences (EAS) at the University of Alberta is known internationally for the quality of its PhD, MSc, and MA degree programs. The Department was created in 1995 by the merger of former departments of Geography (established 1957) and Geology (established 1912).

The leadership of the Department includes the Chair, ***Dr. Stephen Johnston***, and three Associate Chairs: ***Dr. Thomas Chacko***, who has responsibility for graduate student affairs, ***Dr. Murray Gingras***, for undergraduate student affairs, and ***Dr. Paul Myers***, for research. The Assistant Chair (Administration), ***Mary-Jane Turnell***, is responsible for the operation and budget of the Department. The Graduate Program Administrator of the Department is ***René Gobeil***. There are currently ~60 full-time faculty members and ~26 support staff.

The Faculty of Graduate Studies and Research

The Faculty of Graduate Studies and Research (FGSR) is your faculty. It looks after:

- Final admission of students.
- Setting of minimum entrance requirements and academic standing requirements;
- Approving changes to programs; and
- Appointment of supervisors, supervisory committees, and examining committees.

The Department supervises graduate students in their degree programs. The Department ensures that you receive needed supervision and that FGSR regulations are followed. The Department notifies FGSR of changes in a student's status such as meeting degree requirements, and keeps track of developments or changes in a student's program.

The University of Alberta Calendar is the official rule book. Section 200 of the Calendar, about FGSR, should be understood by all graduate students. Additional information is provided at the FGSR website, <http://www.gradstudies.ualberta.ca/> and in particular in the Graduate Program Manual, <http://www.gradstudies.ualberta.ca/gradmanual/index.htm>.

Supervision Guidelines for Graduate Students and Supervisors

Responsibilities of the Graduate Student

Graduate students are responsible for their own program, i.e., you are responsible for running your program and making progress. You are expected to become aware of regulations and deadlines that affect you. You should in particular:

- Communicate with your supervisor or the Associate Chair if you face a problem.
- Report program progress at least yearly to your supervisory committee.
- Meet deadlines for any scholarship applications that you make and seek assistance from the Department in the application process.

Responsibilities of the Supervisor

The faculty supervisor is responsible for guidance and monitoring of a student's program. The supervisor assists in planning the program; ensures that the student is aware of regulations of the Department and FGSR; provides advice in all aspects of the program; and keeps informed of the student's progress. The supervisor ensures that the student conducts research in a manner that is scholarly, safe, and productive. The supervisor prepares a course of study for the student; arranges for and chairs supervisory committee meetings and examinations; and reviews the thesis both in draft and in final form.

The Supervisor is expected to:

- Treat the student as a junior colleague in research and provide an environment in which the student can grow intellectually.
- Provide guidance in research and set standards expected, and offer advice and constructive criticism. The student shall be made aware of expectations of the supervisor and the Department at the beginning of the supervisory relationship.
- Establish with the student a realistic timetable and milestones for completion of the phases of the degree program.
- Ensure that sufficient funding, Departmental, and supervisory resources are provided for every student under their supervision.
- Establish a supervisory committee at the start of the program, ensure that meetings are held at least once a year, and report on meetings to the Department.
- If going on leave or a period of absence, ensure that the student has an acting supervisor who is a member of the supervisory committee. Supervisors who leave for more than two months

submit to the Associate Chair and to the student a written description of the arrangements for supervision during the leave.

- Ensure that the student is aware of his/her responsibilities (see above) and assist in meeting them.
- Constitute degree examination committees (candidacy exam, thesis defence). Schedule degree examinations in consultation with the student. Provide exam scheduling information to the Graduate Program Administrator.

Courses

Students in the Master's program take a minimum of three courses. Students in the PhD program take a minimum of three courses if they hold a Master's degree or a minimum of six courses after a Bachelor's degree. See details in Degree Requirements for each program below.

The list of graduate (500-level) Earth and Atmospheric Sciences courses, and undergraduate (400-level) courses open to graduate students is available on line (see EAS home page). _

Cross-listed Courses

Cross-listed courses are graduate (500-level) courses that have the same lectures as a 400-level undergraduate course. They have separate course outlines and separate assessment procedures from those for the undergraduate students. Although course content is similar, course workload and performance expectations are higher. Examples include additional reading lists, more extensive assignments, more substantial term projects or papers, and more challenging exams.

Reading or Research Courses

A reading or research (individual study) course is available to graduate students as EAS 520. It must be relevant to the student's program and cover material or topics not found in other courses. Graduate students may take one course (*3 weight) as EAS 520. Exceptions require approval of the Department.

Registration for reading or research courses is approved by the instructor; note that there is no guarantee that a course can be offered in a particular academic year, a result of varying faculty availability. The instructor provides the student with a written statement of title, content, work load, and grading before the course begins. A copy of the statement is placed in the student's file.

The instructor and student meet regularly. In the case of a reading course, a reading list is assigned at each meeting and forms the topic of discussion at the next meeting. In the case of a research course, a progress report is made by the student and discussed at each meeting.

A 400-level undergraduate course may be taken as part of a 500-level individual study course providing that:

- Additional reading assignments are set.
- Instructor and student meet regularly at scheduled times, at least once every two weeks, outside class hours.
- A reading list is assigned at each meeting and forms the basis of discussion at the next meeting.

For research courses, a progress report is made by the student at each meeting for continuing evaluation of progress.

General Regulations and Procedures of Thesis-Based Graduate Degree Programs

Time Limits for Completion: 4 and 6 years

For the MA or MSc, students must complete all requirements within **four years** of the term in which they first register (either as a candidate or a probationary student).

For the PhD, candidates must complete all requirements within **six years** of the term in which they first register.

Academic Standing

Course grades obtained by graduate students are found in the University Calendar, Section 23.4. Some important GPA benchmarks for graduate students are:

FGSR Minimum Admission GPA: 3.0

Minimum academic standing GPA: 2.7

Minimum course pass grade: C+ (grade point value 2.3)

A student whose academic performance is unsatisfactory is required to withdraw from graduate study. Students may not take re-examinations. Students who obtain a grade lower than the minimum pass (C+) or who fail a course need permission of both the Department and FGSR to retake the course. They may take another course instead, with approval.

Appeals

Grade appeals by graduate students are not within the jurisdiction of the FGSR, but instead that of the faculty from which the student took the course (e.g., Faculty of Science).

Other student appeals of academic matters are first heard by the course instructor or program supervisor. If the matter is not resolved, students contact the Associate Chair, who may consult the

Graduate Program Committee and the Department Chair. If the issue cannot be resolved within the department, then the student contacts the Associate Dean of FGSR. If resolution is not obtained, the appeal may further proceed to the University's Academic Appeals Committee.

Theses

Regulations for the preparation of theses are available from the FGSR website at (<https://www.ualberta.ca/graduate-studies/about/graduate-program-manual/section-8-supervision-oral-examinations-and-program-completion/8-4-thesis-requirements>). In case of uncertainty about allowed formats of thesis preparation, consult FGSR before proceeding.

The Department requires a bound, hard copy of your finalized (after defense and final corrections) thesis. It is customary for students to make an additional bound copy of the thesis for the supervisor, but it is not a requirement. Students are responsible for costs of preparing the thesis for examination and final submission. This includes drafting, printing, photography, reproduction, and thesis binding costs.

Thesis Collection

All students who carry out object-based research (i.e., which collects tangible or real items, like rock samples) must deposit a thesis reference collection with the Department. At an early stage of the program, the supervisory committee determines if a collection will be required. The committee notifies the departmental Collections Manager. During the program, the Collections Manager can advise the student on preparation of a collection, but responsibility to assemble the material rests with the student. The degree requirements are not satisfied until a thesis collection is deposited.

Ethics training requirement

All graduate students must complete a total of 8 hours of ethics training. Students normally fulfill this requirement by completing the on-line Graduate Ethics Training (GET) Course (5 hours of credit), which can be accessed from the following FGSR website (<https://www.ualberta.ca/graduate-studies/current-students/academic-requirements/ethics>), and ~3 hours of 'live' training by participating in two 1-1.5 hour ethics workshops, seminars, tutorials, etc. put on by FGSR or the Department. Details on these 'live' training opportunities are available from the FGSR web site, and from the EAS Graduate Program Administrator.

Professional Development training requirement

FGSR stipulates that all graduate students at the University of Alberta who started their programs on or after September 2016 are required to complete professional development (PD) training. This training consists of two components: 1) Completion of an Individual Development Plan (IDP); and 2)

8 hours of PD-related activities.

Component #1 of the PD training, the IDP, is a step-by-step worksheet that students must initially go through on their own. The worksheet can be obtained at the following website: <https://www.ualberta.ca/graduate-studies/professional-development/professional-development-requirement/individual-development-plan>. The worksheet consists of various self-assessments of a student's strengths and weaknesses and possible career paths that they may wish to follow. The student then receives feedback from a 'mentor' who discusses their IDP with them. The student is free to choose their own mentor (any faculty member or other person of authority in academia, industry or government who agrees to serve in this capacity) but the expectation is that the student's supervisor, if asked, will agree to be the student's mentor. It will be the mentor's responsibility to indicate in writing to the EAS Graduate Program Administrator that the student has completed their IDP in a satisfactory way.

Component #2 of the PD training can be fulfilled as follows: **1.** Complete any 4 of the on-line courses offered at MyGradSkills (<https://www.mygradskills.ca/>) (4 hours of training credit). **2.** Complete the required WHIMS safety training (2 hours of training credit). Note that this safety training is already a requirement for all grad students in EAS. **3.** Complete 2 hours of PD seminars offered by FGSR and/or EAS (check the FGSR and EAS websites regularly for when these seminars might be offered) (2 hours of training credit). Note that students may also fulfill their PD training component #2 in other ways (e.g., by taking 6 hours of PD seminars in combination with the WHMIS safety training) but the guidelines set above likely reflect the minimum time investment needed to fulfill the requirement.

Ethics in Research Involving Human Subjects

Students who conduct research involving human subjects (e.g., questionnaire surveys) submit a proposal for review by the Faculty of Science Ethics Review Committee. Students receive guidance in the process from their supervisor. Forms are available from the Graduate Program Administrator. Copies of the application and the decision of the Ethics Committee are kept in the student's file.

Public scholarly lecture requirement

In order to share their knowledge with fellow students, graduate students are required to give at least one scholarly public talk in the Department during their graduate program. Talks are to be a minimum of 15 minutes in duration. The subject can be in the general area of the student's specialization, i.e., it does not have to be on the results of thesis research. The ATLAS seminar series or ATLAS symposium are acceptable venues. ATLAS will keep track of students that have fulfilled their requirement in this manner and notify the Department. Other approved venues are possible; they

should involve an advertised public talk that can be attended easily by members of the Department, e.g., seminar in a research group or in another department. Preapproval is required.

The following are not an acceptable fulfillment of the requirement: in-class presentation, poster presentation, talk of less than 15 minutes duration, and conference or other off-campus presentation.

Completion of Program

Upon completion of the program, you are required to fill out the Final Checkout list in which you make sure your office is cleaned out, all equipment and materials have been returned, a thesis collection (if applicable) has been deposited with the collections coordinator and you have handed in a copy of your thesis on CD and made arrangements for a hard copy to be sent to the department. These are all requirements of the program. Your program thesis completion form will not be signed until this checkout sheet is filled out and all items are completed. http://easweb.eas.ualberta.ca/download/file/grad/final_checkout_list.pdf

Master's Degree (MA or MSc)

Purpose of the Master's

A Master's program allows a student to improve their understanding of a specialized area of knowledge and complete a research project of restricted scope under supervision. The program provides experience in planning, performing, and reporting research at an advanced level.

Degree Requirements

A student is admitted into the Master's program only if a faculty member acts as supervisor. The MA and MSc require course work, and research leading to a single-authored, original thesis.

The amount of course work depends on the match between the student's undergraduate training and the Master's degree research area, but a minimum of three single-term (*3) University of Alberta courses are required. No more than two courses (*6) can be taken from the same instructor. Additional courses may be necessary if there is a change from the undergraduate discipline to the graduate program. Students may not take more than one 400-level course and one cross-listed graduate course, or two cross-listed graduate courses, toward their degree requirements. Exceptions are considered by the Associate Chair in consultation with the Graduate Program Committee. Only one (*3) research or reading (directed study) course counts toward the requirement, unless otherwise approved.

Time Limit

An MA or MSc is expected to be completed within two academic years beyond a four-year Honors or Specialization degree from the University of Alberta or equivalent. A student normally completes data collection for the thesis by the beginning of the second academic year. The thesis is expected to be written in the second academic year and defended after that. The Department does not guarantee financial support or office space to a Master's student whose program extends beyond two academic years. The FGSR time limit for completion is four years (see above).

Master's Thesis Proposals

New Master's students submit a thesis (research) proposal in their second term.

- The supervisor assists in preparation. The proposal is submitted to the Department by March 15 following admission in September, and September 15 following admission in January.
- The proposal states the problem or gap in knowledge to be addressed and the overarching significance of that problem or knowledge gap for the discipline, describes scientific or other objectives, outlines techniques to be employed, and includes a relevant literature review. Details of how the project is to be funded, together with a schedule of milestones, are also included. Maximum length is 3,000 words, not including references, figures or tables. Up to 3 figures and 3 tables can be included in the proposal. A copy of applications for outside funding is appended if appropriate. Students submit 2 copies of the proposal.
- The lack of submission by deadline is considered as unsatisfactory program performance; it may be referred to FGSR for termination of the student's program.

Master's Thesis Proposal Guidelines are available at:

http://easweb.eas.ualberta.ca/page/graduate_information.

Examples of proposals can be reviewed in the Graduate Program Administrator's Office (1-26A ESB).

The Supervisor and the Supervisory Committee

Within a month of registration, a supervisory committee is constituted by the Supervisor. The committee consists of the supervisor and one other faculty member from the Department. If the student is co-supervised, the co-supervisors constitute the supervisory committee. Both the student and supervisor may request a change of supervisor during the program.

Thesis and Oral Examination (defence)

A Master's thesis demonstrates scholarly research and knowledge of relevant work published on the subject of the thesis. Two writing formats are allowed: (1) dissertation format; and (2) paper format

(see details at FGSR web site). The thesis is submitted to the examining committee at least three weeks before the oral examination. It is the supervisor's responsibility to constitute an examination committee (see below) and provide the information on the make-up of that committee to the EAS Graduate Program Administrator at least 4 weeks prior to the date of the exam.

As of Fall 2018, the master's thesis examination committee must have a minimum of 4 members, the supervisory committee, at least one additional arms-length examiner and an exam chair who is not an examiner. The exam chair must be a full-time EAS faculty member. The arms-length examiner is typically a faculty member or faculty service officer from the Department of Earth & Atmospheric Sciences or another department at the University of Alberta who was not a member of the student's supervisory committee and who has not had extensive involvement with the student's research program. Specifics on the eligibility of examiners is provided at: <http://uofa.ualberta.ca/graduate-studies/about/graduate-program-manual/section-8-supervision-oral-examinations-and-program-completion/8-2-the-structure-of-examining-committees> .

Persons other than the examiners, such as other graduate students, may attend the oral examination with the permission of the Dean or the chair of the examination committee. Note that:

- Permission must be obtained from the candidate and the chair of the examination.
- The persons may be present only when the candidate is in the room.
- They may not be present when the examination committee's decision is conveyed to the candidate.

What to Bring to the Defence

The candidate should bring the following two items to their thesis defence: 1) a hard copy of the thesis, and 2) a partially filled out, Thesis Completion/Program Approval form, which can be obtained at the following weblink:

<https://cloudfront.ualberta.ca/-/media/gradstudies/forms-cabinet/records/degree-certificate-completion/thesis-approval-program-completion-form.pdf>

The top half of the form should be filled out by the candidate prior to the exam (e.g., with the candidate name and ID number, exact thesis title, names of examiners) and given to the exam chair. If the exam outcome is successful (see below), the examiners will sign the form and Department administration will fill out the bottom half of the form.

Exam procedure

At the start of the examination, with the candidate absent, the supervisor outlines the candidate's academic background, courses taken for the degree, grades, and information relevant to program progress. The order of questioning is established by the chair. The candidate makes a presentation

(not more than 20 minutes) of the research results. One or more rounds of questions take place. Questioning should take not more than two hours, or until all examiners are satisfied that they can make a decision.

A discussion by the committee without the student present follows the questioning. Each examiner states a decision. If all members except one agree, the final decision is that of the majority. If two or more dissenting votes are recorded, the matter is referred to FGSR. Note that the exam chair does not vote on the outcome of the exam. The chair recalls the candidate and informs them of the decision. This is done with the committee present.

There are four possible decisions.

Pass:

The defence is satisfactory and no changes are required to the thesis. All examining committee members sign the thesis signature page.

Pass subject to revisions:

The student has satisfactorily defended the thesis but the revisions to the thesis are sufficiently minor that it will not require a reconvening of the examining committee. The department shall complete a Thesis Approval/Program Completion form and submit it to the FGSR indicating “pass subject to revisions”. In consultation with the examiners, the exam chair is required to prepare a report within 5 days of the thesis defense summarizing the main changes that the student must make to the thesis in order to make it acceptable. The report should be submitted to the EAS Graduate Program Administrator who will forward it to FGSR. It is expected that the student will make the changes in time to submit the thesis to the FGSR on or before the deadline for the next convocation. For this exam outcome, the exam chair and all examiners other than the supervisor typically sign the Thesis Approval/Program Completion form at the end of exam. The supervisor does not sign the form until the student satisfactorily completes the required changes. Other committee members may also wish to withhold their signature until they can verify that their required revisions have been made to their satisfaction.

Adjourned:

The examination is adjourned in the following situations:

- further research is needed
- required revisions of the thesis are substantial
- the general presentation of the thesis is unsatisfactory
- the defence is unsatisfactory, even if the thesis itself is acceptable with revisions

- an emergency situation occurs during the examination (e.g., medical, fire alarm).

When an examination is adjourned, the examination committee reconvenes at a later date. The committee chair follows the procedures outlined by FGSR and communicates these in writing to the student (specify deficiencies and revisions required, decide on date to reconvene the exam committee not later than 6 months, make clear what approval or conditions are needed to reconvene exam, state what assistance is available to the student, notify FGSR of arrangements).

Fail:

If the committee decides that the examination has been failed, the chair provides the reasons for the decision and the department's recommendation for the student's program to FGSR and to the student (e.g., required to withdraw). FGSR meets with the candidate and with the department before making a final decision, following the procedures outlined in the calendar (see FGSR website).

Transferring from the MA or MSc program to the PhD

A change of category can be granted in exceptional circumstances (outstanding academic record and potential of the student, expanded scope of the research project, and a demonstrated ability of the student to carry out and write-up independent research). Applications are reviewed on a case-by-case basis; a transfer is not considered after the 15th month of a Master's degree program.

Regulations of the PhD program apply retroactively upon approval of the change of category (in particular, the deadline for the PhD candidacy and the time limit for completing the degree, see below). For the purpose of calculating departmental financial support in a change of category, a student will be treated as if they had proceeded as an undergraduate directly to the PhD. They receive a maximum of five years of funding from internal or external sources (and maximum RAs = 5, see below). This includes time spent in the Master's program.

Application for transfer is made by the student and must include a letter outlining why the upgrade is being requested, and one or more examples of written documents demonstrating the student's ability to conduct and write-up independent research (e.g., undergraduate thesis, lead-authored publication). Written support from two members of the supervisory committee is also required. The case is reviewed by the Graduate Program Committee. If the decision is favorable, a recommendation of change in program status is sent to FGSR.

Master's Degree (course-based) – Integrated Petroleum Geosciences (IPG)

Petroleum exploration and production is increasingly multi-disciplinary in nature. A collaborative approach among geophysicists, geologists and petroleum engineers is critical during exploration, field development and resource exploitation. This program is offered jointly by the Department of Earth

and Atmospheric Sciences and the Department of Physics with the home department and administration in Earth and Atmospheric Sciences.

Degree Requirements

- Students must take 8 (*3) core courses and 4 (*3) optional courses.
- The optional courses will be offered by the Department of Earth and Atmospheric Sciences and the Department of Physics. The optional courses will be decided by discussion between the applicant and the Director of the IPG program.
- The program requires a minimum of *36 (12 *3 single-term courses or equivalent), that includes the following:
 - Eight core courses (*3)
 - Four optional courses (*3),
 - In addition, all students must complete the mandatory EAS Research Skills and Ethics training module.

Time Limit and Financial Support

The course-based MSc is a one full year program which has a start date in September of each year only. The Department does not guarantee financial support. This program has a limited amount of scholarships.

You may not transfer to the thesis-based MSc or PhD without first completing the IPG program. Progression into the winter term is contingent on attainment of a satisfactory GPA (2.7 as defined by FGSR) at the end of the Fall term. Transfer credit will not be allowed for any course that has been credited towards another degree. Other requests will be considered on a case-by-case basis.

Master's Degree (course-based) – Urban and Regional Planning (URP)

The Master's – Urban and Regional Planning program emphasizes land use planning and policy development to enhance community resilience to economic, social and environmental challenges. There is a practical focus on resilient planning – expressly on issues related to climate change, resource dependency, economic resiliency, winter cities and northern regions. The program is offered in a 2 year or 1 year (accelerated) format.

Degree Requirements

- **2 Year Program**

Completion of 13(*42) PLAN courses, consisting of: 11(*36) required courses and 2(*6) optional courses. In addition, all students must complete the mandatory Ethics and Integrity in Research training.

- **1 Year (Accelerated) Program**

Completion of 9(*30) PLAN courses, consisting of: 7(*24) required courses and 2(*6) optional courses. In addition, all students must complete the mandatory Ethics and Integrity in Research training.

Length of Program

The course-based MSc program in Urban and Regional Planning (Regular) is designed for completion within two calendar years beyond a completed undergraduate degree. The program must normally be completed within three years from admission.

You may not transfer to a MSc (thesis-based) or PhD program while completing the MSc URP program.

Financial Support

The Department cannot guarantee financial support, however there are a limited number of scholarships available.

The PhD Degree

Degree Requirements

A student is admitted into the PhD program only if a faculty member acts as supervisor. A PhD program involves the planning, execution, and reporting of independent research at an advanced level.

At least six single-term (*3) courses beyond the undergraduate level are required. At least three (total of *9 weight) are taken at the University of Alberta. Not more than two (*6) may be taken from the same instructor. Not more than one 400-level course and two cross-listed graduate courses, or three cross-listed graduate courses are allowed. Except with the permission of the Department, only one (*3) research or reading course may be taken (see description above).

To ensure that a student has the necessary knowledge, background, and ability to complete a PhD thesis, a candidacy examination is taken early in the program and normally not later than within 20 months of admission, see below. In the case of a transfer from a Master's into a PhD program, an extension to the candidacy deadline can be granted upon request by the student and supervisory committee and review by the Department's Graduate Program Committee.

Time Limit and Residence Requirement

A PhD should be completed within four academic years beyond a master's degree. The FGSR time limit is six years. The Department guarantees financial support and office space to PhD students for four academic years; exceptions are holders of major scholarships after the fourth academic year, and students who enter the PhD program directly from a Bachelor's degree. The minimum residence for a PhD is one academic year of attendance at the University of Alberta.

General

A student is admitted into the PhD program only if a faculty member is available as supervisor. A student's program is under the direction of a supervisory committee. The supervisor chairs the supervisory committee. The committee consists of the supervisor and at least two other faculty members, chosen by the student and supervisor when the student arrives on campus. Two members of the committee, including the supervisor, are from the Department of Earth and Atmospheric Sciences. The other members may be from other Departments. The committee meets at the beginning of the student's first term to discuss the research program, course requirements, and candidacy examination. It meets at least once a year to review progress after that.

By the end of the first year, the Department reports the membership of the supervisory committee to FGSR. The supervisory committee remains the same over a student's program. A student or committee member may request a change of membership. Changes in membership are reviewed by the Department, and FGSR is notified.

Thesis Proposal and Candidacy Examination

A doctoral candidacy examination is taken by PhD candidates, normally within 20 months of the candidate's enrollment in the PhD program. At least 8 weeks prior to the proposed date of the examination, the supervisor should establish a candidacy examination committee (see below) and arrange for the scheduling of the examination with the EAS Graduate Program Administrator.

The candidacy exam is primarily an oral examination that evaluates the candidate's general knowledge relevant to the chosen topic of thesis research and their ability to conduct independent research. The standard of the doctoral candidacy examination is the same across the University. As stated in the FGSR's regulations: <http://uofa.ualberta.ca/graduate-studies/about/graduate-program-manual/section-8-supervision-oral-examinations-and-program-completion/8-3-conduct-of-examinations> :

"Students must demonstrate to the satisfaction of the examining committee that they possess:

- **an adequate knowledge of the discipline and of the subject matter relevant to the thesis;**
- **the ability to pursue and complete original research at an advanced level.”**

The examination, which is aimed at determining whether the student is adequately prepared to continue as a doctoral student, is judged on the basis of both the candidate’s performance on the oral examination and on the quality of the thesis proposal (see below). The candidate is advised to consult with their supervisor and supervisory committee at least two months prior to the examination to obtain guidance on the subject areas that are likely to be the main focus of questioning in the oral examination.

A *thesis proposal* is a Departmental requirement. It is submitted not less than two weeks before the candidacy examination and can be used as a general basis for questions at the oral examination. The proposal must be less than 4000 words, not including references, figures or tables. It should: 1) outline the problem being addressed or gap in knowledge to be filled and explain the overarching significance of that problem or knowledge gap for the discipline, 2) review previous published work, 3) describe the proposed methods for solution, and 4) provide an approximate budget for conducting the research and a timeline for completing the research program. Up to 4 figures and 4 tables can be included in the proposal. The quality of writing and presentation in the thesis proposal is expected to be of publication standards.

The candidacy examination is not solely an examination of the thesis proposal. Students should be prepared for questions in areas related to and wider than the proposal, and examiners shall test comprehensive knowledge in such areas.

The EAS candidacy requirement is met when both criteria of 1) satisfactory thesis proposal and 2) satisfactory performance at the examination are met. The candidacy requirement is not met if the examination committee finds that either the proposal or the exam performance is unsatisfactory. The outcome in this case is either a conditional pass or a failure (see below).

The Examination Committee

Starting in Fall 2018, the examination committee must have a minimum of 6 members, the supervisory committee, at least two additional arms-length examiners, and an exam chair who is not an examiner. Normally, it is the Associate Chair Graduate who chairs candidacy exams but other full-time EAS faculty members can serve as chair if the Associate Chair is not available or is serving as an examiner. The arms-length examiners are typically faculty members or faculty service officers from the Department of Earth & Atmospheric Sciences or other departments at the University of Alberta. Specifics on the eligibility of examiners is provided at:

<http://uofa.ualberta.ca/graduate-studies/about/graduate-program-manual/section-8-supervision-oral-examinations-and-program-completion/8-2-the-structure-of-examining-committees>

The supervisor makes arrangements for the examination and notifies the EAS Graduate Program Administrator of the make-up of the examination committee. In the absence of the supervisor, the Associate Chair will make arrangements. It is the candidate's responsibility to become familiar with departmental procedures for the examination. These are described below; the supervisor or Associate Chair can be consulted for additional information.

The Examination

The examination process should not exceed three hours. The role of the chair is to:

- Review the procedure of the exam for the student before beginning.
- Ensure that the candidate has adequate opportunity (e. g, comprehension, time, and materials) to answer questions.
- Ensure that each member of the examining committee has adequate opportunity to question the candidate.
- Ensure that only questions are addressed to the candidate, i.e., that examiners do not inform, lecture, or otherwise influence the candidate, or debate with each other. The chair rules on whether questions are relevant.
- Remind the committee of possible exam outcomes (see below).
- Inform the candidate and FGSR of the result of the examination.

At the start of the examination, with the candidate out of the room, the supervisor outlines the candidate's academic background, courses taken for the degree, grades, and information relevant to program progress. The order of questioning is established by the chair. With the candidate present, the chair outlines the order of questioning. The candidate makes a presentation (~ 20 minutes) of the planned research and of progress to date. One or more rounds of questions take place. Questioning takes approximately two hours, or until all examiners are satisfied that they can make a decision; the candidate withdraws and a discussion is held.

Persons other than the examiners, such as other graduate students, may attend with the permission of the Dean or the chair of the examination committee. Attendance is subject to the following conditions:

- Permission has been granted to each person by both the candidate and the chair of the examination committee.
- They may be present only when the candidate is in the room.
- They may not be present when the examination committee's decision is conveyed to the candidate.

The Examination result

If all examiners or all except one vote the same way, the decision is that of the majority. The vote is not communicated to the candidate, only the majority decision. If there are two or more opposing votes, the case is referred to FGSR with a recommendation from the examining committee or a report from the chair. Note that the exam chair does not vote on the outcome of the exam. Once a decision has been reached, the chair recalls the candidate and informs them of the decision in the examination room, with the committee present.

The following are the possible results of the exam:

Pass:

The proposal and the exam performance are acceptable.

Conditional pass:

The proposal is inadequate or the exam performance is marginal. Specific conditions must be met by the student to pass, for example additional course work, directed study, or revision of the thesis proposal. In consultation with the examiners, the exam chair is required to prepare a report within 5 days of the candidacy indicating the conditions that the student must meet to pass the candidacy exam. The report should also specify the date before which the student must fulfill these conditions and who will determine that the conditions have been met (typically the supervisory committee). Normally, the conditions should be fulfilled within 6 months of the candidacy exam. The report of the exam chair should be sent to the EAS Graduate Program Administrator who will forward it to FGSR.

Failure:

Either the proposal or the exam performance is inadequate.

If the result is a failure, the committee adds one of the following recommendations to FGSR: 1) permission to repeat the exam within six months, 2) change of category to a master's program, or 3) termination of the program.

PhD Thesis and Oral Examination

The PhD Thesis

Results of program research are presented in a written thesis. A thesis must be of sufficient merit to meet the standard of a reputable scholarly publication. Two writing formats are accepted: (1) dissertation format; and (2) paper format (see FGSR web site).

Evaluation of the PhD Thesis

Before the submitted thesis is sent to an external examiner (see Examining Committee below), supervisory committee members notify the supervisor that the thesis is of sufficient substance and

quality to proceed. The committee has a minimum of three weeks to complete this evaluation. The external examiner must receive the thesis at least four weeks before the final oral examination (defence); in other words, the candidate must have the thesis ready at least seven weeks before the planned date of the final oral examination.

The Preliminary Acceptance of Thesis signed by the supervisory committee states that the thesis is of adequate substance to proceed to oral examination; it does not imply success of the thesis at the defence. If a supervisory committee member declines to sign the form, a period of not less than one month after submission and not more than three months is available to the supervisor, candidate, and supervisory committee members to resolve the issue(s) involved. If after three months all but one of the members have signed, the supervisor may proceed to set the date for the final examination and recommend an external examiner.

The external examiner receives the thesis at least four weeks before the final oral examination.

Examining Committee

It is the supervisor's responsibility to constitute an examination committee (see below) and provide the information on the make-up of that committee to the EAS Graduate Program Administrator at least 4 weeks prior to the date of the exam.

Starting in Fall 2018, the examination committee must have a minimum of 6 members, the supervisory committee, at least two additional arms-length examiners (one of whom is the external examiner), and an exam chair who is not an examiner. Normally, it is the Associate Chair Graduate who chairs PhD thesis defences but other full-time EAS faculty members can serve as chair if the Associate Chair is not available or is serving as an examiner. The external examiner participates in the exam either in-person or via teleconferencing or Skype. One of the arms-length examiners, the internal arms-length examiner, is typically a faculty member or faculty service officer from the Department of Earth & Atmospheric Sciences or other department at the University of Alberta. The second arms-length examiner is the external examiner (see below). Although not preferred by the Department, it is permissible for the external examiner to be a reader only of the thesis. In this case, the external provides the Associate Chair - Graduate with a written evaluation of the thesis and some written questions to be asked by the exam chair at the oral examination. In the case of an external reader, a fifth 'live' examiner must be added to the examination committee. Specifics on the eligibility of examiners is provided at:

http://www.gradstudies.ualberta.ca/facultystaff/~media/Faculty%20of%20Graduate%20Studies/forms/201311272013-11_Examining_Committee_Membership_Checklist.pdf

The external examiner is a recognized authority in the field of the thesis from outside the University and must be an experienced supervisor of doctoral students. The external provides critical analysis of

the work and its presentation. The external must not have current or previous association with the student, supervisor, or department that would hinder objective analysis. An individual who has been associated with the student as a mentor, collaborator, or co-author is not acceptable. An external examiner also may not have had recent association (within the past 6 years) with the supervisor as a former student, supervisor, or research collaborator. In addition, an external examiner should not have served in the same capacity in the Department in the preceding two years.

Once a potential external examiner has been identified, the supervisor should obtain the examiner's curriculum vitae and fill out the external examiner invite form, which can be obtained at:

http://www.gradstudies.ualberta.ca/~media/Faculty%20of%20Graduate%20Studies/forms/20140606Approve_External_Reader_or_Examiner_for_Final_Doctoral_Oral_Exam.pdf

The Department submits the name of the external examiner to the Associate Dean – Graduate at the Faculty of Science for approval at least 8 weeks in advance of the examination. The Associate Dean is specifically interested in the examiner's experience with PhD student supervision, scholarly publications and research, and any potential conflict of interest that would affect or be perceived to affect objective evaluation of the thesis. The submission consists of the external examiner invite form, a curriculum vitae and a summary of the examiner's qualifications. If approved, the Associate Dean sends a formal invitation to the external examiner, which includes instructions on how the thesis is to be evaluated. Once the invitation has been sent out, neither the supervisor nor the candidate should contact the external examiner unless instructed to do so by the Associate Chair – Graduate.

What to Bring to the Defence

The candidate should bring the following two items to their thesis defence: 1) a hard copy of the thesis, and 2) a partially filled out, Thesis Completion/Program Approval form, which can be obtained at the following weblink:

<https://cloudfront.ualberta.ca/-/media/gradstudies/forms-cabinet/records/degree-certificate-completion/thesis-approval-program-completion-form.pdf>

The top half of the form should be filled out by the candidate prior to the exam (e.g., with the candidate name and ID number, exact thesis title, names of examiners) and given to the exam chair. If the exam outcome is successful (see below), the examiners will sign the form and Department administration will fill out the bottom half of the form.

Examination Procedure

Faculty members in EAS have the right to attend the examination with the permission of the examination chair. Other persons, such as graduate students or members of the public, may attend the examination with permission of the Dean or the chair of the examination. They may not participate in

the questioning except by permission of the chair; they may not attend the committee's discussion of the student's performance. They are subject to the following conditions:

- Permission has been granted by both the candidate and examination chair for each person.
- They may be present only when the candidate is in the room.
- They may not be present when the examination outcome is conveyed to the candidate.

The final oral examination judges 1) the thesis and 2) the candidate's ability to defend its substance. The examination process should not exceed three hours. After informing the student of the order of procedure, the chair asks the student to withdraw. The supervisor reviews the student's academic progress in the original research program. The chair establishes the order and length of examination questioning, with the external examiner and out of department examiner being given priority, and the supervisor generally last.

The student returns and makes a brief presentation of the thesis (not more than 20 minutes). Questioning takes place for approximately two hours, or until all examiners are satisfied that they can make a decision. Once questioning is complete, the candidate withdraws. A discussion follows.

Each examiner states their opinion with respect to 1) the content of the thesis, and 2) its defence. Examiners may change their original vote during discussion. If all examiners except one vote the same way, the final decision is that of the majority, unless the dissenting vote is by the external examiner. In this case, the examination is referred to the FGSR for a decision. If two or more dissenting votes are cast, the case is also referred to FGSR. Note that the exam chair does not vote on the outcome of the exam. Once a decision has been reached, the chair recalls the candidate and informs them of the decision in the examination room, with the committee present.

Possible decisions:

Pass:

The defence is passed and no changes are required to the thesis. All examining committee members sign the Thesis Approval/Program Completion form.

Pass subject to revisions:

The student has satisfactorily defended the thesis but the revisions to the thesis are sufficiently minor that it will not require a reconvening of the examining committee. The department shall complete a Thesis Approval/Program Completion form and submit it to the FGSR indicating "pass subject to revisions". In consultation with the examiners, the exam chair is required to prepare a report within 5 days of the thesis defense summarizing the main changes that the student must make to the thesis in order to make it acceptable. The report should be submitted to the EAS Graduate Program Administrator who will forward it to FGSR. It is expected that the student will make the changes in

time to submit the thesis to the FGSR on or before the deadline for the next convocation. For this exam outcome, the exam chair and all examiners other than the supervisor typically sign the Thesis Approval/Program Completion form at the end of exam. The supervisor does not sign the form until the student satisfactorily completes the required changes. Other committee members may also wish to withhold their signature until they can verify that their required revisions have been made to their satisfaction.

Adjourned:

The examination is adjourned in the following situations. The committee will reconvene the exam at a later date:

- required revisions of the thesis are substantial,
- the thesis presentation is unsatisfactory overall
- further research or experiments are needed
- the defence is unsatisfactory, even if the thesis itself is acceptable
- an emergency situation occurs during the examination (e.g., medical, fire alarm).

When an examination is adjourned, the committee chair follows the procedure outlined by FGSR by setting the date and conditions for reconvening the exam, and informs the student in writing.

Fail:

If the committee decides that the examination has been failed, the chair provides the reasons for this recommendation and the department’s decision for the student’s program to the FGSR and to the student. Following procedure, FGSR will meet with the candidate and with the Department before making a final decision.

Financial Support and Graduate Assistantships

Fellowships, Scholarships and Bursaries

Fellowships, scholarships, and bursaries for full-time graduate students come from national, provincial, university, and other funding sources. Recipients of major awards may be given additional funding in the form of a one-half teaching assistantship during tenure of the award.

Examples of major awards are:

- NSERC scholarship (MSc and PhD) – only Canadian citizens and landed immigrants
- SSHRC scholarship (MA and PhD) – only Canadian citizens and landed immigrants
- Vanier scholarship (PhD)

- Queen Elizabeth II scholarship (master's and PhD) – only Canadian citizens and landed immigrants
- Andrew Stewart Memorial Graduate Prize (MSc and PhD)
- Izaak Walton Killam Memorial Scholarship (PhD)

A number of specialized University awards are made each year in recognition of achievement in specific research areas or other criteria. Students are nominated by their supervisor but may initiate the process. The Associate Chair, after input from the Graduate Program Committee if appropriate, forwards the nomination to the appropriate university adjudication committee. Details and application forms are available from the Graduate Program Administrator.

Research Travel Grant

FGSR offers a grant to provide every graduate student with the opportunity for travel to expose their research results to peer review, test ideas with outside experts, etc. The grant normally supports attendance at one major national or international meeting where the student is presenting a paper or poster or formally participating in a panel. The application form is available on line from FGSR at <http://www.gradstudies.ualberta.ca/awardsfunding/scholarships/index.htm>.

TA and RA: Graduate Assistantships (Teaching and Research)

Purpose of assistantships

A graduate assistant is a registered student in a graduate program that is paid to carry out teaching or research duties. The purpose of assistantships is:

- To assist the Department in its teaching and research responsibilities; and
- To provide training to graduate students through experience in teaching or research.

A full teaching assistantship carries teaching-related duties of twelve hours per week for a 4-month term. TA's are normally held for the eight-month teaching year, September 1 to April 30. The salary amounts are adjusted regularly following contract negotiations with the university's Graduate Students Association (GSA). In 2017-2018, the eight-month salary for a first-year master's student is \$17,278; for a first-year PhD student, it is \$18,312.

Duties and Responsibilities

Teaching duties include preparation of assignments, demonstrating in laboratories and/or seminars, marking assignments, and teaching on field trips under the supervision of the course instructor. Research assistantships involve primarily research supervised by a faculty member, i.e., thesis work.

From the start of term until 5 days after final exams in both terms, assistants remain on campus and assign first priority to their assistantship duties unless released by their supervisor. After the examination period, teaching assistants are expected to store appropriately all teaching materials used during the term. Any absence during the teaching term requires the advance approval of the course instructor and the Associate Chair, using an "Absence from Campus" form (available online in the EAS Forms Cabinet).

Criteria for Allocation of Teaching Assistantships

The following criteria guide the allocation of teaching assistantships:

- Teaching needs in the area of the student's expertise.
- Academic quality and teaching potential or ability of the student.
- Appropriate distribution of teaching support among areas within the Department.

Teaching Evaluations

Teaching performance of graduate students is evaluated by the class students at the end of the course. Data are confidential. They are reviewed by the Associate Chair. They may be used in nominations for teaching awards by the Graduate Students Association and the Faculty of Science, and are considered before awarding further teaching assistantship duties.

Renewal of Assistantships

Students must perform satisfactorily both in their own program and as graduate assistants, to have their TAs renewed. In addition to the teaching evaluations the Department reviews reports received from program supervisors and from course instructors.

- Renewal is contingent on satisfactory academic performance. Grades lower than B- in two courses (or one full-year course) or a GPA lower than 2.7 are considered as unsatisfactory performance.
- For master's students, a condition is the submission of a satisfactory thesis proposal.

Graduate assistantship funding is not terminated without warning. If after discussion between the student, the Associate Chair, and the supervising faculty member, a student's assistantship is terminated for unsatisfactory performance, one month's notice is provided.

Research Assistantships (Summer Support)

Research Assistantship (RA) funding is made available to provide financial support for graduate student research during the summer months (May through August).

Definition and General Regulations

RAs are offered to students with a guarantee of financial support for the duration of their program, i.e., an admission TA or a guarantee to provide a TA following tenure of a major scholarship or fellowship. All students do not automatically receive a Research Assistantship.

Departmental policy (see below) specifies the period of funding.

RAs are intended to support full-time graduate students. A student may not hold an RA and take on paid work during summer months. If a student accepts paid employment for all or part of the summer, they must notify the Associate Chair. The value of the RA will be adjusted to exclude the employment period.

Students in the Master's Program who are eligible for RA support receive it in the summer of their first and second years. Students in the Ph.D. program receive it in the summer of years 1, 2, 3 and 4 of their program. Students who enter a Ph.D. program directly from an undergraduate degree or transfer into the Ph.D. from a Master's program will receive an RA in the summer of years 1, 2, 3, 4, and 5 of their program, as long as they are eligible for RA support (no employment as noted above). When a student does not use an RA in a summer when they are eligible, it cannot be transferred to a subsequent summer.

The amount that the Department allocates in a given year depends on:

- funding provided by the Faculty of Science;
- the number of eligible students;
- satisfactory academic progress (see TA renewal above);

A 4-month RA is a minimum of \$5000 for master's students and \$5500 for PhD students (2017-2018). Qualifying students are not considered for an RA.

Each summer on a major scholarship or other support (e.g., supervisor funds or employment) removes eligibility for one RA. For example, a PhD student who has a two-year NSERC scholarship remains eligible for a Research Assistantship for the third and fourth summers. If the student wins another major award which covers funding for the third and fourth summers, however, then they will no longer be eligible for those summers. Note that the holding of a major award at any time during the PhD program does not create automatic eligibility for an RA after the fourth summer.