

# *Physics Graduate Studies Handbook*

*Department of Physics  
University of Alberta*

*Updated July 2022*



## Statement of Principles

The successful completion of a program of graduate studies requires that students, faculty and the Department as a whole recognize that each has expectations of, and responsibilities toward, each other.

Faculty and students have a mutual responsibility to:

- treat one another with dignity and respect,
- maintain regular and adequate communication,
- establish, by mutual agreement, reasonable goals including dates for completion of assignments, projects and theses.

The Department has a responsibility to maintain a dynamic program. It is the responsibility of the students to utilize the opportunities available, and to contribute to a positive atmosphere in the Department.

The Department shall:

- ensure that supervisors and students are regularly informed of deadlines established by the Department, by the Faculty of Graduate Studies and Research (FGSR), and by the University,
- apprise supervisors and students about the availability of scholarships, fellowships and other forms of financial support; students, in turn, have a responsibility to make use of these sources of funding,
- provide adequate office space and support facilities to meet students' academic needs,
- provide appropriate advice and counseling in an atmosphere which ensures treatment with respect, fair play and confidentiality.



## Purpose of this Document

This Handbook is intended to serve as a guide for Faculty, Graduate Students and Support Staff who participate in the graduate programs in Physics at The University of Alberta. It contains:

- a summary of the regulations established by the University and by the Faculty of Graduate Studies and Research (FGSR), which apply to all graduate students at the University.
- the detailed regulations that apply to graduate students in Physics.

Special attention should be paid to the sequence of steps and deadlines that must be met in order to fulfill the administrative requirements of a graduate degree program.

This document reflects the Department's policies that pertain to the Graduate Program as of July 1, 2020. We also reference sections of the University Calendar, <http://calendar.ualberta.ca/>, and the FGSR Grad Manual, <http://uofa.ualberta.ca/graduate-studies/about/graduate-program-manual>.



## About the Authors

This document was written by the Department's past Associate Chairs, Graduate Studies. Claire Currie, Associate Chair, and Rae Beaumont, the department's Graduate Program Coordinator, maintain the current version.



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## 1 Administration of Graduate Programs

### 1.1 Academic schedule

The University of Alberta Calendar, <http://calendar.ualberta.ca/>, is the published authority on matters pertaining to graduate programs. The Academic Schedule, including critical dates, is posted in the online document. Deadlines for registration, convocation, and examinations are firm.

### 1.2 Faculty of Graduate Studies and Research (FGSR)

While graduate students and supervisors deal directly with the Associate Chair and the Graduate Program Administrator, ultimate responsibility for the administration of graduate programs lies with the FGSR. The FGSR approves the admission of students, changes to programs, and the appointments of supervisors, supervisory and exam committees. The FGSR also sets deadlines for the payment of fees, for completion of programs, and for the meetings of some committees.

The Faculty of Graduate Studies and Research, 2-29 Triffo Hall, is open Monday-Friday 08:30-16:00. Their office is closed during the lunch hour (12:00-13:00).

*University services are closed during holidays.*

### 1.3 Introduction to the Physics Graduate Office staff

The Associate Chair for Graduate Studies (Professor Claire Currie), the Graduate Program Administrator (Kailey Robertson, on leave), and the Graduate Program Coordinator (Rae Beaumont) are the primary departmental contacts for graduate students. Students should feel welcome to bring concerns regarding their program, their supervision, and their courses to the Associate Chair. It may occasionally be useful to discuss one's program with someone who is removed from the supervisory committee.

The Graduate Program Coordinator (Rae Beaumont) handles a wide variety of concerns of graduate students. These include procedural details, registration, office space, payroll, and information about deadlines; typically this includes most non-academic matters.

The Department of Physics is open Monday to Friday, 8:00–12:00 and 13:00–16:00.

### 1.4 Admission to graduate programs

Decisions regarding admission to our graduate programs are made by the department's Graduate Admissions Committee. All applicants must have a University of Alberta baccalaureate degree or its academic equivalent from another recognized academic institution and must demonstrate English language proficiency. To be considered for admission to graduate programs in the Department of Physics, applicants must meet the minimum requirements posted on our website, <http://uofa.ualberta.ca/physics/graduate-studies>. New students normally begin their graduate programs in September although we occasionally accept an applicant's request for January admission. Some offers of admission are made in December, while the majority of offers of admission are made in February and March; applicants should submit their application and all required supporting documents by the published deadline (typically early December) to be considered for all scholarship opportunities. Late applications may be considered if positions are still available.

Students applying for an MSc program should have the equivalent of the honours BSc in physics, geophysics or a related field. Students with less preparation may be considered, but if admitted as provisional students, are likely to be required to take additional courses.

## 2 Academic and Professional Goals of Thesis-Based Programs

The holder of a graduate research degree from this Department must have completed a research project presented in the form of a thesis which has been successfully defended, and must have completed a minimum number of formally instructed courses such that the following goals have been achieved:

- 1) The student has developed expertise in a well-defined subdiscipline of Physics such that, subsequent to

graduation, he/she is capable of designing and implementing a program of independent research in that area of specialization, and is capable of teaching advanced-level (senior undergraduate and graduate) courses in that specialized area.

- 2) The student has acquired a general knowledge of Physics such that, subsequent to graduation, he/she is capable of teaching a wide range of Physics subjects at the junior and intermediate undergraduate levels.

PhD students are held to higher expectations. In particular, the student must demonstrate the ability to independently pursue original research.

### **3 Responsibilities and Expectations of Students and Supervisors**

#### **3.1 Topics to discuss at the first meeting with the student**

Mutual expectations and responsibilities should be discussed early and openly in the early stages of the student-supervisor relationship. Some of the topics to be discussed include: absences and vacation, employment, working hours on campus, time spent in the lab or in the office, authorship and the order in which coauthors would appear in publications, participation in national and international conferences, modes and frequency of communication expected between supervisor and student. In addition to these and the others listed on the "Checklist/Milestones" form, any other topic deemed important by the student or the supervisor should be part of this initial discussion or later, as questions or issues arise.

#### **3.2 Responsibilities of graduate students (see also [the Calendar](#))**

Graduate students are responsible for their own programs. They are expected to read the Calendar and other relevant documents and to familiarize themselves with the regulations and deadlines that apply to them. Students must ensure that their registration is current and correct, that all fees are paid, and that all required forms and documents are completed, signed, and submitted by the due dates. The Department's milestones for the MSc and PhD programs are in Appendices [A](#) and [B](#). On entry into our graduate program, each student will, with advice from the Associate Chair and thesis supervisor, develop an individualized program timeline.

International students are responsible for ensuring that their study permits and related documents are valid, and that they and their dependents who are in Canada are living, working and studying in accordance with Canadian laws. It is the responsibility of the student to give the Graduate Program Administrator a copy of the student's current, valid, study permit.

Graduate students must maintain open communications with their supervisors, with the Associate Chair and with the Graduate Program Administrator. Those individuals must be informed regularly about progress in each student's program, and students should seek their assistance as soon as possible when problems arise.

Many things unfortunately take longer than we expect. Students must plan their activities carefully to ensure that the program is completed in a reasonable length of time. They must establish a framework for their program as soon as possible and become engaged in the intellectual issues of the discipline without undue delay. Remain focused. Solve problems as they arise to avoid a major crisis later which may delay completion of the program.

Upon completion of the program, the student takes full responsibility for future employment. This is worth considering along the way as opportunities for supplementary educational opportunities arise. Students should attempt to obtain diverse skills throughout their program, and give serious thought to the employment options that might be most suitable. Note that the various Professional Development activities provided by the Faculty of Graduate Studies & Research (FGSR; see <https://www.ualberta.ca/graduate-studies/professional-development/professional-development-requirement>) provide excellent opportunities for identifying and developing these skills. The FGSR now requires students to prepare an individual development plan, and to engage in 8 hours of professional development activities inspired by your plan, but we encourage students to do more as they find useful for planning their future.

Students should not expect monetary support beyond the department's guaranteed funding, as stated in the financial offer you received from the Department when you were recommended for admission.



### 3.2.1 What supervisors expect of graduate students

- enthusiasm, curiosity and commitment in research and coursework; appropriate action to meet deadlines, and to discuss difficulties when they occur; taking “ownership” of and responsibility for their education.

### 3.3 Responsibilities of supervisors (see also [the Calendar](#))

The supervisor is directly responsible for the supervision of the student's program. This means that the supervisor, in collaboration with the supervisory committee, will assist the student in planning the research program and in selecting courses to meet program requirements.

The supervisor must be familiar with University, Faculty, and Department regulations, and with deadlines pertaining to graduate programs.

The supervisor and the student will agree on realistic timelines for the achievement of program milestones and for completion of the program. The Department's milestones for the MSc and PhD programs are in Appendices [B](#) and [C](#). At the start of the student's graduate program, the supervisor and Associate Chair will work with the student to develop an individualized timeline, which will be regularly revisited and adjusted by the supervisory committee (see below) during the student's program.

The supervisor will ensure that the student is able to work under conditions that are secure, comfortable, conducive to progress in research and study, and which allow the student to grow intellectually. The student will be provided with all necessary material and supervisory resources. The supervisor is responsible for the provision of the resources that are directly related to the student's research.

Other roles and responsibilities of the supervisor includes:

- creating a supervisory committee;
- maintaining regular and frequent communications;
- providing access to research instruments and facilities appropriate to the student's research;
- providing a summer stipend for students during the normal funding period (2 years for MSc, 4 years for PhD);
- treating the graduate student as “a junior colleague in research”; the relationship will be of mutual benefit to their intellectual and professional development.

Under normal circumstances, graduate students, particularly in the PhD program, should be provided with the opportunity to report the results of their research at an academic conference. Students can apply to the Faculty of Graduate Studies and Research (<https://www.ualberta.ca/graduate-studies/awards-and-funding/scholarships/fgsr-graduate-travel-awards>) and to the Graduate Students' Association (<https://www.ualberta.ca/graduate-students-association/funding/gsa-academic-travel-grants>) for supplementary funding for conference travel.

### 3.3.1 What students expect of supervisors

- a dynamic, challenging, and interactive atmosphere;
- that the supervisor will make available the basic tools for the student's research;
- an opportunity to report the results of the research outside of the University;
- monetary support, if available, throughout the “normal period of progress” toward the degree, including summer RA support from the supervisor.

### 3.4 Supervisory committees ([Calendar](#))

All graduate students in the Department of Physics must have a supervisory committee. Additional information about supervisory and exam committees is found below in sections 4.9 and 4.10, and in Section 8 of the [FGSR Grad Manual](#).

### 3.4.1 The annual review by the supervisory committee (Calendar)

As per FGSR regulation, the supervisory committee will meet at least annually to evaluate and provide input on the student's progress. The format of the meeting is variable, and is at the discretion of the supervisory committee. In some cases, an informal discussion and review of the student's course work and course marks will suffice. In other cases, the committee will want written and verbal reports from the student. If not told otherwise, students will make a short (20 minute) presentation in which they will: a) outline their research topic and objectives; b) summarize the progress accomplished to date; c) present a timeline for completing the project.

This presentation will be followed by a discussion with the committee members. Supervisory Committees may also require a brief written progress report from the student, prior to the meeting.

Departmental financial support is conditional upon demonstration of satisfactory advancement toward the degree and is therefore contingent upon the written annual report of the supervisory committee. Students who fail to have a satisfactory performance may be placed on academic warning and, failing to improve their performance, may become ineligible for TA and RA support.

### 3.4.2 Supervisor on leave / acting supervisor (Calendar)

A supervisor who is on leave or absent for an extended period must ensure in advance that an acting supervisor has been appointed. The acting supervisor must be acceptable to the student and to the Associate Chair and should be a member of the student's supervisory committee. For the duration of the absence from campus, the supervisor must provide the student with the means - telephone numbers or email addresses - to maintain quick, convenient and regular (at least weekly) contact.

### 3.4.3 Supervisor retiring

If a supervisor retires before a student has completed the requirements for a degree, i.e., before the thesis has been defended, there need be no change in supervisor as long as she/he continues to meet the eligibility criteria stated in the Calendar. If, however, the supervisor becomes unavailable to supervise after retirement, then a new supervisor will be appointed in consultation with the student, the supervisory committee and the Graduate Coordinator.

## 4 Graduate Program Requirements for all Programs

### 4.1 Grading system and general requirements

Students will be evaluated in individual courses with a letter grading system (A+, A, A-, B+, B, B-, C+, C, C-, D+, D, F), and with a four-point scale of numerical equivalents for their grade point averages (GPAs). The grading policy is set for each course by the instructor, and final grades must be approved by the Associate Chair of Graduate Studies. The minimum passing grade in graduate courses is C+ (2.3) and students must maintain a grade point average of at least 2.7 (B-) in order to remain as graduate students in their program. A student with a GPA below 2.7 but not below 2.3 will be recommended for academic probation. If the GPA falls below 2.3, a recommendation will be made to the FGSR that the student withdraw from the graduate program. A one-semester course with 3 hours of lectures a week is counted as 3 credits. Most courses are worth 3 credits, however some shorter one-credit courses are sometimes offered.

The Physics Department requires that students take at least 4 courses in the MSc program, and at least 2 courses during the PhD program. Students should complete at least one of the core graduate courses (Phys 511, Advanced Quantum Mechanics; Phys 524, Classical Electrodynamics; and Phys 530, Statistical Mechanics) during an MSc, and should complete two by the completion of their PhD. Geophysics students must complete Geoph 521, if they have not already done so. Additionally, a student's supervisory committee may recommend specific courses. The Chair has the authority (which is normally delegated to the Associate Chair) to act upon these recommendations.

Notwithstanding absences related to conferences and field trips, students are expected to attend seminars given in their respective areas, and weekly departmental colloquia.

#### 4.2 **Satisfactory academic performance (Calendar)**

Satisfactory academic performance is determined by:

- a minimum GPA requirement for "Satisfactory Academic Performance" of 2.7 (over at least 9 credits) and
- a ranking of "satisfactory" in the annual supervisory committee meeting. Satisfactory performance is required for continued support from Graduate Assistantships. A student who does not maintain satisfactory academic performance may lose their financial support.

#### 4.3 **Academic warning and Academic probation (Calendar)**

Students who fail to maintain good academic standing or satisfy requirements set by their department or supervisory committee may be put on Academic Warning. Students would then be informed of the required actions in order to clear this condition. Failure to clear the conditions for Academic Warning could lead to the student being put on academic probation.

Students whose academic standing, whether GPA or general performance, falls below satisfactory standards, who fail to satisfy FGSR or departmental requirements, or who were on academic warning and fail to clear this condition will be placed on academic probation. Students and supervisors will be told the reason(s) for the academic probation, and will be given clear directions regarding what must be done in order for the probation to be cleared. While on academic probation, students may continue to be hired as teaching or research assistants, but they may become ineligible to hold certain scholarships. Failure to clear the conditions of the probation after a prescribed period, however, will result in a recommendation to the FGSR that the student withdraw from the program. Whether or not this recommendation to withdraw is approved by the FGSR, the student will be ineligible to work as a teaching or research assistant in the Department.

#### 4.4 **Course planning and audits**

Several of our elective courses are offered only if five or more students are registered. For planning purposes, the Department might ask students – before the term starts - to indicate to which courses they intend to register. Students are charged for any course that they audit, over and above their full time registration or program fees.

Students are required to pass at least 3 full courses (9 credits) with a GPA of at least 2.7 during the first year of their program.

#### 4.5 **Course withdrawals**

Students should discuss any proposed course withdrawals with the Associate Chair. Withdrawals after the registration deadline will incur a fee for withdrawn courses, **plus** the potential additional cost of adding a Thesis course in order to maintain full time registration. Consult the [Calendar Academic Schedule](#) for the relevant deadlines.

#### 4.6 **Ethics and Academic Citizenship requirement (NEW - Calendar)**

Graduate students are required to complete the Ethics and Academic Citizenship Requirement before graduating. More information is found here: <https://www.ualberta.ca/graduate-studies/professional-development/ethics/new-ethics/index.html>. **The Department of Physics requires that this training take place during the first year of a student's program.**

The training consists of two zero-credit, self-paced online courses:

- 1) INT D 710: Ethics and Academic Citizenship (for both Masters and doctoral students); and
- 2) INT D 720: Advanced Ethics and Academic Citizenship (for doctoral students).

Students who completed the EAC requirement during their MSc studies at the U of A will not be required to repeat the EAI training if they also do a PhD in Physics at the U of A.

*The department will absolutely not set up a PhD candidacy exam nor a final MSc or PhD exam until after the student has shown us proof of having completed both the Ethics requirement and the Professional Development requirement.*

#### 4.7 Professional Development (Calendar, FGSR Grad Manual and FGSR website)

- The FGSR requires that within 12 months in the MSc program, or 18 months in the PhD program, students submit to the Department an Individual Development Plan (IDP). This plan should be given to the Physics grad office.
- Professional development is required for students starting their programs in or after September 2016. Students starting prior to September, 2016, may participate in professional development opportunities if they wish to do so. As with Ethics and Academic Integrity, graduate students are required to get eight hours of formal training in professional development (PD). More information is on the website of the FGSR. Download the PD form from the FGSR's online forms cabinet, complete it, and turn it in to the Graduate Program Administrator. Per the FGSR Grad Manual, master's students must submit their PD plan to the Department within 12 months of starting their programs; PhD students have 18 months to complete/submit their PD plans.

More information concerning the professional Development requirement and the IDP can be found at <https://www.ualberta.ca/graduate-studies/professional-development/professional-development-requirement>.

*The department will absolutely not set up a PhD candidacy exam nor a final MSc or PhD exam until after the student has shown us proof of having completed both the Ethics requirement and the Professional Development requirement.*

#### 4.8 Annual Seminar

Starting the second year of graduate studies, each MSc and PhD student in the department is required to present the results of his or her current research at least once per year at an organized department seminar series, or at the Institute for Geophysical Research conference for those students whose supervisors are members of the IGR. The proof of the presentation (a note from the convener) is added to the student's folder and considered by the annual supervisory committees.

#### 4.9 Thesis production

Students are expected to consult the FGSR's thesis preparation guide found at <http://uofa.ualberta.ca/graduate-studies/current-students>. For reference, previously approved copies of theses are available in CCIS 4-196. However, because thesis format requirements change over the years, recent FGSR guidelines are the ultimate authority.

The Department requires that the student produce two copies of a thesis, to be printed single-sided on thesis bond and taken to McCallum Printing for binding. The copies are for 1) the Department *via* the Graduate Program Administrator and 2) the supervisor. Additional copies are usually printed for personal use. Costs associated with thesis production are the responsibility of the graduate student. The department will pay for the department's copy. If asked, the Graduate Program Administrator will give you the signed indent form for the department's copy.

#### 4.10 MSc programs, specifically

For the MSc program, a minimum of \*12 (4 one-term 3-credit courses) is required of students with the equivalent of an Honours BSc degree from the University of Alberta. A minimum of two courses must be taken at the 500-level or above in the Department of Physics. Students taking courses in other departments (or at other universities) will need prior approval from their supervisory committee and the consent of the Associate Chair.

Students are encouraged to choose a research supervisor as soon as possible after beginning a graduate program. In particular, students registering in September must have a supervisor by January 15 of their first

year. Also by January 15 of their first year, a supervisory committee should be appointed for each student. This committee consists of the supervisor(s) plus two more faculty members. One of the committee members may be from a different department. The supervisory committee meets with the student at least annually and is responsible for monitoring his/her overall progress.

#### 4.10.1 Annual supervisory committee (“Blue sheet”) meeting

The main purpose of the supervisory committee is to oversee and provide general guidance to the student in the several aspects of his/her pursuit of the thesis-based MSc degree. This includes recommendation of courses to be taken, assessment of progress in research and the feasibility of the timeline proposed to complete the degree.

The supervisory committee must meet with the student annually to go over the progress accomplished, assess the timeline for the completion of the degree, and provide guidance as needed. The committee will also make a formal recommendation on the candidate’s potential for graduate work.

At each blue sheet meeting, the student normally makes a short (~20 minute) presentation describing progress accomplished thus far, giving a general outline of a proposed research project and a timeline for completion. After the meeting, the committee will recommend one of the following:

- a) The student’s progress is satisfactory; the student should proceed with the MSc program.
- b) The student transfer to the PhD program.
- c) The student’s progress is unsatisfactory; the student should withdraw from the MSc program.
- d) Other recommendation(s), including possible conduct probation, or academic warning or probation

The committee may also make any other comment or recommendation that it deems relevant. Departmental financial support is conditional upon demonstration of satisfactory advancement toward the degree and is therefore contingent upon the written annual report of the supervisory committee.

#### 4.10.2 Thesis and final oral examination

A research project is required, the results of which are to be presented in a thesis and defended in a final oral examination. The examining committee should consist of at least three members present at the final exam.<sup>1</sup> Normally, the exam committee is composed of the supervisory committee members plus the additional “arm’s-length” examiner. The supervisor is responsible for establishing the committee and arranging for the final examination. The Faculty of Science must approve the committee before the examination may take place. A minimum of four weeks’ notice is required for a thesis defense examination. Full details of the proposed committee plus the thesis title must be submitted to the Associate Chair at least four weeks in advance of the defense. The student must provide all members of the examining committee with a final copy - a hard copy, if so requested - of the thesis at least three weeks before the defense. No modification of the thesis is permitted between the time it is sent to the examiners and the time of the defense.

The exam is conducted as described in the Department’s “Procedures for MSc and PhD Oral Examinations” (online at <http://uofa.ualberta.ca/physics/graduate-studies> and from the Physics grad program office). The research of the student is introduced in a public oral presentation at the beginning of the defense. Then follows an examination period conducted behind closed doors. Only the members of the examining committee, or those present under FGSR regulations, are permitted during the examination portion of the defense. Regarding attendance at an MSc final exam, the FGSR’s Graduate Program Manual states:

“Except for the Dean, FGSR, or a Pro Dean (the Dean’s representative), who may participate fully in the examination, persons other than the examiners may attend only with the approval of the Dean, FGSR, or the chair of the committee.

Visitors may not participate in the committee’s discussion concerning its decision on the student’s performance and must withdraw before such discussion commences.”

<sup>1</sup> An examiner can be “present” by attending the exam in person or by teleconferencing. Teleconferencing guidelines are found in the [Calendar](#).

At the end of a successful thesis defense, the examiners will sign the “Thesis Approval/Program Completion” form that has been prepared by the Associate Chair’s office. In the event of an unsuccessful thesis defense, the supervisor should meet with the Associate Chair to discuss what further action, if any, is required.

In preparing one’s thesis, students should consult the thesis preparation guide found on the [FGSR website](#) in the Current Students section. The student is responsible for the binding and distribution of an appropriate number of copies of the final version of the thesis.

#### 4.10.3 Other requirements

The minimum period of residence for the MSc is one year of full-time attendance at the University of Alberta. The Faculty of Graduate Studies and Research time limit for completion of an MSc program is four years. No competence in any language other than English is required for the MSc.

As per the [University Calendar](#), “Over the duration of their program, students in thesis-based master’s programs admitted Fall 2011 and thereafter must pay the equivalent of at least one full year of program fees”.

#### 4.10.4 Transfers from the MSc program to the PhD program

It is possible to be admitted as an MSc student and later transfer into a PhD program without completing the MSc degree. This is normally done during the first year of the program and requires a strong academic record, recommendations from both the research supervisor and the supervisory committee (at its “blue sheet” meeting with the student), and the student’s consent to the change of category. A student who transfers to a PhD program is then treated as if he/she had originally been admitted directly into that program with a BSc; courses taken and time spent in the MSc transfer to the PhD program.

#### 4.11 PhD programs, specifically

A minimum of \*6 (2 one-term 3-credit courses) is required of students with the equivalent of an MSc degree from the University of Alberta. Students entering the PhD program with the equivalent of an Honours BSc program from the University of Alberta are subject to those same course requirements, plus those applying to students entering the MSc program.

Students are encouraged to choose a research supervisor as soon as possible after beginning a graduate program. In particular, students registering in September should have selected a supervisor by January 15 of their first year. Also by January 15 of their first year, a supervisory committee should be appointed for each student. This committee consists of the supervisor(s) plus two other faculty members, one of whom should be in a different area. One of the committee members may be from a different department. The supervisory committee meets with the student at least annually and is responsible for monitoring his/her overall progress.

##### 4.11.1 Annual supervisory committee (“Pink sheet”) meeting

The main purpose of the supervisory committee is to oversee and provide general guidance to the student in the several aspects of his/her pursuit of the PhD degree. This includes recommendation of courses to be taken, assessment of progress in research and the feasibility of the timeline proposed to complete the degree.

The first committee meeting is to take place within 12 months after the student starts in the program, after the student’s first-semester course marks have been posted. Annually thereafter, the supervisory committee must meet with the student to go over the progress accomplished, assess the timeline for the completion of the degree, and provide guidance as needed. The committee will also make a formal recommendation on the candidate’s potential for graduate work.

At the pink sheet meeting, the student normally makes a short (~20 minute) presentation describing progress accomplished thus far, giving a general outline of a proposed research project and a timeline for completion. After the meeting, the committee will recommend one of the following:

- 1) The student’s progress is satisfactory; the student should proceed with the PhD program.
- 2) The student should transfer to the MSc program.
- 3) The student’s progress is unsatisfactory; the student should withdraw from the PhD program.

- 4) Other recommendation(s), including possible conduct probation or academic warning.

The committee may also make any other comment or recommendation that it deems relevant. Departmental financial support is conditional upon demonstration of satisfactory advancement toward the degree and is therefore contingent upon the written annual report of the supervisory committee.

#### 4.11.2 Doctoral candidacy exam (Calendar)

When the course requirements are completed and the PhD thesis project is well defined, a PhD student must pass an oral candidacy examination in subjects relevant to his/her general field of research. FGSR regulations specify that this examination must be passed at least six months prior to the final thesis defense but that it must be held early in the PhD program. In Physics, students are expected to pass this exam in the third year of the program for students entering with a BSc, or second year for students entering with an MSc. As stated in the Calendar, "All program requirements, other than the thesis, must be completed within three years of the commencement of a student's program. For students who change from a master's program to a doctoral program, without the need to complete the master's program as part of an acceleration or fast-track, the counting of time runs from the beginning of the student's second year in the master's program."

The examination committee consists of the supervisory committee plus at least two other "arm's-length" examiners. Arm's length examiners may not be members of the supervisory committee. They may not be connected with the thesis research in a significant way, be associated with the student, or a close collaborator of the supervisor. The candidacy committee is chaired by a faculty member who is not the supervisor, but is a member of the student's home department, Physics. Full details of the proposed committee must be submitted to the Associate Chair at least four weeks in advance of the exam.

The exam consists of a short oral presentation made by the student, followed by a question period. The student is expected to provide the members of the examining committee with a short document addressing the following points:

- a summary of the status of the field in which s/he plans to do research,
- an outline of the anticipated project, including a statement of the main scientific objectives and a broad description of the methodology,
- milestones and a timeline for completing the research project.

This document should be distributed to the members of the committee no less than one week before the exam.

This examination is intended to demonstrate that the student has

- an adequate knowledge of physics and of the subject matter relevant to the thesis,
- the ability to pursue and complete original research at an advanced level, and
- the capacity to satisfy the requirements of his/her program. The progress accomplished toward the thesis will be reviewed, but it will not be the main focus of the exam.

Five options are available to the candidacy committee at the conclusion of the candidacy exam: 1) adjourn; 2) pass; 3) conditional pass; 4) fail and repeat the candidacy; 5) fail. Consult the FGSR's Grad Program Manual for more information.

- If successful, the department shall complete the candidacy exam section of the "Report of Completion of Candidacy Examination" form, indicating "Pass", and submit it to the FGSR.
- With a "conditional pass", the student will be required to satisfy certain conditions before being recommended for a change of category to "PhD candidate". In this case, it will be the responsibility of the Exam Committee Chair to inform the Graduate Coordinator when the conditions have been met, to ensure that the FGSR is informed that the student has passed the candidacy exam.
- Should the committee deem the student not to have passed the candidacy, he/she may appear before the committee a second time, but within three to six months of the first examination. If unsuccessful on the second attempt, the student will be required to withdraw from the PhD program. In this case, it may be possible to change the student's program category from PhD to MSc. It is in the student's best interest to be informed early in the program if the examining committee believes that the student is not prepared to undertake original research



at the PhD level.

#### 4.11.3 Thesis and final oral examination (Calendar)

The essential requirement for the doctorate is the planning and carrying out of original high quality research leading to an advance in knowledge in the candidate's field of study. The results of this research must be presented in a thesis that satisfies the requirements of the FGSR as set out in the Regulations and Guide for the Preparation of Theses (online at <http://uofa.ualberta.ca/graduate-studies/current-students>).

Each doctoral thesis must be reviewed and a final oral examination, the "thesis defense", conducted. The examining committee includes the supervisory committee and at least two additional examiners who must be considered to be at "arm's-length", with a minimum of five members in total. Arm's length committee members may serve on both the candidacy exam and the final oral examination. One examiner must be an "external examiner" or "external reader" from outside the University of Alberta who is a recognized authority in the student's research area. The external examiner (or reader) must be selected and the nomination sent to the Faculty of Science by the Department at least two months before the examination date. In proposing an external examiner (or reader), the supervisor should give the Graduate Program Administrator the name and e-mail address of the person suggested; she will contact the proposed examiner to get the information required by the Faculty. Persons who have not supervised PhD students through to the completion of their degree will not be approved as an external examiner or reader. At least five examiners must be present at the thesis defense<sup>2</sup>, which is chaired by a faculty member who is not the supervisor but is a member of the student's home department, Physics.

The supervisor is responsible for establishing the committee and arranging for the final examination. The Faculty of Science must approve the constitution of the final examination committee before the examination may take place. Full details (committee members, date, time, place) of the proposed exam plus the thesis title must be submitted to the Associate Chair at least four weeks before the defense.

Before forwarding the thesis to the external examiner, PhD supervisory committee members must sign a "Preliminary Acceptance of the Thesis" form (<https://www.ualberta.ca/physics/graduate-studies/information-for-current-students-and-supervisors/thesis-preparation-and-program-completion>), indicating that the thesis is "of adequate substance to warrant that the student proceed to the final oral examination". This means that the thesis should be completed and distributed to the supervisory committee at least six weeks before the proposed date of the final examination. The supervisory committee should be given a complete copy of the thesis, including the abstract, all tables, figures, and bibliography. Note that the supervisory committee may require alterations to the thesis before it is sent to the external examiner. It is the responsibility of the student to provide sufficient time for these procedures. External constraints such as thesis filing deadlines or promises made to future employers are not the concern of the thesis committee.

The external examiner (or reader) must receive the thesis at least four weeks before the examination date. All examining committee members must be given identical copies of the thesis at the time that it is sent to the external examiner. The thesis should be distributed as hard copy, if so requested by the examiners. No modification of the thesis is permitted between the time it is sent to the examiners and the time of the defense.

The exam is conducted as described in the Department's "Procedures for MSc and PhD Oral Examinations." This document is available on the Department's website or from the Physics grad program office. The research of the student is introduced in a public oral presentation at the beginning of the defense. Then follows an examination period conducted behind closed doors. Only the members of the examining committee, or those present under FGSR regulations, are permitted during the examination portion of the defense. Regarding attendance at a PhD final exam, the FGSR's Graduate Program Manual states:

"Faculty members of the student's home department as well as members of FGSR (or their alternates) have the right to attend doctoral examinations but must notify the chair of the examining committee.

<sup>2</sup> An examiner can be "present" by attending the exam in person or by teleconferencing. Teleconferencing guidelines are found in [the Calendar](#).



Other persons may attend the examination only with permission of the Dean, FGSR, or the chair of the examining committee. Except for the Dean, FGSR, or a Pro Dean (the Dean's representative) who may participate fully in the examination, persons who are not members of the examining committee:

- may participate in the questioning only by permission of the chair of the committee, but
- are not permitted to participate in the discussion of the student's performance and must withdraw before such discussion commences."

At the end of a successful thesis defense, the examiners will sign the "Thesis Approval/Program Completion" form, which has been prepared by the Associate Chair's office. In the event of an unsuccessful thesis defense, the supervisor should meet with the Associate Chair to discuss what further action, if any, is required.

In preparing one's thesis, students should consult the thesis preparation guide found on the FGSR website, <http://uofa.ualberta.ca/graduate-studies/current-students/academic-requirements/thesis-requirement-and-preparation>.

#### 4.11.4 Other requirements

The minimum period of residence for the PhD is two academic years of full-time attendance at the University of Alberta. The Faculty of Graduate Studies and Research time limit for completion of a PhD program is six years. No competence in any language other than English is required for the PhD.

As per the University Calendar, "Over the duration of their program, students in a doctoral program admitted Fall 2011 and thereafter must pay the equivalent of at least three full years of program fees".

### 5 Teaching Opportunities for Graduate Students

There are many opportunities for graduate students to gain teaching experience. Teaching helps to develop communication and organizational skills that will enhance graduate students' job prospects in almost any field. Every student should take advantage of the formal and informal programs available to develop their teaching skills. For example, graduate students can participate in the Graduate Teaching and Learning Program (information at <http://uofa.ualberta.ca/graduate-studies/professional-development/graduate-teaching-and-learning-program>).

#### 5.1 Graduate teaching assistantships (TA) criteria and duties

In order to receive a graduate teaching assistantship you must be a registered student in a graduate program and will be paid to carry out teaching related duties.

The purpose of the teaching assistantships is:

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

A full graduate teaching assistantship performs teaching-related duties of an average of twelve hours per week over a 4-month term. Please note work load will vary from week to week, therefore you will need to budget your time accordingly.

TAs are normally held during 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) outlined in the "[Graduate Student Assistantship Collective Agreement](#)."

Teaching Duties and Responsibilities include preparation of assignments, demonstrating in laboratories and/or seminars and marking assignments.

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 of Graduate Studies using a "Leave of Absence" form on the FGSR [Forms Cabinet](#).

Students must maintain satisfactorily performance in their own program and as graduate teaching assistants to have their TA appointments renewed. Graduate teaching 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.

#### Criteria for 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 research areas within the Department

#### **5.2 Conflict of interest: Graduate teaching assistantships and tutoring for payment**

Teaching assistants are reminded that tutoring for payment (for an individual or company, for money or in-kind payment) for a course while being a TA for that same course is a conflict of interest, unethical and prohibited. Tutoring for the course for which one is a TA will be considered unsatisfactory teaching performance and may lead to the loss of one's teaching assistantship and future TA opportunities.

#### **5.3 Continued TA support is conditional**

Continued TA support is provided conditional on satisfactory performance in a student's teaching duties. If a TA's performance is assessed to be less than satisfactory by the Undergraduate Lab Coordinator, and the Graduate Chair, the student will have one additional term of support with TA duties. Failing to improve his or her performance after this term will result in an interruption of TA support.

#### **5.4 Intersession teaching**

The Department is often in need of TAs to help with teaching during the intersession. Teaching during the

intersession is typically quite intensive, so involvement can be expected to have an impact on research productivity during that time period. Students interested in intersession teaching should contact the Undergraduate Lab Coordinator, and must discuss the possibility with their supervisor(s) **before** requesting or accepting an intersession TA assignment.

### 5.5 Sessional lecturing

Occasionally, there are opportunities for a senior graduate student to be appointed as a sessional lecturer in the Physics Department. A “sessional” has complete responsibility for his/her course, including planning, lecturing, setting and marking exams and assigning final grades. This experience is particularly valuable for students hoping to pursue an academic career. Support and feedback is available through the Department’s faculty mentorship program and from student evaluations.

The Dean of Science must approve all sessional appointments. The Department will only nominate students with experience and who have demonstrated ability as teachers. The minimum qualifications include successful completion of the PhD candidacy exam, a strong research record, and successful experience as a laboratory and/or tutorial TA. Students who are interested in a sessional appointment should be aware that such an activity may take a significant portion of their time, and they should discuss their plans with their supervisor and with the Associate Chair.

## 6 Financial Support

The Department strives to maintain graduate support at levels that are competitive with respect to other physics departments, and with respect to other departments within the Faculty of Science.

The main sources of graduate student support are from employment as graduate teaching and research assistants (TAs and RAs) and scholarships. Most students receive support from a combination of sources over any 12-month period. The various forms of support are described below in more detail.

### 6.1 Graduate teaching assistantships (TAs)

The most common form of student support during Fall and Winter Sessions (September through April) is employment as a Graduate Teaching Assistant (TA). A full-time TA position involves working an average of 12 hours of work per week, usually laboratory demonstrating and marking, tutorials, or assignment grading. The renewal of TA employment is not automatic. The renewal of a TA and the awarding of annual increments is based on service and accomplishment as judged by 1) undergraduate student evaluations, 2) the Undergraduate Laboratory (UGL) staff, 3) members of the academic staff, and 4) the Associate Chair.

The regulations for TAs are governed by the collective agreement between the University’s Board of Governors and the Graduate Students’ Association (GSA). The collective agreement is available through <http://uofa.ualberta.ca/graduate-studies/awards-and-funding/student-employment>.

As defined by the collective agreement, “The TA will be expected to dedicate a higher proportion of their work time during mid-term examinations and during the final week of the University term. The hours of work of a TA who is registered full-time in a graduate program will not exceed an average of 12 hours per week and a total of 192 work hours over a four-month term, exclusive of vacation entitlement; see the graduate student collective agreement for more details. The holder of a TA is considered to be a member of the teaching staff of the Department and, as such, is expected to maintain high standards of conduct and effectiveness, and to contribute to the Department’s good reputation as a teaching unit.

Graduate teaching assistants are expected to have regular office hours set aside for meetings with undergraduate students. They must treat students with respect, must prepare in advance for laboratory sessions, must grade laboratory reports fairly, and must return graded reports promptly.

### 6.2 Tutoring for payment

Teaching assistants are reminded that tutoring for payment (for an individual or company, for money or in-kind payment) for a course while being a TA for that same course is a conflict of interest, unethical and prohibited.

Tutoring for the course for which one is a TA will be considered unsatisfactory teaching performance and may lead to the loss of one's teaching assistantship and future TA opportunities.

### **6.3 Graduate research assistantships (RAs) and Graduate research assistant fellowships (GRAF)**

Graduate Research Assistantships and GRAFs are provided by the student's thesis supervisor. Information about these can be found online in the Graduate Student Assistantship Collective Agreement.

### **6.4 Summer research support**

Support for the four spring/summer months is normally as a GRAF, paid from research grants or contracts held by the student's supervisor. Duties are directly arranged with the supervisor. Support is normally at the applicable GA rate.

### **6.5 Financial support policies**

The Department attempts to provide adequate, secure financial support to its graduate students for the normal duration of their MSc and PhD programs, provided that their academic performance and work as a graduate assistant is satisfactory, and that funds are available. Note that the support periods referred to below are calculated from a student's initial enrolment in a program regardless of whether such funding is actually received during any part of the program.

The Department of Physics uses a pay scale provided by the Faculty of Science to determine the salary component of a graduate assistant's stipend. The "Science Scale" begins at "Step 1" (currently \$8,399/term for a full-time graduate assistantship) and increases by about 3% per step. First-year MSc students in Physics start on salary Step 4. First-year PhD students in Physics start on Step 5 (if they enter with an honours BSc or equivalent) or Step 6 (if they enter with post-graduate studies). Students move up the scale by one step each year, contingent upon their satisfactory performance as a graduate assistant. Unsatisfactory performance can result in no increment and jeopardize TA support in subsequent terms. Step 11 is the top of the pay scale for Physics graduate students.

#### **6.5.1 Financial support for students in MSc programs**

Financial support from the Department, if offered, is for the first two years, the normal duration of an MSc program. Students should not expect financial support beyond those two years.

#### **6.5.2 Financial support for students in PhD programs**

Financial support from the Department, if offered, is for the periods stated below, the normal durations of the PhD program. Students should not expect support beyond these periods:

- four years for students admitted with an MSc or post-graduate studies;
- five years for students admitted into the PhD program directly from undergraduate studies, including those who were admitted from BSc to an MSc program, and then, via a Change of Category, from MSc to a PhD program.

For students who transfer from another institution or department where they were registered as doctoral students, the same periods of financial support apply as stated above, but in these cases, the start-date of support is determined by the initial registration date in the original doctoral program.

#### **6.5.3 Financial support for students who transfer from other institutions or departments**

If a student transfers to the Department from another institution or U of A department, the normal support period by the Department will be determined from the initial date of registration in the other institution or department.

#### **6.5.4 Leaves of absence (see also section 9.4)**

The duration of an approved leave of absence, as defined in Section 7 of the FGSR Grad Manual, will not be subtracted from the normal period of financial support by the Department. Students will not receive financial support from the Department or their supervisor during a leave of absence except as mandated by the current

AEGS Collective Agreement.

### 6.5.5 Other leaves and interruptions of program

Students occasionally interrupt their program for various personal or professional reasons not included in the paragraph "Leaves of absence". While on leave, students must maintain their registration (see "Maintenance of registration") These leave periods count as part of the normal duration of financial support by the Department. Thus, for example, a PhD student entering on the basis of a MSc who is on leave for one year within the first four years of the program, would only receive financial support from the Department for a period of three years (the first four years minus the one year of leave).

### 6.5.6 Extended financial support

Beyond the limits specified above, students should not expect to be offered employment as graduate assistants. This is a general rule, regardless of the source of the student's support earlier in the program. The policy is intended to encourage students to complete their program in a timely fashion. A student *might* be supported from a supervisor's research grant, but such funding is not guaranteed and arrangements must be made directly with the grant-holder. Students extending their programs beyond the above limits cannot expect further financial support as a graduate assistant.

### 6.5.7 Vacation for graduate assistants (GAs)

The vacation year runs September 1-August 31 (Article 13 of the AEGS collective agreement). During the vacation year, a GA is entitled to one week of vacation leave for each 4-month GA (teaching or research) assignment (Article 13.01).

- Per Article 13 of the collective agreement, the timing and duration of the vacation leave must not adversely affect the duties of the GA;
- **vacation leave must be agreed upon beforehand** by
  - a) the student,
  - b) Dr. Rosolowsky (the Undergraduate Laboratories Coordinator), if the student has accepted employment as a graduate teaching assistant, and
  - c) the thesis supervisor.
- students are also required to notify the Graduate Program Administrator (Graduate Studies Office) of their departure and return date when they take a vacation period;
- unless pre-approved by the Graduate Office and the research supervisor, vacation periods may not be accumulated between successive 4-month terms.

## 7 Scholarships

Scholarships and fellowships are available from external agencies (e.g. NSERC, AITF), from the University (e.g., the QEII and KAS scholarships). Students will be notified of all upcoming scholarship competitions and deadlines as the information becomes available. Eligible students are expected to apply for external awards, and will have the support of the Associate Chair's office in doing so. Nominations for the recruitment and entrance awards, and some specialized awards, are made by the Department; no separate application is necessary.

## 8 Department services

### 8.1 Services provided by the Department

- Office space (initial office assignments might be temporary);
- Photocopying, printing, textbooks, and office supplies for teaching purposes;
- Mail;
- Shipping and receiving of work-related [i.e., non-personal] items.

## 8.2 Services provided by the Supervisor

- Photocopying and printing for research purposes;
- Computing facilities;
- Electronic and machine shop resources; the Department charges a nominal hourly fee to support research projects or for students to use the shop themselves. Note that students are required to attend a training class prior to being allowed to use the machine shop

## 9 Pertinent Miscellany

### 9.1 Tuition

Students who are not working as Graduate Assistants are responsible for paying their own tuition and fees by the payment deadline. Students working as GAs who have not paid their fees by the payment deadline will have their tuition and fees automatically deducted from their paycheques by the Registrar's Office. Typically, fall term tuition will be deducted in 6 equal instalments from September 25-Dec 10 paycheques; winter term tuition deductions (n=6) will be taken January 25-Apr 10; spring will be May 25-Jun 25; summer will be July 25-Aug 25. This deduction schedule is subject to change.

The most recent tuition information and sample fees assessments can be found on the FGSR's website, <http://uofa.ualberta.ca/graduate-studies>. Look under "Current Students."

Students starting in or after September 2011 must register for, and are assessed fees for, all four terms. Tuition payment deadlines are in the Calendar. For your information, program and non-instructional fees in 2019-2020 are ~\$5,660 for full-time graduate students who are citizens or permanent residents of Canada.

International students are required to pay differential fees in addition to the basic program fees. In 2019-2020, the differential fees were ~\$3,800 for students who started in or after September 2011.

Graduate students may anticipate annual increases in tuition of approximately 9% (approximately \$350) per year.

Students who are experiencing extreme financial difficulty can apply for bursaries and emergency loans; information is online at <http://registrarsoffice.ualberta.ca/Financial-Support.aspx>.

### 9.2 Registration and thesis (THES) registration

Full-time registration is required for scholarship holders, international students, students who have full-time graduate assistantships, students with outstanding student loans. Full-time registration in fall and winter semesters is a minimum of 9 credit hours [=18 fee index units] per term. For students in thesis-based graduate programs, examples of minimum full-time registration are:

- 1) three 3-credit courses;
- 2) THES 906 plus a 3-credit course; THES 903 plus two 3-credit courses;
- 3) THES 909, with no other courses.

Students starting graduate programs in September 2011 or later, and who are full-time. As of this writing, the FGSR automatically registers students for THES 906 in spring and summer terms in order to maintain full-time registration in their programs.

Additional information about thesis registration can be found in Section 6 of the FGSR Grad Manual.

### 9.3 Maintenance of registration (Calendar)

In order to keep their programs active, full-time students registered in masters and doctoral programs must register each year full-time in coursework and/or thesis. Eligible part-time students must register in coursework, and/or thesis; registration in M REG 800 is allowed in certain circumstances. Students starting a

graduate program in September 2011 or later must be registered for THES 906 in each of spring and summer terms (May-August) in addition to full-time fall and winter term registration. Students who started their programs before September 2011 are not required to register for Spring and Summer terms. Students who fail to keep the program active will be considered to have withdrawn from their program. If they wish to resume work in the program, they must apply for re-admission and have their program reassessed. There is no assurance, however, that they will be readmitted. If readmitted, they must pay readmission fees in addition to registration fees.

Registration can be done online (<https://www.beartracks.ualberta.ca>). Students with questions about registration should consult with Kailey Robertson (Graduate Program Administrator) or Professor Heinke (Associate Chair, Graduate Program Coordinator) as soon as possible upon arrival. Registration can be checked through one's account on Bear Tracks.

#### 9.4 Leaves of absence

Leaves of absence can be granted by the FGSR for maternity, serious illness, professional development, or other compelling reasons. Such leaves must be recommended by the Department and approved by the FGSR. During a Leave of Absence, students are not required to register in order to maintain their registration, and they may be considered for an extension of their program by a period proportional to the duration of the leave. More details can be found in the university Calendar, in Section 7 of the FGSR Graduate Program Manual, in the Collective Agreement Governing the Academic Employment of Graduate Students, and by talking to the Physics Associate Chair or Graduate Program Administrator.

#### 9.5 Program extensions (Calendar)

Per the FGSR, the time limit for graduate programs is 4 years (thesis-based MSc) or 6 years (PhD). In rare situations, students might find themselves coming up to the end of the time limit without having made the expected progress in their programs. Students approaching the end of their time limit can apply for a program extension. Please note that approval is not automatic and that requests can be denied. The departments take responsibility for considering a student's first request for a program extension; second requests are considered by the FGSR. Talk to the Graduate Program Administrator or Associate Chair, Graduate Studies for more information.

- 1) The FIRST request for a program extension is considered and approved at the department level.
  - a) Supporting documents required from the student:
    - i) a summary of progress to date;
    - ii) a timeline for completion preferably approved by the supervisor and/or supervisory committee;
  - b) Additional required documents:
    - i) A supervisory committee meeting must be held if there has not been one in the twelve months before the request for extension. The supervisory committee must meet with the student and decide whether or not to recommend an extension. This recommendation will be recorded on the blue/pink sheet, which will be forwarded to the Physics grad office.
- 2) The Faculty of Graduate Studies and Research considers requests for SECOND and SUBSEQUENT program extensions. As per section 7 of the FGSR Grad Manual, the department must submit a Request for a Program Extension form and attach the following information:
  - a) a summary of the student's progress to date;
  - b) the timetable for completion approved by the supervisor and/or supervisory committee;
  - c) an explanatory letter from the supervisor;
  - d) a recommendation from the supervisory committee;
  - e) an explanatory letter from the student with the expected date of completion;
  - f) written departmental recommendation.

### Course and other requirements by focus area

	Astrophysics, Space and Plasma Physics	Condensed Matter	Particle Physics	Geophysics
MSc <sup>1</sup>	<ul style="list-style-type: none"> <li>A minimum of four courses at the 400 level or higher, of which</li> <li>at least two of the courses must be at the graduate level</li> <li>at least one of: PHYS 511, PHYS 524, PHYS 530</li> <li>Mandatory seminars (see App. B)</li> </ul>			<ul style="list-style-type: none"> <li>A minimum of four courses at the 400 level or higher, of which</li> <li>at least two courses at the graduate level</li> <li>GEOPH 521</li> <li>Mandatory seminars (see App. B)</li> </ul>
		PHYS 541 is strongly recommended		
PhD <sup>2</sup>	<ul style="list-style-type: none"> <li>At least two courses at the 400 level or higher when entering with a MSc, of which</li> <li>at least two of: PHYS 511, PHYS 524, PHYS 530.</li> <li>If a student already took one of these (or equivalent) during their MSc studies, it will count toward the requirement</li> <li>For students entering with a BSc: Same requirements as above plus those of the MSc</li> <li>Mandatory seminars (see App. C)</li> </ul>			<ul style="list-style-type: none"> <li>At least two courses at the 400 level or higher when entering with a MSc</li> <li>GEOPH 521</li> <li>Mandatory seminars (see App. C)</li> <li>For students entering with a BSc: Same requirements as above plus those of the MSc</li> </ul>
		PHYS 511, 541, 543 are strongly recommended		

Students are required to pass at least 3 full courses (9 credits) with a GPA of at least 2.7 during the first year of their program.

The courses listed here are identified as essential for any student engaged in the respective research areas. When a research area does not identify a set of common core courses, students, in coordination with their supervisor and supervisory committee, must select the courses that best meet their learning and research development objectives. All students are required to take a minimum number of courses, as described in Sec. 4 (Graduate Program Requirements).

<sup>1</sup> **Mandatory seminar presentation for all MSc and PhD students.** Starting the second year of graduate studies, each MSc and PhD student in the department is required to present the results of his or her current research at least once per year at an organized department seminar series, or at the Institute for Geophysical Research conference for those students whose supervisors are members of the IGR. The proof of the presentation (a note from the convener) is added to the student's folder and considered by the annual supervisory committees.

<sup>2</sup> **Mandatory seminar presentation for all MSc and PhD students.** Starting the second year of graduate studies, each MSc and PhD student in the department is required to present the results of his or her current research at least once per year at an organized department seminar series, or at the Institute for Geophysical Research conference for those students whose supervisors are members of the IGR. The proof of the presentation (a note from the convener) is added to the student's folder and considered by the annual supervisory committees.



## Appendix A. Graduate program milestones – MSc (thesis)

Year 1	Year 2
<p>Student and supervisor (in consultation with the Associate Chair) develop a program timeline</p> <p><b>By 4th month in program:</b></p> <ul style="list-style-type: none"> <li>◇ Supervisor (in consultation with student) establishes the Supervisory Committee</li> <li>◇ have 1st supervisory committee [=“blue sheet”] meeting</li> </ul> <p><b>Complete</b> course requirements</p> <p><b>Complete</b> the required 8 hours of <u>Ethics Training</u></p> <p><b>Complete</b> the mandatory Professional Development requirement</p>	<p><b>All students</b> - Seminar</p> <p><b>All students: Supervisory committee</b> [“blue sheet”] <b>meeting</b>; a defense date is discussed and a tentative exam date set.</p> <p><b>Write</b> thesis</p> <p style="padding-left: 40px;">At least <b>4 weeks before</b> the thesis defense</p> <ul style="list-style-type: none"> <li>◇ supervisor sets up the exam by notifying the Physics graduate office of the date and time of the exam, and the examination committee members. The committee consists of the supervisory committee plus one additional examiner; one examiner must be from outside the Physics Department.</li> </ul> <p style="padding-left: 40px;">At least <b>3 weeks before</b> the exam date</p> <ul style="list-style-type: none"> <li>◇ distribute the final version of your thesis to the examining committee members</li> </ul> <p><b>Thesis defense</b></p> <p><b>Revise</b> thesis and submit copies to the FGSR</p> <p><b>2 years</b> marks the end of employment as a graduate assistant (TA and RA)</p>

## Appendix B. Graduate program milestones – PhD

Year 1	Year 2	Year 3 and forth	Final year <sup>1</sup>
<p><u>Supervisor and student</u> (in consultation with the Associate Chair) develop a program timeline</p> <p><b>By 4th month in program:</b></p> <p>◇ <u>Supervisor</u> (in consultation with student) establishes the Supervisory Committee</p> <p>◇ have 1st supervisory committee [=“pink sheet”] meeting</p> <p><b>Complete</b> course requirements</p> <p><b>Complete</b> the required 8 hours of Ethics Training</p> <p><b>Complete</b> the mandatory Professional Development requirement<sup>2</sup></p>	<p><b>Complete</b> course requirements if necessary</p> <p><b>Supervisory committee</b> [“pink sheet”] meeting</p> <p><b>Candidacy exam</b><sup>4</sup></p> <p>At least <b>4 weeks before</b> the candidacy exam</p> <p>◇ supervisor sets up the exam by notifying the Physics graduate office of the date and time of the exam, and the names of examination committee members.</p> <p>At least <b>1 week prior</b> to the exam</p> <p>Student’s candidacy report <b>is given</b> to the exam committee members</p> <p><b>All students</b> - Seminar</p>	<p><b>All students</b> - Seminar</p> <p><b>All students</b> - <b>Supervisory committee</b> [“pink sheet”] meeting</p>	<p><b>All students</b> - Seminar</p> <p><b>All students: Supervisory committee</b> [“pink sheet”] meeting; a defense date is discussed and a tentative exam date set</p> <p>◇ <b>finish</b> research if necessary</p> <p>◇ <b>write</b> the thesis</p> <p>◇ <b>invite</b> the external</p> <p>At least <b>8 weeks prior to the exam</b>, the supervisor contacts the Physics graduate office with the name and email address of the proposed external examiner</p> <p>At least <b>5 weeks prior</b> to the exam: student gives “final” version of thesis to supervisory committee for preliminary reading.</p> <p>at least <b>4 weeks before</b> the exam:</p> <p>- supervisory committee signs off on the thesis (sign the Preliminary Acceptance of Thesis form)</p> <p>- thesis is sent to all examiners including the external examiner</p> <p>◇ thesis defense</p> <p>◇ thesis revisions and submission of thesis to FGSR</p>

N.B.: Students are required to pass their candidacy exam by the middle of the normal duration of their program. This is by the end of year 2 for students entering the PhD program on the basis of a MSc, and by the middle of their third year in the program if a) they entered the U of A PhD program on the basis of BSc, or b) they transferred to the PhD from the MSc, which they entered on the basis of a BSc.

<sup>1</sup> **Year 4** is the final year of employment as a graduate assistant (TA and RA) for students starting the PhD program on the basis of post-graduate studies. **Year 5** marks the final year of employment as a graduate assistant (TA and RA) for students starting the PhD with no post-grad studies.

<sup>2</sup> Students must complete the PD requirement by the middle of their second year in the program

<sup>4</sup> Students must pass the **candidacy exam** by the middle of the third year in the graduate program if they entered the U of A PhD program on the basis of only a BSc.