



The University of British Columbia
Institute of Applied Mathematics

Graduate Student Handbook

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I. INTRODUCTION

This handbook provides a brief guide to graduate studies in the Institute of Applied Mathematics at the University of British Columbia. It outlines administrative procedures, Masters and Ph.D. programme requirements, and forms of financial aid.

II. ADMINISTRATIVE PROCEDURES

The Institute of Applied Mathematics (IAM) provides an administrative structure to arrange graduate programme of an interdisciplinary nature for students with an interest in both mathematics and another field. Examples of IAM programme are graduate studies in Mathematical Finance, Mathematical Biology, or Fluid Mechanics.

Prospective IAM students should register through the department they have chosen and should clearly state their intention of joining the Institute of Applied Mathematics. They must provide the IAM with a copy of their application, including the main application form and any application questionnaire or a similar document required by their home department. Preferably, the completed online application/questionnaire should be printed to a pdf file that could then be sent to the IAM as an email attachment. The applicant should make sure that the quality of the sent copy is sufficiently good and the document is legible.

The availability of financial support and the location of a potential supervisor usually determine the student's department. Many IAM students are registered in the Department of Mathematics, although some of them may have a supervisor in a different department. An IAM student may also choose to be registered in, for example, Computer Science, Electrical Engineering, Mechanical Engineering, Earth and Ocean Sciences, Physics, Chemistry, Zoology, and so on.

Every graduate student, upon arrival, is assigned a faculty member as his/her advisor. These assignments are made keeping in mind the research interests of the student and the workload of the faculty member. The advisor will oversee the student's programme, including recommending and approving courses. After eight months, the student will normally have chosen a thesis topic and thesis supervisor, and consequently, responsibility for the student will shift from the advisor to the thesis supervisor. It is not necessarily intended that the initial advisor be the future thesis supervisor. The thesis supervisor should be a member of the IAM, or is expected to join the Institute.

The Director of the IAM handles administrative matters concerning all graduate students. Although the academic programme of each student is typically decided upon in consultation with the advisor or thesis supervisor, graduate students are invited at any time to call on the Director for advice on their programmes. However, the final responsibility of meeting deadlines of the Faculty of Graduate Studies or other requirements of the graduate programme rests with each individual student.

Students should consult the [UBC Calendar](#) and the [IAM website](#) for the descriptions of available graduate and undergraduate courses that might be of interest to them. The graduate courses for the upcoming academic term are normally announced a few weeks before the beginning of the term, but the previous year's course list may also serve as a rough guideline and help in the course selection. Students are encouraged to take courses from several departments and should consult their advisors for recommendations. Information on suitable courses can be found on the [IAM website](#).

All students are expected to attend the weekly IAM seminars, and participation at the annual IAM Seminar Retreat is strongly encouraged.

III. MASTERS PROGRAMME

All graduate students must follow regulations from the Faculty of Graduate Studies (refer to the UBC Calendar for details). There are three options available to a Masters student:

1. 18 credits of course work plus a 12-credit Masters thesis.
2. 24 credits of course work plus a six-credit Masters thesis.
3. 27 credits of course work plus a three-credit Masters essay.

Students choosing options 1 or 2 are normally expected to complete the programme within two years. During the first year, the student must formulate an appropriate thesis topic and find a thesis supervisor. It is essential that students begin their thesis or essay work in the summer following their first two terms of course work. While the student is normally responsible for defining a suitable thesis topic on his/her own, the supervisor must approve the thesis programme and topic.

Masters students submitting a 12- or six-credit thesis are expected to present their work at some stage before the final submission of their thesis, in a seminar at the IAM or a related forum.

After one year in the Masters programme, students with sufficiently high standing can petition their home department for transfer directly into the Ph.D. programme. The possibility of such a transfer must be discussed with the thesis supervisor and confirmed with the IAM Director before petitioning the home department.

Part-time study is also available: A student may be enrolled part-time in the Faculty of Graduate Studies and take from six to 12 credits per year, as well as work on a thesis. The programme must be completed in five years.

The following sections outline the details of the three Masters options:

1. 12-Credit Masters Thesis

This is roughly equivalent in effort to four graduate courses. A thesis supervisor is required in addition to two additional readers. The 12-credit Masters thesis must satisfy the following criteria:

- a. It involves some original and publishable research results, or a novel exploratory technique.
- b. Of the 18 credits of course work required under this option, a maximum of six credits can be 300 or 400 level undergraduate courses. At least six credits of 500 level mathematics are required. At most 15 of the 18 credits can be from any single department. The student's advisor or thesis supervisor must approve all courses.

2. Six-Credit Masters Thesis

This is roughly equivalent in effort to two graduate courses. A thesis supervisor is required plus one additional reader. The six-credit Masters thesis must satisfy the following criteria:

- a. It is a comprehensive critical survey of the literature in some area of Applied Mathematics, and must go well beyond the material covered in any of the student's courses. Typically, it involves an analysis or implementation of lesser scope than that required for the 12-credit thesis.
- b. Of the 24 credits of course work required under this option, a maximum of six credits can be 300 or 400 level undergraduate courses. At least six credits of 500 level mathematics are required. At most 18 of the 24 credits can be from any one department. The student's advisor or thesis supervisor must approve all courses.

3. Masters Essay

An essay supervisor is required. The basic distinction between an essay and a thesis (six or 12 credits), aside from the lesser scope of the former, is that the supervisor, in consultation with the student, normally assigns the essay topic.

The Masters essay must satisfy at least one of the following criteria:

- a. The supervisor will specify one or more papers and/or books in the literature. The student will write an essay that reports on the assigned reading and which demonstrates appropriate comprehension of the material. The assigned reading will be an extension of, but not identical with, material covered in the student's course work.
- b. The supervisor will specify a technique to be implemented by the student. The essay will report on the implementation. The project will be an extension of, or adjunct to, some course project already completed by the student.

Of the 27 credits of course work required under this option, a maximum of six credits can be 300 or 400 level undergraduate courses. At least 12 credits of 500 level mathematics are required. At most 21 of the 27 credits can be from any one department. The student's advisor or thesis supervisor must approve all courses.

IV. Ph.D. PROGRAMME

Immediately upon transferring into the programme a student will choose, or be assigned, a Ph.D. supervisor. Students entering the Ph.D. programme from outside UBC will normally choose a thesis topic and a thesis supervisor within eight months of arrival. The supervisor will be responsible, in consultation with the student, for assembling four additional members of the student's Ph.D. committee, not all from the same department. This Ph.D. committee must approve the student's petition for satisfaction of the IAM breadth requirements, and act as the examination committee for the student's Ph.D. thesis proposal and comprehensive examination.

There are three main Ph.D. programme requirements that must be satisfied: 1) the breadth requirement; 2) thesis proposal and a comprehensive examination; and 3) thesis and final oral examination. (Form IAM-SP1 records the current status of an IAM student, and should be held in the IAM but kept up to date by the student.) At some stage during their Ph.D. and before the thesis examination, students are expected to present their work in a formal seminar at the IAM or a related forum.

Ph.D. students in the IAM are also required to satisfy additional requirements that may be imposed by their home departments. In particular, the IAM Ph.D. students whose home department is Mathematics are required to take and eventually pass a written Applied Mathematics comprehensive examination based on undergraduate coursework. The details of this examination can be found on the website of the UBC Department of Mathematics. M.Sc. students in the IAM, with Mathematics as their home department, do not have to take this exam.

1. Breadth Requirements

a. Preliminary Breadth Report

Shortly after the student enters the Ph.D. programme, the supervisor, in consultation with the student, will decide on three of the 10 core areas listed below which will define the student's Ph.D. breadth requirements. The supervisor and student will prepare a brief report indicating:

- (i) The student's choice of three core areas from the following list:
 1. Applied Mathematical Methods.

2. Numerical Analysis and Computation.
3. Dynamics.
4. Mathematical Biology.
5. Probability and Statistics.
6. Discrete Mathematics.
7. Mathematical Analysis.
8. Financial Mathematics.
9. Applications in the Physical Sciences.
10. Applications in the Engineering Sciences.

One of the three chosen core areas should be specified as the student's major field. Recommended courses within each area are listed on the IAM website ([Form IAM-CA1](#)).

- (ii) Courses taken, and their grades, which already fulfill part of the breadth requirements. In addition, previously written theses and papers as well as previous work experience, which can be viewed as contributing to the fulfillment of the breadth requirements, may be included in the report. Courses taken at the M.Sc. level at UBC for students transferring into the Ph.D. programme can be counted towards the breadth requirement.
- (iii) Proposed programme of studies. This includes courses, readings, etc., which the student intends to complete in order to fill any gaps in his/her breadth requirements.

Although not mandatory, it is strongly recommended that this preliminary report be submitted to the thesis committee and IAM Director. Based on this report, the committee and Director may offer suggestions for improving the academic preparation of the student. Once the preliminary breadth report has been formulated, the student will proceed with his/her programme of study. The final breadth report is normally to be completed **within 16 months** from the date of registration.

b. Satisfying the Breadth Requirements

The student's major area requires the equivalent of at least nine credits of related course work, with at least six credits at the graduate level. The other core areas require at least six credits of related course work, with at least three credits at the graduate level. At least six credits of 500 level mathematics are required. At least three credits must be taken outside of the student's home department (for non-Math students these three credits can be part of the six credits of 500 level mathematics). In order to satisfy the Ph.D. breadth requirements, the student must obtain a minimum grade of 70% in each of those courses taken at UBC contributing to the requirement and an overall average in these courses across all three core areas of at least 75%. In those cases where previous work experience, previously written theses or papers, or courses taken elsewhere, contribute to the breadth requirements, the Director will be the final arbiter.

c. Breadth Report

When the student feels that he/she has satisfied the breadth requirements, the student will submit a written report documenting the courses taken and their grades, theses, papers, previous work experience, etc., which, taken together, are intended to fulfill the breadth requirement. On the basis of this report, the thesis committee and Director will decide whether the student has fulfilled the breadth requirements. There are three possible outcomes of this decision:

- (i) Approval to proceed with a thesis proposal ([Form IAM-BR1](#) to be completed).
- (ii) Adjourned, with exactly one more opportunity to fulfill the requirement within 12 months.
- (iii) Failure. Withdrawal from the Ph.D. programme in the IAM is required.

2. Ph.D. Thesis Proposal

Having satisfied the breadth requirements the student will continue his/her research and will prepare a Ph.D. thesis proposal. The thesis proposal must be presented in written form to the thesis committee at least two weeks prior to the oral comprehensive examination; typically, the written proposal should be about 20-30 pages long. The purpose of this exam is the defense of the student's thesis proposal and the examination of the candidate on related material in the major core area. A committee member other than the thesis supervisor will chair the defense and examination. The defense begins with an oral presentation by the student of approximately 20-25 minutes length (and not to exceed 30 minutes), and is then followed by detailed questioning by the examination committee. The comprehensive examination will normally be taken within two years of entering the Ph.D. programme; in exceptional circumstances this may be extended to three years. There are three possible outcomes of this examination:

- a. Approval to proceed with the thesis (Form IAM-TP1 to be completed).
- b. Adjourned, with exactly one more opportunity to retake the qualifying exam within six months.
- c. Failure: A withdrawal from the Ph.D. programme in the IAM is required.

3. Ph.D. Thesis and Final Oral Examination

Once the comprehensive examination is passed, the student must carry out a research programme in accordance with his/her research proposal under the supervisor's guidance, with periodic reviews by the student's committee. A thesis describing his/her research findings must be written by the student, approved by the committee and the IAM Director, and defended at a final oral examination set up by the Faculty of Graduate Studies. The Faculty of Graduate Studies provides a guide to the preparation of Ph.D. theses. The student has the final responsibility for meeting the requirements and deadlines of the Faculty of Graduate Studies. In particular, the student must complete all requirements within six years of becoming a Ph.D. student. Extensions beyond six years are given only in exceptional circumstances.

V. FINANCIAL AID

Although the IAM does not, at present, provide financial support for graduate students, several other forms of financial aid are available. Most IAM students are supported by a combination of the following sources:

- **Federal Government Fellowships and Bursaries (Including NSERC)**
Available only to Canadian and landed immigrants; applications must be made by the student in October for the following academic year.
- **University Graduate Fellowships and Bursaries**
Recommendations are made by departments in January for continuing students and in April for incoming students for the following academic year (see the [Faculty of Graduate Studies website](#) and [UBC Calendar](#) for more information). NOTE: Students eligible for an NSERC fellowship must apply for it in order to be eligible for a University Graduate Fellowship.
- **Teaching Assistantships, Available Through Departments**
Usually involve six or 12 hours/week tutoring and/or grading in undergraduate courses.
- **Research Assistantships**
From the grant funds of individual faculty members, to assist on research projects.