A GUIDE TO OUR GRADUATE PROGRAMS

Department of Mathematics & Statistics
Dalhousie University

2026-2027

November 2026

Disclaimer: In case of inconsistency between the Faculty of Graduate Studies information and this document; the Faculty of Graduate Studies information takes precedence.

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1 Introduction

Welcome to Dalhousie University and the Department of Mathematics & Statistics. This handbook is written to help graduate students and faculty navigate their way through our programs. Some of the regulations listed here apply only to our department, while others are university-wide regulations designed by the Faculty of Graduate Studies (FGS). Therefore, we encourage everyone to refer to the FGS page, https://www.dal.ca/faculty/gradstudies.html for additional information. In case of any discrepancy between this handbook and the Graduate Academic Calendar, the Graduate Academic Calendar will have precedence https://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=142&chapterid=10141&loaduseredits=False. A list of Mathematics and Statistics faculty and their areas of expertise is found on our web page https://www.dal.ca/faculty/science/math-stats.html, along with a list of office staff.

This document is a work in progress and will evolve partly in response to the needs of students. Suggested changes and proposed additions can be sent to your graduate coordinator or grad admin.

We would like to thank the Department of Physics and Atmospheric Science, who generously allowed us to use their graduate handbook as a template for this document.

1.1 Short Checklist for New Students

- *Do you know your Banner ID number (B0- - - - - - -)?* This was provided to you in your admission letter from the Registrar. You will need this number to register, obtain a Dalhousie Student ID card and to set up your Net ID. To obtain your Student ID Card, upload your photo at this link, https://dalcard-photo.dalcard.dal.ca/ then pick up your DalCard at the Dalhousie ID Card Office, located at 6230 Coburg Street (Howe Hall).

  To set up your Net ID go to https://password.dal.ca/ (see also the email alias manager https://aliasmanagement.dal.ca/login). Your @dal.ca email is the main source of email correspondence at Dalhousie University. All messages sent by Dalhousie University will go to your Dalhousie email address. You will be able to check the status of your student account, payroll and stipend information once you have set up your Dalhousie Net ID.

- *Have you registered?* All graduate students must register for all three terms (Fall, Winter and Summer) each academic year. In addition to any classes you will take during the year, you MUST register for REGN 9999. See Section 5.9. If you are not registered, you will not receive your monthly stipend.

- *Have you checked in with the Departmental Office?* Jeanne Clyburne is the grad admin. She will assign you a shared office space, extend after-hours access to the Chase building, and is the go-to person for any administrative questions about the graduate program. Contact her at gradadminsupport.mathstat@dal.ca.
  Mark Monk is the department's reception administrative support. He will assign you a mail slot in the mail room. Contact Mark at mathstat@dal.ca.

Nora Amaro is our department's payroll and finance admin. She'll answer questions about payroll, TA pay or explain a breakdown of your funding payments. Contact Nora at pfamast@dal.ca.

- *Have you met with your graduate coordinator?* Your graduate coordinator will provide information about the program and talk to you about courses. Early in the term you will fill out your program requirements form (Section 7.3), and it is important to start thinking about it as soon as possible.

- *Have you submitted your "Direct Deposit" information?* All payments to Dalhousie students, faculty and staff are made by direct deposit. It is important to submit your direct deposit account details to receive your monthly stipend. The monthly stipend is deposited near the end of each month. Contact Nora for instructions, pfamast@dal.ca, or see Pay Information on the People and Culture webpage https://dalu.sharepoint.com/sites/hr/SitePages/pay-information.aspx

- *Have you taken care of your Health/Dental and Medical Coverage?* See Section 6.5 for details.

- *Have you sent your 'final transcript' stating that you conferred your degree (with date conferred) to FGS?* An official e-copy of your final transcript needs to be submitted at the beginning of the Fall term to FGS at graduate.studies@dal.ca.

1.2 Departmental Contact Information

Our department consists of the Mathematics Division and the Statistics Division. Each division has a director and graduate coordinator who are responsible for running the undergraduate and graduate programs, course offerings, admission of graduate students and so on. Both divisions operate under the Department of Mathematics & Statistics and share the facilities of the Chase Building. The department chair and staff serve both divisions.

The graduate coordinators, with the help of the grad admin, are the liaisons between the graduate students in the department and the university. They look after the running of the graduate program and make sure all students are progressing towards the completion of their degrees. Students should feel free to bring all concerns and questions to their graduate coordinator in their division. Responsibilities of the graduate coordinator are detailed at the website of the Faculty of Graduate Studies https://dalu.sharepoint.com/sites/graduate-studies/SitePages/graduate-coordinators.aspx Log in with your Net ID and password

In cases when a conflict-of-interest prevents a student from approaching the graduate coordinator, students are encouraged to take the matter to the division directors, the department chair, department administrator, or grad admin to ask for further advice.

- Dr. David Iron: Mathematics Graduate Coordinator (David.Iron@dal.ca) Room 322, (902) 494-2385
- Dr. Lam Ho: Statistics Graduate Coordinator (Lam.Ho@dal.ca) Room 301, (902) 494-1069
- Dr. Sarah Chisholm: Department Chair (masthead@dal.ca) Room 219, (902) 494-7063 & Learning Centre Coordinator (sarahchisholm@dal.ca) Room 122, (902) 494-248
- Dr. Bruce Smith: Statistics Director (statdirector@mathstat.dal.ca) Room 309, (902) 494-2257

- Dr. Peter Selinger: Mathematics Director (mathdirector@mathstat.dal.ca) Room 303, (902) 494-3311
- Ann Marie Bannon, née David (preferred: Anna Marie): Department Administrator (Ann.Bannon@dal.ca) Room 219, (902) 399-6943
- Balagopal Pillai: Systems Administrator (Balagopal.Pillai@dal.ca) Room B004, (902) 494-3204
- Nora Amaro: Payroll and Financial Assistant (pfamast@dal.ca) Room 219, (902) 494-6909
- Jeanne Clyburne: Graduate Administrative Support (gradadminsupport.mathstat@dal.ca) Room 219, (902) 494-3214
- Mark Monk: Reception / Administrative Support, (mathstat@dal.ca) Room 219, (902) 494- 2572

2 Preview of Our Graduate Programs

2.1 Admission Requirements

Candidates must satisfy the general requirements for admission to the Faculty of Graduate Studies. For details on admission, fees, course listings and general information see https://www.dal.ca/faculty/gradstudies/apply-graduate-studies/how-to-apply.html and also Section 4 of this document. MSc candidates will normally be expected to hold a degree recognized by Dalhousie University at the equivalent of a Dalhousie Bachelor's degree with Honours. PhD candidates will normally be expected to hold a first-class MSc degree (or equivalent) from a recognized university. To ensure consideration for scholarship funds, applications should be submitted by January 15. All Math and Statistics graduate programs begin in the Fall term, except in special circumstances.

2.2 Mathematics and Statistics Programs

The Department of Mathematics & Statistics offers programs leading to the degrees of MSc and PhD in many research areas. A description of our research groups is located at the Department of Math and Statistics website https://www.dal.ca/faculty/science/math-stats/research-groups.html.

Pure and applied mathematics faculty research interests include:

algebra
algebraic topology
applied mathematics
approximation theory
category theory
combinatorics
commutative algebra
convex geometry
differential equations
differential geometry
functional analysis
general relativity and cosmology
graph theory
harmonic analysis
logic
number theory
quantum computing
topology
wavelet theory

Statistics faculty research interests include:

bioinformatics	multivariate analysis
data mining	ocean science
ecology and evolution	state space model
environmental statistics	statistical ecology
epidemiology	statistical genetics
information theory	statistical inference
machine learning	time series analysis
molecular evolution	

Graduate students in the statistics division can also take part in one or more applied projects through the activities of the statistical consulting service.

2.3 Requirements for a Master's (MSc) Degree

- At least six classes (18 credit hours), not including seminar classes, at the graduate level to be chosen in consultation with a department advisor (i.e. a supervisor and/or the graduate coordinator). In addition, students whose preparation in a particular area is deficient will be required to complete appropriate classes which will be designated by the advisor.
- Attendance and participation in a seminar.
- A satisfactory thesis.
- Students are required to give an oral presentation (defence) of their thesis and at that time to answer questions about the thesis. This presentation will be after the thesis is in the hands of the student's committee and will be considered when the committee makes its decision.

2.4 Requirements for a Doctor of Philosophy (PhD) Degree

- At least four classes (12 credit hours).
- Comprehensive examinations and thesis proposal–consult Sections 9.3 and 9.4 for details about these exams and relevant deadlines.
- Attendance and participation in an appropriate seminar.
- Preparation and defence of a satisfactory research thesis.

2.5 Courses We Offer

2.5.1 Mathematics Courses

Below is a list of the most frequently offered graduate courses. A selection of the following courses will be offered in any given year.

MATH 5010.03: Introduction to Measure Theory and Integration*

MATH 5020.03: Analytic Function Theory*

MATH 5025.03: Commutative Algebra I

MATH 5045.03: Advanced Algebra I*

MATH 5055.03: Advanced Algebra II*

MATH 5057.03: Lie Theory

MATH 5065.03: Algebraic Geometry

MATH 5066.03: Advanced Statistical Theory I

MATH 5070.03: Topics in Number Theory

MATH 5135.03: Introduction to Category Theory

MATH 5136.03: Topics in Category Theory

MATH 5140.03: Introduction to Functional Analysis

MATH 5160.03: Operator Theory

MATH 5165.03: Mathematical Methods in Physics

MATH 5170.03: General Topology

MATH 5180.03: Introduction to Algebraic Topology

MATH 5190.03: Ordinary Differential Equations

MATH 5200.03: Ordinary Differential Equations - Qualitative Theory

MATH 5220.03: Introduction to Partial Differential Equations

MATH 5230.03: Partial Differential Equations

MATH 5250.03: Asymptotic Analysis

MATH 5330.03: Topics in Graph Theory

MATH 5331.03: Topics in Combinatorics

MATH 5340.03: Discrete Random Structures

MATH 5360.03: Combinatorial Modelling

MATH 5410.03: Topics in Cosmology

MATH 5500.03: Introduction to Harmonic Analysis

MATH 5530.03: Differential Geometry

MATH 5540.03: Applied Analysis*

MATH 5650.03: General Relativity and Cosmology

MATH 5660.03: Automata and Computability

MATH 5680.03: Topics in Logic and Computation

MATH 5900 Combinatorial Game Theory

* These courses are core courses and are offered most years. Mathematics students can use them to complete their PhD Comprehensive Exam requirement; see Section 9.3 for more details.

2.5.2 Statistics Courses

A selection of the following courses will be offered in any given year.

STAT 5066.03: Advanced Statistical Theory I

STAT 5067.03: Advanced Statistical Theory II

STAT 5070.03: Multivariate Distributions

STAT 5075.03: Multivariate Analysis

STAT 5090.03: Probability

STAT 5100.03: Survival Analysis

STAT 5130.03: Bayesian Data Analysis

STAT 5300.03: Topics in Statistics and Probability

STAT 5350.03: Applied Multivariate Analysis

STAT 5360.03: Robust Statistics

STAT 5370.03: Stochastic Processes

STAT 5390.03: Time Series Analysis I

STAT 5410.03: Advanced Topics in Time Series Analysis

STAT 5500.03: Topics in Advanced Statistics

STAT 5550.03: Longitudinal Data Analysis

STAT 5570.03: Statistical Genetics

STAT 5620.03: Data Analysis

STAT 5690.03: Computational Statistics

STAT 5750.03: Statistical Data Mining

3 Graduate Student Funding

If you are admitted to our graduate programs, you are guaranteed a minimum level of financial support as long as you are making satisfactory progress and have met the conditions of financial support.

Departmental funding will be provided for up to four consecutive terms (typically September to the following December) to an MSc student, and twelve consecutive terms (four years) to a PhD student.

One condition of continued funding is maintaining good standing in the program as determined by the student's supervisory committee. Some supervisors have specific expectations regarding the length of their student's program. Every student must discuss the expected duration of their studies, their expected progress, their funding, timing of their graduation and applications to postgraduate positions with their supervisor.

Most of our students hold external scholarships. Even when students start their program with departmental funding, they are expected to apply for external funding as long as they are eligible. The purpose is two-fold: external scholarships are prestigious additions to a student's CV, and they contribute significantly to the student's success in seeking further funding and postdoctoral positions. Also, every student receiving external funding allows us to reallocate our funding to recruit new students into our graduate program.

3.1 Dalhousie - Administered Scholarships

The most common sources of non-departmental scholarships are listed in Table 1 below. There are other scholarships that are awarded each year and can be found at this link.
https://www.dal.ca/faculty/gradstudies/finance-your-studies/scholarships-bursaries.html

All eligible students are expected to apply for these major scholarships. When applying, consult with your supervisor/potential supervisor to write your research proposal. Remember to send the application to the Math or Statistics grad coordinator at least one week before the application deadline for departmental review and feedback.

Table 1. Major Scholarships and Application Deadlines for 2026-2027			
Scholarship	**Deadline**	**Eligibility**	**Process**
TriAgency Canada Graduate Research Scholarship - Doctoral (CGRS-D)	Oct 5, 2026, at 11:59pm AT	-Entrance- Canadian -In-program- Canadian or International, enrolled in program up to 36 months by Dec 31, 2026	Apply through relevant Tri-Agency application portal and FGS Online Scholarship Platform - eligible applicants will automatically be considered for Killam-Predoctoral Fellowship and DRES awards
Killam Predoctoral Fellowship	Round 1: Oct 16, 2026, at midnight Round 2: Jan 31, 2027, at midnight (applications open Dec 1, 2026)	-Entrance or in-program -Canadian or International -If already in-program- must have spent less than 6 terms in PhD as of May 1st, 2027 *See Note below	2 ways to apply: 1. Through the CGRS-D application process, if eligible. 2. Or, apply through the FGS Online Scholarship Platform
Dalhousie Research Excellence Scholarship (DRES)	Round 1: Oct 16, 2026, at midnight Round 2: Jan 31, 2027, at midnight (applications open Dec 1, 2026)	-Entrance only -Canadian or International *See Note below	2 ways to apply: 1. Through the CGRS-D application process, if eligible. 2. Or, apply through the FGS Online Scholarship Platform
TriAgency Canada Graduate Research Scholarship - Master's (CGRS-M)	Dec 1, 2026 at 9:00pm	-Entrance or in-program -Canadian -If in-program- must have been enrolled less than 12 months by Dec. 31, 2026	Apply through the Tri-Agency application portal - eligible applicants will automatically be considered for the DMRS
Dalhousie Master's Research Scholarship (DMRS)	Round 1: Dec 1, 2026, at midnight (applications open Oct 15, 2026) Round 2: Feb 28, 2027, at midnight (applications open Jan 5, 2027)	-Entrance or in program -Canadian or International -If enrolled-award must start no later than 4th term of MSc. program *See Note below	2 ways to apply: 1. Through the CGRS-M application process, if eligible. 2. Or, apply through the FGS Online Scholarship Platform

*Note - *Shortlisted applications that are unsuccessful in Round 1 will be considered by institutional reviewers in Round 2, but a second application will not be accepted.*

3.2 Departmental Funding

Students who have been accepted into the graduate program will be provided with a minimum level of funding that comes from a combination of sources that includes external scholarships, TA-ships, supervisor grants and departmental funds. Every graduate student is expected to apply for scholarships for which they are eligible since our internal resources are limited. See our current level of support in Table 2.

Table 2. Current Level of Funding Support from Mathematics and Statistics			
Division	**Degree**	**Duration**	**Level of Support**
Mathematics	MSc	4 terms (16 Months)	Tuition and fees are paid + $2000/month
	PhD	12 terms	Tuition and fees are paid + $2000/month
Statistics	MSc	3 terms (12 months)	Funding is dependent on the supervisor and will be communicated in the letter of offer.
	PhD	12 terms	

***Important note- Departmental funding is not added to other scholarships. If the scholarship amount is lower, we supplement the difference between the scholarship amount and the amount in the table above*.

3.3 Teaching Assistantships (TA)

Students may receive financial support from Teaching Assistantships (TA) as part of their departmental funding package. TA support is governed by rules of The Canadian Union of Public Employees, Local 3912 https://cupe3912.ca/. A teaching assistant position involves teaching tutorials, invigilating exams, or working in the Mathematics & Statistics Learning Centre https://www.dal.ca/faculty/science/math-stats/about/learning-centre.html.

The Mathematics & Statistics Learning Centre is located in Chase 119. It is a place for student support in mainly 1000 and 2000 level courses, and is open throughout the term during the weekdays, primarily in the afternoons. We also provide remote support via Brightspace https://dal.brightspace.com/d2l/login. The Learning Centre is staffed by Teaching Assistants (graduate students, and, on occasion, upper year undergraduate students). The goal of the Learning Centre is to provide a space where students can collaborate to help each other and seek assistance from the Teaching Assistants when needed. The Learning Centre is coordinated by Dr. Sarah Chisholm (sarahchisholm@dal.ca). The Centre for Teaching & Learning offers TA support and workshops; see Section 6.9 in this document for more details.

3.4 Math Circles

Math Circles presents an opportunity for graduate students to supplement their income while practicing presentation and public speaking skills, as well as engaging young Nova Scotians in Mathematics. (This income is in *addition* to departmental funding.) Math Circles is a Mathematics outreach program based in the Math & Statistics department. The goal is to encourage math education for young people both inside and outside the classroom. Graduate students create math-related programs and visit elementary, junior high and high schools in Nova Scotia to present math activities, games and problems in an engaging and fun environment. Graduate students serve as role models for budding young mathematicians of all ages.

3.5 Teaching Opportunities as a Part-time Academic (PTA)

PhD students may have the opportunity to teach a course as the main instructor during their program. Typically, these openings are for summer courses, but opportunities may be available during the Fall and Winter semesters. PhD students may be selected to teach up to four courses during their program. These

job openings are announced by the department via email. Training opportunities to prepare you to teach will be made available by the Learning Centre Coordinator, Dr. Sarah Chisholm.

3.6 Scholarship/Stipend Payments

The procedures for calculating funding amounts are complex, and mistakes may occur. Students typically receive a funding letter during the summer stating their total graduate student funding payment amounts for the upcoming year. Grad funding payments come from scholarships, research grants, departmental and FGS funding. Students are encouraged to discuss this letter with their supervisor, graduate coordinator, or payroll & finance administrator if there is anything about the letter they do not understand. They are also encouraged to monitor their subsequent pay cheques to ensure consistency with their funding letter.

Grad funding payments are divided equally over the terms covered by the award, usually Fall (September to December), Winter (January to April) and Summer (May to August). Fees will be deducted at the beginning of each term and the remainder paid in equal monthly instalments. Grad funding payments are made monthly.

Please note that payment for TAs is made on a different schedule than the monthly Grad funding payments. As noted above, contact the Payroll & Finance admin for help in understanding your pay.

3.7 Lett Bursary

The Patrick Lett Student Assistance Bursary is a fund to provide financial aid to graduate students who are having difficulties obtaining assistance from other sources.

This bursary is primarily intended for students who have run out of regular funding; this means that students in their first year of an MSc program or in the first two or three years of a PhD program are not usually funded by the Lett Bursary, unless there are special circumstances.

If you think you may qualify, you can find an application form and instructions on the department website under Programs/ Financial Assistance - https://www.dal.ca/faculty/science/math-stats/programs/financial-assistance.html.
The department will send an email call for applications to notify students of the application process at the time the committee meets.

There is a similar source of emergency funds called “The Faculty of Graduate Studies Emergency Bursary”. Eligible graduate students experiencing a temporary financial emergency such as unforeseen medical expenses, may apply and must demonstrate financial need. https://www.dal.ca/faculty/gradstudies/finance-your-studies/scholarships-bursaries/emergency-bursary.html

4 Application and Admission

4.1 Language Requirements

All applicants whose first language is not English must submit test scores for an English language proficiency test. The language proficiency test scores are not required if the applicant has completed a degree at a recognized university where the language of instruction is English and the official language of the country is also English. https://www.dal.ca/faculty/gradstudies/apply-graduate-studies/admission-requirements/english-requirements.html

4.2 Admission Application Deadlines

Graduate programs in Mathematics and Statistics are designed to start in September. The deadline to submit the admission application is January 15.

Non-Canadian students:

Applications for admission must be completed and submitted by January 15. Applicants who require a student visa and are not funded by the university or an officially recognized funding agency must provide proof of financial ability with their application. Canadian immigration is increasingly rigorous about requiring proof of sufficient financial support to complete the program of studies. Also, given the length of time student visa applications may take, international students are encouraged to apply early so they can be here for the start of their program.

4.3 Admission Application Process

The complete graduate admission application process and the link to the application portal is found on the Faculty of Graduate Studies website. For more details see “How to Apply” https://www.dal.ca/faculty/gradstudies/apply-graduate-studies/how-to-apply.html.

1. Fill out the graduate application form online.
2. Upload the following documents to the application portal:
    - CV
    - Statement of Intent
    - Unofficial transcript/s
    - English language proficiency test score for international applicants, if applicable (see Section 4.1 in this Handbook)
    - 2 References
3. Pay the application fee
4. Find a supervisor - We strongly encourage applicants to contact potential supervisors early. Review our Faculty Research Profiles to identify faculty whose research intersects with your interests. Send

a concise email to those faculty with whom you are interested, and state that you are seeking a graduate supervisor. Include your transcript/s and CV in the email.
See our Faculty Research profiles…
https://www.dal.ca/faculty/science/math-stats/research-groups/faculty_research_profiles.html

5. Apply for the entrance scholarship/s for which you are eligible (See Table 1 in section 3.1) https://www.dal.ca/faculty/gradstudies/finance-your-studies.html
    - **Master's Scholarships**
        - CGRS-M – For applicants who are Canadian citizens or permanent residents
        - Dalhousie Master's Research Scholarship (DMRS) – applicants may be Canadian Citizens or International students, who are entering the program or enrolled in their 1st year.

      Note: Eligible candidates who have submitted applications for CGRS-M will automatically be considered for the Dalhousie Master's Research Scholarship (DMRS)

    - **Doctoral Scholarships**
        - CGRS-D – for applicants to the program who are Canadian citizens or permanent residents
        - Killam Predoctoral Scholarship (Killam-D) - for applicants who are Canadian citizens, permanent residents or international students
        - Dalhousie Research Excellence Scholarship (DRES) – Entrance award only, for applicants to the program who are Canadian citizens or international candidates

      Note: Eligible candidates who have submitted applications for CGRS-D will automatically be considered for the Killam-D Scholarship and the Dalhousie Research Excellence Scholarship (DRES). Separate applications should be submitted for Killam-D and DRES awards if candidate is not eligible to apply for CGRS-D.

Make sure to provide the email addresses of your referees on your online application. Dalhousie will only accept referee email addresses if they are from a university, a teaching hospital, or if it is a government email address. If you made an error in the submission of an email address, log in to the application portal and edit the information.

Note that supporting documents (transcripts, letters of reference, etc.) will be verified for authenticity. Applicants submitting fraudulent documents may have their names published on the listserv of the Association of Registrars of Universities and Colleges of Canada and have their acceptance rescinded.

4.4 Application Fee

The application fee is currently $115 CDN. This fee is paid to the university (not the department). Payment instructions are found in the online application portal.

4.5 Program Fees (Tuition and Other Fees)

At Dalhousie, the graduate studies academic year (Sept.1 to Aug.31) is divided into three terms: Fall (September-December), Winter (January-April) and Summer (May-August). The total tuition and fees for one full year are due in three instalments, corresponding to the three terms.

Mathematics & Statistics degree programs are based on a program fee structure. Fees are paid for three terms each academic year, regardless of how many courses are being taken in a particular term. There are three payment due dates (September, January and May). Exact dates can be found on the Graduate Studies website. Students who fail to register and pay tuition fees for any term before the degree program requirements have been fulfilled are considered to have withdrawn and will be required to apply for re-admission. Re-admitted program fee students (except those who were withdrawn for academic reasons) must pay fees for the terms in which they were not registered, to a maximum of three terms at the current continuing fee rate.

Most graduate programs at Dalhousie University (including Mathematics & Statistics) have a minimum period for program fee payment and residency requirements. See Graduate Academic Calendar, Section 2.2 and Section 5.

Full-time Master's students in Mathematics or Statistics pay full-time program fees for three consecutive terms. The student may take two years to complete the MSc, but after the first year, the student will begin to pay continuing fees.

PhD students pay full program fees for the duration of their program. There are no part-time PhD programs at Dalhousie.

Students are expected to register for three consecutive terms unless otherwise approved to take classes or undertake research elsewhere.

To find the most current listing of tuition and fees, see Dalhousie's Student Accounts page https://www.dal.ca/admissions/cost-and-payment/tuition.html

4.5.1 International Tuition Fees

International Master's students registering at Dalhousie are charged an International Tuition Fee. This fee is applied to all graduate degrees in which the student registers, regardless of whether the student has already completed a Dalhousie graduate degree. For students in our programs the International Tuition fee is charged for the first two years.

4.5.2 Residency Requirement

The minimum residency requirement by Dalhousie University is 1 year for the MSc program and 2 years for the PhD program. This means that to obtain a degree, the fees corresponding to the relevant length of time for each degree must have been paid to Dalhousie University. See Section 2.3 in the Graduate Academic Calendar.

5 Acceptance and Registration

5.1 Admission Decisions

Our first round of offers is usually sent out in late March, and we continue to make offers into April. Our funds change in that period as scholarship competition results are announced, and accordingly, we continue to make new offers. We ask you to please let us know if you are considering other offers and have not yet heard from us. Also, if you have an offer from our department and already know that you will be going elsewhere, please let us know at the earliest possible date so we may admit another student.

5.2 Notification

When you are accepted into our graduate program, you will first receive an email from the Department of Mathematics and Statistics with an offer letter informing you that the department has recommended you to the Dean of Graduate Studies for admission. It is important to know that this letter or email is not considered an “official” offer; if you accept the departmental offer letter, it will be followed by an official admission letter from the Dean of Graduate Studies. In some cases, it is possible for the Dean not to accept the department’s recommendations. Please contact us if you do not receive your official admission letter in a timely manner, and particularly if you have alternative offers to consider from other universities.

You will two weeks to reply to the Dean’s admission letter and accept the offer of admission through the application portal. If you do not reply by the deadline set out in the letter, your offer will expire and your funding may be reallocated. Once you have decided whether or not to accept our offer, please let the department know immediately. This helps us greatly in deciding how many students we can admit in a given year.

5.3 Admission Deposit

All students who have been accepted to a graduate program are required to pay a $200 non-refundable deposit. The deposit reserves your seat in their program and provides departments with earlier confirmation of incoming students. The deposit will be credited towards the student’s tuition fees once they are registered.

After students accept the official offer from the Dean of Graduate Studies, an email will be sent to the student 2-3 days later which will include a link and instructions about how to pay the deposit from the portal. Students will have 2 weeks to pay the deposit from the day the payment link is issued. If the deposit is not paid within 2 weeks, the payment link will be cancelled and a decision of “Offer Expired” will be put on their record. Students will not be able to register until the deposit is paid.

5.4 Qualifying Year (MSc only)

A student applying for admission into the Mathematics MSc program, but with some deficiency in the particular discipline, may be admitted to a Qualifying Year. Qualifying students are required to take specific courses that are chosen in consultation with the graduate coordinator. These courses are chosen from

undergraduate and/or graduate classes. Qualifying students can study full-time or part-time and may be required to take as little as one 3-hour-credit class or as many as ten 3-hour credit classes.

Qualifying-year students are not eligible for scholarship or bursary support and must apply for admission to the appropriate graduate program in the usual way towards the end of the qualifying period. Qualifying students must pass all classes taken as qualifying students with an average of at least B, and no grades below a B-, and fulfill any other requirements in order to be considered for admission.

Students applying to the Statistics program are unlikely to be admitted to a qualifying program. Strong preference is given to students who can be admitted directly into the program. Students wishing to improve their application through additional course work can take courses as special students (undergraduate); consult the Undergraduate Academic Calendar for additional information, https://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=141

5.5 Special Student Graduate Studies

With permission of the Faculty of Graduate Studies, students are sometimes permitted to take a graduate class without being enrolled in a graduate program. The registration category for non-program students taking graduate classes is Special Student-Graduate Studies (SSGS). Such students may normally take a maximum of four classes (12 credit hours) with the permission of the class instructor and the graduate coordinator. Because all graduate classes must be taught at a consistent standard to graduate level students, non-program students must have records which meet the minimum entrance requirements and follow the same application procedure as for a graduate program. See Graduate Academic Calendar, section 5.7.7.

With permission granted from FGS, it is possible to receive credit towards a graduate degree for courses completed under SSGS.

5.6 MSc With Option to Transfer to PhD

If you apply to our PhD program, you might be accepted into the Master's program with the option to transfer to the PhD program after one term. This means that you begin the graduate program at Dalhousie in September as an MSc student, and at the end of the Fall term, if your performance is deemed satisfactory by the department, transfer into the PhD program effective the Winter term (January). Once transferred, you may receive credit for the courses taken in the Fall term. A transfer is requested by filling out the Graduate Student Transfer form found on the FGS SharePoint site.

5.7 Admission Conditional on ESL

We may conditionally admit students into our graduate program who meet all the admissions criteria but have not satisfied the language requirements of Dalhousie University (Section 4.1 in this Handbook). In such cases, the student will have one year to achieve the required scores on an ESL test and may subsequently begin the graduate program. The list of accepted tests can be found in the Graduate Academic Calendar, Section 3.4.

5.7.1 Where to Take ESL Courses

The Faculty of Open Learning & Career Development at Dalhousie University runs English as a Second Language (ESL) courses and administers the tests year-round https://www.dal.ca/faculty/open/programareas/englishstudies.html. The English for Academic Purposes course can be used to fulfill the English language requirement for admissions. https://www.dal.ca/study/faculties/open-learning-and-career-development/english-language-studies/english-for-academic-purposes.html The EAP 2 can be a replacement for the IELTS. Students without the required language scores do not need to be accepted at Dal to do this program, but they need to complete it before they start their graduate program. It is not required that you take the ESL courses here: you can use any program to obtain the required scores.

5.8 Deferral

We can request a deferral of admittance for up to one year from the Dean of Graduate Studies, provided you instruct us in a timely manner; however, scholarships may or may not be deferred.

5.9 Registration

Graduate students must maintain their registration in all three terms until their program is completed, except in those cases where a formal Leave of Absence has been officially approved by the Faculty of Graduate Studies. In addition to registering for classes, students must register for the Graduate Registration course, (REGN 9999) each term. In the Banner registration system, if REGN 9999 is not added each term, graduate students are not considered registered. Failure to register properly, before the deadline, may result in a payment delay of scholarships and stipends. The deadline for the REGN registration for the Fall term is August 1st, and for the Winter term the deadline to register is December 1st. It is usually more convenient to register for both Fall and Winter terms at this time, if you anticipate continuing for an entire year.

5.9.1 Graduate Registration Course - REGN 9999

All students must add the Registration Course-Graduate (REGN 9999) each term.

REGN 9999 CRN's by term for 2026-27	
Fall 2026	13982
Winter 2027	23851
Summer 2027	TBD

5.9.2 First Year Math PhD Students

Register for Comprehensive Examinations (MATH 9520) every semester until you have passed your PhD comprehensive exams.

5.9.3 Statistics PhD Students

Register for Thesis Proposal (STAT 9500) in the term it takes place which should be within the first 18 months.

5.9.4 Seminars

Students are required to attend the seminar series each semester. Statistics students should register for STAT 7320. Math students can choose from different seminar topics and should choose the seminar series that is most relevant to their area of research. Consult the timetable for the seminar course number.

5.9.5 Continuing Students

Once you have completed all your courses (including MATH 9520 for Math PhD students, or STAT 9500 for Statistics PhD students), you must register for the thesis relevant thesis course. See list below:

MATH 9000 - MSc Thesis

MATH 9530 - PhD Thesis

STAT 9000 - MSc Thesis

STAT 9530 - PhD Thesis

For registration details and deadlines, see

https://dalu.sharepoint.com/sites/graduate-studies/SitePages/course-registration.aspx

5.10 Student E-mail Address

The university will issue an @dal.ca e-mail address to all students. This address is entered automatically in the Student Information System as the preferred e-mail address; it will be the address to which all e-mail messages to students will be sent and it will be the address provided to faculty members when they request distribution lists for sending messages to students in their classes. A message sent by the university, or a faculty or staff member, to your @dal.ca address will be considered to have been delivered to you. We recommend personalizing your email account to make it easier to use. Visit https://password.dal.ca/ for detailed instructions on how to activate your @dal.ca account.

5.11 DalSAFE & Emergency Phone Text Messaging

DalSafe is an integrated messaging service used to announce important information to the Dalhousie community in events like campus hazards, campus closures, or other unpredictable events that might affect large groups. DalSAFE uses a variety of messaging media (e.g. email, text messaging, web, etc.) to reach a broad cross section of the Dalhousie community in a timely fashion. https://www.dal.ca/dept/dalsafe.html

5.12 Notification of Address Change

All students must provide Dalhousie with a valid mailing address and are responsible for keeping this information current. If your address changes, report your new address at DalOnline. Notifications from the university will be sent to the most recent address on file, and failure to report a change of address is not a valid excuse for missing such notifications. https://dalonline.dal.ca/home.html

6 Arrival on Campus

6.1 Housing: Short and Long Term

Affordable short-term and nightly accommodations are available during the summer months at the Dalhousie residences. This is a good option to use when arriving on campus. See https://www.dal.ca/dept/summer-accommodations.html. It can be difficult to find housing if you arrive on campus after classes start. The Residence Office, located at 6230 Coburg Road, has information on university accommodation and off-campus housing. https://www.dal.ca/residence

6.2 Dalhousie ID Card (i.e. Student ID or BANNER No.)

On your arrival at Dalhousie (and assuming that you have registered online), one of your first priorities will be to obtain an ID card. Go to the DalCard Photo Upload website for specific instructions on how to upload your photo and pick up your card. (Note: There is no photo service offered at the Dalhousie Card Office.) Once you have uploaded your photo, you will be notified by email that your card is ready for pick-at the DalCard Office located at 6230 Coburg Road. dalcard-photo.dalcard.dal.ca

6.3 Departmental Facilities

The office admin team will assign each new student an office, a mail slot, and after-hours access to the front door of the building.

The Faculty/Staff lounge includes a small kitchen with fridge and microwave on the second floor that is available to use by all graduate students, staff and faculty. Please be respectful of the space and keep it clean and quiet so that everyone can enjoy this common area.

Rooms for seminars and meetings can be booked through the department office. *Note: Contact the grad admin to book a room for your thesis proposal, thesis defense or to rehearse your defense.*

6.4 Departmental Computing Facilities

The department provides the following computing facilities to graduate students, faculty, staff and visitors in the Chase Building:

- Office desktops with windows or Linux as available options, if a computer is available
- Accounts that provide storage space with tape backup and space on web server
- Two heavy duty multi-function printers in photocopy room 211, black & white printing only

- An 18 node Linux compute cluster for research computing

Here is some useful information on how to access the departmental computing resources.

- Please use a secure shell client to connect to chase.mathstat.dal.ca for access to storage space.
- Go to www.mathstat.dal.ca/~your-user-name for your web space.
- Go to https://www.mathstat.dal.ca/cluster for compute cluster documentation. Default disk quotas with daily tape backup:
- 1 GB for home volumes on chase.mathstat.dal.ca
- 1 GB on cluster
- Extra storage space on chase/cluster with no backup 30 TB (/scratch/username)

Contact Balagopal Pillai (balagopal.pillai@dal.ca), the departmental systems administrator with any computing questions in the Chase building.

6.5 Health and Dental Care

Nova Scotia MSI Card (Medical Services Insurance):

Provincial medical insurance (MSI) is available to Nova Scotia residents at no charge and provides hospital and medical care that is free of charge. If you have been residing in Nova Scotia for 12 consecutive months and have not left the province for more than 30 days at a time, you may be eligible for MSI. International Students who have secured positions as teaching or research assistants from a Dalhousie University department or faculty are eligible to apply for MSI immediately and do not have to wait the usual 12 months.

Please note that this is not an extended health coverage plan and prescription drugs, etc. are not covered. To obtain an application and determine your eligibility, contact the MSI office at 902-496-7008 or msi@medavie.ca.

You will need to get a letter signed by the Dean of the Faculty of Science. See the grad admin who will compose the standard letter for you to take over to the Faculty of Science for the Dean's signature.

DSU Health and Dental Plan: The Dalhousie Student Union Health and Dental Plan is required unless you have alternative coverage (proof required). **You must apply to opt out of the plan.** Visit their website for more information. https://www.dsu.ca/health-plan

International Student Health Plan: For international students, the International Student Health Plan is mandatory if you are not eligible to apply for an MSI card. For more information on this plan https://www.dal.ca/life-at-dal/health-and-wellness/my-insurance-plan/dsu-international-health-plan.html

International Students who have secured positions as teaching or research assistants from a Dalhousie University department or faculty are eligible to apply for MSI immediately and do not have to wait the usual 12 months. Once you receive your MSI card, you can visit the International Student & Exchange Services office and inquire about opting out of the International Student Health Plan.

Dalhousie Health Services provides health care and services for students. Health Services is located at 1246 LeMarchant Street (between South St. and University Ave.) Call 902-494-2171 or see https://www.dal.ca/life-at-dal/health-and-wellness/health-centre-locations.html

The Dalhousie Dental Clinic is an educational facility and offers a wide range of services to students. Patients accepted for treatment provide clinical experiences for dental students, and at the same time receive quality care at reduced fees. The clinic is located at 5981 University Avenue. Call 902-494-2101 or see https://www.dal.ca/faculty/dentistry/patients.html

6.6 Libraries

All mathematics and statistics books are located in the Killam Library. Your Dalhousie ID serves as a library card. This also entitles you to use other libraries on campus (e.g. Law or Medicine) or to borrow materials from other local university libraries. Library tours are available. Consult the front desk at the Killam for further information.

The Grad Pad is located on the fourth floor of the Killam Library. This space is exclusively reserved for Dalhousie graduate students. The area contains social rooms and quiet study spaces. The 12-person capacity seminar room can be booked as well as 2 study rooms with 6-person capacity. https://libraries.dal.ca/hours-locations/workspaces/study-rooms.html

6.7 Bookstore

The university bookstore is located in the basement of the Student Union Building (6136 University Ave). Both new and used textbooks are available, though private sale of graduate textbooks is more common.

6.8 Student Accessibility & Accommodation

The Office of Student Accessibility & Accommodation, located next to the Killam Library on University Ave., administers the Accommodation Policy for Students.

This office is Dalhousie's centre of expertise for student accessibility and accommodation. All requests for academic and non-academic accommodation made by registered students must be directed to this office. https://www.dal.ca/life-at-dal/student-support/accessibility-accommodations.html

6.9 Centre for Learning & Teaching

The Centre for Learning and Teaching (CLT) works in partnership with academic units, faculty members, and graduate students to enhance the practice and scholarship of learning and teaching at Dalhousie University. CLT runs various workshops throughout the year and offers support to teaching assistants. In particular, each year they host TA Professional Development Days, usually in late August. https://www.dal.ca/dept/clt.html

6.10 Transportation and Parking

The University Bus Pass (U-Pass) is a transit pass specifically designed for Dalhousie and King's students. If you're a full-time student, the U-Pass allows you unlimited access to Metro Transit buses, ferries and Community Transit buses from September to April. The U-Pass is provided to all full-time students, and the fee is automatically assessed in September with your incidental fees. https://www.dal.ca/life-at-dal/upass.html

Parking passes may be purchased online through the app, HotSpot. For details on parking areas and permits, see the Parking FAQs https:// www.dal.ca/campus- maps/parking/ParkingFAQs.html

6.11 University Closure/Cancellation of Classes

Any decision to close the university (e.g. for a severe snowstorm) is made in the President's Office and announced on Dalhousie's web page (https://www.dal.ca), via Dal Alert, and on local CBC Radio 1 at 90.5 FM and social media.

7 General Program Information

7.1 Supervisory Committees

All members of supervisory committees are Regular, Adjunct or External Scholar members of the Faculty of Graduate Studies. Regular members should constitute no less than 50% of the membership of a supervisory committee. The tables entitled 'Serving on a supervisory committee', given in Section 9.1 of the Graduate Academic Calendar, define explicitly the permission to serve on supervisory committees. Supervisory committees are selected by the supervisor in consultation with the student. A supervisory committee should complement the expertise available to the student to complete their research program. The membership of all supervisory committees must be recorded in the Graduate Student Program Administration in DalOnline under the Graduate Student Progress Portal. To change the membership of the committee, contact the grad coordinator or the grad admin to record this in the portal.

7.2 Seminars

Students are required to attend the departmental seminar series most relevant to their area of research and are encouraged to attend the colloquia in their division. Students who are unable to attend seminars regularly must have the specific agreement of their supervisor or graduate coordinator that this requirement be waived.

Mathematics graduate students are required to give one talk per year in the Graduate Seminar Series (unless they speak in one of the departmental research seminars), on a subject relevant to their area of research, and regularly attend these seminars. This is a good opportunity to give a public talk in an informal environment.

7.3 Program Requirements Form

Program Requirements form specifies the course requirements for the Master's or Doctoral programs, as well as the members of the supervisory committee. They are normally filled out during the first month of study in consultation between the student and supervisor. In early October, the grad admin will send each incoming student and their supervisor the Program Requirements form to fill out and ask for it to be returned within the next month. The form will be included with the student's file so coursework can be monitored throughout the duration of the student's program. Students should only take courses listed on their Program Requirements form.

7.4 Degree Audit Reporting System (DARS)

For 2026-27, FGS eliminated GSIS and the Program Requirements tab and replaced it with the Degree Audit Reporting System (DARS). Degree audits compare the completed and in-progress courses against the standard program requirements outlined in the Graduate Academic Calendar. DARS is found in DalOnline under the new Graduate Student Program Administration location. Students may review their degree audit at any time during their programs. For instructions on reading and interpreting the degree audit report, see https://dalu.sharepoint.com/sites/graduate-studies/SitePages/gspa-read-dars.aspx

7.5 Modification of Degree Requirements

Certain approved modifications can be made to a student's degree requirements. These include courses outside of Math or Statistics, senior level undergraduate courses, as well as auditing more than 6 credit hours, Advanced Placement, or Advanced Standing. Students should consult with their supervisor when considering taking a course outside their program requirements. They may request a degree requirement modification on their own through the new portal, but it is recommended that you talk to your supervisor first. Next, contact your grad coordinator or grad admin to assist with the input of the modification into the portal. All degree modification requests will need to be reviewed and approved by the grad coordinator and FGS. Any courses taken that are not approved as a degree modification or requirement are taken at additional expense to the student. Note that graduate students may be approved to audit a maximum of 2 courses during their program. To request a degree requirement modification, see the instructions https://dalu.sharepoint.com/sites/graduate-studies/SitePages/gspa-request-degree-mod.aspx

For any other changes to a student's program requirements, the supervisor, grad coordinator and FGS must be notified. These changes include changes in the length of the program, a change from full-time to part-time status, a change in supervisor, a change in the supervisory committee, or a transfer from MSc to PhD.

7.6 Progress Reports

Every graduate student in a thesis program is required to submit an annual Progress Report online to the Faculty of Graduate Studies. It is due one month prior to the anniversary of the student's admission date. This means that they are due August 1st for September admissions, December 1st for January admissions, or April 1st for May admissions.

If you hold an NSERC scholarship you must complete a progress report one month in advance of the anniversary date of the start of your award. If the appropriate progress report is not received by the posted deadline, it may result in the award being terminated or a delay in the renewal of the award.

Instructions on how to fill out this report on the Graduate Student Progress Portal are described here https://dalu.sharepoint.com/sites/graduate-studies/SitePages/gspa-progress-report-submit.aspx

7.7 Repeating Cross-listed Courses

If a student has already taken and passed one of our courses at the 4000-level and wishes to repeat the course at the 5000-level, the 5000-level course will not count towards their degree requirements.

7.8 Taking Courses Outside Dalhousie

With the approval of the department and FGS, registered graduate students may take courses for credit at another university, provided the class is not available at Dalhousie. Students may not take classes outside Dalhousie for graduate credit unless prior approval has been granted by FGS. Classes are not approved retroactively. To find the graduate student Letter of Permission form and guidelines locate https://dalu.sharepoint.com/sites/graduate-studies/SitePages/forms.aspx.

The maximum number of classes taken outside Dalhousie University is normally confined to 33% of the course requirements except in cases where a university-level agreement, governing specific cooperative arrangements, has been negotiated and is in operation.

The normal regulations governing grading policy (Graduate Academic Calendar, Section 6.6.2) apply to classes taken at other institutions (e.g., a C+ on a graduate class taken elsewhere will be deemed an “F” in the student’s program and may render him/her liable to academic dismissal). Students who fail a class may not replace that class with the Letter of Permission except by special permission from the Faculty of Graduate Studies.

Dalhousie will normally pay the tuition for students who pay a program fee to take classes offered at other Maritime universities, to the equivalent cost of a Dalhousie course, provided the class is not available at Dalhousie. Any course charges above that amount are the responsibility of the student. Students who are required to take classes at other institutions outside the Maritimes will be considered on a case-by-case basis, e.g. if the class is a necessary component of a student’s program. The tuition for an approved class taken at a university outside the Maritimes is normally the responsibility of the student. Students who receive approval to take classes at institutions within or outside the Maritimes for convenience or for non-academic reasons do so at their own expense.

7.9 Transfer of Credit for Courses Taken Outside Dalhousie

With the approval of the graduate coordinator and the supervisor, a student may transfer up to 33% of their required credits from a different university. The appropriateness of the level and subject of each course will be decided by the graduate coordinator, in consultation with the supervisor.

7.10 AARMS Courses

The Atlantic Association for Research in the Mathematical Sciences (AARMS) runs a summer school every year. The school takes place at a university in Atlantic Canada. We quote from their website:

“During a four-week period every summer AARMS invites highly regarded faculty from around the world to deliver graduate courses in the mathematical sciences and their applications. Our goals are to broaden the education of graduate students and to encourage promising undergraduates to continue their studies.”

Many of our students take courses at the AARMS summer school. Depending on the topics, we have two courses in Mathematics (MATH 5001, MATH 5002) and two in Statistics (STATS 5001, STATS 5002) at Dalhousie that you can sign up for to receive credit for the summer school. If you wish to take these courses for credit, please talk to the graduate coordinator in advance to have them approved.

We encourage our students to participate in these schools. For deadlines and all other details, please visit their website https://aarms.math.ca/summer-school/

The AARMS course numbers are also used for getting credit for graduate courses run virtually by AARMS members departments.

7.11 Reading Courses

By FGS regulations, students may not register for more than two reading courses. Written approval of their graduate coordinator is required.

To register for a reading course, the course instructor must provide a syllabus and grading plan to the graduate coordinator for approval before the course is created.

7.12 Extensions

The normal upper time limits for an MSc are four years for full-time students, and five years for part-time students. The time limit for a PhD student (always full-time) is six years. A first extension of one year may be granted by the Faculty of Graduate Studies on the recommendation of the department, along with a satisfactory Progress Report form completed and signed by the student and the supervisor. Under no circumstances can a student be registered in a program for more than 10 years. Requests for a final one-year extension must include a Progress Report form for the previous year together with a detailed plan and timetable for completion of the thesis within the following twelve (12) month period. The student is then expected to defend and submit the approved thesis within that academic year. A further extension will only be given for one term to provide for necessary revisions to the thesis following defence.

7.13 Grading Policy for Graduate Students

Under FGS regulations, all instructors of graduate classes (i.e., designated 5000 and above) at Dalhousie, with the exception of a few classes for which a pass/fail grading scheme has been approved, will use the following grading scheme:

Letter Grade	Percentage Equivalent	Grad Point Value
A+	90-100	4.3
A	85-89	4
A-	80-84	3.7
B+	77-79	3.3
B	73-76	3
B-	70-72	2.7
F	<70	0

Faculty of Graduate Studies regulations stipulate that graduate students must achieve a minimum, or passing, grade of "B-" in all classes. Any lower grade will be recorded as a failure. A student who fails to meet these requirements (in 3 credit hours) in any year is immediately and automatically withdrawn (academically dismissed) from the program. However, such a student may apply, in writing, to the department for immediate reinstatement, (Graduate Academic Calendar, Section 5.4.2). Reinstatement to a program after a failing grade must be supported by the graduate coordinator and must be approved in writing by the Faculty of Graduate Studies. If re-admitted, any subsequent "F" will result in a final program dismissal. Note that any academic withdrawal and reinstatement will be recorded on the student's official transcript.

7.14 FGS Travel Support

Students who are planning to present a poster or paper at a scholarly meeting are encouraged to apply to FGS for travel support. Students are eligible for one travel grant during the period of their graduate degree program at Dalhousie and should be presenting research related to their thesis. For more details, https://www.dal.ca/faculty/gradstudies/finance-your-studies/scholarships-bursaries/travel-grant.html

7.15 Dalhousie Math & Stats Graduate Student Society

The Dalhousie Mathematics and Statistics Grad Society organizes the Graduate Seminar Series, and social events for Dalhousie Math and Stats grad students. Events in the past have included bowling, game nights and boat cruises. msgss@dal.ca

7.16 Guidelines for the Supervision of Graduate Students

The rights and responsibilities of students, supervisors, and the department are outlined in the FGS Calendar, and can be found in the Graduate Academic Calendar, Section 9.4.

8 MSc Program Requirements

8.1 Curriculum Requirements

Students are normally required to complete six three-hour courses at the 5000 level or higher. Courses are expected to have some relevance to the student's research. The required courses are specified in the Program Requirements Form. Upon failure of any course (grade strictly less than B-), a student will be withdrawn from the graduate program and must apply to the department for reinstatement. Reinstatement is at the discretion of the department and Faculty of Graduate Studies, following input from the supervisory committee. If a student fails two courses, re-admission is at the discretion of the Faculty of Graduate Studies and is highly unlikely.

8.2 MSc Supervisory Committee

Each Master's thesis candidate shall have a supervisory committee, comprised of at least two faculty members who have membership in the Faculty of Graduate Studies, and at least one who is from the student's graduate department. A sole supervisor needs to have regular full (not Adjunct) membership in the Faculty of Graduate Studies.

Additional full or adjunct members of the Faculty of Graduate Studies may be appointed as appropriate. Additional members of the committee who are not members of the Faculty of Graduate Studies, including members of the non-university community (such as a practicing profession), may be appointed to the supervisory committee when their particular expertise makes it appropriate. See Graduate Academic Calendar Section 10.3.

8.3 MSc Thesis

The MSc thesis should report on research by a student on a specific topic. The MSc thesis can contain original theoretical results, or it can be expository. The thesis must demonstrate the student's ability to read, understand and analyze the literature on a specific subject, add their own perspective, and synthesize their findings into a coherent presentation. It can include original observations in the form of computations, applications or discussions. Sometimes an MSc thesis results in a journal publication, and often it is a stepping-stone to more in-depth research towards a PhD degree.

Students must familiarize themselves with the thesis format guidelines. These guidelines are meant to ensure that high-quality manuscripts are produced in a consistent style and that reproduction and reduction in size done by the National Library will produce readable copies. https://dalu.sharepoint.com/sites/graduate-studies/SitePages/formatting.aspx

A Thesis Template in LaTeX is maintained by Computer Science and is available at this link, https://projects.cs.dal.ca/dalthesis/.

8.4 The MSc Examining Committee

Each Master's thesis shall be examined by an Examining Committee, following the criteria given below:

1. There shall be a Chair, usually the Graduate Coordinator or designate, who is not a participating member of the Supervisory Committee, and whose duty is to ensure that the exam is appropriate and fair and to submit a report as noted below. The Chair is not an examiner.
2. In the case of a thesis with a single supervisor, the minimum set of examiners will consist of the supervisor plus two other readers. If the thesis is co-supervised, the co-supervisors will both act as examiners; there must also be two other readers in this case. The table in Section 10.3.2 of the Graduate Academic Calendar summarizes these minimum requirements and the examiner's status with the Faculty of Graduate Studies. Additional examiners, who may or may not be members of the Faculty of Graduate Studies, are permitted beyond these minimums.
3. The Faculty of Graduate Studies may appoint an additional FGS representative, if it is deemed necessary.
4. Voting: Only examiners with a Faculty of Graduate Studies appointment may vote on the outcome of an examination and sign the Master's Thesis Approval Form.

8.5 MSc Thesis Defence

The agreement of all supervisory committee members is normally required before a department brings forward a thesis for examination. Notice of an MSc thesis defence, including an abstract, is posted within the Mathematics & Statistics Department several days before the defence. The MSc Thesis Defence format consists of a 20–25-minute talk by the student, several rounds of committee questions and, if time permits, audience questions. This is followed by deliberations by the examination committee. The MSc thesis defence is open to the public, but the committee deliberations are not. A thesis is either approved or not approved. The categories are:

- approved as submitted;
- approved upon specific corrections being made (a clear timetable for completion of the revisions must be presented to the student, normally with a maximum of one month to complete the revisions);
- rejected but with permission to re-submit a revised thesis for re-examination (a clear timetable for completion must be presented, normally with a maximum of one year to re-submit);
- rejected outright.

Reporting: There are two forms to be filled out. Both forms are available at https://dalu.sharepoint.com/sites/graduate-studies/SitePages/forms.aspx, but the grad admin will email them to the candidate and the supervisor before the defense:

1. Master's Thesis Approval Form
2. Dalhousie Thesis License Agreement

In the case of an outright failure, or failure with a right to re-submit by a specific date, the Graduate Coordinator must send expeditiously an additional written notification of failure to the Faculty of Graduate Studies.

8.6 MSc Thesis Timeline

8.6.1 Deadlines to Submit Thesis

Students (either Master's or Doctoral candidates) should be aware of the FGS deadlines for submitting a finished thesis in order to graduate in the preferred convocation.

Table 3. Deadlines to Submit Thesis to DalSpace	
May Convocation:	**October Convocation:**
December 15 – without Winter term enrolment	**April 30** - without Summer term enrolment
April 15 – with Winter term enrolment	**August 31** – with Summer term enrolment

Students are expected to distribute copies of their thesis to their examination committee at least 3 weeks in advance of the thesis submission deadline. This is intended to give members of the examination committee sufficient time to read the thesis, and for the student to make minor changes to the thesis as recommended by the examination committee after the defence. It is the responsibility of the student to ensure that the MSc defence is held sufficiently in advance of the final FGS submission date to make any changes that might be required by the examination committee. Thesis submission deadlines, in order to be eligible to graduate in May or October, are final in all cases.

8.7 Thesis Format Check

The Faculty of Graduate Studies provides a format check of your thesis ahead of the thesis defence date. This ensures that your thesis is formatted correctly and allows time to correct any mistakes. To request a format check, email a PDF copy of your thesis to thesis.review@dal.ca. Be sure to include your banner number, department and degree program in the email. You will receive feedback from the FGS thesis team within two business days.

8.8 Apply to Graduate

To complete your graduate program and to be considered for graduation, students must apply to graduate via DalOnline. This step is required whether or not students plan to attend convocation.

Table 4. Deadlines to Apply to Graduate	
Spring Convocation	December 1
Fall Convocation	July 2

There is no fee to apply to graduate before the deadline, but after the deadline the fee is $50. You may cancel your application to graduate if you need more time to complete your program. It's better to apply to graduate and then cancel, than to apply late. For instructions: https://www.dal.ca/study/graduation-and-convocation/apply-to-graduate.html

8.9 When to Submit Your Thesis

Your stipend will be discontinued at the end of the month in which your degree requirements are met, and the final submission of your thesis is received in FGS, but the balance of the fees you paid for that term will not be refunded to you. Therefore, it is wise to discuss the timing of your thesis submission with your supervisor.

8.10 Required Forms for Thesis Submission

Specific signed forms must be submitted to FGS before the thesis can be submitted to DalSpace:

- Master's or PhD Thesis Approval Form
- Dalhousie Thesis License Agreement
- Student Contribution to Manuscript form (if applicable)
- Request to Embargo a Thesis (if applicable)

The grad admin will prepare these forms and provide them to the supervisor and the student on the day before the MSc Thesis Defence. The forms are found at https://dalu.sharepoint.com/sites/graduate-studies/SitePages/forms.aspx

8.11 Electronic Submission of Final Approved Theses

All final and approved Master's and Doctoral theses are submitted via DalSpace. After examination, the approval of any required thesis changes are submitted electronically directly to DalSpace as PDF/A files. The procedure for submitting a thesis is found at https://dalu.sharepoint.com/sites/graduate-studies/SitePages/submitting.aspx. It is the student's responsibility to meet Faculty of Graduate Studies formatting requirements for the thesis and to ensure that the thesis has been converted into a compatible PDF/A version. Electronic submission of the thesis must be preceded by the following original signed forms, which are retained on file at the Faculty of Graduate Studies: Dalhousie Thesis License Agreement, MSc. Thesis Approval form or PhD Thesis Submission Form, and Student Contribution to Manuscripts form (if applicable).

Within one week of submitting the E-thesis to the Dalhousie Institutional Repository (DalSpace) it is reviewed by the Faculty of Graduate Studies. If it is not approved as complete it will be returned to the student once for corrections. After it is approved as complete it is then committed to the institutional repository and then harvested by Theses Canada, sent to the National Library, Ottawa and listed in Dissertation Abstracts International or Master's Abstracts International. The National Library can circulate such copy according to the International Inter-Library Loan Code, with full copyright protection for the author. Similarly, E-theses are also stored by DalSpace where they are searchable and available to the public via the internet. When protection of intellectual property is a concern, the thesis may, with Faculty of Graduate Studies approval, be retained for a maximum of one year before publication and distribution.

Faculty of Graduate Studies will not accept or bind paper copies of any theses. Students wishing to obtain bound copies for themselves, supervisors, departments, or other parties may contact a binding company directly to do so.

9 PhD Program Requirements

9.1 Curriculum Requirements

Students are normally required to complete four three-hour courses at the 5000-level or higher. Courses are expected to have some relevance to the student's research. Supervisors may require additional courses beyond these numbers. The required courses are specified in the Program Requirements Form. Upon failure of any course (grade strictly less than B-), a student will be withdrawn from the graduate program and must apply to the department for reinstatement. Reinstatement is at the discretion of the department and Faculty of Graduate Studies, following input from the supervisory committee. If a student fails two courses, readmission is at the discretion of the Faculty of Graduate Studies and is highly unlikely.

9.2 PhD Supervisory Committee

Within the first year of their program, all Doctoral students must have a formally constituted supervisory committee, consisting of the thesis supervisor(s) and at least two other members of the Faculty of Graduate Studies who are knowledgeable in the field of research. Membership of all Doctoral supervisory committees must be approved formally by the Faculty of Graduate Studies.

Supervisory committees should meet during the thesis research period; FGS recommends at least twice per year.

9.3 Mathematics Comprehensive Examinations

As part of the Mathematics PhD program, each student must successfully pass three examinations. A PhD student must register for MATH 9520 (Comprehensive Examinations) each term until they have completed all three examinations and received a passing grade. These exams consist of:

1. Two non-specialist examinations to be chosen from the following areas:

   Algebra
   Analysis
   Combinatorics and Graph Theory
   Differential Equations
   Differential Geometry
   General Relativity
   Number Theory
   Numerical Analysis
   Probability Statistics
   Topology (General and Algebraic).

2. An examination in the candidate's area of specialization

Syllabi for some of these comprehensive examinations can be found in Section 11 of this handbook. Contact the organizer of your exam for additional material.

9.3.1 Non-specialist Examinations

1. There will be no overlap in the syllabi of any two non-specialist comprehensive examinations a student takes.

2. At least one of the examinations must be in either Algebra or Analysis.

The syllabi for the Algebra and Analysis exams closely follow those of the mathematics core courses MATH 5045and MATH 5055 for Algebra and MATH 5010, MATH 5020, and MATH 5540 for Analysis. Comprehensive exams for these two subjects are given in conjunction with the final exams for these courses. To receive credit for the comprehensive exam in:

- Algebra - the candidate may write and pass the two exams given in conjunction with the courses MATH 5045 and MATH 5055;
- Analysis - the candidate may write and pass the exams set in conjunction with two of the three courses MATH 5010, MATH 5020 and MATH 5540.

These comprehensive exams are written in the same period as the final exams for these courses. At the discretion of the instructor, the comprehensive exam may contain different questions than the final exam for the course. The level required for the comprehensive exam may be different than that of the final exam, and the length will be three hours. The setting and grading of the comprehensive exam at the end of these courses will be overseen by a second faculty member.

Banking Comprehensive Examinations for MSc Students: MSc students taking the core courses mentioned above are allowed to take the corresponding comprehensive final exam for the course, with the permission of the graduate coordinator, and bank their passing grade so that it could be used once they are enrolled in the Mathematics PhD program at Dalhousie. This option is only available if there is no gap between the MSc and PhD programs for the student. MSc students wishing to avail themselves of this option must inform the graduate coordinator and the course instructors at the beginning of the term in which they take the courses.

3. The exams must be taken for the first time within 12 months and successfully completed within 16 months of registration in the program.

Usually, the non-course-based exams are scheduled within a few days of each other, and typically at the end of the summer following a September start date (or December for a January start date).

9.3.2 Specialist Examination

The specialist examination is a combination written and oral exam **to be completed within 24 months of entry into the PhD program.** The written portion of the specialist exam is to consist of a written report prepared in advance by the student outlining the student's proposed thesis research. The oral examination will be on the content of the written report together with a syllabus prepared by the student's supervisory committee prescribing a selection of published sources relevant to the student's proposed thesis research.

The examiners for the oral exam will be the student's supervisory committee and a departmental representative appointed by the chair.

9.3.3 Procedures

1. The candidate selects a specialty area and an advisor from this area and then obtains the advisor's consent. (Normally this advisor becomes the research supervisor.)
2. The candidate and the advisor in consultation select the two non-specialty areas and inform the graduate coordinator of these areas.
3. The graduate coordinator, in consultation with the advisor and the candidate, appoints a comprehensive examination committee of two for each examination (normally including the advisor for the specialty examination), and obtains the consent of these committee members. Committee members must be members of the Dalhousie Faculty of Graduate Studies.
4. It is the responsibility of the comprehensive examination committee to interpret the prepared syllabi. The candidate should consult with the appropriate examiners if clarification of the syllabus is required.
5. The graduate coordinator and examination committee will schedule the examinations.
6. The official notification of the results of each examination will always come from the graduate coordinator.

9.3.4 Oral Examinations

Oral examinations are 60 to 90 minutes long and begin with a 20-minute presentation by the student followed by two or more rounds of questions from the committee. All members of the examining committee must be present at an oral examination. The graduate coordinator will assign an observer to an oral examination session who makes sure that the candidate has been given sufficient time to consider each question within the designated time-frame of the examination Details of how each session is to proceed will be set ahead of time with the candidate, examination committee, observer and graduate coordinator.

9.3.5 Written Examinations

Written examinations are three hours in length, are marked by the examination committee and filed with the graduate coordinator.

9.3.6 Evaluation

The comprehensive examination committee will notify the graduate coordinator of its decision, in writing, that:

(i) the candidate has passed the comprehensive examination, or
(ii) the candidate has failed the comprehensive examination, or
(iii) the candidate should repeat the comprehensive examination.

- A candidate who fails exactly one of the three examinations must be given the chance to repeat that examination.
- A candidate who fails all three examinations will not be allowed to repeat the examinations and is no longer eligible to continue in the PhD program.
- No examination may be repeated more than once.

9.3.7 Grievances

The candidate should bring any grievance or complaint regarding the implementation of their comprehensive examinations to the attention of the graduate coordinator as soon as any such matter arises. It is necessary that we have a transparent system for the examining committees as well as the candidate.

9.4 Statistics Thesis Proposal

Statistics PhD students must submit a written document to their thesis committee members as a PhD proposal. This proposal will summarize the relevant literature related to their proposed thesis research topic. It should also outline a plan for successful completion of the project. The proposal needs to be defended orally approximately one week after submission.

Committee members will decide whether the proposal constitutes a viable plan for an eventual successful PhD thesis. Failure occurs when and if committee members decide that the proposal is unlikely to lead to a successful thesis or does not contain enough information to make a clear judgment. In such cases, students will be granted the opportunity to provide a new proposal within one month of the original oral exam.

To complete this requirement, students must register in Stat 9500 for the term in which the proposal takes place.

10 PhD Thesis

The PhD thesis should report original research of such value as to merit publication in a refereed scientific journal and be in a satisfactory and consistent form. Students should familiarize themselves with the Thesis Format Guidelines. These guidelines allow the incorporation of scholarly articles into the thesis, are meant to ensure the production of high-quality manuscripts in a consistent style, and this allows the reproduction and size-reduction by the National Library to produce readable copies. See the Faculty of Graduate Studies SharePoint site for the Thesis Format Guidelines, https://dalu.sharepoint.com/sites/graduate-studies/SitePages/formatting.aspx.

Additionally, a Thesis Template in LaTeX is maintained by Computer Science and is available at this link, https://projects.cs.dal.ca/dalthesis/

Students are advised to submit their thesis for a format check to thesis.review@dal.ca well in advance of final submission dates to ensure there is enough time to make revisions.

Table 5. Timeline – Summary of Timeline for PhD Thesis Defence	
12 weeks before defence:	- Inform Grad Coordinator and Grad Admin of intent to defend PhD **Submit these documents to** thesis@dal.ca: ▫ 'Request to Arrange Oral Defence of a Doctoral Thesis' form ▫ CV of proposed External Examiner (cc gradadminsupport.mathstat@dal.ca on the email)
8 weeks before defence:	- Submit thesis for Format Check to thesis.review@dal.ca - Send thesis to Supervisory Committee
6 weeks before defence	- Present Thesis at Internal Defence in Department **Submit these documents to** thesis@dal.ca: ▫ 'PhD Thesis Submission' form ▫ 'PhD Examination Information' Form ▫ Thesis (pdf) ▫ Abstract (doc) ▫ Candidate's CV (Word)
After defence	**Submit these signed documents to** thesis@dal.ca: ▫ Candidate sends 'Dalhousie Thesis Licence Agreement' ▫ Supervisor sends 'PhD Thesis Approval' Form *Note: These 2 documents must be submitted to FGS before a thesis can be submitted to Dalspace.*

10.1 The PhD Examining Committee

The examining committee consists of the research supervisor or co-supervisors, at least two additional members (Readers who normally have been members of the supervisory committee), and the external examiner who shall be from outside the University. A departmental representative (the chair of the department or a designate) is included as a non-voting and non-examining member of the committee. All members of the examining committee must have current membership in the Faculty of Graduate Studies (see Section 1 of the Graduate Academic Calendar).

10.2 PhD Internal Defence

The Department of Mathematics and Statistics requires students to publicly defend their thesis within the department before being allowed to submit their thesis to FGS. This defence consists of a 20-minute talk by the candidate followed by several rounds of questions by the examiners. Following questions by the examiners, questions by the public are considered. Immediately after the question period, a closed-room meeting with the examining committee results in one of the following three recommendations – that the candidate:

1) be permitted to submit the thesis to FGS,
2) be permitted to submit the thesis to FGS after specific changes, or

3) be asked to make major changes to the thesis and re-submit it to the internal examination committee at a later date.

When the internal defence is passed successfully, the internal examining committee signs the 'PhD Thesis Submission' form and the department chair or director signs the 'PhD Examination Information' form. FGS will provide both forms to the student. Once approved and signed, the candidate submits these forms to FGS along with the final version of the thesis. FGS provides detailed instructions to the candidate about this process.

10.3 FGS Regulations Regarding PhD Examinations

The following regulations have been copied from Faculty of Graduate Studies Regulations and somewhat edited to fit our department's procedures.

10.3.1 Deadline for Graduation

The Faculty of Graduate Studies adheres firmly to the thesis submission deadlines which coincide with graduating in either the Fall or Spring convocations. These deadline are final in all cases.

10.3.2 Regulations for the Defence of a Doctoral Thesis

All Doctoral theses must be examined in a public oral defence, to be conducted by an examining committee recommended by the department and approved by the Faculty of Graduate Studies. A candidate shall not be permitted to proceed with the oral defence and examination until all of the following requirements have been met:

1) all required classwork completed successfully,
2) comprehensive examination passed,
3) examining committee established, and
4) the style and format of the thesis meet the requirements of the university and appropriate copies of the thesis have been submitted as per regulations and deadlines in paragraphs 1-9 below.

Normally a candidate proceeds to oral defence with the approval of the supervisor and supervisory committee. A candidate may proceed without the consent of the supervisor and committee, but a signed declaration included on the 'Thesis Submission' Form is required by the Faculty of Graduate Studies

10.3.3 FGS Doctoral Defence Procedures

1. **Appointment of External Examiner:** The Chairperson of the Department (or Graduate Coordinator where appropriate) shall recommend to the Associate Dean of the Faculty of Graduate Studies the names of the proposed external examiner that was approved by the supervisory committee (with CV). The appointment of an external examiner should preferably occur three months before the anticipated date of defence. The person suggested should be an acknowledged expert in the field or discipline of the research being examined in the thesis, must not have been

directly involved in the student's research in any way, should possess a Doctoral degree or equivalent, and should have demonstrated experience of Doctoral supervision to degree completion and examination. Evidence of these qualifications must be explicit in the CV submitted for the first external candidate. The choice of external examiner must be approved by the Faculty of Graduate Studies. If the first choice is unacceptable to FGS or if that person is unavailable, FGS will contact the department Chair/Grad Coordinator to discuss arrangements for an alternative External Examiner. The Graduate Coordinator may then confirm the availability of the external examiner and propose dates and times for the defence. Once the date and time have been confirmed by the department then the formal invitation to the external examiner is issued by the Faculty of Graduate Studies.

2. **Format Check:** The Faculty of Graduate Studies provides a format check of your thesis ahead of your thesis defence date. This ensures that your thesis is formatted correctly and allows you time to correct any mistakes. To request a format check, send a pdf of your thesis to thesis.review@dal.ca. Be sure to include your banner number, department and degree in the email. You will receive feedback from the FGS thesis team within 2 business days

3. **Thesis Documents Required for Examination:** At least six weeks prior to the scheduled defence, the candidate shall send the following documents to the Faculty of Graduate Studies Office, thesis@dal.ca:

    - Thesis (pdf)
    - PhD Thesis Submission Form
    - PhD Examination Information Form
    - Thesis (pdf)
    - Abstract (doc)
    - CV (Word)

    The Faculty of Graduate Studies will send clear instructions to the candidate about when and how to submit the draft of their thesis and the documents (listed above) to FGS. The Faculty of Graduate Studies will send the electronic thesis to the External Examiner once a date, time and format of the defence are determined.

4. **Thesis Required for Committee and Department:** The Candidate will provide the thesis to the examining committee (excluding the External Examiner).

5. No arrangements will be made for the oral examination until all these requirements are fulfilled. **The examination will be held no earlier than five weeks after submission of the thesis,** thereby allowing adequate time for the thesis to be read by the external examiner

6. The Faculty of Graduate Studies will issue a formal invitation to the external examiner and will send a copy of the thesis to them at least five weeks before the examination, with a request to submit a written appraisal (the Examiner's Report – see paragraph 7) of the thesis no later than one week prior to the date of the defence

7. **External Examiner's Report:** The external examiner will submit a constructively critical and analytical report to the Faculty of Graduate Studies at least one week prior to the scheduled date of the defence. A copy will be sent to the department Chair or Graduate Coordinator. The Examiner's Report must include a recommendation on whether or not the thesis should proceed to defence. If the recommendation is not to proceed, the report should indicate what, if anything, would be required to make the thesis acceptable. Note that a decision to proceed to defence does not imply that the thesis is approved, only that it is acceptable for defence. The external examiner (and the examining committee) will have questions that must be answered to their satisfaction, and a thesis can be rejected as a result of the defence. The Examiner's Report must not be disclosed to the candidate or the supervisory committee prior to the defence (however, see paragraph 8, below)

8. The defence will only occur if the External Examiner states that the thesis may proceed. The report of the External Examiner must contain a clear indication whether the thesis is ready to defend or not. If the External does not recommend that the thesis proceeds to examination, then within 12 months, a revised thesis may be resubmitted and sent to either the original external examiner or to a new external examiner, as deemed appropriate by the Faculty of Graduate Studies. A doctoral thesis may be submitted to the Faculty of Graduate Studies for examination no more than twice
9. If the external examiner recommends that the thesis proceed to defence, notice of the public defence of the thesis will be published and sent to all relevant departments by the Faculty of Graduate Studies. All interested faculty, students, and members of the public will be welcome to attend.Variation of the regulations outlined above may be permitted only with the written permission of the Faculty of Graduate Studies.

10.3.4 Oral Examination

The oral examination of a Doctoral thesis is the culmination of the candidate's research program. It exposes the work to scholarly criticism and provides the opportunity for the candidate to defend the thesis in public.

1. **Chair of the Defence:** The Examination is chaired by a member of the Panel of PhD Defence Chairs.
2. **Examining Committee**: The examining committee consists of the research supervisor or co-supervisors, at least two additional members (readers who normally have been members of the supervisory committee), and the external examiner who shall be from outside the University. A departmental representative (the chair of the department or a designate) is included as a non-voting and non-examining member of the committee. All members of the examining committee must have current membership in the Faculty of Graduate Studies. (see Section 1 and Section 10.5.1 of the Graduate Academic Calendar)
3. **The Departmental Representative** attends the public and in-camera sessions of the defence and reports to the Defence Chair. The Departmental Representative ensures departmental expectations are followed.
4. **Order of Examination Proceedings:**
    (a) The Chair of the Defence opens the proceeding with a brief description of the protocol.
    (b) The candidate is questioned on the thesis following a summary presentation of no longer than 20 minutes.

(c) The Chair will give priority to questions from the external examiner and then from the other members of the examining committee in some pre-arranged order.
(d) The audience will then be invited to ask questions.
(e) The Chair adjourns the examination when the examining committee decides that further questioning is unnecessary, and the candidate and all members of the audience are required to leave the room.
(f) The Chair then presides over the examining committee during its deliberations in-camera.
(g) Following the in-camera session, the candidate is invited back into the room and is informed of the decision of the committee.
(h) The Chair oversees the completion of the PhD Thesis Approval Form for examining members present at the hybrid/ in-person defence while the Faculty of Graduate Studies will oversee the completion of the PhD Thesis Approval Form for those attending virtually (for virtual defences). The Chair completes the Defence Report and returns it immediately to the Faculty of Graduate Studies.

5. **In-camera Deliberations and Grading:** The decision of the Examining Committee is based both on the thesis and on the candidate's ability to defend it. The thesis is graded approved or rejected. A thesis can be a) accepted by the examining committee as submitted; b) accepted on condition that the specific corrections with a clear timetable for completion are made, or; c) rejected, The Thesis can be rejected on grounds of form as well as content. If specific minor corrections are required, the thesis will be returned to the candidate with a time limit for the completion of all corrections, normally no more than one month. Specific corrections will usually be left to the satisfaction of the research supervisor.
6. **Proceedings in the Case of Rejection:** If the thesis is rejected with permission to submit a revised thesis (within 12 months of the first defence), the revised thesis will be re-read by an Examining Committee, at least two of whose members were on the original committee. The thesis shall be submitted to an external examiner who may be the original external examiner if the Associate Dean of Graduate Studies considers this to be desirable. The candidate shall defend the thesis before an Examining Committee in the usual way. If the thesis is rejected again, there will be no third examination. Such a student will be academically dismissed without the possibility of reinstatement.
7. **Variation of the procedures:** Variation of the procedures stipulated above may be permitted only with the written permission of the Faculty of Graduate Studies.

Anomalies or deviations from the procedures or actions detailed above will be dealt with solely by the Dean of the Faculty of Graduate Studies. The dean(s) of the faculty in which the student is enrolled cannot intercede in matters related to the defence of a thesis (Master's or PhD).

10.4 PhD Defence Timeline

(See summary in Table 5, Section 10)

The timeline is usually dictated by the date when the candidate must submit the completed version of the thesis to graduate in May or October. The timeline below assumes that any changes to the recommended thesis are minor, following the Internal Defence and Final Defence. It is the responsibility of the student to

initiate the defence process sufficiently in advance of all deadlines to allow sufficient time to make changes to the thesis. The timeline below is intended to complement the PhD timeline given on the FGS web site https://dalu.sharepoint.com/sites/graduate-studies/SitePages/preparing.aspx.

12 Weeks Before the Final Defence:

Supervisors should supply the graduate coordinator/grad admin with the name of a potential external examiner. The graduate coordinator/grad admin requires this information to submit the 'Request to Arrange Oral Defence of a Doctoral Thesis' form. The supervisor should confirm with the recommended external examiner that he/she is willing to participate in the FGS Defence prior to giving this name to the graduate coordinator. The external examiner should be an acknowledged expert in the field or discipline of the research being examined in the thesis; must not have been directly involved in the student's research in any way; must not have collaborated, been a co-applicant for external funding, or published with the student, supervisor, lab members, etc. within the last five years; should possess a Doctoral degree or equivalent; and should have demonstrated experience of Doctoral supervision to degree completion and examination.

The 'Request to Arrange Oral Defence of a Doctoral Thesis' form states that no external examiner with a conflict of interest may participate in any part of a doctoral thesis examination. An external examiner is considered to have a conflict of interest with a thesis if they:

- are from the same immediate department, institution, organization or company as the student and/or their supervisor, and who interact with student and/or supervisor in the course of their duties at the department, institution, organization or company;
- have collaborated, been a co-applicant for external funding or published with the student and/or supervisor, within the last 10 years;
- have been a student of the supervisor or supervisor of the student;
- are a close personal friend or relative of the student and/or supervisor;
- have had long-standing scientific or personal differences with the student and/or super- visor;
- are in a position to gain or lose financially from the outcome of the examination; or
- have some other reason that they cannot provide an objective review of the thesis.

Discuss your ideal defence format with your supervisor. You have the option of 1) In-person, 2) Virtual, or 3) Hybrid. After the proposed external examiner is approved by FGS, your supervisor will connect with all members of the examining committee to identify the ideal date, time, and format for your defence.

Apply to Graduate.
(See Table 4, Section 8.8)

The candidate must apply to graduate at DalOnline.
For Spring convocation apply by December 1.
For Fall convocation, apply by July 1.
There is no fee to apply to graduate before the deadline, but after the deadline, the fee is $50. See...
https://www.dal.ca/convocation/graduate_information/graduate_apply.html

2 Months Before Final Defence:

The candidate distributes copies of the thesis to their supervisory committee plus graduate coordinator and the departmental office for faculty viewing.

At least 6 weeks Before Final Defence:

Internal PhD thesis Defence.

a) Make sure there is sufficient time between the Internal Defence and the date for final submission to FGS to make any revisions requested by the supervisory committee after the Internal Defence.
b) Submit your thesis to FGS for a Format Check, thesis.review@dal.ca.
c) Complete all changes required by the format check.
d) Send completed documents to FGS, thesis@dal.ca
    - PhD Thesis Submission Form,
    - PhD Examination Information Form,
    - your current CV (Word)
    - Thesis (pdf)
    - Abstract
e) Contact the grad admin to book a room for your Internal Thesis Defence and also plan to request a room booking to rehearse your presentation for your internal defense.

Week of the Posted FGS Thesis Submission Deadline:

FGS does not schedule any PhD Thesis Defences during the week of the final thesis submission deadline. This is intended to allow sufficient time to make minor corrections to the thesis.

10.5 When to Submit Your Thesis

Please see Section 8.6.

10.6 Required Forms for Thesis Submission

Please see Section 8.10.

10.7 Final Thesis Submission

Please see Section 8.11.

11 Syllabi for some Mathematics Comprehensive Examinations

11.1 Syllabus for Non-specialist Comprehensive Exam in Algebra

(Updated: September 2014)

To pass the non-specialist examination in Algebra, a student has to pass **both of the following options.** Please note that each of these topics corresponds to the syllabus of a course that is listed next to it. To pass the examination in each subject, the student may choose to pass the corresponding course, following procedures outlined in section 9.3 of this Handbook.

11.1.1 Abstract Algebra I (MATH 5045)

Topics

1. Rings and ideals.

   (Chapters 7.1-7.5 of Dummit & Foote)

2. Modules, including the structure theorem for finite generated modules over a PID.

   (Chapters 10 and 12.1 of Dummit & Foote)

11.1.2 Abstract Algebra II (MATH 5055)

Topics

1. Basic group theory.

   (Chapters 1, 2, 3.1–3.3, 4.6 of Dummit & Foote)

2. Galois Theory.

   (Chapters 13, 14 of Dummit & Foote)

Suggested References

- Artin, E. *Galois Theory*, Notre Dame (QA171 A79)
- Dummit, D. & Foote, R. *Abstract Algebra*, Prentice Hall (QA162 D85)
- Jacobson, N. *Basic Algebra I*, Freeman (QA154.2 J32)
- Lang, S. *Algebra*, Addison Wesley (QA154 L27)

12 Syllabus for Non-specialist Comprehensive Exam in Analysis

(Updated: January 2011)

To pass the non-specialist examination in Analysis, a student must pass **TWO out of the following three options.** The exact combination of the three options that can be used to satisfy comprehensive requirements

should be decided by the grad coordinator in consultation with the student and supervisor. Please note that each of these topics corresponds to the syllabus of a course that is listed next to it. To pass the examination in each subject, the student may choose to pass the corresponding course, following procedures outlined in 9.3 of the Graduate Handbook.

12.1.1 Real Analysis (MATH 5010)

Topics

1. Measure spaces: σ-algebras; measures; measurable functions.

2. Construction of measures: either locally compact Hausdorff spaces and the Riesz representation theorem, or outer measures and Carathéodory's theorem; construction of Borel measures on the real line; Lebesgue measure on the real line.

3. Lebesgue Integration: integrals of real- and complex-valued functions; monotone and dominated convergence theorems; product measures, Fubini and Tonelli theorems; Lebesgue integral in R^n.

4. Signed Measures: Lebesgue-Radon-Nikodym theorem.

5. Elementary Banach space theory; L^p, L^∞ spaces; Hölder's and Minkowski's inequalities; completeness; relations between L^p spaces; duality and L^p spaces.

Suggested References

- G. B. Folland, *Real Analysis: Modern Techniques and their Applications,* John Wiley, 2nd ed., 1999.
- H. L. Royden, *Real Analysis,* Prentice Hall, 3rd ed., 1988.
- W. Rudin, *Real and Complex Analysis,* McGraw-Hill Science/Engineering/Math; 3rd ed., 1986.

12.1.2 Complex Analysis (MATH 5020)

Topics

1. Holomorphic functions: Cauchy and Morera theorems.

2. Residues, contour integration including branch cuts.

3. Liouville's theorem, maximum modulus principle, Schwartz lemma.

4. Rouché's theorem, argument principle.

5. Conformal mapping, Möbius transformations, Riemann Mapping theorem, applications.

Suggested References

- L. V. Ahlfors, Complex Analysis, McGraw-Hill Education, 1980.
- J. B. Conway, Functions of One Complex Variable, Springer-Verlag, 2002.
- J. E. Marsden, Basic Complex Analysis, W. H. Freeman & Company, 3rd ed., 1998.

- W. Rudin, Real and Complex Analysis, McGraw-Hill Science/Engineering/Math; 3rd ed., 1986.

12.1.3 Applied Analysis (MATH 5540)

(Updated May 2015)

Topics

1. Dynamical Systems: Classification of planar systems, nonlinear systems, equilibria, global nonlinear techniques, closed orbits and limit cycles.

2. Calculus of Variations: Functionals, necessary conditions for an extremum, Euler-Lagrange equation, second variations, sufficient conditions for an extremum, principle of least action, Lagrangian and Hamiltonian systems, completely integrable systems, Hamilton-Jacobi theory, applications.

Suggested References

- J. K. Hale and M. Kocak, *Dynamics and Bifurcations*, Springer Verlag, 1991.
- I. M. Gelfand and S. V. Fomin, *Calculus of Variations,* Prentice-Hall, 1963.

12.2 Syllabus for Non-specialist Algebraic Topology Comprehensive Exam

(Updated September 2014)

Topics

1. Homotopy and the fundamental group
2. Covering Spaces
3. Chain complexes
4. Singular and Simplicial Homology
5. Eilenberg-Steenrod Axioms
6. Homology of CW complexes
7. Higher Homotopy Groups
8. Classification of surfaces
9. Cohomology and the cup product
10. Kunneth and Universal Coefficient Theorem
11. PoincarÃ© Duality Theorem
12. Fixed Point Theorems

Suggested References

- M.Harper, J.Greenberg, *Algebraic Topology, a first course*, Benjamin, 1981.

- W. Massey, *A Basic Course in Algebraic Topology*, Springer GTM v. 127, 1991.
- J. Junkers, *Elements of Algebraic Topology*, Addison-Wesley, 1984.

12.3 Syllabus for Non-specialist Comprehensive Exam in Differential Equations

For the most up-to-date version, see https://mathstat.dal.ca/~tkolokol/decomp/

12.4 Syllabus for Non-specialist Comprehensive Exam in Combinatorics

(Updated November 2016)

Topics

- Combinatorial techniques
  1. Basic counting: combinations and permutations, inclusion/exclusion, pigeonhole principle, asymptotics
  2. Recurrence relations: solving recurrence relations, generating functions, formal power series.
- Combinatorial structures
  1. Partial orders and equivalence relations, including chains and antichains
  2. Systems of Distinct Representatives
  3. Graph Theory:
     - connectivity, walks and paths, trees
     - Eulerian and Hamiltonian graphs
     - network flows and matchings
     - graph colourings

References

[Brualdi] Introductory Combinatorics. Richard A. Brualdi, Pearson/Prentice Hall, 5th edition, 2010.

- Basic counting techniques. [Brualdi] Ch. 1–6
- Recurrence relations and generating functions. [Brualdi] Ch. 7, 8
- Partial orders and equivalence relations. [Brualdi] S. 4.5, 5.6
- Systems of Distinct Representatives [Brualdi] S. 9.1–9.3
- Graph Theory [Brualdi] Ch. 11-13