Graduate Program in Mathematics
University of British Columbia Okanagan[1]

PROGRAM INFORMATION

Name of Credential: M.Sc. and Ph.D.

Title: Graduate Program in Mathematics

Unit Offering the Program: Department of Computer Science, Mathematics, Physics, and Statistics (CMPS), Irving K. Barber Faculty of Science, UBC Okanagan

Contact Person: Dr. Warren Hare
CMPS, IKBFOS
University of British Columbia
Kelowna, B.C. V1V 1V7
CANADA
e-mail: Warren.Hare@ubc.ca

PROGRAM OBJECTIVES

The Graduate Program in Mathematics offers the degrees of M.Sc. and Ph.D. The program is designed for students with a background in mathematics, statistics, mathematical astrophysics or mathematical related areas. It provides students with opportunities for research in five areas of specialization: Mathematical Biology and Differential Equations; Optimization and Analysis; Number Theory and Algebra; Statistics and Probability; and Mathematical Astrophysics. It prepares graduating students for careers in research and teaching as well as industry and government.

[1] Version: July 2025.

PROGRAM MEMBERSHIP

Continuing Members: Currently, the Mathematics Graduate Program Committee consists of the following continuing members.

Name	Rank	Area
Jeff Andrews	Associate Professor	Clustering and Classification
Heinz Bauschke	Full Professor	Optimization and Analysis
John Braun	Full Professor	Computational Statistics
Wayne Broughton	Associate Professor	Combinatorics and Design Theory
Ed Butz	Associate Professor	Financial Mathematics
Sylvie Desjardins	Associate Professor	Mathematical Biology
Eric Foxall	Assistant Professor	Mathematical Biology and PDEs
Yong Gao	Full Professor	Arti. Intelligence & Networks
Lengyi Han	Assistant Professor of Teaching	Statistical Consulting
Donovan Hare	Associate Professor	Graph Theory, Discrete Optim.
Warren Hare	Full Professor	Numerical Optimization
Alex Hill	Assistant Professor	Mathematical Astrophysics
Yves Lucet	Full Professor	Computational Convex Analysis
Xiaoping Shi	Assistant Professor	Computational Statistics
Javad Tavakoli	Full Professor	Applied probability and Queuing
John Thompson	Assistant Professor	Enviro. & Financial Statistics
Paul Tsopmé**né**	Assistant Professor of Teaching	Algebraic Topology
Rebecca Tyson	Full Professor	Mathematical Biology
Irene Vrbik	Assistant Professor of Teaching	Mixture models, Comp. Statistics
Shawn Wang	Full Professor	Analysis and Optimization
Amy Wiebe	Assistant Professor	Combinatorics & optimization

Term-Limited Members: Faculty members who have research interests with a significant mathematical or statistical component may become term-limited members of the Mathematics Graduate Program Committee and participate in the graduate program in mathematics through co-supervision of graduate students. At least one supervisor of every Graduate student must be a continuing member of the Mathematics Graduate Program.

Currently, the Mathematics Graduate Program Committee includes the following term-limited members.

Name	**Rank at UBCO**	**Home Department, Institution**	**Term (Sept – Aug)**
Amir Ardestani-Jaafari	Assistant Professor	Management, UBCO	2020 - 2028
Michael Noonan	Assistant Professor	Biology, UBCO	2023--2027
Sedi Bartz*	Assistant Professor	Math, U. Massachusetts Lowell	2024-2028
Sylvia Esterby	Emeritus Professor	CMPS, UBCO	2015 - 2115
Paramjit Gill	Emeritus Professor	CMPS, UBCO	2024 – 2124
Jason Loeppky	Emeritus Professor	CMPS, UBCO	2020 – 2120
Qiduan Yang	Emeritus Professor	CMPS, UBCO	2018 – 2118

* Eligibility for co-supervision and/or membership on graduate supervisory committees is determined in accordance with the policies and guidelines of the College of Graduate Studies. In particular, individuals who are external to UBC or those who do not hold the rank of tenure-track Professor, Associate Professor or Assistant Professor may require additional approval by Dean of the College of Graduate Studies.

GRADUATE PROGRAM IN MATHEMATICS

OVERVIEW

The Graduate Program in Mathematics offers both M.Sc. and Ph.D. degrees. The program prepares students for careers in research and teaching as well as industry and government, with specialization in five areas: Mathematical Biology and Differential Equations; Optimization and Analysis; Number Theory and Algebra; Statistics and Probability; and Mathematical Astrophysics. Degrees require course work, research, and a thesis (M.Sc.) or a dissertation (Ph.D.) that is defended at an oral examination.

ADMISSION REQUIREMENTS

General admission requirements stipulated by the College of Graduate Studies must be satisfied.

Master of Science (M.Sc.): Applicants are normally required to hold a bachelor's degree in mathematics or a related field with at least a B+ average (76% or greater) across the last 60 credits[2] taken toward the degree. Applicants without a bachelor's degree in mathematics must demonstrate their background provides the ability to complete the core coursework (see completion requirements).

Doctor of Philosophy (Ph.D.): Applicants are normally required to hold a Master of Science or equivalent in mathematics or a related field with at least a B+ (76% or greater) average. Applicants without a Master of Science in mathematics must demonstrate their background provides the ability to complete the comprehensive exams (see completion requirements).

Part-time Doctor of Philosophy (Ph.D.): Subject to senate approval, starting in Sept 2026, the program will support a part-time option for Ph.D. candidates. Basic requirements for entry into the part-time program are the same. Additionally, applicants seeking to enter the part-time Ph.D. program must submit a rationale for why part-time status is appropriate for their personal situation. The rationale must include and

- why a full-time Ph.D. is not appropriate;
- how the part-time Ph.D. will be funded[3]; and
- how the student will ensure their commitment to a program that can take up to 8 years.

Rationales are evaluated on a case-by-case basis. Admittance into the program requires an accepted rationale.

---

[2] "credit" means UBC credit or equivalent.

[3] "self-funded" is not an acceptable rationale for entry into the part-time Ph.D.

Students opting into the part-time Ph.D. program are advised of the following.

- They are exempt from the minimum funding package guarantee for full-time PhD students.
- They may not be eligible to receive interest-free status government loans, teaching assistantships, research assistantships, student housing, and some fellowships or scholarships.
- They will be assessed tuition fees according to Schedule C, and will not be permitted to revert to Schedule A throughout the duration of their program. Likewise, students who pay tuition fees according to Schedule A are not permitted to revert to Schedule C.
- Due to Canadian immigration regulations, part-time study has particular implications for international students. International applicants should seek advice from a Regulated Canadian Immigration Consultant before pursuing part-time classification.

COMPLETION REQUIREMENTS

The requirements below represent the normal completion requirements for each program. If the proposed course plan deviates from the requirements below, then it must acquire **pre-approval** by the Graduate Program Coordinator.

COMPLETION REQUIREMENTS: Supervisory committee

Throughout either program, a student is guided by the *Student's Supervisory Committee* that consists of the student's thesis (M.Sc.) or dissertation (Ph.D.) supervisor and at least two committee members, or consists of two co-supervisors and at least two additional committee members.[4] The supervisor and co-supervise must be a member of the Mathematics Graduate Program Committee. The supervisor must be a continuing member of the Mathematics Graduate Program Committee. When beneficial to the student's progress, the student's Supervisory Committee may include additional members. The Supervisory Committee will form the core of a student's *Thesis* or *Dissertation Proposal Examination Committee*.

COMPLETION REQUIREMENTS: Master of Science (M.Sc.)

Coursework: The student must complete a minimum of 18 credits in coursework and 12 credits for the M.Sc. thesis (MATH 549). The student must complete a minimum of 4 approved course-credits in every Winter term (i.e., the terms starting in September and January) until the term in which they will complete their coursework.

The Supervisory Committee, in consultation with the student, will propose a course plan

[4] The supervisory committee must also satisfy all requirements of the College of Graduate Studies. Consult Section 9 of the CoGS Policy Manual for details.

that will normally conform to the following four requirements.

- **9 credits from the list of core courses:**
  MATH 538 (Algebraic Number Theory, 3 credits)
  MATH 559 (Mathematical Biology, 3 credits)
  MATH 563 (Convex Optimization and Nonsmooth Analysis, 3 credits)
  STATS 560 (Probability and Stochastic Processes, 3 credits)
  ASTR 501 (Astrophysical Processes, 3 credits)
  The three core courses chosen have to be approved by the advisory committee of the graduate student. Students that completed a B.Sc. at UBCO and took the undergraduate version of one or two of these core courses should fulfill their core requirements from the remaining options. Students that completed a B.Sc. at UBCO and took the undergraduate version of three or more of these core courses should take any missing core courses and then request alternatives to the other courses. If a core course is not offered in a given year, students can consult with the Program Coordinator for alternatives.

- **3 credits from MATH 590 (Mathematics Graduate Seminar, taken thrice)**

- **6 credits from elective courses:** Elective courses may include any graduate course (numbered 500 or higher) with the course code MATH, STATS, or ASTR from either Okanagan or Vancouver campus. Graduate courses outside MATH, STATS, ASTR, or advanced undergraduate courses (numbered 400 or higher) **require pre-approval by the Graduate Program Advisory Committee.**
  In general, an upper year undergraduate course (numbered 400 or higher) may only be used when a graduate version of the course does not exist.

- Students taking ASTR 511 should typically take ASTR 501 first.
- Graduate students must take at least 9 credits from courses labelled MATH numbered 500 and above (non-inclusive of MATH 590 and MATH 549).
- **12 credits from MATH 549 (Master's Thesis)**
  * MSc students should enroll in MATH 549 every term until graduation.

When applicable, a minimum course grade of 68% is required in each course counted towards the M.Sc. degree (this is not applicable to pass/fail courses). A cumulative average of 80% is required across M.Sc. coursework.

Defense: The M.Sc. defense will be held in accordance with the policies and guidelines of the College of Graduate Studies.

All master's students are required to defend their theses in a final *oral examination,* in which the student will demonstrate his/her knowledge of the material in the thesis. The thesis may be submitted at any time of the year, but candidates are advised to allow ample time for revision and examination. As the thesis is being written, the candidate will be in

regular communication with the supervisor.
The student may request an examination once the Supervisory Committee recommends the final draft. Arrangements for the final oral examination are then made. Final oral examinations are typically four weeks after submission of the approved thesis.
When the final draft of the thesis is submitted to the College of Graduate Studies, an announcement will be made within the Unit/Department that the final draft is publicly available for inspection with the Administrative Assistant.
The Defense will follow the guidelines of the College of Graduate Studies M.Sc. defense.
The Examining Committee will include

- the members of the student's Supervisory Committee (at least 3 individuals, see above) and
- one university examiner (UE).

The UE will meet the guidelines of the College of Graduate Studies.
In addition

- a neutral chair will be appointed in consultation with the College of Graduate Studies.

As a result of the final oral examination, corrections may be necessary to produce a revised final version of the thesis.

COMPLETION REQUIREMENTS: Full-time Doctor of Philosophy (Ph.D.)

Steps to completion: The Ph.D. program requires the completion of following steps.

- **Coursework:** The student must complete 30 graduate credits. Up to 18 credits may be transferred from M.Sc. degrees, see below.
  * PhD students should enroll in MATH 649 every term until graduation.
- **Comprehensive Exams: (normally achieved within 12-16 months)** The student must pass the written comprehensive examinations. Before completing this step, students are required to take a minimum of 6 credits per year.
- **Dissertation Proposal Examination (normally achieved within 24-28 months):** Student passes the *dissertation proposal examination*.
- **Candidacy:** Upon completing the coursework, passing the written comprehensive examination, and passing the dissertation proposal examination the student becomes a *Ph.D. Candidate*. This is normally achieved within 28 months and must be achieved within 36 months. (The title *Ph.D. Candidate* is required to accept sessional teaching positions at UBC.)
- **Dissertation Defense (normally achieved within 42-54 months):** Submission and defence of a dissertation with a public oral examination.

Coursework: The student must complete a minimum of 30 graduate course credits approved by the supervisory committee.

- Up to 18 course credits from an M.Sc. program may count towards satisfying this requirement. This must be approved via a request to the graduate program coordinator.

- The student is required to obtain 6 approved graduate course credits per year until the student has passed the comprehensive exams.
- Courses may include any graduate course (numbered 500 or higher) with the course code MATH, STATS, or ASTR. Graduate courses outside MATH, STATS, ASTR, or advanced undergraduate courses (numbered 400 or higher) require pre-approval by the Graduate Program Advisory Committee. In general, an upper year undergraduate course (numbered 400 or higher) may only be used when a graduate version of the course does not exist.
- Graduate students must have at least 9 credits from courses labelled MATH numbered 500 and above (non-inclusive of MATH 590 and MATH 549).

Written Comprehensive Exams: Doctoral students must take and pass the *written comprehensive examinations* held no later than 16 months after initial enrolment in the Ph.D. program.

The comprehensive examinations are designed to

- help students integrate their knowledge of advanced undergraduate mathematics,
- give students and supervisors an early baseline indication of preparedness,
- give students' course selections in case where weakness is identified,
- define standard clearly and uniformly for perspective and new students,
- allow well-prepared students to move into research more rapidly.

The comprehensive examinations consist of two 3-hour long written exams. These two exams must be written within 2 weeks of each other.

- The first exam is designed to cover the breadth of undergraduate knowledge in Mathematics, Statistics, and for students who have studied Astrophysics, Astrophysics. Its goal is to confirm that the student is capable of teaching this material at an undergraduate level. Material comes from undergraduate course material covered in Mathematics, Statistics and Astrophysics at UBC. A list of study questions is available on request to the graduate program coordinator. This exam is set by the graduate program coordinator in consultation with the student's supervisor(s) and is based on the aforementioned study questions. This exam is marked by the graduate program coordinator with the passing grade set at 70%.
- The second exam is designed to cover advanced knowledge (1st year graduate material) of Mathematics, Statistics and Astrophysics with a focus on the specific subdiscipline of the student's expected research. Its goal is to confirm that the student is capable of understanding this material at a graduate level. This exam is set by the student's supervisor and approved by the student's supervisory committee. This exam is marked by the student's supervisor with the passing grade set at 70%.

Copies of both marked exams are stored by the graduate program coordinator until the student completes the dissertation proposal examination.

In the case of a student failing one or both of these comprehensive examinations, the

student will be granted the opportunity to retake the exam 1 time. The retake exam must be within 6 months of the first testing date. If a student fails a retake exam, then they will be asked to leave the program.

Dissertation proposal examination: The *dissertation proposal examination* must be taken no later than 3 years after a student starts the program. The dissertation proposal examination tests the student's overall knowledge of mathematics, with particular emphasis on the student's area of research and the proposed contents of the Ph.D. dissertation. It has a written and an oral component.

- The entire student supervisory committee should be present for the dissertation proposal examination.
- The written component consists of a report prepared by the student outlining the proposed Ph.D. dissertation research.
- The oral component consists of an *in camera* presentation (20-30 minutes) by the student outlining the dissertation proposal, followed by a question period where the student must demonstrate in-depth knowledge of the proposal and corresponding background material, provided by the student's advisory committee in form of a reading list. The Ph.D. Supervisory Committee will have a minimum of two rounds of questions for the student.
- While a neutral chair is not required for the oral component, a neutral chair may be requested by the supervisor or student. In that case, a neutral chair must be used. Any UBC faculty member not on the student's committee is eligible for this role.
- The length of the proposal examination should not exceed 2.5 hours (30 minute presentation plus 2 hour question period).

The dissertation proposal examination may be repeated once (within 6 months of the original examination or within 40 months of initial enrolment, whichever comes first).

- If the dissertation proposal examination is repeated, then a neutral chair is required during the oral component of the second exam.

Upon successful completion of these two pass/fail examinations, the doctoral student will be admitted to candidacy. The GPC will formally inform in writing the student that he/she will be recommended to the Dean of College of Graduate Studies for the Ph.D. candidacy. A student who is not admitted to candidacy will be asked to withdraw from the program. Extensions to the completion of the examinations may be granted under exceptional circumstances.

The dissertation proposal examination is a mandatory formal event to assess the student's readiness to undertake research at the doctoral level. It probes the student knowledge, problem solving, and communication skills through mathematical writing, oral presentation, and interactive discussion.

Dissertation defense: The dissertation defense will be held in accordance with the policies and guidelines of the College of Graduate Studies.

All doctoral candidates are required to take a final oral examination (defense) of the dissertation. The administration of the oral examination follows the policies and guidelines

of the College of Graduate Studies.

Ph.D. candidates are advised to allow ample time for revision and examination. As the dissertation is being written, the candidate will be in regular communication with the Supervisory Committee. When a draft is completed that the Supervisory Committee recommends for examination, the student may request the oral examination. A copy of the final draft is then sent to the external examiner. When the final draft of the dissertation is submitted to the College of Graduate Studies, an announcement will be made within the Unit/Department that the final draft is publicly available for inspection with the Administrative Assistant.

The Examining Committee will include

- the members of the student's Supervisory Committee (at least 3 individuals, see above),
- one university examiner (UE), and
- one external examiner.

The UE and external examiner will meet the guidelines of the College of Graduate Studies for the UE role. The external examiner will provide a written report before the final examination of the dissertation can take place.

In addition

- a neutral chair will be appointed in consultation with the College of Graduate Studies.

As a result of the final oral examination, corrections may be necessary to produce a final version of the dissertation.

COMPLETION REQUIREMENTS: Part-time Doctor of Philosophy (Ph.D.)

Subject to senate approval, starting in 2026, the program will support a part-time option for Ph.D. candidates. Requirements for completion of the part-time program are unchanged. Timelines for completion are adjusted as follows.

- **Coursework:** The student must complete 30 graduate credits. Up to 18 credits may be transferred from M.Sc. degrees. This is normally achieved within 36 months and must be achieved within 48 months. Students are required to take a minimum of 3 credits per year until the coursework requirement is complete.
- **Written Comprehensive Exams:** The student must pass the written comprehensive examinations. This is normally achieved within 24 months and must be achieved within 30 months.
- **Dissertation Proposal Examination:** The student must pass the *dissertation proposal examination*. This is normally achieved within 36 months and must be achieved within 48 months.
- **Candidacy:** Upon completing the coursework, passing the written comprehensive examination, and passing the dissertation proposal examination the student becomes a *Ph.D. Candidate*. This is normally achieved within 36 months and must be achieved within 48 months.
- **Dissertation Defense:** Submission and defence of a dissertation with a public oral examination. This is normally achieved within 72 months and must be achieved

within 96 months**.**

ANNUAL REPORTS AND PROGRESS REQUIREMENTS

Once each year, each graduate student in conjunction with their supervisory committee will complete an annual report. Within the report, the supervisory committee will rate the performance of each Graduate student. The three possible ratings are: SATISFACTORY PROGRESS (SP), IMPROVEMENT REQUIRED (IR), and UNSATISFACTORY PROGRESS (USP).

For a Graduate student, the following conditions will normally result in SATISFACTORY PROGRESS.

- Course work: The student has completed all coursework for the degree, or has taken at least the minimum number of course credit required as outlined in the completion requirements above.
- The student receives at least 68% in all courses taken in that year, maintains a term average of at least 76%, and maintains a cumulative average of at least 80%.
- The student makes satisfactory progress (as determined by his/her supervisor(s)) towards the completion of his/her M.Sc. thesis or Ph.D. dissertation.

A student not meeting the above requirements and timelines will normally receive a rating of IR or USP unless exceptional circumstances are proven.

The student will be notified in writing if progress is rated IR or USP with a list of specific requirements for the next semester included in the notification. If a student is rated IR in a semester, then the student will be rated either SP or USP in the following semester. The student will be asked to withdraw from the Mathematics graduate program if the student has accumulated two semesters where progress was rated USP.

Failure to complete the annual report on time may result in the loss of TA positions and/or scholarship funding.

PROGRAM ADMINISTRATION

GRADUATE PROGRAM COMMITTEE MEMBERSHIP

Besides teaching graduate courses and supervising graduate students, Mathematics Graduate Program Committee members are eligible to serve on the Supervisory Committees of individual graduate students, as well as the Graduate Program Advisory Committee. Faculty members appointed to the department of CMPS as (Assistant, Associate, or Full) Professors of Mathematics, Statistics and Astrophysics are automatically Continuing Members of the Mathematics Graduate Program Committee. Adjunct Professors may be appointed as non-voting Term-limited Members of the Mathematics Graduate Program Committee for a term of up to four years or up to the length of their appointment as an adjunct professor, whichever is less. Emeritus Professors in the

department of CMPS in Mathematics, Statistics and Astrophysics are automatically non-voting Term-limited Members of the Mathematics Graduate Program Committee for life. Faculty members of other departments or units, and faculty members appointed to the department of CMPS in subjects other than Mathematics, Statistics and Astrophysics, may also be appointed as non-voting term-limited members for terms of up to three years. In all cases the individual must have a Ph.D. or equivalent and their appointment must be approved by a 2/3-majority vote of the continuing members of the Mathematics Graduate Program Committee.

GRADUATE PROGRAM COORDINATOR

The Mathematics Graduate Program will be administered by the Graduate Program Coordinator (GPC) in consultation with the Department Head. The Graduate Program Coordinator is appointed by the Head in consultation with the continuing members of the Mathematics Graduate Program Committee. This individual must be a continuing member of the Mathematics Graduate Program Committee. The GPC chairs the Graduate Program Advisory Committee. In addition, the GPC acts as liaison with the College of Graduate Studies and helps with the following tasks:

- Arranging the review of applications to the program and notifying applicants of the outcome.
- Approving the composition of students' Supervisory Committees.
- Ensuring that students' Supervisory Committees conduct annual reviews.
- Arranging for Ph.D. written and oral comprehensive examinations.
- Arranging for the oral examination of submitted theses.
- Mentoring and advising graduate students and their supervisors.
- Assisting with conflict resolution within the Mathematics graduate program.
- Ensuring that program standards are maintained.

See section 9.4 of the CoGS Policy Manual for further information.

GRADUATE PROGRAM ADVISORY COMMITTEE

The Mathematics Graduate Program Advisory Committee (GPAC) consists of the Graduate Program Coordinator (GPC) and at least two members of the Mathematics Graduate Program Committee. This committee generally advises the GPC on matters pertaining to the program and specifically recommends to the GPC which applicants should be accepted into the program.

The GPC will revisit this document regularly and propose changes as needed. Minor changes to the graduate program are reviewed and approved by the GPAC. Major changes to the program will be brought before the full program committee.

STUDENT SUPERVISORY COMMITTEES

Membership in students' Supervisory Committees will be determined in accordance with the policies and guidelines of the College of Graduate Studies. A student's Supervisory Committee consists of at least three members, one of whom is the student's thesis or dissertation supervisor or co-supervisor. The committee will include at least 2 individuals who are continuing members of the Mathematics Graduate Program Committee, one of whom will be the supervisor; or will require written approval from the Mathematics

Graduate Program. The composition of a committee is determined by the GPC in consultation with the student's thesis or dissertation supervisor. When beneficial to the student's progress, the student's Supervisory Committee may include an additional member who is not a mathematician and a statistician. The GPC will endeavour to ensure that at least one of the members of each M.Sc. supervisory committee has successfully supervised a student through the completion of a M.Sc. or Ph.D. degree. Similarly, the GPC will arrange, when possible, that at least one of the members of each Ph.D. advisory committee has successfully supervised a student through the completion of a Ph.D. degree. While primary supervision of a student rests with the student's thesis or dissertation supervisor, the Supervisory Committee must conduct an annual review of the student's progress and file a report with the GPC. The report may include recommendations, or require the student take additional courses or seminars above and beyond the program requirements, or request the withdrawal of a student from the program in the case of unsatisfactory progress. The Supervisory Committee will also form the core of a Ph.D. student's Dissertation Proposal Examination Committee.

WRITTEN COMPREHENSIVE AND DISSERTATION PROPOSAL EXAMINATION COMMITTEES

The written comprehensive committee consists of the Graduate Program Coordinator, the student's supervisors, and, if applicable, the student's co-supervisor. The GPC is responsible for arranging the breadth exam, while the supervisor is responsible for arranging the specialization exam.

The student's dissertation proposal examination committee consists of three members of the student's Supervisory Committee.

ORAL EXAMINATION COMMITTEES

Membership in thesis or dissertation examination committees will be determined in accordance with the policies and guidelines of the College of Graduate Studies.

MASTER'S THESIS OR DOCTORAL DISSERTATION EXAMINATIONS

All examinations will follow the policies and guidelines of the College of Graduate Studies.