

Senate Graduate and Research Council

November 18, 2024

10:30 a.m. - 12:00 p.m.

Needles Hall

NH 3318 / Virtual option

Waterloo Campus

Think Differently | Act with Purpose | Work Together

2024 11 18 SGRC Meeting Book

AGENDA

OPEN SESSION

Governance Resources

[Link to Governance Resources](#)

1. Conflict of Interest

1.1 Conflict of Interest 4

Consent Agenda

Motion: To approve or receive for information the items on the consent agenda, listed as items 2-4 below.

10:30 a.m.

2. Minutes of October 21, 2024 Meeting

2.1 Minutes of October 21, 2024 Meeting Decision (SGRC) 5

3. Graduate Scholarships and Awards

List of Graduate Scholarships and Awards Decision (SGRC) 8

4. Curricular Submissions

4.1 Faculty of Engineering Decision (SGRC) 11

4.2 Faculty of Environment Decision (SGRC) 187

4.3 Faculty of Science Decision (SGRC) 192

4.4 Faculty of Math Decision (SGRC) 222

Regular Agenda

5. Business Arising from the Minutes Oral/Input

10:35 a.m.

6. Chair Remarks Information

10:40 a.m.

7. 2025-2026 Academic Calendar

Report - Academic Calendar Dates 25/26 Decision (SEN-C) 258

10:45 a.m.

8. Graduate Studies Academic Calendar Changes

Graduate Studies Academic Calendar Changes Decision (SEN-C) 262

10:55 a.m.

9. Open Research Conference Information

11:00 a.m.

10. Curricular Submissions

10.1 Faculty of Engineering Decision (SEN-R) 276

10.2 Faculty of Environment Decision (SEN-R) 330

11:20 a.m.

11. DORA Workshop Discussion

11:50 a.m.

12. Other Business Oral/Input

13. Adjournment

Next meeting of SGRC is January 27, 2025

Excerpt from Senate Bylaw 1

8. Declarations of conflict of interest

8.01	At the beginning of each meeting of Senate or any of Senate's committees or councils, the chair will call for members to declare any conflicts of interest with regard to any agenda item. For agenda items to be discussed in closed session, the chair will call for declarations of conflict of interest at the beginning of the closed portion of the meeting. Members may nonetheless declare conflicts at any time during a meeting.
8.02	A member shall be considered to have an actual, perceived or potential conflict of interest, when the opportunity exists for the member to use confidential information gained as a member of Senate, or any of Senate's committees or councils, for the personal profit or advantage of any person, or use the authority, knowledge or influence of the Senate, or a committee or council thereof, to further her/his personal, familial or corporate interests or the interests of an employee of the university with whom the member has a marital, familial or sexual relationship.
8.03	Members who declare conflicts of interest shall not enter into debate nor vote upon the specified item upon which they have declared a conflict of interest. The chair will determine whether it is appropriate for said member to remove themselves from the meeting for the duration of debate on the specified item(s).
8.04	Where Senate or a committee or council of Senate is of the opinion that a conflict of interest exists that has not been declared, the body may declare by a resolution carried by two-thirds of its members present at the meeting that a conflict of interest exists and a member thus found to be in conflict shall not enter into debate on the specified item upon which they have declared a conflict of interest. The chair will determine whether it is appropriate for said member to remove themselves from the meeting for the duration of debate on the specified item(s).

University of Waterloo
SENATE GRADUATE & RESEARCH COUNCIL
Minutes of the October 21, 2024 Meeting

Present:

Sue Ann Campbell, David Clausi, Ashley Day (secretary), Robert de Loe, Peter Deadman, Charmaine Dean (co-chair), Mrittika Dreesha, Bernard Duncker, Ana Ferrer, Abhishesh Homagain, Brian Ingalls, Julie Joza, Joseph Meleshko, Ian Milligan, Carlee Ann Montgomery, Marina Mourtzakis, Martin Ross, Siva Sivoththaman, Clarence Woudsma (co-chair), Shirley Tang

Resources/Guests: Phil Bigelow, Catherine Burns, Nancy Collins, Leslie Copp, David DeVidi, Maysah Eid, Mike Grivicic, Cathy Newell Kelly, Carrie MacKinnon Molson, Justin Wan, Richard Wikkerink,

Absent: Steven Bednarski, Mrittika Dreesha, Anna Esselment, Neela Hassan, Agnes Kolic, Nicholas Pellegrino, Marianne Simm, Mike Szarka

Organization of Meeting: Charmaine Dean and Clarence Woudsma took the chair, and Ashley Day acted as secretary. The secretary advised that a quorum was present. The agenda was approved without formal motion.

1. CONFLICT OF INTEREST

No conflicts of interest were declared.

CONSENT AGENDA

Council heard a motion to approve or receive for information the items of the consent agenda.

2. MINUTES OF THE SEPTEMBER 16, 2024 MEETING

Council approved the minutes of the meeting as distributed.

3. RESEARCH ETHICS

Council approved the Waterloo Clinical Research Ethics Board (CREB) [Terms of Reference Update]

4. GRADUATE AWARDS'

Council received the Buitrago Opportunity Graduate Scholarship in Engineering [trust] for information.

REGULAR AGENDA

5. BUSINESS ARISING FROM THE MINUTES

There was no business arising from the minutes.

6. CO-CHAIR'S REMARKS

Dean welcomed the new committee members, Carlee Ann Montgomery, who is the Science Graduate Student representative and a 4th year Chemistry student. It was also noted that the new Chancellor will be installed at this Friday's Convocation Ceremony and to please consider attending.

Dean noted the task forces for *Social Responsibility in Investing* and *Principles for Institutional Partnerships* will soon be requesting feedback from the UW community. Dean tasked the SGRC Committee to participate and provide feedback as well as encouraging others from the Faculties to engage in the process.

Woudsma provided an update on the International Student Letters, which is pending a technical update. There is also advancement of Ontario College's gaining MCU approval for Masters programming. Currently at the MCU are proposals from George Brown (Construction) and Humber (Engineering). These two programs are currently before the Board for approval.

7. Credentials Framework Report (David DeVidi & Cathy Newell Kelly)

Woudsma introduced the presentation which was launched by the Deans and PVP 18-months ago. This framework will set the University up for the future. The committee that worked on this report included faculty members and key professional staff and underwent considerable consultation.

DeVidi presented the Framework with three broad areas: Strategic Commitments, Removal of Barriers, and Appropriate Governance. DeVidi reviewed the recommendations from the report which included: Preparing UW for the future, alignment of "problem based" programs with Futures Framework; Building Blocks model will promote combinations of credentials across Waterloo's administrative boundaries. DeVidi noted that already existing mechanisms will be used, such as the course equivalency process and standard Senate pathways. There is intention to replace ACAC with official Senate Alternative Credentials Committee; also the new AQuE committee was approved by Senate (June 2024) and will soon be up and running this Fall term.

Committee members discussed that many programs are trying to find innovations to respond to the current budget conversation. If sunseting is to occur, there needs to be consideration to ease administrative burden, however, there are also logistical and governance issues as well. There will be a working group created to look at many of these issues. The working group will recommend removing hurdles and put roadmaps in place.

Next steps are to receive any feedback from SGRC and solicit feedback from Senate Undergraduate Council in November. The feedback will be incorporated into a final presentation to Senate in the new year. DeVidi will return to SGRC in the future for consideration on items such as credential stacking, for example.

8. Freedom of Expression and Inclusive Engagement Task Force Report (Christine McWebb)

Christine McWebb presented an overview of the Freedom of Expression and Inclusive Engagement Task Force Report. The implementation plan included a cluster in three topics – University's Voice – Policies and Guidelines – Culture and Climate. The Task Force is currently drafting a Positioning Statement which will go forward to FAUW, CAL, DC+, EC by late Fall 2024 – Spring 2025. An Institutional Neutrality and Communications have a preliminary statement published, with a full statement going through consultations. The Freedom of Expression Action Plan and Freedom of Expression and Inquiry at Waterloo are both published. There are a number of items currently in progress (dialogue for sharing program, programming for new faculty and students, freedom of expression and inclusive engagement presidential advisory group). There will be alignment with the two current task forces on Principles for Institutional Partnerships, and Social Responsibility in Investing. The task forces are working on alignment now to ensure these two task forces are aligned Freedom of Expression and Inclusive Engagement Task Force.

9. New CREATE Grant Proposal/Procedures (Bernard Duncker and Leslie Copp)

Duncker introduced the CREATE Grant Proposal, as it had been previously presented to SGRC for feedback. The CREATE program is not as strong as it should be and was lacking a formal process. It's important to have strategic priorities but also have bottom-up grass roots efforts. Duncker introduced Leslie Copp, Director FANS, to give an overview.

Copp provided an overview of proposal expectations, which can be found in the shared presentation materials. They must be value add and have strong involvement with collaborating entities. There are currently challenges with limited funding from NSERC and will require co-funding and support to have a viable program. Next year the program will be subject to STRAC and NSGRP, which may add challenges. After significant consultation, the new CREATE Grant Proposal process will have a two-track approach: Top-down vs bottom-up. This will hopefully garner stronger applications. The timeline will include two engagements with SGRC, the first in Winter to determine which EOIs move forward and the second in Fall to determine which topics are chosen for the next year.

Members then discussed: Copp is looking for support from SGRC with the pitch sessions, including feedback for the proposal teams; Copp will send an announcement for the pitch sessions, but is open to having ADRs and ADGs forward the information to anyone they think may be interested; Copp will bring proposals back to SGRC in the future.

Next steps will include Copp pulling together a communication for SGRC members to share to Faculties; with a follow-up to ADGs and ADRs for volunteers

10. OTHER BUSINESS

There was no further business.

11. ADJOURNMENT

With no further business, the meeting adjourned. The next meeting will be held on Monday, November 18, 2024, 10:30 a.m. to noon in NH 3318.

October 21, 2024

Ashley Day
Governance Officer



November 4, 2024

TO: Mike Grivicic, Associate University Secretary
Ashley Day, Governance Officer

FROM: Heidi Mussar, Associate Director, Graduate Financial Aid & Awards

RE: Agenda items for Senate Graduate & Research Council – November 2024

Items for Consent

a) Cornfield PhD Fellowship in Sustainable Energy Systems – trust

Doctoral fellowships, valued at up to \$120,000, will be awarded to full-time graduate students enrolled in the doctoral program of the Department of Systems Design Engineering in the Faculty of Engineering. The fellowship will be paid to recipients in equal instalments over the standard program length, as long as they remain registered full time in the doctoral program. Selection will be based on academic excellence (minimum 80% cumulative average or equivalent in their current or most recently completed graduate program) combined with demonstrated interest in sustainable energy systems. Interested students should submit an application found on the Department of Systems Design Engineering website by February 1. This fund is made possible by a donation from David J. and Linda Archer Cornfield.

The goal will be to select six students in each of 2025 and 2026 to each receive a fellowship of up to \$120,000 each.

b) Wefers Bettink Family Graduate Scholarship – endowment

An award, valued at \$1,500, will be provided annually to a full-time graduate student enrolled in the master's program in the Department of Political Science in the Faculty of Arts. Selection is based on academic excellence (minimum 80% cumulative average) and research potential at the time of admission to the program. The Department of Political Science will identify candidates and select recipients normally each Spring. This fund is made possible by a donation from Paul Anthony Wefers Bettink (BA '87).

The value of the award will be determined by the income generated by the Fund each year. The goal will be to provide at least one award valued at \$1,500 annually. The value and/or number of awards may change from year to year. The first award will be paid from the endowment when the fund can sustain an award of \$1,500.

Total endowment = \$50,000

c) Severin Hacker PhD Fellowship in Amblyopia Research – trust

A fellowship, valued at up to \$30,000, will be awarded to a full-time student enrolled in the doctoral program in the School of Optometry & Vision Science in the Faculty of Science. The scholarship will be paid in equal instalments over the standard program length, as long as they remain registered full time. Selection is based on academic excellence and demonstrated interest in amblyopia research. Students are identified and selected by the School of Optometry & Vision Science Graduate Office based on their application for admission. This fund is made possible through the generosity of Severin Hacker to elevate exceptional research and improve visual outcomes for patients with amblyopia.

This funding will be in addition to the minimum funding the student may already be receiving. The scholarship will be paid in equal instalments each term for as long as the student is registered full time within time limits of the program (12 terms). Future instalments of the award are contingent upon maintaining good academic standing (as defined by the recipient's academic program) and full-time enrolment in the doctoral program. In the event that a recipient fails to meet the renewal criteria, or completes their degree early, residual funds may be used to offer additional scholarships based on the above criteria.

d) Statistics and Actuarial Science Graduate Entrance Award – operating

Awards, with a minimum value of \$1,000, will be provided annually to select students who will be registered full time in their first term of a research-based Master's or Doctoral program in the Department of Statistics and Actuarial Science. The selection will be made by the Associate Chair and the Awards subcommittee of the Statistics and Actuarial Science Graduate Committee, normally in the spring term, based on a student's application for admission to the program.

e) Civil and Environmental Engineering Graduate Award – operating

The Civil and Environmental Engineering Graduate Award, normally valued at \$500 per term for up to three terms, is awarded to graduate students registered full time in a Master's or Doctoral program at the University of Waterloo. Eligible students must have a minimum first-class (80%) cumulative average in their current program or over the last two full-time academic years. No application is required, the department will nominate eligible students automatically based on their allocation of funds.

f) Tikkun Olam Award – trust

One award, valued at \$2,000, will be provided annually to a full-time undergraduate or graduate student enrolled in any year of any program at the University of Waterloo. Selection will be based on academic achievement (minimum 70% cumulative average) combined with contributions to Jewish culture and community through extracurricular or volunteer activities on campus and/or in other communities. As part of their application, students must include an essay/statement of 250-1000 words to describe these contributions.

Total gift = min. \$10,000

g) Innovation in Psychology Graduate Scholarship – trust

Two scholarships, valued at \$7,500 each, are awarded annually to graduate students in the Department of Psychology who are conducting innovative research on improving the mental health outcomes for children and their families. This could be helping children and adolescents function better in a variety of environments, including school, their peer group or in their family. Students are required to submit an application which can be found on the Department of Psychology website. The deadline to apply is February 15. A committee comprised of representatives from the Department of Psychology will select recipients annually, normally in the winter term.

The period of this defined term award will be from 2025 to 2029. The first selection will be made in winter 2025 and the last in winter 2029.

Total gift = \$75,000

h) Major Graduate Award for Innovation in Engineering – trust

An award, valued at \$7,500, will be awarded annually to a full-time graduate student enrolled in the master's or doctoral program in the Faculty of Engineering who is conducting research that

overlaps in the area of life sciences or biology with preference to those whose research is interdisciplinary. Selection is based on academic achievement (minimum 75% cumulative average or equivalent over the last two years of full-time study). Interested students should submit an application by February 15 to their Departmental Graduate Coordinator in the Faculty of Engineering. A committee within the Faculty of Engineering Graduate Studies Office will evaluate the candidates and select recipients normally each winter.

The period of this defined term award will be from 2025 to 2029. The first selection will be made in winter 2025 and the last in winter 2029.

Total gift = \$37,500

i) Major Graduate Award for Innovation in Science - trust

An award, valued at \$7,500, will be awarded annually to a full-time graduate student enrolled in the master's or doctoral program in the Faculty of Science who is conducting research that overlaps in the area of life sciences or biology with preference to those whose research is interdisciplinary. Selection is based on academic achievement (minimum 75% cumulative average or equivalent over the last two years of full-time study). Interested students are to submit their expressions of interest and supporting material to the Faculty of Science Graduate Studies Office by February 15.

The period of this defined term award will be from 2025 to 2029. The first selection will be made in winter 2025 and the last in winter 2029.

Total gift = \$37,500

Items for Information

j) Statistics and Actuarial Science Chair's Graduate Award – operating

Originally created in 2022, the Department of Statistics and Actuarial Science are amending the terms by reducing the minimum award value from \$1,000 to \$500 and clarifying the criteria under which students will be selected. The updated award description is as follows:

Awards, valued at a minimum of \$500, will be provided to students in research-based Master's and Doctoral programs who demonstrate outstanding achievement in one of the following areas: academics, research, teaching, teaching assistantships. Recipients will be selected, each term, automatically by the Associate Chair, Graduate Studies and the Statistics and Actuarial Science Graduate Awards Committee.

MEMO

TO: Ashley Day, Governance Officer, Senate Graduate and Research Council
FROM: Siva Sivoththaman, Associate Dean, Graduate Studies, Faculty of Engineering
RE: Senate Graduate & Research Council
DATE: November 11, 2024

Please place the following motions on the consent agenda at the November SGRC meeting. These changes were approved by the Engineering Faculty Council on October 15, 2024.

- 1) Department of Civil Engineering:
 - a. New course: AE 601 Comprehensive Building Design Studio.
- 2) Department of Electrical and Computer Engineering:
 - a. New course: ECE 676B Experimental Quantum Engineering.
 - b. New course: ECE 676C Programming of Quantum Computing Algorithms.
 - c. New course: ECE 676D Superconducting Quantum Circuits.
 - d. New course: ECE 676E Lab on Low-Temperature Quantum Engineering.
- 3) Department of Management Science and Engineering:
 - a. New course: MSE 619 Healthcare Analytics.
 - b. PhD in Management Sciences: Changing the PhD program name to align with the name of the Department which changed from the "Department of Management Sciences" to the "Department of Management Science and Engineering" in Fall 2023.
 - c. MASc in Management Sciences: Changing the MASc program names to align with the name of the Department which changed from the "Department of Management Sciences" to the "Department of Management Science and Engineering" in Fall 2023.
 - d. MASc in Management Sciences - Co-operative Program: Changing the MASc program names to align with the name of the Department which changed from the "Department of Management Sciences" to the "Department of Management Science and Engineering" in Fall 2023.
 - e. Master of Management Sciences (MMSc): Changing the MMSc program names to align with the name of the Department which changed from the "Department of Management Sciences" to the "Department of Management Science and Engineering" in Fall 2023.
 - f. Master of Management Sciences (MMSc) - Co-operative Program: Changing the MMSc program names to align with the name of the Department which changed from the "Department of Management Sciences" to the "Department of Management Science and Engineering" in Fall 2023.
 - g. Master of Management Sciences (MMSc) - Management of Technology: Changing the MMSc program names to align with the name of the Department which changed

from the "Department of Management Sciences" to the "Department of Management Science and Engineering" in Fall 2023.

- 4) Department of Mechanical and Mechatronics Engineering:
 - a. New course: ME 600 Engineering Practice, Research Methods, Ethics & Professional Development for MME Graduate Students.
 - b. New course: ME 654 Advanced Applied Thermal Engineering.
 - c. PhD in Mechanical and Mechatronics Engineering: 1) Adding ME 600 as a required course and 2) Adding a "PhD Research Seminar" milestone.
 - d. PhD in Mechanical and Mechatronics Engineering - Nanotechnology: Adding ME 600 as a required course.
 - e. MASc in Mechanical and Mechatronics Engineering: 1) Updating the course requirements to specify that students must complete at least two ME courses and at least one of the ME courses must be at the 600-level and 2) Adding ME 600 as a required course.
 - f. MASc in Mechanical and Mechatronics Engineering - Nanotechnology: Adding ME 600 as a required course.
 - g. MEng in Mechanical and Mechatronics Engineering: 1) Replacing the core course MEng degree requirement with the requirement of two ME 600-level courses, 2) Adding ME 600 as a required course, and 3) Adding a "Seminar Attendance" milestone.
 - h. MEng in Mechanical and Mechatronics Engineering - Co-operative Program: 1) Replacing the core course MEng degree requirement with the requirement of two ME 600-level courses, 2) Adding ME 600 as a required course, and 3) Adding a "Seminar Attendance" milestone.
- 5) Department of Systems Design Engineering:
 - a. PhD in Systems Design Engineering: Changing the minimum admission requirements for the PhD programs in Systems Design Engineering.
 - b. PhD in Systems Design Engineering - Aeronautics: Changing the minimum admission requirements for the PhD programs in Systems Design Engineering.
 - c. PhD in Systems Design Engineering - Nanotechnology: Changing the minimum admission requirements for the PhD programs in Systems Design Engineering.
 - d. MASc in Systems Design Engineering: Changing the minimum admission requirements for the MASc programs in Systems Design Engineering.
 - e. MASc in Systems Design Engineering - Aeronautics: Changing the minimum admission requirements for the MASc programs in Systems Design Engineering.
 - f. MASc in Systems Design Engineering - Nanotechnology: Changing the minimum admission requirements for the MASc programs in Systems Design Engineering.
 - g. MEng in Systems Design Engineering: Changing the minimum admission requirements for the MEng program in Systems Design Engineering.

AE 601

Comprehensive Building Design Studio

Under Review | Winter 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

- Mike Grivicic
- Tim Weber-Kraljevski
- Diana Goncalves
- Melanie Figueiredo
- Ashley Day

Effective Date & Career

Career ⓘ	Important!	Quest Course ID
Graduate		
	Effective Term and Year ⓘ	Offering Number
	Winter 2025	

Proposal Details

Proposal Type ⓘ	Academic Unit Approval
New	09/19/2024

Rationale for New Course

This course is an essential component for the MEng in Civil Engineering AE specialization to provide the experience that AE students need, as successfully implemented at the undergraduate level. Also, this course can be an attracting element to the main MEng program, when it opens to the broader MEng population.

Consultations

Supporting Documentation

Course Information

Faculty ⓘ	Academic Unit ⓘ
Faculty of Engineering	Department of Civil and Environmental Engineering
Subject Code ⓘ	Number ⓘ

AE

601

Title ⓘ

Comprehensive Building Design Studio

Abbreviated Title ⓘ

Comp Building Design Studio

Description ⓘ

This Comprehensive Building Design Studio is in collaboration with the School of Architecture. Integration of structure, systems, and enclosure assemblies is explored in the process. Preparation of construction drawings and specifications with a concern for technical material, environmental and legal aspects of architecture will be addressed.

Units ⓘ

0.50

Components ⓘ

Studio

Primary Component

Studio

Grading Information

Grading Basis

Numerical Grading Basis

Cross-Listing Information

Is this course cross-listed? ⓘ

No

Repeatable Courses

Can this course be repeated for credit?



No

Enrolment Rules

Consent to Add

Department consent required

Consent to Drop

No consent required

Prerequisites

No Rules

Corequisites

No Rules

Antirequisites

- Not completed nor concurrently enrolled in: AE400, AE425

Course Notes

Fee Statement

Workflow Information

Workflow Path

Committee approvals

Faculty/AFIW Path(s) for Workflow

Faculty of Engineering

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

ECE 676B

Experimental Quantum Engineering

Under Review | Winter 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Effective Date & Career

Career ⓘ

Graduate

Important!

Quest Course ID

Effective Term and Year ⓘ

Winter 2025

Offering Number

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

04/25/2024

Rationale for New Course ⓘ

Expand the suite of graduate courses in ECE in the area of quantum engineering by introducing the basic experimental tools and techniques on which the main quantum computing platforms are based.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Electrical and Computer Engineering

Subject Code ⓘ

ECE

Number ⓘ

676B

Title ⓘ

Experimental Quantum Engineering

Abbreviated Title ⓘ

Experimental Quantum Eng

Description ⓘ

This course introduces basic experimental tools and techniques on which the main quantum computing platforms are based. The course topics will be covered through lectures and through hands on lab experiments and will include photon generation and detection; Rabi oscillations, coherence, and NMR; atom cooling and ion traps; low temperature physics; and Bell inequalities and two-qubit quantum tomography.

Units ⓘ

0.50

Components ⓘ

Lecture

Primary Component

Lecture

Grading Information

Grading Basis

Numerical Grading Basis

Cross-Listing Information

Is this course cross-listed? ⓘ

No

Repeatable Courses

Can this course be repeated for credit?



No

Enrolment Rules

Consent to Add

No consent required

Consent to Drop

No consent required

Prerequisites

No Rules

Corequisites

No Rules

Antirequisites

No Rules

Course Notes

Fee Statement

Workflow Information

Workflow Path

Committee approvals

Faculty/AFIW Path(s) for Workflow

Faculty of Engineering

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

ECE 676C

Programming of Quantum Computing Algorithms

Under Review | Winter 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Effective Date & Career

Career ⓘ

Graduate

Important!

Quest Course ID

Effective Term and Year ⓘ

Winter 2025

Offering Number

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

04/25/2024

Rationale for New Course ⓘ

Expand the suite of graduate courses in ECE in the area of quantum engineering by teaching the programming of quantum algorithms. This course introduces the basic elements for creating quantum circuits in quantum computers and the principles and practical aspects of quantum algorithms.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Electrical and Computer Engineering

Subject Code ⓘ

Number ⓘ

ECE

676C

Title ⓘ

Programming of Quantum Computing Algorithms

Abbreviated Title ⓘ

Program of Quant Comp Algor

Description ⓘ

The course introduces basic elements to create quantum circuits in quantum computers: qubits, single-qubit gates, two-qubit gates, quantum operators, and measurements. The principles and practical aspects of quantum algorithms are covered. Students are expected to gain hands-on programming experience with a quantum programming language (one of three: Qiskit, q#, Pennylane) and to implement representative quantum circuits on quantum simulators or real quantum computers through a cloud service such as IBM Q experience, Microsoft Azure, or Xanadu.

Units ⓘ

0.50

Components ⓘ

Lecture

Primary Component

Lecture

Grading Information

Grading Basis

Numerical Grading Basis

Cross-Listing Information

Is this course cross-listed? ⓘ

No

Repeatable Courses

Can this course be repeated for credit?



No

Enrolment Rules

Consent to Add

No consent required

Consent to Drop

No consent required

Prerequisites

No Rules

Corequisites

No Rules

Antirequisites

No Rules

Course Notes

Fee Statement

Workflow Information

Workflow Path

Committee approvals

Faculty/AFIW Path(s) for Workflow

Faculty of Engineering

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

ECE 676D

Superconducting Quantum Circuits

Under Review | Winter 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Effective Date & Career

Career ⓘ

Graduate

Important!

Quest Course ID

Effective Term and Year ⓘ

Winter 2025

Offering Number

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

04/25/2024

Rationale for New Course ⓘ

Expand the suite of graduate courses in ECE in the area of quantum engineering by teaching about superconducting quantum circuits. This course introduces the applications of superconductivity in quantum information devices and circuits at microwave frequencies.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Electrical and Computer Engineering

Subject Code ⓘ

Number ⓘ

ECE

676D

Title ⓘ

Superconducting Quantum Circuits

Abbreviated Title ⓘ

Superconducting Quant Circ

Description ⓘ

This course offers applications of superconductivity in quantum information devices and circuits at microwave frequencies. Introducing the basic physics of superconductivity, superconducting transmission lines and cavity resonators are presented as the elementary passive components in quantum circuits. Josephson junctions as an active element in superconducting electronics is introduced and it is shown how a qubit can be constructed based on various two-level system manipulated in Josephson junctions. Three superconducting qubit archetypes, i.e. charge, flux and phase, are introduced along with some hybrid qubits such as transmon and fluxonium. Single qubit operation and qubit coupling in the form of circuit cavity electrostatics and their associated qubit readout are discussed. Some existing quantum computers such as IBM Q System One and Google Sycamore are briefly introduced.

Units ⓘ

0.50

Components ⓘ

Lecture

Primary Component

Lecture

Grading Information

Grading Basis

Numerical Grading Basis

Cross-Listing Information

Is this course cross-listed? ⓘ

No

Repeatable Courses

Can this course be repeated for credit?



No

Enrolment Rules

Consent to Add

No consent required

Consent to Drop

No consent required

Prerequisites

No Rules

Corequisites

No Rules

Antirequisites

No Rules

Course Notes

Fee Statement

Workflow Information

Workflow Path

Committee approvals

Faculty/AFIW Path(s) for Workflow

Faculty of Engineering

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

ECE 676E

Lab on Low-Temperature Quantum Engineering

Under Review | Winter 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Effective Date & Career

Career ⓘ

Graduate

Important!

Quest Course ID

Effective Term and Year ⓘ

Winter 2025

Offering Number

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

04/25/2024

Rationale for New Course ⓘ

Expand the suite of graduate courses in ECE in the area of quantum engineering by teaching about low temperature quantum technology and nanofabrication. This course gives an introduction of low temperature measurement techniques and the properties of superconducting devices relevant to quantum technologies.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Electrical and Computer Engineering

Subject Code ⓘ

Number ⓘ

ECE

676E

Title ⓘ

Lab on Low-Temperature Quantum Engineering

Abbreviated Title ⓘ

Lab on Low-Temp Quant Eng

Description ⓘ

Low-temperature measurement techniques and fundamentals of superconducting devices, including an introduction to device fabrication methods.

Units ⓘ

0.50

Components ⓘ

Laboratory

Primary Component

Laboratory

Grading Information

Grading Basis

Numerical Grading Basis

Cross-Listing Information

Is this course cross-listed? ⓘ

No

Repeatable Courses

Can this course be repeated for credit?



No

Enrolment Rules

Consent to Add

No consent required

Consent to Drop

No consent required

Prerequisites

No Rules

Corequisites

No Rules

Antirequisites

- Complete all of the following
 - Not completed nor concurrently enrolled in:
 - PHYS762 - Laboratory on Low Temperature Quantum Technology and Nanofabrication (0.50)
 - QIC862 - Laboratory on Low Temperature Quantum Technology and Nanofabrication (0.50)
 - Not completed nor concurrently enrolled in: ECE730 (Topic 35: Low Temp Quantum Tech Nanofab)

Course Notes

Fee Statement

Workflow Information

Workflow Path

Committee approvals

Faculty/AFIW Path(s) for Workflow

Faculty of Engineering

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

MSE 619

Healthcare Analytics

Under Review | Winter 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Effective Date & Career

Career ⓘ

Graduate

Important!

Quest Course ID

Effective Term and Year ⓘ

Winter 2025

Offering Number

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

06/10/2024

Rationale for New Course ⓘ

Data analytics is rapidly growing within the health sector, with health systems worldwide investing in analytics infrastructure to improve service delivery and efficiency. This course aims to elevate students' health data literacy and analytic skills, supporting evidence-based decision-making in the health sector.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Management Science and Engineering

Subject Code ⓘ

Number ⓘ

MSE

619

Title ⓘ

Healthcare Analytics

Abbreviated Title ⓘ

Healthcare Analytics

Description ⓘ

This course provides an introduction on health analytics including such topics as data acquisition, modelling, and predictive analytics. The course focuses on the practical application of the concepts to improve the quality of the analyses often found in the health sector. Application areas will be concentrated on topics found in health systems and may include topics such as planning and scheduling, disease diagnosis, and treatment planning. The learning outcomes include the ability to identify and apply appropriate analytical methods and models for healthcare.

Units ⓘ

0.50

Components ⓘ

LectureReading

Primary Component

Lecture

Grading Information

Grading Basis

Numerical Grading Basis

Cross-Listing Information

Is this course cross-listed? ⓘ

No

Repeatable Courses

Can this course be repeated for credit?



No

Enrolment Rules

Consent to Add

Instructor consent required

Consent to Drop

No consent required

Prerequisites

No Rules

Corequisites

No Rules

Antirequisites

No Rules

Course Notes

Fee Statement

Workflow Information

Workflow Path

Committee approvals

Faculty/AFIW Path(s) for Workflow

Faculty of Engineering

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

PhD in Management Sciences Doctor of Philosophy (PhD) in Management Science and Engineering

Under Review | Spring 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

- Mike Grivicic
- Tim Weber-Kraljevski
- Diana Goncalves
- Melanie Figueiredo
- Ashley Day

Changes

- Effective Term and Year
- Program/Plan Name
- Graduate Course Requirements
- End Term

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Spring 2025

Existing

Effective Term and Year ⓘ

Fall 2023

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

09/16/2024

Quality Assurance Designation ⓘ

Major Modification

Major Modification Categories

Change program name

Is there an impact to existing students? ⓘ

Yes

Impact on Existing Students

See "Current Student Impact" section below.

Is the credential name changing?

Yes

Impact of Credential Name Change

The name change applies only to future students (current students may opt in)

Current Student Impact

All currently registered MSE PhD and MASc students will have the option of graduating with either the original or revised program name. Details of the program name change will be communicated to them by the Department, via email. By default, students will retain the original program name. Students who wish to change to the revised program name will need indicate this to the Graduate Officer/Graduate Coordinator.

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s)

Changing the PhD and MASc program names to align with the name of the Department which changed from the "Department of Management Sciences" to the "Department of Management Science and Engineering" in Fall 2023: The Department is proposing to change the names of our MMSc programs to align with the new name of the Department.

Consultations (Departmental)

Supporting Documentation

General Program/Plan Information

Faculty

Faculty of Engineering

Academic Unit

Department of Management Science and Engineering

Graduate Field of Study

Management Science and Engineering

Faculty

Faculty of Engineering

Proposed

Program/Plan Name ⓘ

Doctor of Philosophy (PhD) in Management Science and Engineering

Existing

Program/Plan Name ⓘ

Doctor of Philosophy (PhD) in Management Sciences

Graduate Credential Type

PhD

Accelerated Program

Not applicable

Program Types**Admit Term(s)**

Fall

Delivery Mode

On-campus

Delivery Mode Information**Length of Program****Registration Option(s)**

Full-time

Part-time

Registration Options Information**Graduate Research Fields**

- Applied Operations Research
- Information Systems
- Management of Technology

Graduate Specializations**Additional Program Information**

Admissions

Admission Requirements: Minimum Requirements ⓘ

- A Master's degree with at least an 83% average and evidence of ability to pursue independent research.
- Background in quantitative methods (e.g., Calculus, Linear Algebra, Probability and Statistics).
- All applicants must submit a "Statement of Purpose" - a one page statement addressing their academic background, area of research interest, proposed research studies.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé/Curriculum vitae
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 3
- Type of references: if the applicant has been working for several years, 1 business reference will be accepted along with 2 academic references

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).

Graduate Course Requirements

No Rules

Proposed

Graduate Course Requirements

- PhD candidates possessing a Master's degree are required to take at least 4 courses (0.50 unit weight per course) of graduate credit. Students must successfully complete at least 2 courses (0.50 unit weight per course) from the list of core courses.
- All courses must be approved by the student's supervisor.
- Core courses:
 - MSE 605 Organizational Behaviour
 - MSE 607 Applied Economics for Management
 - MSE 623 Big Data Analytics
 - MSE 630 Human Computer Interaction
 - MSE 631 Probabilistic Models in Operations Research
 - MSE 634 Deterministic Models in Operations Research
 - MSE 641 Text Analytics
- Core courses may be replaced by other advanced courses if the student can demonstrate competency based on previous studies of similar material. The decision is made by the Associate Chair for Graduate Studies after the course replacement is recommended by the supervisor. The student may be required to demonstrate competency by taking an exam.
- All courses must be at the 600 and 700-level. Students must maintain an overall average of at least 73% at the end of each term, with no more than 2 failed courses overall.
- No more than 2 courses (0.50 unit weight per course) may be taken outside the Management Sciences Department. These courses will require the approval of the Associate Chair for Graduate Studies.
- PhD candidates without a Master's degree are required to take at least 8 courses (0.50 unit weight per course) of graduate credit. They must successfully complete at least 2 courses from the list of core courses.

Existing

Graduate Course Requirements

- PhD candidates possessing a Master's degree are required to take at least 4 courses (0.50 unit weight per course) of graduate credit. Students must successfully complete at least 2 courses (0.50 unit weight per course) from the list of core courses.
- All courses must be approved by the student's supervisor.
- Core courses:
 - MSCI 605 Organizational Behaviour
 - MSCI 607 Applied Economics for Management
 - MSCI 623 Big Data Analytics
 - MSCI 630 Human Computer Interaction
 - MSCI 631 Probabilistic Models in Operations Research
 - MSCI 634 Deterministic Models in Operations Research
 - MSCI 641 Text Analytics
- Core courses may be replaced by other advanced courses if the student can demonstrate competency based on previous studies of similar material. The decision is made by the Associate Chair for Graduate Studies after the course replacement is recommended by the supervisor. The student may be required to demonstrate competency by taking an exam.
- All courses must be at the 600 and 700-level. Students must maintain an overall average of at least 73% at the end of each term, with no more than 2 failed courses overall.
- No more than 2 courses (0.50 unit weight per course) may be taken outside the Management Sciences Department. These courses will require the approval of the Associate Chair for Graduate Studies.

- PhD candidates without a Master's degree are required to take at least 8 courses (0.50 unit weight per course) of graduate credit. They must successfully complete at least 2 courses from the list of core courses.

Milestone Requirements

PhD Comprehensive Examination

- Students are required to meet the University-level PhD Comprehensive Examination minimum requirements, with certain noted differences that are specific to the Faculty of Engineering Comprehensive Examination minimum requirements:
 - Comprehensive examination purpose: Consistent with University-level minimum requirements.
 - Timing: Students must follow the Faculty of Engineering completion timelines whereby students shall complete their comprehensive examination before the end of their 4th term or 6th term in cases where the student is admitted to the PhD program without a completed Master's degree.
 - Committee: Students must follow the Faculty of Engineering committee composition guidelines which differ from the University-level minimum requirements in both number of committee members and committee makeup.
 - Who Chairs an examination: Students must follow the Faculty of Engineering Chair guidelines whereby the Chair is normally selected from outside of the student's home department.
 - Format / Content: Consistent with University-level minimum requirements but with additional information provided in the Faculty of Engineering Comprehensive Examination minimum requirements.
 - Academic integrity: Consistent with University-level minimum requirements.
- In addition to the University-level and Faculty-level PhD Comprehensive Examination minimum requirements, students in the PhD in Management Sciences program are also required to meet the following requirements:
 - Students must pass a comprehensive examination, scheduled according to the Faculty of Engineering requirements above. This examination will focus on three issues:
 - Suitability of the proposed thesis topic.
 - Adequacy of the preparation of the student for completing the proposed research.
 - Knowledge of the fundamental concepts of the management sciences.

PhD Thesis

- Students must submit and defend a thesis.

Notes

- Department of Management Science and Engineering website
- Doctor of Philosophy (PhD) in Management Sciences future students program page

Workflow Information

Workflow Path

Committee approvals

Faculty/AFIW Path(s) for Workflow

Faculty of Engineering

Senate Workflow

Senate Regular

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

MASc in Management Sciences **Master of Applied Science (MASc) in Management** **Science and Engineering**

Under Review | Spring 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Changes

- Effective Term and Year
- Program/Plan Name
- Thesis Option: Course Requirements
- End Term

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Spring 2025

Existing

Effective Term and Year ⓘ

Fall 2023

Proposal Details

Proposal Type

 ⓘ

Change

Academic Unit Approval

09/16/2024

Quality Assurance Designation

 ⓘ

Major Modification

Major Modification Categories

Change program name

Is there an impact to existing students?

 ⓘ

Yes

Impact on Existing Students

See "Current Student Impact" section below.

Is the credential name changing?

Yes

Impact of Credential Name Change

The name change applies only to future students (current students may opt in)

Current Student Impact

All currently registered MSE PhD and MASc students will have the option of graduating with either the original or revised program name. Details of the program name change will be communicated to them by the Department, via email. By default, students will retain the original program name. Students who wish to change to the revised program name will need indicate this to the Graduate Officer/Graduate Coordinator.

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s)

Changing the PhD and MASc program names to align with the name of the Department which changed from the "Department of Management Sciences" to the "Department of Management Science and Engineering" in Fall 2023: The Department is proposing to change the names of our MMSc programs to align with the new name of the Department.

Consultations (Departmental)

Supporting Documentation

General Program/Plan Information

Faculty

Faculty of Engineering

Academic Unit

Department of Management Science and Engineering

Graduate Field of Study

Management Science and Engineering

Faculty

Faculty of Engineering

Proposed

Program/Plan Name ⓘ

Master of Applied Science (MASc) in Management Science and Engineering

Existing

Program/Plan Name ⓘ

Master of Applied Science (MASc) in Management Sciences

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Thesis

Program Types**Admit Term(s)**

Fall

Delivery Mode

On-campus

Delivery Mode Information**Length of Program****Registration Option(s)**

Full-time

Part-time

Registration Options Information**Graduate Research Fields**

- Applied Operations Research
- Information Systems
- Management of Technology

Graduate Specializations**Additional Program Information**

Admissions

Admission Requirements: Minimum Requirements ⓘ

- The Department of Management Sciences requires either (i) a 75% overall standing in the last two years, or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent; or (ii) a 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent, as the minimum requirement for admission to a Master's program for applicants educated at a Canadian institution. A 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent is the minimum requirement for admission to a Master's program for applicants educated outside of Canada.
- Background in quantitative methods (e.g., Calculus, Linear Algebra, Probability and Statistics).
- All applicants must submit a "Statement of Purpose" - a one page statement addressing their academic background, area of research interest, proposed research studies.
- Applicants who fall slightly below the minimum academic requirements may be considered for admission as transitional or probationary students.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé/Curriculum vitae
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 3
- Type of references: if the applicant has been working for several years, 1 business reference will be accepted along with 2 academic references

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).

Thesis Option: Course Requirements

No Rules

Proposed

Thesis Option: Course Requirements

- The requirements for the program consist of at least 4 courses (0.50 unit weight per course) of graduate credit. At least 2 of the courses (0.50 unit weight per course) must be from the list of core courses.
- All courses must be approved by the student's supervisor.
- Core courses:
 - MSE 605 Organizational Behaviour
 - MSE 607 Applied Economics for Management
 - MSE 623 Big Data Analytics
 - MSE 630 Human Computer Interaction
 - MSE 631 Probabilistic Models in Operations Research
 - MSE 634 Deterministic Models in Operations Research
 - MSE 641 Text Analytics
- All courses must be at the 600 and 700-level. Students must maintain an overall average of at least 73% at the end of each term, with no more than 2 failed courses overall.
- No more than 1 course (0.50 unit weight per course) may be taken outside the Management Sciences Department. This course will require the approval of the Associate Chair for Graduate Studies.

Existing

Thesis Option: Course Requirements

- The requirements for the program consist of at least 4 courses (0.50 unit weight per course) of graduate credit. At least 2 of the courses (0.50 unit weight per course) must be from the list of core courses.
- All courses must be approved by the student's supervisor.
- Core courses:
 - MSCI 605 Organizational Behaviour
 - MSCI 607 Applied Economics for Management
 - MSCI 623 Big Data Analytics
 - MSCI 630 Human Computer Interaction
 - MSCI 631 Probabilistic Models in Operations Research
 - MSCI 634 Deterministic Models in Operations Research
 - MSCI 641 Text Analytics
- All courses must be at the 600 and 700-level. Students must maintain an overall average of at least 73% at the end of each term, with no more than 2 failed courses overall.
- No more than 1 course (0.50 unit weight per course) may be taken outside the Management Sciences Department. This course will require the approval of the Associate Chair for Graduate Studies.

Thesis Option: Milestone Requirements**Master's Seminar**

- The Master's Seminar is a 30 minute presentation about the student's thesis. This is not a formal defence, but a milestone that each student is required to fulfill prior to degree completion.

Master's Thesis

- Students in the program complete a thesis which contains some elements of original work. The thesis is supervised by a faculty advisor, examined by a committee including two or more other members, and placed on display in the Faculty of Engineering Graduate Office.

Notes ⓘ

- Department of Management Science and Engineering website
- Master of Applied Science (MASc) in Management Sciences future students program page

Workflow Information

Workflow Path ⓘ

Committee approvals

Faculty/AFIW Path(s) for Workflow ⓘ

Faculty of Engineering

Senate Workflow

Senate Regular

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

MASc in Management Sciences-Co-op Master of Applied Science (MASc) in Management Science and Engineering - Co-operative Program

Under Review | Spring 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

- Mike Grivicic
- Tim Weber-Kraljevski
- Diana Goncalves
- Melanie Figueiredo
- Ashley Day

Changes

- Effective Term and Year
- Program/Plan Name
- Thesis Option: Course Requirements
- End Term

Effective Date and Career

Career

Graduate

Important!

Proposed
Effective Term and Year ⓘ
 Spring 2025

Existing
Effective Term and Year ⓘ
 Fall 2023

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

09/16/2024

Quality Assurance Designation ⓘ

Major Modification

Major Modification Categories

Change program name

Is there an impact to existing students? ⓘ

Yes

Impact on Existing Students

See "Current Student Impact" section below.

Is the credential name changing?

Yes

Impact of Credential Name Change

The name change applies only to future students (current students may opt in)

Current Student Impact

All currently registered MSE PhD and MASc students will have the option of graduating with either the original or revised program name. Details of the program name change will be communicated to them by the Department, via email. By default, students will retain the original program name. Students who wish to change to the revised program name will need indicate this to the Graduate Officer/Graduate Coordinator.

Graduate Co-operative Requirements

No

Internship Requirements

Not Applicable

Rationale and Background for Change(s)

Changing the PhD and MASc program names to align with the name of the Department which changed from the "Department of Management Sciences" to the "Department of Management Science and Engineering" in Fall 2023: The Department is proposing to change the names of our MMSc programs to align with the new name of the Department.

Consultations (Departmental)

Supporting Documentation

General Program/Plan Information

Faculty

Faculty of Engineering

Academic Unit

Department of Management Science and Engineering

Graduate Field of Study

Management Science and Engineering

Faculty

Faculty of Engineering

Proposed

Program/Plan Name ⓘ

Master of Applied Science (MASc) in Management Science and Engineering - Co-operative Program

Existing

Program/Plan Name ⓘ

Master of Applied Science (MASc) in Management Sciences - Co-operative Program

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Thesis

Program Types

Co-operative

Admit Term(s)

Winter

Delivery Mode

On-campus

Delivery Mode Information**Length of Program****Registration Option(s)**

Full-time

Registration Options Information**Graduate Research Fields**

- Applied Operations Research
- Information Systems
- Management of Technology

Graduate Specializations**Additional Program Information**

Admissions

Admission Requirements: Minimum Requirements ⓘ

- Students in the MASc in Management Sciences program can apply to transfer into the MASc in Management Sciences Co-operative Program after completing at least one academic term. Admission will be decided based on the student's progress to date, and is subject to approval by the student's research supervisor and the Department Associate Chair for Graduate Studies.

Admission Requirements: Application materials**Admission Requirements: References**

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).

Thesis Option: Course Requirements

No Rules

Proposed

Thesis Option: Course Requirements

- The requirements for the program consist of at least 4 courses (0.50 unit weight per course) of graduate credit. At least 2 of the courses (0.50 unit weight per course) must be from the list of core courses.
- All courses must be approved by the student's supervisor.
- Core courses:
 - MSE 605 Organizational Behaviour
 - MSE 607 Applied Economics for Management
 - MSE 623 Big Data Analytics
 - MSE 630 Human Computer Interaction
 - MSE 631 Probabilistic Models in Operations Research
 - MSE 634 Deterministic Models in Operations Research
 - MSE 641 Text Analytics
- All courses must be at the 600 and 700-level. Students must maintain an overall average of at least 73% at the end of each term, with no more than 2 failed courses overall.
- No more than 1 course (0.50 unit weight per course) may be taken outside the Management Sciences Department. This course will require the approval of the Associate Chair for Graduate Studies.

Existing

Thesis Option: Course Requirements

- The requirements for the program consist of at least 4 courses (0.50 unit weight per course) of graduate credit. At least 2 of the courses (0.50 unit weight per course) must be from the list of core courses.
- All courses must be approved by the student's supervisor.
- Core courses:
 - MSCI 605 Organizational Behaviour
 - MSCI 607 Applied Economics for Management
 - MSCI 623 Big Data Analytics
 - MSCI 630 Human Computer Interaction
 - MSCI 631 Probabilistic Models in Operations Research
 - MSCI 634 Deterministic Models in Operations Research
 - MSCI 641 Text Analytics
- All courses must be at the 600 and 700-level. Students must maintain an overall average of at least 73% at the end of each term, with no more than 2 failed courses overall.
- No more than 1 course (0.50 unit weight per course) may be taken outside the Management Sciences Department. This course will require the approval of the Associate Chair for Graduate Studies.

Thesis Option: Milestone Requirements**Graduate Studies Work Report I and Graduate Studies Work Report II**

- Students in the program, who qualify, may choose a co-operative program of study. For a co-operative program of study a student must complete two work-terms and must complete the program during an academic term. The co-operative placements must relate to the program of study. Enrolment in the co-operative program must be approved by the student's supervisor and the Associate Chair Graduate Studies.
- Co-operative students are responsible for following the regulations and procedures of Co-operative and Experiential Education (CEE).

Master's Seminar

- The Master's Seminar is a 30 minute presentation about the student's thesis. This is not a formal defence, but a milestone that each student is required to fulfill prior to degree completion.

Master's Thesis

- Students in the program complete a thesis which contains some elements of original work. The thesis is supervised by a faculty advisor, examined by a committee including two or more other members, and placed on display in the Faculty of Engineering Graduate Office.

Notes

- Department of Management Science and Engineering website

Workflow Information

Workflow Path

Committee approvals

Faculty/AFIW Path(s) for Workflow

Faculty of Engineering

Senate Workflow

Senate Regular

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

Master of Management Sciences (MMSc)

Master of Management Science (MMSc)

Under Review | Spring 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Changes

- Effective Term and Year
- Program/Plan Name
- Coursework Option: Course Requirements
- End Term

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Spring 2025

Existing

Effective Term and Year ⓘ

Fall 2023

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

09/16/2024

Quality Assurance Designation ⓘ

Minor Modification

Is there an impact to existing students? ⓘ

Yes

Impact on Existing Students ⓘ

See "Current Student Impact" section below.

Is the credential name changing?

Yes

Impact of Credential Name Change

The name change applies only to future students (current students may opt in)

Current Student Impact

All currently registered MSE MMSc students will have the option of graduating with either the original or revised program name. Details of the program name change will be communicated to them by the Department, via email. By default, students will retain the original program name. Students who wish to change to the revised program name will need indicate this to the Graduate Officer/Graduate Coordinator.

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

Changing the MMSc program names to align with the name of the Department which changed from the "Department of Management Sciences" to the "Department of Management Science and Engineering" in Fall 2023: The Department is proposing to change the names of our MMSc programs to align with the new name of the Department.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Management Science and Engineering

Graduate Field of Study

Management Science and Engineering

Faculty ⓘ

Faculty of Engineering

Proposed

Program/Plan Name ⓘ

Master of Management Science (MMSc)

Existing

Program/Plan Name ⓘ

Master of Management Sciences (MMSc)

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Coursework

Program Types

Admit Term(s)

Fall

Delivery Mode

On-campus

Delivery Mode Information

Length of Program

- Full-time: 4 terms (16 months)
- Part-time: 8 terms (32 months)

Registration Option(s)

Full-time

Part-time

Registration Options Information

Graduate Research Fields

- Applied Operations Research
- Information Systems
- Management of Technology

Graduate Specializations

Additional Program Information

Admissions

Admission Requirements: Minimum Requirements ⓘ

- The Department of Management Sciences requires either (i) a 75% overall standing in the last two years, or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent; or (ii) a 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent, as the minimum requirement for admission to a Master's program for applicants educated at a Canadian institution. A 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent is the minimum requirement for admission to a Master's program for applicants educated outside of Canada.
- Background in quantitative methods (e.g., Calculus, Linear Algebra, Probability and Statistics).
- All applicants must submit a "Statement of Purpose" - a one page statement addressing their academic background and future goals.
- Applicants who fall slightly below the minimum academic requirements may be considered for admission as transitional or probationary students.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé/Curriculum vitae
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 2
- Type of references: academic (preferred) or professional

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).

Coursework Option: Course Requirements

No Rules

Proposed

Coursework Option: Course Requirements

- Students must successfully complete the following 4 General Requirement courses (0.50 unit weight per course/4 units):
 - MSE 603 Principles of Operations Research [this course may be replaced with MSE 634 if a student has a strong background in Operations Research]
 - MSE 605 Organizational Behaviour
 - MSE 607 Applied Economics for Management
 - MSE 609 Quantitative Data Analysis for Management Sciences
- In addition to the 4 General Requirement courses (MSE 603, MSE 605, MSE 607, MSE 609), students must take at least 4 additional courses, totaling a minimum requirement of 8 courses overall (0.50 unit weight per course/4 units). These courses may include at most 2 500-level courses approved by the Associate Chair for Graduate Studies. All other courses must be at the 600 and 700 level. Students must maintain an overall average of at least 73% at the end of each term, with no more than 2 failed courses overall.
- No more than 1 course (0.50 unit weight per course) may be taken outside of the Management Sciences Department. This course will require the approval of the Associate Chair for Graduate Studies.
- Students who have completed their BAsC degree in Management Engineering at the University of Waterloo are required to choose their courses in consultation with the Associate Chair for Graduate Studies

Existing

Coursework Option: Course Requirements

- Students must successfully complete the following 4 General Requirement courses (0.50 unit weight per course/4 units):
 - MSCI 603 Principles of Operations Research [this course may be replaced with MSCI 634 if a student has a strong background in Operations Research]
 - MSCI 605 Organizational Behaviour
 - MSCI 607 Applied Economics for Management
 - MSCI 609 Quantitative Data Analysis for Management Sciences
- In addition to the 4 General Requirement courses (MSCI 603, MSCI 605, MSCI 607, MSCI 609), students must take at least 4 additional courses, totaling a minimum requirement of 8 courses overall (0.50 unit weight per course/4 units). These courses may include at most 2 500-level courses approved by the Associate Chair for Graduate Studies. All other courses must be at the 600 and 700 level. Students must maintain an overall average of at least 73% at the end of each term, with no more than 2 failed courses overall.
- No more than 1 course (0.50 unit weight per course) may be taken outside of the Management Sciences Department. This course will require the approval of the Associate Chair for Graduate Studies.
- Students who have completed their BAsC degree in Management Engineering at the University of Waterloo are required to choose their courses in consultation with the Associate Chair for Graduate Studies

Coursework Option: Milestone Requirements**Notes** ⓘ

- Department of Management Science and Engineering website
- Master of Management Sciences (MMSc) future students program page

Workflow Information

Workflow Path ⓘ

Committee approvals

Faculty/AFIW Path(s) for Workflow ⓘ

Faculty of Engineering

Senate Workflow

No Senate

Dependencies

Dependent Courses and Programs/Plans

PREREQUISITES

- ✓ BE 606 - Entrepreneurship and Innovation View Courses >
- ✓ BE 601 - Introduction to Financial and Managerial Accounting View Courses >
- ✓ BE 604 - Marketing Management View Courses >
- ✓ BE 610 - Special Topics in Business and Entrepreneurship View Courses >

Master of Management Sciences (MMSc)-Co-op Master of Management Science (MMSc) - Co-operative Program (direct entry)

Under Review | Spring 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

- Mike Grivicic
- Tim Weber-Kraljevski
- Diana Goncalves
- Melanie Figueiredo
- Ashley Day

Changes

- Program/Plan Name
- Coursework Option: Course Requirements
- Effective Term and Year
- Admin Notes
- End Term

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Spring 2025

Existing

Effective Term and Year ⓘ

Winter 2024

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

09/16/2024

Quality Assurance Designation ⓘ

Minor Modification

Is there an impact to existing students? ⓘ

Yes

Impact on Existing Students ⓘ

See "Current Student Impact" section below.

Is the credential name changing?

Yes

Impact of Credential Name Change

The name change applies only to future students (current students may opt in)

Current Student Impact

All currently registered MSE MMSc students will have the option of graduating with either the original or revised program name. Details of the program name change will be communicated to them by the Department, via email. By default, students will retain the original program name. Students who wish to change to the revised program name will need indicate this to the Graduate Officer/Graduate Coordinator.

Graduate Co-operative Requirements

No

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

Changing the MMSc program names to align with the name of the Department which changed from the "Department of Management Sciences" to the "Department of Management Science and Engineering" in Fall 2023: The Department is proposing to change the names of our MMSc programs to align with the new name of the Department.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Management Science and Engineering

Graduate Field of Study

Management Science and Engineering

Faculty ⓘ

Faculty of Engineering

Proposed

Program/Plan Name ⓘ

Master of Management Science (MMSc) - Co-operative Program (direct entry)

Existing

Program/Plan Name ⓘ

Master of Management Sciences (MMSc) - Co-operative Program (direct entry)

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Coursework

Program Types

Co-operative

Admit Term(s)

Fall

Delivery Mode

On-campus

Delivery Mode Information**Length of Program**

- 5 terms (20 months)

Registration Option(s)

Full-time

Registration Options Information**Graduate Research Fields**

- Applied Operations Research
- Information Systems
- Management of Technology

Graduate Specializations**Additional Program Information**

Admissions

Admission Requirements: Minimum Requirements ⓘ

- The Department of Management Sciences requires either (i) a 75% overall standing in the last two years, or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent; or (ii) a 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent, as the minimum requirement for admission to a Master's program for applicants educated at a Canadian institution. A 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent is the minimum requirement for admission to a Master's program for applicants educated outside of Canada.
- Background in quantitative methods (e.g., Calculus, Linear Algebra, Probability and Statistics).
- All applicants must submit a "Statement of Purpose" - a one page statement addressing their academic background and future goals.
- Applicants who fall slightly below the minimum academic requirements may be considered for admission as transitional or probationary students.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé/Curriculum vitae
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 2
- Type of references: academic (preferred) or professional

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).
- The MMSc - Co-operative Program will enable students to combine graduate studies with work experience. The program includes completion of 2 required work terms. The work terms typically take place in terms 3 and 4. The work terms must meet Co-operative and Experiential Education (CEE) standard work term requirements and Departmental requirements. Students should apply to jobs related to their program of study. Note: the program must start and end on an academic term. Students in the program are encouraged to complete WIL 601 Career Foundations for Work-Integrated Learning in the academic term prior to the first work term.

Coursework Option: Course Requirements

No Rules

Proposed

Coursework Option: Course Requirements

- Students must successfully complete the following 4 General Requirement courses (0.50 unit weight per course/4 units):
 - MSE 603 Principles of Operations Research [this course may be replaced with MSE 634 if a student has a strong background in Operations Research]
 - MSE 605 Organizational Behaviour
 - MSE 607 Applied Economics for Management
 - MSE 609 Quantitative Data Analysis for Management Sciences
- In addition to the 4 General Requirement courses (MSE 603, MSE 605, MSE 607, MSE 609), students must take at least 4 additional courses, totaling a minimum requirement of 8 courses overall (0.50 unit weight per course/4 units). These courses may include at most 2 500-level courses approved by the Associate Chair for Graduate Studies. All other courses must be at the 600 and 700 level. Students must maintain an overall average of at least 73% at the end of each term, with no more than 2 failed courses overall.
- No more than 1 course (0.50 unit weight per course) may be taken outside of the Management Sciences Department. This course will require the approval of the Associate Chair for Graduate Studies.
- Students who have completed their BAsC degree in Management Engineering at the University of Waterloo are required to choose their courses in consultation with the Associate Chair for Graduate Studies

Existing

Coursework Option: Course Requirements

- Students must successfully complete the following 4 General Requirement courses (0.50 unit weight per course/4 units):
 - MSCI 603 Principles of Operations Research [this course may be replaced with MSCI 634 if a student has a strong background in Operations Research]
 - MSCI 605 Organizational Behaviour
 - MSCI 607 Applied Economics for Management
 - MSCI 609 Quantitative Data Analysis for Management Sciences
- In addition to the 4 General Requirement courses (MSCI 603, MSCI 605, MSCI 607, MSCI 609), students must take at least 4 additional courses, totaling a minimum requirement of 8 courses overall (0.50 unit weight per course/4 units). These courses may include at most 2 500-level courses approved by the Associate Chair for Graduate Studies. All other courses must be at the 600 and 700 level. Students must maintain an overall average of at least 73% at the end of each term, with no more than 2 failed courses overall.
- No more than 1 course (0.50 unit weight per course) may be taken outside of the Management Sciences Department. This course will require the approval of the Associate Chair for Graduate Studies.
- Students who have completed their BAsC degree in Management Engineering at the University of Waterloo are required to choose their courses in consultation with the Associate Chair for Graduate Studies

Coursework Option: Milestone Requirements**Graduate Studies Work Report I and Graduate Studies Work Report II**

- Students must complete two work-term experiences. The co-operative work-term experiences must relate to the program of study. For each work experience, a work report must be submitted to the Department for review to earn credit for the work report.
- Students are responsible for following the roles and responsibilities of Co-operative and Experiential Education (CEE).

Notes ⓘ

- Department of Management Science and Engineering website
- Master of Management Sciences (MMSc) - Co-operative Program future students program page

Workflow Information

Workflow Path ⓘ

Committee approvals

Faculty/AFIW Path(s) for Workflow ⓘ

Faculty of Engineering

Senate Workflow

No Senate

Dependencies

Dependent Courses and Programs/Plans

PREREQUISITES

- | | |
|----------------------------------------------------------------|--------------------------------|
| ✓ BE 606 - Entrepreneurship and Innovation | View Courses > |
| ✓ BE 601 - Introduction to Financial and Managerial Accounting | View Courses > |
| ✓ BE 604 - Marketing Management | View Courses > |
| ✓ BE 610 - Special Topics in Business and Entrepreneurship | View Courses > |

Master of Management Sciences (MMSc)-Management of Technology

Master of Management Science (MMSc) - Management of Technology

Under Review | Spring 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

- Mike Grivicic
- Tim Weber-Kraljevski
- Diana Goncalves
- Melanie Figueiredo
- Ashley Day

Changes

- Program/Plan Name
- Effective Term and Year

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Spring 2025

Existing

Effective Term and Year ⓘ

Fall 2024

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

09/16/2024

Quality Assurance Designation ⓘ

Minor Modification

Is there an impact to existing students? ⓘ

Yes

Impact on Existing Students ⓘ

See "Current Student Impact" section below.

Is the credential name changing?

Yes

Impact of Credential Name Change

The name change applies only to future students (current students may opt in)

Current Student Impact

All currently registered MSE MMSc students will have the option of graduating with either the original or revised program name. Details of the program name change will be communicated to them by the Department, via email. By default, students will retain the original program name. Students who wish to change to the revised program name will need indicate this to the Graduate Officer/Graduate Coordinator.

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

Changing the MMSc program names to align with the name of the Department which changed from the "Department of Management Sciences" to the "Department of Management Science and Engineering" in Fall 2023: The Department is proposing to change the names of our MMSc programs to align with the new name of the Department.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Management Science and Engineering

Graduate Field of Study

Management Science and Engineering

Faculty ⓘ

Faculty of Engineering

Proposed

Program/Plan Name ⓘ

Master of Management Science (MMSc) - Management of Technology

Existing

Program/Plan Name ⓘ

Master of Management Sciences (MMSc) - Management of Technology

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Coursework

Program Types**Admit Term(s)**

Fall

Winter

Spring

Delivery Mode

Online

Delivery Mode Information**Length of Program**

- 8 terms (32 months)

Registration Option(s)

Part-time

Registration Options Information**Graduate Research Fields****Graduate Specializations****Additional Program Information**

Admissions

Admission Requirements: Minimum Requirements ⓘ

- An Honours Bachelor's degree (or equivalent) with a minimum 75% standing in the last two years.
- Background in quantitative methods (e.g., Calculus, Linear Algebra, Probability and Statistics).
- All applicants must submit a "Statement of Purpose" - a one page statement addressing their academic background and future goals.
- Applicants who fall slightly below the minimum academic requirements may be considered for admission as conditional or probationary students.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé/Curriculum vitae
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 2
- Type of references: academic (preferred) or professional

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).

Coursework Option: Course Requirements

- Complete all of the following
 - Complete all the following:
 - MSE602 - Strategic Management of Technological Innovation (0.50)
 - MSE603 - Principles of Operations Research (0.50)
 - MSE605 - Organizational Behaviour (0.50)
 - MSE606 - Foundations of Senior Management (0.50)
 - MSE607 - Applied Economics for Management (0.50)
 - MSE609 - Quantitative Data Analysis for Management Sciences (0.50)
 - Students in the program must take at least 2 additional courses, totaling a minimum requirement of 8 courses overall (0.50 unit weight per course/4 units of credit). These courses must be at the 600 and 700 level. Students must maintain an overall average of at least 73% at the end of each term, with no more than two failed courses overall.

Coursework Option: Course Requirements**Coursework Option: Milestone Requirements**

Notes ⓘ

- Department of Management Science and Engineering website
- Master of Management Sciences (MMSc) - Management of Technology future students program page

Workflow Information

Workflow Path ⓘ

Committee approvals

Faculty/AFIW Path(s) for Workflow ⓘ

Faculty of Engineering

Senate Workflow

No Senate

Dependencies

Dependent Courses and Programs/Plans

PREREQUISITES

✓ MSE 606 - Foundations of Senior Management

[View Courses](#) ▶

ME 600

Engineering Practice, Research Methods, Ethics & Professional Development for MME Graduate Students

Under Review | Winter 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Effective Date & Career

Career ⓘ

Graduate

Important!

Quest Course ID

Effective Term and Year ⓘ

Winter 2025

Offering Number

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

04/05/2024

Rationale for New Course ⓘ

ME 600 addresses the need for graduate level professional development and will improve the breadth of graduate training provided by MME. In particular, the 2023 MME IQAP cyclical reviewers report highlighted some deficiencies in our graduate programs (MEng, MAsC, PhD) and student training which this course will address.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Mechanical and Mechatronics Engineering

Subject Code ⓘ

Number ⓘ

ME

600

Title ⓘ

Engineering Practice, Research Methods, Ethics & Professional Development for MME Graduate Students

Abbreviated Title ⓘ

Eng Res Mths, Ethcs, Prct

Description ⓘ

Introduction to a range of topics related to engineering practice and research. Engineering profession in Canada, including continuing professional development and code of ethics. Academic integrity and responsible conduct of research. Effective communication. Research methodology, scientific methods, and literature reviews. Intellectual property and commercialization. Equity, diversity, and inclusion in engineering. Career paths for MME graduate students.

Units ⓘ

0.25

Components ⓘ

Seminar

Primary Component

Seminar

Grading Information

Grading Basis

Credit/No Credit

Cross-Listing Information

Is this course cross-listed? ⓘ

No

Repeatable Courses

Can this course be repeated for credit?



No

Enrolment Rules

Consent to Add

No consent required

Consent to Drop

No consent required

Prerequisites

No Rules

Corequisites

No Rules

Antirequisites

No Rules

Course Notes

Fee Statement

Workflow Information

Workflow Path

Committee approvals

Faculty/AFIW Path(s) for Workflow

Faculty of Engineering

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

ME 654

Advanced Applied Thermal Engineering

Under Review | Winter 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Effective Date & Career

Career ⓘ

Graduate

Important!

Quest Course ID

Effective Term and Year ⓘ

Winter 2025

Offering Number

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

04/05/2024

Rationale for New Course ⓘ

The existing 600-level thermal engineering courses (ME 651/652/653) have been offered for many years and were created prior to introduction of the MEng program. Their content was developed primarily with research students (i.e. MASC and PhD) in mind, and they continue to be useful in that regard. We wish to add ME 654 to provide a core thermal engineering course with greater focus on applications. We anticipate it will be of interest to MME graduate students in all degree programs, but especially MEng.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Mechanical and Mechatronics Engineering

Subject Code ⓘ

ME

Number ⓘ

654

Title ⓘ

Advanced Applied Thermal Engineering

Abbreviated Title ⓘ

Advanced Applied Thermal Eng

Description ⓘ

Review of selected fundamentals in engineering thermodynamics and heat transfer. Application of numerical methods and software, including evaluating thermodynamic properties. Energy analysis as a diagnostic tool for steady flow systems. Analysis and selection of heat exchangers. Detailed study of selected industrial applications such as compressed air systems, refrigeration, heat recovery, and heat rejection.

Units ⓘ

0.50

Components ⓘ

Lecture

Primary Component

Lecture

Grading Information

Grading Basis

Numerical Grading Basis

Cross-Listing Information

Is this course cross-listed? ⓘ

No

Repeatable Courses

Can this course be repeated for credit?



No

Enrolment Rules

Consent to Add

No consent required

Consent to Drop

No consent required

Prerequisites

No Rules

Corequisites

No Rules

Antirequisites

No Rules

Course Notes

Fee Statement

Workflow Information

Workflow Path

Committee approvals

Faculty/AFIW Path(s) for Workflow

Faculty of Engineering

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

PhD in Mechanical & Mechatronics Engineering

Doctor of Philosophy (PhD) in Mechanical and Mechatronics Engineering

Under Review | Winter 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Changes

- Effective Term and Year
- Graduate Course Requirements
- Milestone Requirements

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Winter 2025

Existing

Effective Term and Year ⓘ

Fall 2023

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

04/05/2024

Quality Assurance Designation ⓘ

Minor Modification

Is there an impact to existing students? ⓘ

No

Is the credential name changing?

No

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

1) Adding ME 600 as a required course: ME 600 addresses the need for graduate level professional development and will improve the breadth of graduate training provided by the Department of Mechanical and Mechatronics Engineering (MME). In particular, the 2023 MME IQAP cyclical reviewers report highlighted some deficiencies in our graduate programs (MEng, MASc, PhD) and student training which this course will address.

2) Adding a "PhD Research Seminar" milestone: Currently, research seminar attendance is a degree requirement for MASc (at least 8) and for MEng in MME (at least 4) and PhD Nanotechnology (at least 8), however no research seminar attendance is currently specified for regular PhD in MME. For consistency with existing MME graduate degrees, the Department of MME would like to add the attendance of at least 8 department research seminars to the degree requirements. This will strengthen the research exposure of PhD students and build a stronger graduate community in the Department of MME.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Mechanical and Mechatronics Engineering

Graduate Field of Study

Mechanical and Mechatronics Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Doctor of Philosophy (PhD) in Mechanical and Mechatronics Engineering

Graduate Credential Type

PhD

Accelerated Program

Not applicable

Program Types**Admit Term(s)**

Fall

Winter

Spring

Delivery Mode

On-campus

Delivery Mode Information**Length of Program****Registration Option(s)**

Full-time

Part-time

Registration Options Information**Graduate Research Fields**

- Automation and Controls
- Fluid Mechanics
- Materials Engineering and Processing
- Solid-Body Mechanics and Mechanical Design
- Thermal Engineering

Graduate Specializations**Additional Program Information**

Admissions

Admission Requirements: Minimum Requirements ⓘ

- A thesis-based Master's degree from a university of recognized standing with a minimum 80% standing with demonstrated research capabilities.
- In order to be admitted to PhD candidacy, applicants must have demonstrated research capabilities. For this reason, should graduates with a Master's degree obtained without producing a research thesis desire to enter the PhD program, they must satisfy the Department that they are able to carry out independent research.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 3
- Type of references: at least 2 academic

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).

Graduate Course Requirements

No Rules

Proposed

Graduate Course Requirements

- Candidates must successfully complete ME 600 Engineering Practice, Research Methods, Ethics & Professional Development for MME Graduate Students (0.25 unit weight) and at least 3 graduate courses at the 600 or 700 level (0.50 unit weight) with an overall average of 70% (no more than 1 of the courses used for credit towards the PhD degree may be taught by the candidate's supervisor). The actual program is decided by the student and the supervisor(s), subject to the approval of the Associate Chair for Graduate Studies.
- Candidates admitted to the PhD program who do not possess a recent and relevant Master's degree or have transferred directly to the PhD program without a Master's degree, are required to complete a minimum of 7 courses, at least 5 of which must be at the 600 or 700 levels (0.50 unit weight).

Existing

Graduate Course Requirements

- Candidates must successfully complete at least 3 graduate courses at the 600 or 700 level (0.50 unit weight) with an overall average of 70% (no more than 1 of the courses used for credit towards the PhD degree may be taught by the candidate's supervisor). The actual program is decided by the student and the supervisor(s), subject to the approval of the Associate Chair for Graduate Studies.
- Candidates admitted to the PhD program who do not possess a recent and relevant Master's degree or have transferred directly to the PhD program without a Master's degree, are required to complete a minimum of 7 courses, at least 5 of which must be at the 600 or 700 levels (0.50 unit weight).

Proposed

Milestone Requirements**Graduate Safety Milestone**

- The Graduate Safety Milestone must be completed by the end of the student's second registered term.

PhD Research Seminar

- Students must attend at least 8 Mechanical and Mechatronics Engineering research seminars.

PhD Comprehensive Examination

- Students are required to meet the University-level PhD Comprehensive Examination minimum requirements, with certain noted differences that are specific to the Faculty of Engineering Comprehensive Examination minimum requirements:
 - Comprehensive examination purpose: Consistent with University-level minimum requirements.
 - Timing: Students must follow the Faculty of Engineering completion timelines whereby students shall complete their comprehensive examination before the end of their 4th term or 6th term in cases where the student is admitted to the PhD program without a completed Master's degree.
 - Committee: Students must follow the Faculty of Engineering committee composition guidelines which differ from the University-level minimum requirements in both number of committee members and committee makeup.
 - Who Chairs an examination: Students must follow the Faculty of Engineering Chair guidelines whereby the Chair is normally selected from outside of the student's home department.
 - Format / Content: Consistent with University-level minimum requirements but with additional information provided in the Faculty of Engineering Comprehensive Examination minimum requirements.
 - Academic integrity: Consistent with University-level minimum requirements.

- In addition to the University-level and Faculty-level PhD Comprehensive Examination minimum requirements, students in the PhD in Mechanical and Mechatronics Engineering program are also required to meet the following requirements:
 - The thesis topic is decided by the student and supervisor(s), in consultation with an Advisory Committee.
 - The Comprehensive Examination Committee, on the advice of the candidate's supervisor(s), should examine:
 - The adequacy of the course of study being undertaken.
 - The student's performance both in the coursework and in the research studies.
 - The proposal for research program as presented by the student.
 - The adequacy of the student's technical background in related areas of knowledge.
 - The main decision to be reached is whether the candidate should proceed with the proposed study or change the emphasis in the research work. Advice about taking additional graduate courses may also be given.

PhD Thesis

- This degree is awarded after candidates have satisfied the Examining Committee that their thesis is a substantial original contribution to knowledge and have also demonstrated a high degree of competence in areas of knowledge related to their specialization.
- Regulations governing the submission and examination of the PhD thesis are found in the Minimum Requirements for the PhD Degree section of the Graduate Studies Academic Calendar.
- The Examining Committee consists of the supervisor(s) and four other members nominated by the supervisor(s) and is approved by the Faculty Graduate Studies Committee. One of the committee members is appointed from outside the University, another from outside the Department.

Existing

Milestone Requirements

Graduate Safety Milestone

- The Graduate Safety Milestone must be completed by the end of the student's second registered term.

PhD Comprehensive Examination

- Students are required to meet the University-level PhD Comprehensive Examination minimum requirements, with certain noted differences that are specific to the Faculty of Engineering Comprehensive Examination minimum requirements:
 - Comprehensive examination purpose: Consistent with University-level minimum requirements.
 - Timing: Students must follow the Faculty of Engineering completion timelines whereby students shall complete their comprehensive examination before the end of their 4th term or 6th term in cases where the student is admitted to the PhD program without a completed Master's degree.
 - Committee: Students must follow the Faculty of Engineering committee composition guidelines which differ from the University-level minimum requirements in both number of committee members and committee makeup.
 - Who Chairs an examination: Students must follow the Faculty of Engineering Chair guidelines whereby the Chair is normally selected from outside of the student's home department.
 - Format / Content: Consistent with University-level minimum requirements but with additional information provided in the Faculty of Engineering Comprehensive Examination minimum requirements.
 - Academic integrity: Consistent with University-level minimum requirements.
- In addition to the University-level and Faculty-level PhD Comprehensive Examination minimum requirements, students in the PhD in Mechanical and Mechatronics Engineering program are also required to meet the following requirements:
 - The thesis topic is decided by the student and supervisor(s), in consultation with an Advisory Committee.
 - The Comprehensive Examination Committee, on the advice of the candidate's supervisor(s), should examine:
 - The adequacy of the course of study being undertaken.
 - The student's performance both in the coursework and in the research studies.

- The proposal for research program as presented by the student.
- The adequacy of the student's technical background in related areas of knowledge.
- The main decision to be reached is whether the candidate should proceed with the proposed study or change the emphasis in the research work. Advice about taking additional graduate courses may also be given.

PhD Thesis

- This degree is awarded after candidates have satisfied the Examining Committee that their thesis is a substantial original contribution to knowledge and have also demonstrated a high degree of competence in areas of knowledge related to their specialization.
- Regulations governing the submission and examination of the PhD thesis are found in the Minimum Requirements for the PhD Degree section of the Graduate Studies Academic Calendar.
- The Examining Committee consists of the supervisor(s) and four other members nominated by the supervisor(s) and is approved by the Faculty Graduate Studies Committee. One of the committee members is appointed from outside the University, another from outside the Department.

Notes

- Department of Mechanical and Mechatronics Engineering website
- Doctor of Philosophy (PhD) in Mechanical and Mechatronics Engineering future students program page

Workflow Information

Workflow Path

Committee approvals

Faculty/AFIW Path(s) for Workflow

Faculty of Engineering

Senate Workflow

No Senate

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

PhD in Mechanical & Mechatronics Engineering- Nanotechnology

Doctor of Philosophy (PhD) in Mechanical and Mechatronics Engineering - Nanotechnology

Under Review | Winter 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Changes

- Graduate Course Requirements
- Effective Term and Year
- Admin Notes

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Winter 2025

Existing

Effective Term and Year ⓘ

Fall 2024

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

04/05/2024

Quality Assurance Designation ⓘ

Minor Modification

Is there an impact to existing students? ⓘ

No

Is the credential name changing?

No

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

Adding ME 600 as a required course: ME 600 addresses the need for graduate level professional development and will improve the breadth of graduate training provided by the Department of Mechanical and Mechatronics Engineering (MME). In particular, the 2023 MME IQAP cyclical reviewers report highlighted some deficiencies in our graduate programs (MEng, MAsc, PhD) and student training which this course will address.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Mechanical and Mechatronics Engineering

Graduate Field of Study

Mechanical and Mechatronics Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Doctor of Philosophy (PhD) in Mechanical and Mechatronics Engineering - Nanotechnology

Graduate Credential Type

PhD

Accelerated Program

Not applicable

Program Types

Collaborative

Admit Term(s)Fall
Winter
Spring**Delivery Mode**

On-campus

Delivery Mode Information

Length of Program

Registration Option(s)

Full-time

Registration Options Information

Graduate Research Fields

Graduate Specializations

Additional Program Information

Admissions

Admission Requirements: Minimum Requirements ⓘ

- A thesis-based Master's degree from a university of recognized standing with a minimum 80% standing with demonstrated research capabilities.
- In order to be admitted to PhD candidacy, applicants must have demonstrated research capabilities. For this reason, should graduates with a Master's degree obtained without producing a research thesis desire to enter the PhD program, they must satisfy the Department that they are able to carry out independent research.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 3
- Type of references: at least 2 academic

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).

Graduate Course Requirements

No Rules

Proposed

Graduate Course Requirements

- Candidates must successfully complete ME 600 Engineering Practice, Research Methods, Ethics & Professional Development for MME Graduate Students (0.25 unit weight), NANO 600 Introduction to Nanotechnology, 1 nanotechnology core course, and at least 1 more graduate course (0.50 unit weight) with an overall average of 70% (no more than 1 of the courses used for credit towards the PhD degree may be taught by the candidate's supervisor). The actual program is decided by the student and the supervisor(s), subject to the approval of the Associate Chair for Graduate Studies.
- Students who are admitted with an appropriate honours bachelor's degree or who transfer directly from a master's program to the PhD program must complete a total of at least 7 courses (0.50 unit weight) including NANO 600 Introduction to Nanotechnology, 1 nanotechnology core course and 5 elective courses.
- Nanotechnology core courses:
 - NANO 601 Characterization of Nanomaterials
 - NANO 602 Structure and Spectroscopy of Nanoscale Materials
 - NANO 603 Nanocomposites
 - NANO 604 Nanomechanics and Molecular Dynamics Simulations
 - NANO 605/SYDE 683 Design of MEMS & NEMS
 - NANO 606/SYDE 682 Advanced MicroElectroMechanical Systems: Physics, Design & Fabrication
 - NANO 707 From Atoms to Crystals, Quantum Wells, Wires and Dots
- Core courses are designed to provide the base knowledge and skill set required to prepare students for more specialized courses and to conduct interdisciplinary nanoscale research.
- Students who have completed their Bachelor of Applied Science (BASc) or MASc degree in Nanotechnology Engineering at the University of Waterloo can not take NANO 600. Instead, they can choose 1 course from the list of nanotechnology core courses.

Existing

Graduate Course Requirements

- Candidates must successfully complete NANO 600 Introduction to Nanotechnology, 1 nanotechnology core course, and at least 1 more graduate course (0.50 unit weight) with an overall average of 70% (no more than 1 of the courses used for credit towards the PhD degree may be taught by the candidate's supervisor). The actual program is decided by the student and the supervisor(s), subject to the approval of the Associate Chair for Graduate Studies.
- Students who are admitted with an appropriate honours bachelor's degree or who transfer directly from a master's program to the PhD program must complete a total of at least 7 courses (0.50 unit weight) including NANO 600 Introduction to Nanotechnology, 1 nanotechnology core course and 5 elective courses.
- Nanotechnology core courses:
 - NANO 601 Characterization of Nanomaterials
 - NANO 602 Structure and Spectroscopy of Nanoscale Materials
 - NANO 603 Nanocomposites
 - NANO 604 Nanomechanics and Molecular Dynamics Simulations
 - NANO 605/SYDE 683 Design of MEMS & NEMS
 - NANO 606/SYDE 682 Advanced MicroElectroMechanical Systems: Physics, Design & Fabrication
 - NANO 707 From Atoms to Crystals, Quantum Wells, Wires and Dots
- Core courses are designed to provide the base knowledge and skill set required to prepare students for more specialized courses and to conduct interdisciplinary nanoscale research.
- Students who have completed their Bachelor of Applied Science (BASc) or MASc degree in Nanotechnology Engineering at the University of Waterloo can not take NANO 600. Instead, they can choose 1 course from the list of nanotechnology core courses.

Milestone Requirements

Graduate Safety Milestone

- The Graduate Safety Milestone must be completed by the end of the student's second registered term.

PhD Research Seminar

- This seminar is a forum for student presentation of research results or proposals. Invited speakers from academia and industry will also present results of research from time to time. The range of topics that will be addressed in the seminar crosses all areas of research in the collaborative program. Each student is required to present at least 1 research seminar. To receive credit, students are expected to attend at least 8 seminars other than their own before completing their program.

PhD Comprehensive Examination

- Students are required to meet the University-level PhD Comprehensive Examination minimum requirements, with certain noted differences that are specific to the Faculty of Engineering Comprehensive Examination minimum requirements:
 - Comprehensive examination purpose: Consistent with University-level minimum requirements.
 - Timing: Students must follow the Faculty of Engineering completion timelines whereby students shall complete their comprehensive examination before the end of their 4th term or 6th term in cases where the student is admitted to the PhD program without a completed Master's degree.
 - Committee: Students must follow the Faculty of Engineering committee composition guidelines which differ from the University-level minimum requirements in both number of committee members and committee makeup.
 - Who Chairs an examination: Students must follow the Faculty of Engineering Chair guidelines whereby the Chair is normally selected from outside of the student's home department.
 - Format / Content: Consistent with University-level minimum requirements but with additional information provided in the Faculty of Engineering Comprehensive Examination minimum requirements.
 - Academic integrity: Consistent with University-level minimum requirements.
- In addition to the University-level and Faculty-level PhD Comprehensive Examination minimum requirements, students in the PhD in Mechanical and Mechatronics Engineering - Nanotechnology program are also required to meet the following requirements:
 - The thesis topic is decided by the student and supervisor(s), in consultation with an Advisory Committee.
 - The Comprehensive Examination Committee, on the advice of the candidate's supervisor(s), should examine:
 - The adequacy of the course of study being undertaken.
 - The student's performance both in the coursework and in the research studies.
 - The proposal for research program as presented by the student.
 - The adequacy of the student's technical background in related areas of knowledge.
 - The main decision to be reached is whether the candidate should proceed with the proposed study or change the emphasis in the research work. Advice about taking additional graduate courses may also be given.

PhD Thesis

- This degree is awarded after candidates have satisfied the Examining Committee that their thesis is a substantial original contribution to knowledge and have also demonstrated a high degree of competence in areas of knowledge related to their specialization.
- Regulations governing the submission and examination of the PhD thesis are found in the Minimum Requirements for the PhD Degree section of the Graduate Studies Academic Calendar.
- The Examining Committee consists of the supervisor(s) and four other members nominated by the supervisor(s) and is approved by the Faculty Graduate Studies Committee. One of the committee members is appointed from outside the University, another from outside the Department (often from Mathematics or Physics).

Notes ⓘ

- Department of Mechanical and Mechatronics Engineering website
- Doctor of Philosophy (PhD) in Mechanical and Mechatronics Engineering - Nanotechnology future students program page

Workflow Information

Workflow Path ⓘ

Committee approvals

Faculty/AFIW Path(s) for Workflow ⓘ

Faculty of Engineering

Senate Workflow

No Senate

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

MASc in Mechanical & Mechatronics Engineering

Master of Applied Science (MASc) in Mechanical and Mechatronics Engineering

Under Review | Winter 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Changes

- Effective Term and Year
- Thesis Option: Course Requirements

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Winter 2025

Existing

Effective Term and Year ⓘ

Fall 2023

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

04/05/2024

Quality Assurance Designation ⓘ

Minor Modification

Is there an impact to existing students? ⓘ

No

Is the credential name changing?

No

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

1) Updating the course requirements to specify that students must complete at least two ME courses and at least one of the ME courses must be at the 600-level: Currently, there is no requirement for Mechanical and Mechatronics Engineering (MME) MASc students to take any course from MME. We want to provide consistency in the MME Master's programs. The MME MASc degree should reflect some MME content for research and courses. The proposed requirement is in line with MASc requirements in other UW Engineering departments.

2) Adding ME 600 as a required course: ME 600 addresses the need for graduate level professional development and will improve the breadth of graduate training provided by the Department of Mechanical and Mechatronics Engineering (MME). In particular, the 2023 MME IQAP cyclical reviewers report highlighted some deficiencies in our graduate programs (MEng, MASc, PhD) and student training which this course will address.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Mechanical and Mechatronics Engineering

Graduate Field of Study

Mechanical and Mechatronics Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Master of Applied Science (MASc) in Mechanical and Mechatronics Engineering

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Thesis

Program Types**Admit Term(s)**

Fall
Winter
Spring

Delivery Mode

On-campus

Delivery Mode Information**Length of Program****Registration Option(s)**

Full-time
Part-time

Registration Options Information**Graduate Research Fields**

- Automation and Controls
- Fluid Mechanics
- Materials Engineering and Processing
- Solid-Body Mechanics and Mechanical Design
- Thermal Engineering

Graduate Specializations**Additional Program Information**

Admissions

Admission Requirements: Minimum Requirements

- The Department of Mechanical and Mechatronics Engineering requires either (i) a 75% overall standing in the last two years, or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent or (ii) a 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent, as the minimum requirement for admission to a Master's program for applicants educated at a Canadian institution. A 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent is the minimum requirement for admission to a Master's program for applicants educated outside of Canada.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 2
- Type of references: professors

Requirements Information

Graduate Degree Requirements

- Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).
- Note: The MASc program emphasizes high level independent research by candidates. The topic of the thesis and the choice of courses are decided by the student and their supervisor(s). Each student's program is subject to the approval of the Associate Chair for Graduate Studies. Candidates will participate in a research program generally involving either theory or experimentation, or both.

Thesis Option: Course Requirements

No Rules

Proposed

Thesis Option: Course Requirements

- Students must complete ME 600 Engineering Practice, Research Methods, Ethics & Professional Development for MME Graduate Students (0.25 unit weight) and 4 one-term (0.50 unit weight) graduate level courses (or courses acceptable for graduate credit).
- In addition to ME 600, at least 1 course out of the required courses must be a (0.50 unit weight) ME 600-level course and at least another course must be a ME course (500, 600 or 700 level course). In total, at least 2 (0.50 unit weight) ME courses must be taken.
- A maximum of 1 500-level course may be counted for credit.
- Additional Faculty regulations concerning Master's degree requirements are:
 - At least two-thirds of the courses used for credit in a candidate's program must be taken from the 600 and 700 series.
 - No more than half of the courses used for credit may be taught by the candidate's supervisor.
 - The candidate must obtain a pass in all courses credited to their program, with a minimum overall average of 70% (a grade of less than 65% in any course counts as a failure).
 - At least half of the courses used for credit must normally be Faculty of Engineering courses.

Existing

Thesis Option: Course Requirements

- Students must complete 4 one-term (0.50 unit weight) graduate level courses (or courses acceptable for graduate credit). A maximum of 1 500-level course may be counted for credit.
- Additional Faculty regulations concerning Master's degree requirements are:
 - At least two-thirds of the courses used for credit in a candidate's program must be taken from the 600 and 700 series.
 - No more than half of the courses used for credit may be taught by the candidate's supervisor.
 - The candidate must obtain a pass in all courses credited to their program, with a minimum overall average of 70% (a grade of less than 65% in any course counts as a failure).
 - At least half of the courses used for credit must normally be Faculty of Engineering courses.

Thesis Option: Milestone Requirements**Graduate Safety Milestone**

- The Graduate Safety Milestone must be completed by the end of the student's second registered term.

Seminar Attendance

- Students must attend at least 8 Mechanical and Mechatronics Engineering research seminars.

Master's Thesis

- Candidates are requested to give advance notice of their intention to submit a thesis approximately three months prior to submission.
- Students must orally defend a thesis embodying the results of independent research work to the satisfaction of an Examining Committee. The composition of the Examining Committee must be consistent with the committee composition outlined in the Faculty of Engineering minimum requirements section of the Graduate Studies Academic Calendar. The topic of the thesis is arranged by the supervisor(s) and the student.

Notes ⓘ

- Department of Mechanical and Mechatronics Engineering website
- Master of Applied Science (MASc) in Mechanical and Mechatronics Engineering future students program page

Workflow Information

Workflow Path ⓘ

Committee approvals

Faculty/AFIW Path(s) for Workflow ⓘ

Faculty of Engineering

Senate Workflow

No Senate

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

MASc in Mechanical & Mechatronics Engineering- Nanotechnology

Master of Applied Science (MASc) in Mechanical and Mechatronics Engineering - Nanotechnology

Under Review | Winter 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

- Mike Grivicic
- Tim Weber-Kraljevski
- Diana Goncalves
- Melanie Figueiredo
- Ashley Day

Changes

- Thesis Option: Course Requirements
- Effective Term and Year
- Admin Notes

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Winter 2025

Existing

Effective Term and Year ⓘ

Fall 2024

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

04/05/2024

Quality Assurance Designation ⓘ

Minor Modification

Is there an impact to existing students? ⓘ

No

Is the credential name changing?

No

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

Adding ME 600 as a required course: ME 600 addresses the need for graduate level professional development and will improve the breadth of graduate training provided by the Department of Mechanical and Mechatronics Engineering (MME). In particular, the 2023 MME IQAP cyclical reviewers report highlighted some deficiencies in our graduate programs (MEng, MASc, PhD) and student training which this course will address.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Mechanical and Mechatronics Engineering

Graduate Field of Study

Mechanical and Mechatronics Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Master of Applied Science (MASc) in Mechanical and Mechatronics Engineering - Nanotechnology

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Thesis

Program Types

Collaborative

Admit Term(s)

Fall
Winter
Spring

Delivery Mode

On-campus

Delivery Mode Information**Length of Program****Registration Option(s)**

Full-time

Registration Options Information**Graduate Research Fields****Graduate Specializations****Additional Program Information**

Admissions

Admission Requirements: Minimum Requirements ⓘ

- The Department of Mechanical and Mechatronics Engineering requires either (i) a 75% overall standing in the last two years, or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent or (ii) a 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent, as the minimum requirement for admission to a Master's program for applicants educated at a Canadian institution. A 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent is the minimum requirement for admission to a Master's program for applicants educated outside of Canada.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 2
- Type of references: professors

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).
- Note: The MAsc program emphasizes high level independent research by candidates. The topic of the thesis and the choice of courses are decided by the student and their supervisor(s). Each student's program is subject to the approval of the Associate Chair for Graduate Studies. Candidates will participate in a research program generally involving either theory or experimentation, or both.

Thesis Option: Course Requirements

No Rules

Proposed

Thesis Option: Course Requirements

- Students must complete ME 600 Engineering Practice, Research Methods, Ethics & Professional Development for MME Graduate Students (0.25 unit weight) and 4 one-term (0.50 unit weight) graduate level courses (or courses acceptable for graduate credit), including NANO 600 Introduction to Nanotechnology and 1 nanotechnology core course. A maximum of 1 500-level course may be counted for credit.
- Nanotechnology core courses:
 - NANO 601 Characterization of Nanomaterials
 - NANO 602 Structure and Spectroscopy of Nanoscale Materials
 - NANO 603 Nanocomposites
 - NANO 604 Nanomechanics and Molecular Dynamics Simulations
 - NANO 605/SYDE 683 Design of MEMS & NEMS
 - NANO 606/SYDE 682 Advanced MicroElectroMechanical Systems: Physics, Design & Fabrication
 - NANO 707 From Atoms to Crystals, Quantum Wells, Wires and Dots
- Core courses are designed to provide the base knowledge and skill set required to prepare students for more specialized courses and to conduct interdisciplinary nanoscale research.
- Students who have completed their Bachelor of Applied Science (BASc) degree in Nanotechnology Engineering at the University of Waterloo can not take NANO 600. Instead, they can choose 1 course from the list of nanotechnology core courses.
- Additional Faculty regulations concerning Master's degree requirements are:
 - At least two-thirds of the courses used for credit in a candidate's program must be taken from the 600 and 700 series.
 - No more than half of the courses used for credit may be taught by the candidate's supervisor.
 - The candidate must obtain a pass in all courses credited to their program, with a minimum overall average of 70% (a grade of less than 65% in any course counts as a failure).
 - At least half of the courses used for credit must normally be Faculty of Engineering courses.

Existing

Thesis Option: Course Requirements

- Students must complete 4 one-term (0.50 unit weight) graduate level courses (or courses acceptable for graduate credit), including NANO 600 Introduction to Nanotechnology and 1 nanotechnology core course. A maximum of 1 500-level course may be counted for credit.
- Nanotechnology core courses:
 - NANO 601 Characterization of Nanomaterials
 - NANO 602 Structure and Spectroscopy of Nanoscale Materials
 - NANO 603 Nanocomposites
 - NANO 604 Nanomechanics and Molecular Dynamics Simulations
 - NANO 605/SYDE 683 Design of MEMS & NEMS
 - NANO 606/SYDE 682 Advanced MicroElectroMechanical Systems: Physics, Design & Fabrication
 - NANO 707 From Atoms to Crystals, Quantum Wells, Wires and Dots
- Core courses are designed to provide the base knowledge and skill set required to prepare students for more specialized courses and to conduct interdisciplinary nanoscale research.
- Students who have completed their Bachelor of Applied Science (BASc) degree in Nanotechnology Engineering at the University of Waterloo can not take NANO 600. Instead, they can choose 1 course from the list of nanotechnology core courses.
- Additional Faculty regulations concerning Master's degree requirements are:
 - At least two-thirds of the courses used for credit in a candidate's program must be taken from the 600 and 700 series.
 - No more than half of the courses used for credit may be taught by the candidate's supervisor.

- o The candidate must obtain a pass in all courses credited to their program, with a minimum overall average of 70% (a grade of less than 65% in any course counts as a failure).
- o At least half of the courses used for credit must normally be Faculty of Engineering courses.

Thesis Option: Milestone Requirements

Graduate Safety Milestone

- The Graduate Safety Milestone must be completed by the end of the student's second registered term.

Seminar Attendance

- Students must attend at least 8 Mechanical and Mechatronics Engineering research seminars.

Nanotechnology Seminar

- This seminar is a forum for student presentation of research results or proposals. Invited speakers from academia and industry will also present results of research from time to time. The range of topics that will be addressed in the seminar crosses all areas of research in the collaborative program. Each student is required to present at least 1 research seminar. To receive credit, students are expected to attend at least 8 seminars other than their own before completing their program.
- The Nanotechnology Seminar may simultaneously count towards the Seminar Attendance requirement of the Mechanical and Mechatronics Engineering Department.

Master's Thesis

- Candidates are requested to give advance notice of their intention to submit a thesis approximately three months prior to submission.
- Students must orally defend a thesis embodying the results of independent research work to the satisfaction of an Examining Committee. The composition of the Examining Committee must be consistent with the committee composition outlined in the Faculty of Engineering minimum requirements section of the Graduate Studies Academic Calendar. The topic of the thesis is arranged by the supervisor(s) and the student.

Notes

- Department of Mechanical and Mechatronics Engineering website
- Master of Applied Science (MASc) in Mechanical and Mechatronics Engineering - Nanotechnology future students program page

Workflow Information

Workflow Path

Committee approvals

Faculty/AFIW Path(s) for Workflow

Faculty of Engineering

Senate Workflow

No Senate

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

MEng in Mechanical & Mechatronics Engineering **Master of Engineering (MEng) in Mechanical and Mechatronics Engineering**

Under Review | Winter 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Changes

- Effective Term and Year
- Coursework Option: Course Requirements
- Coursework Option: Milestone Requirements

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Winter 2025

Existing

Effective Term and Year ⓘ

Fall 2023

Proposal Details

Proposal Type

 ⓘ

Change

Academic Unit Approval

04/05/2024

Quality Assurance Designation

 ⓘ

Minor Modification

Is there an impact to existing students? ⓘ

No

Is the credential name changing?

No

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

1) Replacing the core course MEng degree requirement with the requirement of two ME 600-level courses: Most of the core courses were developed for research students. The list of core courses is not adapted to MEng students and taking two core courses from this list is too restrictive and challenging for students to complete their MEng degree in a timely manner. Instead, choosing two (0.50 unit weight) ME 600-level courses will provide more flexibility for students, while maintaining some Mechanical and Mechatronic Engineering foundation courses in their degree requirements. Additional course structure is provided when a MEng specialization is selected. These changes are also in line with the recommendations of the external reviewers for the 2023 Mechanical and Mechatronics Engineering (MME) IQAP cyclical review.

2) Adding ME 600 as a required course: ME 600 addresses the need for graduate level professional development and will improve the breadth of graduate training provided by the Department of MME. In particular, the 2023 MME IQAP cyclical reviewers report highlighted some deficiencies in our graduate programs (MEng, MAsC, PhD) and student training which this course will address.

3) Adding a "Seminar Attendance" milestone: Seminar Attendance is already included in the degree requirements for the programs, but has been administered as part of the course requirements. The requirement is being converted to a milestone so that it can be more effectively administered/tracked and to be consistent with the other MME graduate programs.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Mechanical and Mechatronics Engineering

Graduate Field of Study

Mechanical and Mechatronics Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Master of Engineering (MEng) in Mechanical and Mechatronics Engineering

Graduate Credential Type**Accelerated Program**

Master's

Not applicable

Study Options (New)

Coursework

Program Types**Admit Term(s)**

Fall

Winter

Spring

Delivery Mode

On-campus

Delivery Mode Information**Length of Program**

- Full-time: 4 terms (16 months)
- Part-time: 8 terms (32 months)

Registration Option(s)

Full-time

Part-time

Registration Options Information**Graduate Research Fields****Graduate Specializations**

- Green Energy

Additional Program Information

- The University of Waterloo does not provide funding for MEng in Mechanical and Mechatronics Engineering students, and the candidates are expected to be self-supporting.

Admissions

Admission Requirements: Minimum Requirements ⓘ

- The Department of Mechanical and Mechatronics Engineering requires either (i) a 75% overall standing in the last two years, or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent or (ii) a 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent, as the minimum requirement for admission to a Master's program for applicants educated at a Canadian institution. A 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent is the minimum requirement for admission to a Master's program for applicants educated outside of Canada.
- Graduate Record Examination (GRE) test scores (requirement only for applicants who completed their undergraduate degree from an institution located outside of Canada or the United States of America).
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 2
- Type of references: academic

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).

Coursework Option: Course Requirements

No Rules

Proposed

Coursework Option: Course Requirements

- Students must complete ME 600 Engineering Practice, Research Methods, Ethics & Professional Development for MME Graduate Students (0.25 unit weight) and 8 one-term (0.50 unit weight) graduate level courses (or courses acceptable for graduate credit).
- At least 2 out of the 8 (0.50 unit weight) required courses must be ME 600-level courses.
- A maximum of 2 500-level courses may be counted for credit.
- An English for Multilingual Speakers (EMLS) technical/professional course is normally required for all students who were not English Language Proficiency (ELP) exempt at the time of admission. This course is normally taken in the first term of the program.
- The EMLS communication course can be waived at the discretion of the Department.
- Additional Faculty regulations concerning Master's degree requirements are:
 - The candidate must obtain a pass in all courses credited to their program, with a minimum overall average of 70% (a grade of less than 65% in any course counts as a failure).
 - At least half of the courses used for credit must normally be Faculty of Engineering courses and the other half need to be Mechanical and Mechatronics Engineering courses.
- Students in the MEng in Mechanical and Mechatronics Engineering program may choose to pursue the following Graduate Specialization:
 1. Green Energy
- A Graduate Specialization is a University credential that is recognized on the student's transcript but not on the diploma and is intended to reflect that a student has successfully completed a set of courses that together provide an in-depth study in the area of the Graduate Specialization. A student will only obtain the Graduate Specialization on their transcript if they have completed the requirements associated with the MEng degree and the requirements associated with the Graduate Specialization.
- All MEng Graduate Specializations in Mechanical and Mechatronics Engineering consist of a set of at least 4 graduate (0.50 weight) level courses and this set is comprised of a mix of compulsory and elective courses. Compulsory courses are those that are prescribed as part of the Graduate Specialization. Elective courses are those that are on a list of courses designated as electives for a given Graduate Specialization. The requirements for the Graduate Specialization are described below.

1. Graduate Specialization in Green Energy

- To receive the Graduate Specialization in Green Energy, students must successfully complete 1 compulsory course and 3 elective courses:
 - Compulsory course:
 - ME 659 Energy and Environment
 - Elective courses (choose 3 from the following list):
 - ME 738 Special Topics in Materials: Hydrogen Storage Materials
 - ME 751 Fuel Cell Technology
 - ME 753 Solar Energy
 - ME 760 Special Topics in Thermal Engineering: Low Energy Building Systems
 - ME 760 Special Topics in Thermal Engineering: Building Energy Performance
 - ME 760 Special Topics in Thermal Engineering: Air Pollution and Greenhouse Gases
 - ME 760 Special Topics in Thermal Engineering: Wind Energy

Existing

Coursework Option: Course Requirements

- Students must complete 8 one-term (0.50 unit weight) graduate level courses (or courses acceptable for graduate credit).
- A maximum of 2 500-level courses may be counted for credit.

- An English for Multilingual Speakers (EMLS) technical/professional course is normally required for all students who were not English Language Proficiency (ELP) exempt at the time of admission. This course is normally taken in the first term of the program.
- The EMLS communication course can be waived at the discretion of the Department.
- At least 2 out of the 8 required courses must be taken from the following list of ME graduate core courses:
 - ME 620 Mechanics of Continua
 - ME 621 Advanced Finite Element Method
 - ME 631 Mechanical Metallurgy
 - ME 632 Experimental Methods in Materials Engineering
 - ME 640 Autonomous Mobile Robotics
 - ME 649 Control of Machines and Processes
 - ME 651 Heat Conduction
 - ME 652 Convective Heat Transfer
 - ME 653 Radiation Heat Transfer
 - ME 662 Advanced Fluid Mechanics
 - ME 664 Turbulent Flow
- MEng students completing the Graduate Diploma (GDip) program option or the Graduate Specialization are allowed to use the mandatory courses from the GDip or Graduate Specialization to count toward 2 of the 8 core courses.
- MEng students must attend at least 4 MME research seminars.
- Additional Faculty regulations concerning Master's degree requirements are:
 - The candidate must obtain a pass in all courses credited to their program, with a minimum overall average of 70% (a grade of less than 65% in any course counts as a failure).
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 - ME 760 Special Topics in Thermal Engineering: Building Energy Performance
 - ME 760 Special Topics in Thermal Engineering: Air Pollution and Greenhouse Gases
 - ME 760 Special Topics in Thermal Engineering: Wind Energy

Proposed

Coursework Option: Milestone Requirements**Seminar Attendance**

- Students must attend at least 4 Mechanical and Mechatronics Engineering research seminars.

Existing

Coursework Option: Milestone Requirements**Notes**

- Department of Mechanical and Mechatronics Engineering website
- Master of Engineering (MEng) in Mechanical and Mechatronics Engineering future students program page

Workflow Information**Workflow Path**

Committee approvals

Faculty/AFIW Path(s) for Workflow

Faculty of Engineering

Senate Workflow

No Senate

Dependencies**Dependent Courses and Programs/Plans**

PREREQUISITES

✓ BE 605 - Project Management	View Courses
✓ BE 603 - Operations and Supply Chain Management	View Courses
✓ BE 602 - Data Analysis and Management	View Courses
✓ BE 606 - Entrepreneurship and Innovation	View Courses
✓ BE 601 - Introduction to Financial and Managerial Accounting	View Courses
✓ BE 604 - Marketing Management	View Courses
✓ BE 600 - Management and Leadership	View Courses
✓ BE 610 - Special Topics in Business and Entrepreneurship	View Courses

MEng in Mechanical & Mechatronics Engineering-Co-op Master of Engineering (MEng) in Mechanical and Mechatronics Engineering - Co-operative Program (direct entry)

Under Review | Winter 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Changes

- Coursework Option: Course Requirements
- Coursework Option: Milestone Requirements
- Effective Term and Year
- Admin Notes

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Winter 2025

Existing

Effective Term and Year ⓘ

Winter 2024

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

04/05/2024

Quality Assurance Designation ⓘ

Minor Modification

Is there an impact to existing students? ⓘ

No

Is the credential name changing?

No

Graduate Co-operative Requirements

No

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

1) Replacing the core course MEng degree requirement with the requirement of two ME 600-level courses: Most of the core courses were developed for research students. The list of core courses is not adapted to MEng students and taking two core courses from this list is too restrictive and challenging for students to complete their MEng degree in a timely manner. Instead, choosing two (0.50 unit weight) ME 600-level courses will provide more flexibility for students, while maintaining some Mechanical and Mechatronic Engineering foundation courses in their degree requirements. Additional course structure is provided when a MEng specialization is selected. These changes are also in line with the recommendations of the external reviewers for the 2023 Mechanical and Mechatronics Engineering (MME) IQAP cyclical review.

2) Adding ME 600 as a required course: ME 600 addresses the need for graduate level professional development and will improve the breadth of graduate training provided by the Department of MME. In particular, the 2023 MME IQAP cyclical reviewers report highlighted some deficiencies in our graduate programs (MEng, MAsC, PhD) and student training which this course will address.

3) Adding a "Seminar Attendance" milestone: Seminar Attendance is already included in the degree requirements for the programs, but has been administered as part of the course requirements. The requirement is being converted to a milestone so that it can be more effectively administered/tracked and to be consistent with the other MME graduate programs.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Mechanical and Mechatronics Engineering

Graduate Field of Study

Mechanical and Mechatronics Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Master of Engineering (MEng) in Mechanical and Mechatronics Engineering - Co-operative Program (direct entry)

Graduate Credential Type**Accelerated Program**

Master's

Not applicable

Study Options (New)

Coursework

Program Types

Co-operative

Admit Term(s)

Fall

Winter

Spring

Delivery Mode

On-campus

Delivery Mode Information**Length of Program**

- 5-6 terms (20-24 months)

Registration Option(s)

Full-time

Registration Options Information**Graduate Research Fields****Graduate Specializations**

- Green Energy

Additional Program Information

- The University of Waterloo does not provide funding for MEng in Mechanical and Mechatronics Engineering students, and the candidates are expected to be self-supporting.

Admissions

Admission Requirements: Minimum Requirements ⓘ

- The Department of Mechanical and Mechatronics Engineering requires either (i) a 75% overall standing in the last two years, or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent or (ii) a 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent, as the minimum requirement for admission to a Master's program for applicants educated at a Canadian institution. A 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent is the minimum requirement for admission to a Master's program for applicants educated outside of Canada.
- Graduate Record Examination (GRE) test scores (requirement only for applicants who completed their undergraduate degree from an institution located outside of Canada or the United States of America).
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 2
- Type of references: academic

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).
- The MEng in Mechanical and Mechatronics Engineering - Co-operative Program will enable students to combine graduate studies with work experience. The program includes completion of 1-2 required work terms. The work term(s) typically takes place in term 3 (or terms 3 and 4). The work term(s) must meet CEE standard work term requirements and Departmental requirements. Students should apply to jobs related to their program of study. Note: the program must start and end on an academic term. Students in the program are encouraged to complete WIL 601 Career Foundations for Work-Integrated Learning in the academic term prior to the first work term.

Coursework Option: Course Requirements

No Rules

Proposed

Coursework Option: Course Requirements

- Students must complete ME 600 Engineering Practice, Research Methods, Ethics & Professional Development for MME Graduate Students (0.25 unit weight) and 8 one-term (0.50 unit weight) graduate level courses (or courses acceptable for graduate credit).
- At least 2 out of the 8 (0.50 unit weight) required courses must be ME 600-level courses.
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Existing

Coursework Option: Course Requirements

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- An English for Multilingual Speakers (EMLS) technical/professional course is normally required for all students who were not English Language Proficiency (ELP) exempt at the time of admission. This course is normally taken in the first term of the program.
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 - ME 760 Special Topics in Thermal Engineering: Air Pollution and Greenhouse Gases
 - ME 760 Special Topics in Thermal Engineering: Wind Energy

Proposed

Coursework Option: Milestone Requirements**Seminar Attendance**

- Students must attend at least 4 Mechanical and Mechatronics Engineering research seminars.

Graduate Studies Work Report

- Students must complete one or two work-term experiences. For each work experience, a work report must be submitted to the Department for review to earn credit for the work report.
- Students are responsible for following the roles and responsibilities of Co-operative and Experiential Education (CEE).

Existing

Coursework Option: Milestone Requirements**Graduate Studies Work Report**

- Students must complete one or two work-term experiences. For each work experience, a work report must be submitted to the Department for review to earn credit for the work report.
- Students are responsible for following the roles and responsibilities of Co-operative and Experiential Education (CEE).

Notes

- Department of Mechanical and Mechatronics Engineering website
- Master of Engineering (MEng) in Mechanical and Mechatronics Engineering - Co-operative Program future students program page

Workflow Information**Workflow Path**

Committee approvals

Faculty/AFIW Path(s) for Workflow

Faculty of Engineering

Senate Workflow

No Senate

Dependencies**Dependent Courses and Programs/Plans**

PREREQUISITES

✓ BE 605 - Project Management	View Courses
✓ BE 603 - Operations and Supply Chain Management	View Courses
✓ BE 602 - Data Analysis and Management	View Courses
✓ BE 606 - Entrepreneurship and Innovation	View Courses
✓ BE 601 - Introduction to Financial and Managerial Accounting	View Courses
✓ BE 604 - Marketing Management	View Courses
✓ BE 600 - Management and Leadership	View Courses
✓ BE 610 - Special Topics in Business and Entrepreneurship	View Courses

PhD in Systems Design Engineering

Doctor of Philosophy (PhD) in Systems Design Engineering

Under Review | Winter 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Changes

- Admission Requirements: Minimum Requirements
- Effective Term and Year
- Admin Notes

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Winter 2025

Existing

Effective Term and Year ⓘ

Fall 2024

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

01/11/2024

Quality Assurance Designation ⓘ

Minor Modification

Is there an impact to existing students? ⓘ

No

Is the credential name changing?

No

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

Change the minimum admission requirements for the PhD programs in Systems Design Engineering: In order to streamline applications for the PhD programs in Systems Design Engineering the department wants to impose more rigorous admission criteria to ensure that incoming students have the necessary mathematical background to be successful in an engineering graduate level program.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Systems Design Engineering

Graduate Field of Study

Systems Design Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Doctor of Philosophy (PhD) in Systems Design Engineering

Graduate Credential Type

PhD

Accelerated Program

Not applicable

Program Types**Admit Term(s)**

Fall
Winter
Spring

Delivery Mode

On-campus

Delivery Mode Information

Length of Program

- The minimum period of registration for a PhD degree is four terms. Degree requirements must be satisfied within four calendar years following the date of admission into the PhD program, unless extensions are approved by the Associate Dean for Graduate Studies and Research in the Faculty of Engineering. Requests for extension must be supported by a written departmental recommendation along with a realistic timetable for the completion of the degree, and evidence of adequate progress in research. Extensions are not granted automatically and will be refused in the case of inadequate progress. University of Waterloo regulations stipulate that approval of an extension past three extended terms is at the discretion of the Associate Provost, Graduate Studies.

Registration Option(s)

Full-time
Part-time

Registration Options Information

A minimum of two terms of full-time residence is expected from students who wish to proceed on a part-time basis. Full-time residency means that a candidate is present on campus for at least three days a week, or a sufficient period of time per week to satisfy the supervisor. The most appropriate time for this residence period will be established in consultation with the supervisor(s) and the Associate Chair of Graduate Studies. Part-time students should be advised that the Faculty of Engineering expects at least 20 hours per week to be devoted to advanced study and research.

Graduate Research Fields

- Biomedical Engineering
- Human Factors and Ergonomics
- Machine Learning and Intelligence
- Mechatronic and Physical Systems
- Modelling, Simulation and Systems Theory
- Optimization and Decision Making
- Societal and Environmental Systems
- Vision, Image and Signal Processing

Graduate Specializations

Additional Program Information

Admissions

Proposed

Admission Requirements: Minimum Requirements

- A master's degree in engineering with a minimum average of 80% or a Master of Applied Science that includes the following two courses or their equivalent:
 - Calculus II (SYDE 112)
 - Matrices and Linear Systems SYDE 114)
- And one of the following two courses or their equivalent:
 - Probability and Statistics (SYDE 212)
 - Calculus 3 (SYDE 211)
- Demonstrated ability to formulate research problems and to execute the research required to solve problems (such as a Master of Applied Science (MASC) research thesis or published scientific/technical papers).
- Transfer to the PhD program without completion of the MASC program: a student enrolled in a MASC program at the University of Waterloo may apply for transfer to the PhD program without completing a Master's degree. Transfer from a MASC program to a PhD program will normally be considered if an applicant:
 - Has an excellent undergraduate record.
 - Has obtained a grade average of at least 80% in courses that have been taken for graduate credit.
 - Has developed a clearly defined research program that seems likely to satisfy the research proposal component of the PhD comprehensive examination and has demonstrated an aptitude for research.
 - Presents objective evidence of adequate English language skills which should enable the candidate to write a thesis and to communicate orally.
 - Is not beyond the fourth academic term of a MASC program.
- English language proficiency (ELP) (if applicable)

Existing

Admission Requirements: Minimum Requirements

- Excellent background preparation and academic achievement in prior degrees, usually a relevant (i.e. thesis-based) Master's degree with an 80% average from a recognized university.
- Demonstrated ability to formulate research problems and to execute the research required to solve problems (such as a Master of Applied Science (MASC) research thesis or published scientific/technical papers).
- At the time of admission, each student must have an approved PhD supervisor or two co-supervisors (at least one of whom is an approved PhD supervisor) who have agreed in writing to supervise the academic program of a candidate. The Faculty of Engineering maintains a list of individually approved research supervisors ("LIARS", which is equivalent to the current University of Waterloo designation of "ADDS": Approved Doctoral Dissertation Supervisors). Additions and deletions to this list are made by the Engineering Graduate Studies Subcommittee upon the recommendation of the Associate Chair for Graduate Studies in the appropriate department.
- Note: in the Faculty of Engineering, a minimum 80% standing in an applicant's appropriate Master's program is the usual requirement. A MASC obtained without a full research thesis is normally an inadequate qualification for admission to the PhD program. Admission to the PhD program is based upon the student's academic record and evidence of ability to pursue independent work. No candidate will be admitted to the program before a faculty advisor is appointed as the student's supervisor.
- Transfer to the PhD program without completion of the MASC program: a student enrolled in a MASC program at the University of Waterloo may apply for transfer to the PhD program without completing a Master's degree. Transfer from a MASC program to a PhD program will normally be considered if an applicant:
 - Has an excellent undergraduate record.
 - Has obtained a grade average of at least 80% in courses that have been taken for graduate credit.
 - Has developed a clearly defined research program that seems likely to satisfy the research proposal component of the PhD comprehensive examination and has demonstrated an aptitude for research.
 - Presents objective evidence of adequate English language skills which should enable the candidate to write a thesis and to communicate orally.
 - Is not beyond the fourth academic term of a MASC program.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 3
- Type of references: 2 from academic sources that are able to comment upon academic preparation and research ability

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).

Graduate Course Requirements

No Rules

Graduate Course Requirements

- PhD candidates possessing a Master's degree in an appropriate discipline are required to successfully complete 3 graduate courses (0.50 unit weight per course) at the 600 or 700 level satisfying the following criteria:
 - At least 1 course from the Systems Design Engineering core methods course list.
 - A maximum of 1 course may be taken from outside the Faculty of Engineering but must be from the Faculties of Mathematics, Health, or Science.
- Systems Design Engineering core methods courses:
 - SYDE 600 Systems Theory, Models, Research & Design
 - SYDE 620 Fundamentals of Continuous System Models
 - SYDE 631 Time Series Modelling
 - SYDE 640 Experimental Design
 - SYDE 675 Pattern Recognition
- The Department may require individual candidates to take more than 3 courses. In every case, a graduate course program is established by the supervisor(s) in consultation with the student, and is subject to the approval of the Associate Chair for Graduate Studies. Candidates may also be required to take additional courses as a result of a comprehensive examination. Students pursuing one of the program's Graduate Research Fields, should inform their supervisor(s) of their chosen field(s) to ensure appropriate course selection.
- Candidates admitted to the PhD program who do not possess a relevant Master's degree, or have transferred directly to the PhD program without a Master's degree, are required to complete a minimum of 7 graduate courses (0.50 unit weight per course) satisfying the following criteria:
 - At least 5 courses from the Faculty of Engineering at the 600 or 700 levels.
 - At least 2 courses from Systems Design Engineering.
 - At least 1 course from the Systems Design Engineering core methods courses list.
 - A maximum of 2 courses may be taken from outside the Faculty of Engineering but must be from the Faculties of Mathematics, Health, Environment, and/or Science.
- Candidates holding a Master's degree in Systems Design Engineering at the University of Waterloo do not need to take a course from the Systems Design Engineering core methods course list. Instead they can take any graduate course from Systems Design Engineering.
- The Faculty of Engineering requires that no more than one-half of the courses used for credit towards a graduate degree may be taught by the candidate's supervisor(s). In the case of co-supervision in small research groups, it may be necessary to relax this rule, but the student's file must contain a statement of formal approval from the Department and endorsement from the Associate Dean for Graduate Studies and Research in the Faculty of Engineering.

Milestone Requirements

PhD Comprehensive Examination

- Students are required to meet the University-level PhD Comprehensive Examination minimum requirements, with certain noted differences that are specific to the Faculty of Engineering Comprehensive Examination minimum requirements:
 - Comprehensive examination purpose: Consistent with University-level minimum requirements.
 - Timing: Students must follow the Faculty of Engineering completion timelines whereby students shall complete their comprehensive examination before the end of their 4th term or 6th term in cases where the student is admitted to the PhD program without a completed Master's degree.
 - Committee: Students must follow the Faculty of Engineering committee composition guidelines which differ from the University-level minimum requirements in both number of committee members and committee makeup.
 - Who Chairs an examination: Students must follow the Faculty of Engineering Chair guidelines whereby the Chair is normally selected from outside of the student's home department.

- o Format / Content: Consistent with University-level minimum requirements but with additional information provided in the Faculty of Engineering Comprehensive Examination minimum requirements.
- o Academic integrity: Consistent with University-level minimum requirements.

PhD Seminar

- Students are required to present a research seminar on their thesis at the Systems Design Engineering Graduate Colloquium or at a publicly attended seminar administered by their supervisor and advertised by the Department. Members of the Comprehensive Examining Committee should be invited to attend the seminar.

Seminar Attendance

- Students are required to attend an average of four University of Waterloo research seminars per full-time term and two per part-time term. It is the student's responsibility to attach a list of seminars attended to their activity report.
- To earn the seminar attendance milestone, the Department records should show that the number of seminars a student has attended is, at least, four times the number of terms the student has been registered as a full-time student in the Department.

Annual Progress Meeting with Advisory Committee I and Annual Progress Meeting with Advisory Committee II

- In the period between their comprehensive examination and their thesis defense, each PhD candidate will meet with their approved Advisory Committee on an annual basis, usually within one month of the anniversary of their comprehensive examination. This meeting is an annual milestone that must be met in order to continue in the program.
- The meeting will last no longer than one and a half hours.
- The meeting will consist of:
 - o A presentation by the candidate,
 - o an examination and discussion with their committee members, and
 - o committee deliberations.
- The outcome of each meeting will be a recommendation from the committee in one of the following three categories:
 - o Category 1: candidate is making good progress and should continue with their plans.
 - o Category 2: candidate has made sufficient progress and must take action to improve or respond to recommendations by the committee.
 - o Category 3: candidate has made insufficient progress and remedial action is required within four months.
- In the case, of a category 3 recommendation, the committee shall meet within one month of the deadline to make a recommendation on whether the candidate has made sufficient progress or should be Required to Withdraw from the program.

PhD Thesis

- Students may choose to pursue up to 2 of the following Graduate Research Fields:
 - o Biomedical Engineering
 - o Human Factors and Ergonomics
 - o Machine Learning and Intelligence
 - o Mechatronic and Physical Systems
 - o Modelling, Simulation and Systems Theory
 - o Optimization and Decision Making
 - o Societal and Environmental Systems
 - o Vision, Image and Signal Processing
- A Graduate Research Field is a University credential that is recognized on the student's transcript and is intended to reflect that a student has successfully completed research concentrated in the area of the Graduate Research Field. The Department, represented by the student's supervisor and examining committee, must assess whether a student's completed research warrants the field designation at the time of degree completion. To obtain the Graduate Research

Field designation, a student must also complete the requirements associated with the PhD degree. Students can choose to pursue a maximum of 2 Graduate Research Field designations (1 methodology field and 1 application field) for their degree.

- Candidates are expected to maintain continuous registration until the thesis is submitted to Graduate Studies and Postdoctoral Affairs. Under exceptional circumstances, inactive terms or a leave of absence may be requested for a prior specified period with departmental approval. The role of a supervisor is to assist a candidate in establishing a research problem with an appropriate scope, to suggest alternative general approaches to the solution of a problem and to provide general advice on the structure and content of a thesis. It is imperative that the engineering code of ethics be strictly observed in the supervisor-candidate relationship.
- The PhD degree in the Faculty of Engineering is awarded to a candidate who has successfully completed a program of advanced study and conducted original research. The program of research and its findings must be presented in the form of a thesis and submitted to the University for public examination prior to its oral defence.
- Before the thesis is submitted for public examination, the candidate must submit a graphical abstract for their thesis to the Department. Guidelines for the graphical abstract are available from the Department.
- The writer of a thesis must demonstrate a critical awareness and understanding of the literature in the research field, exhibit a capability of defining original and useful research problems and a capability of independent thought in solving a research problem. An ability to communicate research results verbally and in writing must be shown. The University of Waterloo allows students to submit theses in English or in French, the latter being governed by certain important constraints. The principles governing the submission of theses in French are specified in the Graduate Studies Academic Calendar. The oral examination of a thesis will assess the ability of a candidate to communicate orally the results of the research and to defend the contents of the thesis.
- Originality in a thesis may be reflected in a number of ways. A candidate may have posed and solved an important new problem or have formulated an existing problem in a novel and useful way. A candidate may offer new and significant insights into problems examined previously by other researchers. Replications of previous investigations may be acceptable if, and only if, they incorporate [significantly new] elements in the design or execution of an experiment.
- Objective criteria describing what is meant by a significant contribution to knowledge are difficult to specify. One way of gauging a candidate's contribution is to consider the extent to which parts of the thesis might be published in peer-reviewed technical journals with an international stature or as a monograph by an acceptable publisher. The ultimate test of the acceptability of a thesis is the ability of a candidate to satisfy, through an oral examination, to a University-appointed committee of research specialists in the general field of study, that a significant research contribution has been made and communicated adequately.

Notes

- Systems Design Engineering website
- Doctor of Philosophy (PhD) in Systems Design Engineering future students program page

Workflow Information

Workflow Path

Committee approvals

Faculty/AFIW Path(s) for Workflow

Faculty of Engineering

Senate Workflow

No Senate

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

PhD in Systems Design Engineering-Aeronautics Doctor of Philosophy (PhD) in Systems Design Engineering - Aeronautics

Under Review | Winter 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Changes

- Admission Requirements: Minimum Requirements
- Effective Term and Year
- Admin Notes

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Winter 2025

Existing

Effective Term and Year ⓘ

Fall 2024

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

01/11/2024

Quality Assurance Designation ⓘ

Minor Modification

Is there an impact to existing students? ⓘ

No

Is the credential name changing?

No

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

Change the minimum admission requirements for the PhD programs in Systems Design Engineering: In order to streamline applications for the PhD programs in Systems Design Engineering the department wants to impose more rigorous admission criteria to ensure that incoming students have the necessary mathematical background to be successful in an engineering graduate level program.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Systems Design Engineering

Graduate Field of Study

Systems Design Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Doctor of Philosophy (PhD) in Systems Design Engineering - Aeronautics

Graduate Credential Type

PhD

Accelerated Program

Not applicable

Program Types

Collaborative

Admit Term(s)

Fall
Winter
Spring

Delivery Mode

On-campus

Delivery Mode Information

Length of Program

- The minimum period of registration for a PhD degree is four terms. Degree requirements must be satisfied within four calendar years following the date of admission into the PhD program, unless extensions are approved by the Associate Dean for Graduate Studies and Research in the Faculty of Engineering. Requests for extension must be supported by a written departmental recommendation along with a realistic timetable for the completion of the degree, and evidence of adequate progress in research. Extensions are not granted automatically and will be refused in the case of inadequate progress. University of Waterloo regulations stipulate that approval of an extension past three extended terms is at the discretion of the Associate Provost, Graduate Studies.

Registration Option(s)

Full-time
Part-time

Registration Options Information

A minimum of two terms of full-time residence is expected from students who wish to proceed on a part-time basis. Full-time residency means that a candidate is present on campus for at least three days a week, or a sufficient period of time per week to satisfy the supervisor. The most appropriate time for this residence period will be established in consultation with the supervisor(s) and the Associate Chair of Graduate Studies. Part-time students should be advised that the Faculty of Engineering expects at least 20 hours per week to be devoted to advanced study and research.

Graduate Research Fields**Graduate Specializations****Additional Program Information**

Admissions

Proposed

Admission Requirements: Minimum Requirements

- A master's degree in engineering with a minimum average of 80% or a Master of Applied Science that includes the following two courses or their equivalent:
 - Calculus II (SYDE 112)
 - Matrices and Linear Systems SYDE 114)
- And one of the following two courses or their equivalent:
 - Probability and Statistics (SYDE 212)
 - Calculus 3 (SYDE 211)
- Demonstrated ability to formulate research problems and to execute the research required to solve problems (such as a Master of Applied Science (MASC) research thesis or published scientific/technical papers).
- Transfer to the PhD program without completion of the MASC program: a student enrolled in a MASC program at the University of Waterloo may apply for transfer to the PhD program without completing a Master's degree. Transfer from a MASC program to a PhD program will normally be considered if an applicant:
 - Has an excellent undergraduate record.
 - Has obtained a grade average of at least 80% in courses that have been taken for graduate credit.
 - Has developed a clearly defined research program that seems likely to satisfy the research proposal component of the PhD comprehensive examination and has demonstrated an aptitude for research.
 - Presents objective evidence of adequate English language skills which should enable the candidate to write a thesis and to communicate orally.
 - Is not beyond the fourth academic term of a MASC program.
- English language proficiency (ELP) (if applicable)

Existing

Admission Requirements: Minimum Requirements

- Excellent background preparation and academic achievement in prior degrees, usually a relevant (i.e. thesis-based) Master's degree with an 80% average from a recognized university.
- Demonstrated ability to formulate research problems and to execute the research required to solve problems (such as a Master of Applied Science (MASC) research thesis or published scientific/technical papers).
- At the time of admission, each student must have an approved PhD supervisor or two co-supervisors (at least one of whom is an approved PhD supervisor) who have agreed in writing to supervise the academic program of a candidate. The Faculty of Engineering maintains a list of individually approved research supervisors ("LIARS", which is equivalent to the current University of Waterloo designation of "ADDS": Approved Doctoral Dissertation Supervisors). Additions and deletions to this list are made by the Engineering Graduate Studies Subcommittee upon the recommendation of the Associate Chair for Graduate Studies in the appropriate department.
- Note: in the Faculty of Engineering, a minimum 80% standing in an applicant's appropriate Master's program is the usual requirement. A MASC obtained without a full research thesis is normally an inadequate qualification for admission to the PhD program. Admission to the PhD program is based upon the student's academic record and evidence of ability to pursue independent work. No candidate will be admitted to the program before a faculty advisor is appointed as the student's supervisor.
- Transfer to the PhD program without completion of the MASC program: a student enrolled in a MASC program at the University of Waterloo may apply for transfer to the PhD program without completing a Master's degree. Transfer from a MASC program to a PhD program will normally be considered if an applicant:
 - Has an excellent undergraduate record.
 - Has obtained a grade average of at least 80% in courses that have been taken for graduate credit.
 - Has developed a clearly defined research program that seems likely to satisfy the research proposal component of the PhD comprehensive examination and has demonstrated an aptitude for research.
 - Presents objective evidence of adequate English language skills which should enable the candidate to write a thesis and to communicate orally.
 - Is not beyond the fourth academic term of a MASC program.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 3
- Type of references: 2 from academic sources that are able to comment upon academic preparation and research ability

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).

Graduate Course Requirements

No Rules

Graduate Course Requirements

- PhD candidates possessing a Master's degree in an appropriate discipline are required to successfully complete AVIA 601 Interdisciplinary Aeronautics, AVIA 802 Interdisciplinary Aeronautics Project – PhD Level, and 2 additional graduate courses (0.50 unit weight per course) at the 600 or 700 level satisfying the following criteria:
 - At least 1 course from the Systems Design Engineering core methods course list.
 - A maximum of 1 course may be taken from outside the Faculty of Engineering but must be from the Faculties of Mathematics, Health, or Science.
- Systems Design Engineering core methods courses:
 - SYDE 600 Systems Theory, Models, Research & Design
 - SYDE 620 Fundamentals of Continuous System Models
 - SYDE 631 Time Series Modelling
 - SYDE 640 Experimental Design
 - SYDE 675 Pattern Recognition
- Candidates admitted to the PhD program who do not possess a relevant Master's degree, or have transferred directly to the PhD program without a Master's degree, are required to complete AVIA 601 and AVIA 802, and 6 additional graduate courses (0.50 unit weight per course) satisfying the following criteria:
 - At least 4 courses from the Faculty of Engineering at the 600 or 700 levels.
 - At least 2 courses from Systems Design Engineering.
 - At least 1 course from the Systems Design Engineering core methods course list.
 - A maximum of 2 courses may be taken from outside the Faculty of Engineering but must be from the Faculties of Mathematics, Health, Environment and/or Science.
- This degree is offered through the Collaborative Aeronautics Program. This program, jointly offered by a range of departments/schools across several academic faculties, promotes the development of interdisciplinary perspectives on aeronautics. Collaborative Aeronautics Program students complete their specialist training in their respective home departments/schools, while working with colleagues from a variety of other departments/schools in core interdisciplinary courses (AVIA 601 and AVIA 602/802).
- Students who have already completed AVIA 601 and AVIA 602 as part of their Master's Aeronautics degree, must complete the following course requirements:
 - AVIA 802 Interdisciplinary Aeronautics Project - PhD Level
 - 1 elective graduate course that is applicable to aeronautics (approved by their supervisor with support from the Director of the Collaborative Aeronautics Program).
 - At least 1 course from the Systems Design Engineering core methods course list.
 - 1 additional course from the Faculties of Engineering, Mathematics, Health, or Science.
- Candidates holding a Master's degree in Systems Design Engineering at the University of Waterloo do not need to take a course from the Systems Design Engineering core methods course list. Instead they can take any graduate course from Systems Design Engineering.
- The Faculty of Engineering requires that no more than one-half of the courses used for credit towards a graduate degree may be taught by the candidate's supervisor(s). In the case of co-supervision in small research groups, it may be necessary to relax this rule, but the student's file must contain a statement of formal approval from the Department and endorsement from the Associate Dean for Graduate Studies and Research in the Faculty of Engineering.

Milestone Requirements

PhD Comprehensive Examination

- Students are required to meet the University-level PhD Comprehensive Examination minimum requirements, with certain noted differences that are specific to the Faculty of Engineering Comprehensive Examination minimum requirements:
 - Comprehensive examination purpose: Consistent with University-level minimum requirements.

- Timing: Students must follow the Faculty of Engineering completion timelines whereby students shall complete their comprehensive examination before the end of their 4th term or 6th term in cases where the student is admitted to the PhD program without a completed Master's degree.
- Committee: Students must follow the Faculty of Engineering committee composition guidelines which differ from the University-level minimum requirements in both number of committee members and committee makeup.
- Who Chairs an examination: Students must follow the Faculty of Engineering Chair guidelines whereby the Chair is normally selected from outside of the student's home department.
- Format / Content: Consistent with University-level minimum requirements but with additional information provided in the Faculty of Engineering Comprehensive Examination minimum requirements.
- Academic integrity: Consistent with University-level minimum requirements.

PhD Seminar

- Students are required to present a research seminar on their thesis at the Systems Design Engineering Graduate Colloquium or at a publicly attended seminar administered by their supervisor and advertised by the Department. Members of the Comprehensive Examining Committee should be invited to attend the seminar.

Seminar Attendance

- Students are required to attend an average of four University of Waterloo research seminars per full-time term and two per part-time term. It is the student's responsibility to attach a list of seminars attended to their activity report.
- To earn the seminar attendance milestone, the Department records should show that the number of seminars a student has attended is, at least, four times the number of terms the student has been registered as a full-time student in the Department.

Annual Progress Meeting with Advisory Committee I and Annual Progress Meeting with Advisory Committee II

- In the period between their comprehensive examination and their thesis defense, each PhD candidate will meet with their approved Advisory Committee on an annual basis, usually within one month of the anniversary of their comprehensive examination. This meeting is an annual milestone that must be met in order to continue in the program.
- The meeting will last no longer than one and a half hours.
- The meeting will consist of:
 - A presentation by the candidate,
 - an examination and discussion with their committee members, and
 - committee deliberations.
- The outcome of each meeting will be a recommendation from the committee in one of the following three categories:
 - Category 1: candidate is making good progress and should continue with their plans.
 - Category 2: candidate has made sufficient progress and must take action to improve or respond to recommendations by the committee.
 - Category 3: candidate has made insufficient progress and remedial action is required within four months.
- In the case, of a category 3 recommendation, the committee shall meet within one month of the deadline to make a recommendation on whether the candidate has made sufficient progress or should be Required to Withdraw from the program.

PhD Thesis

- Candidates are expected to maintain continuous registration until the thesis is submitted to Graduate Studies and Postdoctoral Affairs. Under exceptional circumstances, inactive terms or a leave of absence may be requested for a prior specified period with departmental approval. The role of a supervisor is to assist a candidate in establishing a research problem with an appropriate scope, to suggest alternative general approaches to the solution of a problem

and to provide general advice on the structure and content of a thesis. It is imperative that the engineering code of ethics be strictly observed in the supervisor-candidate relationship.

- The PhD degree in the Faculty of Engineering is awarded to a candidate who has successfully completed a program of advanced study and conducted original research. The program of research must be applicable to Systems Design Engineering and Aeronautics and its findings must be presented in the form of a thesis and submitted to the University for public examination prior to its oral defence.
- Before the thesis is submitted for public examination, the candidate must submit a graphical abstract for their thesis to the Department. Guidelines for the graphical abstract are available from the Department.
- The writer of a thesis must demonstrate a critical awareness and understanding of the literature in the research field, exhibit a capability of defining original and useful research problems and a capability of independent thought in solving a research problem. An ability to communicate research results verbally and in writing must be shown. The University of Waterloo allows students to submit theses in English or in French, the latter being governed by certain important constraints. The principles governing the submission of theses in French are specified in the Graduate Studies Academic Calendar. The oral examination of a thesis will assess the ability of a candidate to communicate orally the results of the research and to defend the contents of the thesis.
- Originality in a thesis may be reflected in a number of ways. A candidate may have posed and solved an important new problem or have formulated an existing problem in a novel and useful way. A candidate may offer new and significant insights into problems examined previously by other researchers. Replications of previous investigations may be acceptable if, and only if, they incorporate [significantly new] elements in the design or execution of an experiment.
- Objective criteria describing what is meant by a significant contribution to knowledge are difficult to specify. One way of gauging a candidate's contribution is to consider the extent to which parts of the thesis might be published in peer-reviewed technical journals with an international stature or as a monograph by an acceptable publisher. The ultimate test of the acceptability of a thesis is the ability of a candidate to satisfy, through an oral examination, to a University-appointed committee of research specialists in the general field of study, that a significant research contribution has been made and communicated adequately.

Notes

- Systems Design Engineering website
- Doctor of Philosophy (PhD) in Systems Design Engineering - Aeronautics future students program page

Workflow Information

Workflow Path

Committee approvals

Faculty/AFIW Path(s) for Workflow

Faculty of Engineering

Senate Workflow

No Senate

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

PhD in Systems Design Engineering-Nanotechnology

Doctor of Philosophy (PhD) in Systems Design Engineering - Nanotechnology

Under Review | Winter 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

- Mike Grivicic
- Tim Weber-Kraljevski
- Diana Goncalves
- Melanie Figueiredo
- Ashley Day

Changes

- Admission Requirements: Minimum Requirements
- Effective Term and Year
- Admin Notes

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Winter 2025

Existing

Effective Term and Year ⓘ

Fall 2024

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

01/11/2024

Quality Assurance Designation ⓘ

Minor Modification

Is there an impact to existing students? ⓘ

No

Is the credential name changing?

No

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

Change the minimum admission requirements for the PhD programs in Systems Design Engineering: In order to streamline applications for the PhD programs in Systems Design Engineering the department wants to impose more rigorous admission criteria to ensure that incoming students have the necessary mathematical background to be successful in an engineering graduate level program.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Systems Design Engineering

Graduate Field of Study

Systems Design Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Doctor of Philosophy (PhD) in Systems Design Engineering - Nanotechnology

Graduate Credential Type

PhD

Accelerated Program

Not applicable

Program Types

Collaborative

Admit Term(s)

Fall
Winter
Spring

Delivery Mode

On-campus

Delivery Mode Information

Length of Program

- The minimum period of registration for a PhD degree is four terms. Degree requirements must be satisfied within four calendar years following the date of admission into the PhD program, unless extensions are approved by the Associate Dean for Graduate Studies and Research in the Faculty of Engineering. Requests for extension must be supported by a written departmental recommendation along with a realistic timetable for the completion of the degree, and evidence of adequate progress in research. Extensions are not granted automatically and will be refused in the case of inadequate progress. University of Waterloo regulations stipulate that approval of an extension past three extended terms is at the discretion of the Associate Provost, Graduate Studies.

Registration Option(s)

Full-time

Registration Options Information**Graduate Research Fields****Graduate Specializations****Additional Program Information**

Admissions

Proposed

Admission Requirements: Minimum Requirements

- A master's degree in engineering with a minimum average of 80% or a Master of Applied Science that includes the following two courses or their equivalent:
 - Calculus II (SYDE 112)
 - Matrices and Linear Systems SYDE 114)
- And one of the following two courses or their equivalent:
 - Probability and Statistics (SYDE 212)
 - Calculus 3 (SYDE 211)
- Demonstrated ability to formulate research problems and to execute the research required to solve problems (such as a Master of Applied Science (MASC) research thesis or published scientific/technical papers).
- Transfer to the PhD program without completion of the MASC program: a student enrolled in a MASC program at the University of Waterloo may apply for transfer to the PhD program without completing a Master's degree. Transfer from a MASC program to a PhD program will normally be considered if an applicant:
 - Has an excellent undergraduate record.
 - Has obtained a grade average of at least 80% in courses that have been taken for graduate credit.
 - Has developed a clearly defined research program that seems likely to satisfy the research proposal component of the PhD comprehensive examination and has demonstrated an aptitude for research.
 - Presents objective evidence of adequate English language skills which should enable the candidate to write a thesis and to communicate orally.
 - Is not beyond the fourth academic term of a MASC program.
- English language proficiency (ELP) (if applicable)

Existing

Admission Requirements: Minimum Requirements

- Excellent background preparation and academic achievement in prior degrees, usually a relevant (i.e. thesis-based) Master's degree with an 80% average from a recognized university.
- Demonstrated ability to formulate research problems and to execute the research required to solve problems (such as a Master of Applied Science (MASC) research thesis or published scientific/technical papers).
- At the time of admission, each student must have an approved PhD supervisor or two co-supervisors (at least one of whom is an approved PhD supervisor) who have agreed in writing to supervise the academic program of a candidate. The Faculty of Engineering maintains a list of individually approved research supervisors ("LIARS", which is equivalent to the current University of Waterloo designation of "ADDS": Approved Doctoral Dissertation Supervisors). Additions and deletions to this list are made by the Engineering Graduate Studies Subcommittee upon the recommendation of the Associate Chair for Graduate Studies in the appropriate department.
- Note: in the Faculty of Engineering, a minimum 80% standing in an applicant's appropriate Master's program is the usual requirement. A MASC obtained without a full research thesis is normally an inadequate qualification for admission to the PhD program. Admission to the PhD program is based upon the student's academic record and evidence of ability to pursue independent work. No candidate will be admitted to the program before a faculty advisor is appointed as the student's supervisor.
- Transfer to the PhD program without completion of the MASC program: a student enrolled in a MASC program at the University of Waterloo may apply for transfer to the PhD program without completing a Master's degree. Transfer from a MASC program to a PhD program will normally be considered if an applicant:
 - Has an excellent undergraduate record.
 - Has obtained a grade average of at least 80% in courses that have been taken for graduate credit.
 - Has developed a clearly defined research program that seems likely to satisfy the research proposal component of the PhD comprehensive examination and has demonstrated an aptitude for research.
 - Presents objective evidence of adequate English language skills which should enable the candidate to write a thesis and to communicate orally.
 - Is not beyond the fourth academic term of a MASC program.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 3
- Type of references: 2 from academic sources that are able to comment upon academic preparation and research ability

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).

Graduate Course Requirements

No Rules

Graduate Course Requirements

- PhD candidates possessing a Master's degree in an appropriate discipline are required to successfully complete NANO 600 Introduction to Nanotechnology, 1 nanotechnology core course, and 1 Systems Design Engineering core methods course.
- Note: it is possible that some students may need to take additional courses to meet the specific course requirements of the collaborative program.
- Nanotechnology core courses:
 - NANO 601 Characterization of Nanomaterials
 - NANO 602 Structure and Spectroscopy of Nanoscale Materials
 - NANO 603 Nanocomposites
 - NANO 604 Nanomechanics and Molecular Dynamics Simulations
 - NANO 605/SYDE 683 Design of MEMS & NEMS
 - NANO 606/SYDE 682 Advanced MicroElectroMechanical Systems: Physics, Design & Fabrication
 - NANO 707 From Atoms to Crystals, Quantum Wells, Wires and Dots
- Systems Design Engineering core methods courses:
 - SYDE 600 Systems Theory, Models, Research & Design
 - SYDE 620 Fundamentals of Continuous System Models
 - SYDE 631 Time Series Modelling
 - SYDE 640 Experimental Design
 - SYDE 675 Pattern Recognition
- Core courses are designed to provide the base knowledge and skill set required to prepare students for more specialized courses and to conduct interdisciplinary nanoscale research.
- Candidates admitted to the PhD program who do not possess a relevant Master's degree, or have transferred directly to the PhD program without a Master's degree, are required to successfully complete NANO 600 and 6 additional graduate courses (0.50 unit weight per course) satisfying the following criteria:
 - At least 2 courses from Systems Design Engineering.
 - At least 1 course from the Nanotechnology core course list.
 - At least 1 course from the Systems Design Engineering core methods course list.
 - A maximum of 2 courses may be taken from outside the Faculty of Engineering but must be from the Faculties of Mathematics, Health, Environment and/or Science.
 - At most 2 courses at the 500 level.
- Students holding a Bachelor of Applied Science (BASc) degree in Nanotechnology Engineering or Master's degree in Nanotechnology at the University of Waterloo can not take NANO 600. Instead, they can choose 1 course from the list of nanotechnology core courses.
- Candidates holding a Master's degree in Systems Design Engineering at the University of Waterloo do not need to take a course from the Systems Design Engineering core methods course list. Instead they can take any graduate course from Systems Design Engineering.
- A graduate course program is established by the supervisor(s) in consultation with the student, and is subject to the approval of the Associate Chair for Graduate Studies. Candidates may also be required to take additional courses as a result of a comprehensive examination.
- The Faculty of Engineering requires that no more than one-half of the courses used for credit towards a graduate degree may be taught by the candidate's supervisor(s). In the case of co-supervision in small research groups, it may be necessary to relax this rule, but the student's file must contain a statement of formal approval from the Department and endorsement from the Associate Dean for Graduate Studies and Research in the Faculty of Engineering.

Milestone Requirements

PhD Comprehensive Examination

- Students are required to meet the University-level PhD Comprehensive Examination minimum requirements, with certain noted differences that are specific to the Faculty of Engineering Comprehensive Examination minimum requirements:
 - Comprehensive examination purpose: Consistent with University-level minimum requirements.
 - Timing: Students must follow the Faculty of Engineering completion timelines whereby students shall complete their comprehensive examination before the end of their 4th term or 6th term in cases where the student is admitted to the PhD program without a completed Master's degree.
 - Committee: Students must follow the Faculty of Engineering committee composition guidelines which differ from the University-level minimum requirements in both number of committee members and committee makeup.
 - Who Chairs an examination: Students must follow the Faculty of Engineering Chair guidelines whereby the Chair is normally selected from outside of the student's home department.
 - Format / Content: Consistent with University-level minimum requirements but with additional information provided in the Faculty of Engineering Comprehensive Examination minimum requirements.
 - Academic integrity: Consistent with University-level minimum requirements.

Nanotechnology Seminar

- This seminar is a forum for student presentation of research results or proposals. Invited speakers from academia and industry will also present results of research from time to time. The range of topics that will be addressed in the seminar crosses all areas of research in the collaborative program. Each student is required to present at least one research seminar. To receive credit, students are required to attend seminars according to the Department's Seminar Policy posted on the Department of Systems Design Engineering website.

PhD Seminar

- Students are required to present a research seminar on their thesis at the Systems Design Engineering Graduate Colloquium or at a publicly attended seminar administered by their supervisor and advertised by the Department. Members of the Comprehensive Examining Committee should be invited to attend the seminar.
- Note: The PhD Seminar may simultaneously count towards the Nanotechnology Seminar requirement of the Systems Design Engineering Department.

Seminar Attendance

- Students are required to attend an average of four University of Waterloo research seminars per full-time term and two per part-time term. It is the student's responsibility to attach a list of seminars attended to their activity report.
- To earn the seminar attendance milestone, the Department records should show that the number of seminars a student has attended is, at least, four times the number of terms the student has been registered as a full-time student in the Department.

Annual Progress Meeting with Advisory Committee I and Annual Progress Meeting with Advisory Committee II

- In the period between their comprehensive examination and their thesis defense, each PhD candidate will meet with their approved Advisory Committee on an annual basis, usually within one month of the anniversary of their comprehensive examination. This meeting is an annual milestone that must be met in order to continue in the program.
- The meeting will last no longer than one and a half hours.
- The meeting will consist of:
 - A presentation by the candidate,
 - an examination and discussion with their committee members, and
 - committee deliberations.
- The outcome of each meeting will be a recommendation from the committee in one of the following three categories:
 - Category 1: candidate is making good progress and should continue with their plans.

- Category 2: candidate has made sufficient progress and must take action to improve or respond to recommendations by the committee.
 - Category 3: candidate has made insufficient progress and remedial action is required within four months.
- In the case, of a category 3 recommendation, the committee shall meet within one month of the deadline to make a recommendation on whether the candidate has made sufficient progress or should be Required to Withdraw from the program.

PhD Thesis

- Candidates are expected to maintain continuous registration until the thesis is submitted to Graduate Studies and Postdoctoral Affairs. Under exceptional circumstances, inactive terms or a leave of absence may be requested for a prior specified period with departmental approval. The role of a supervisor is to assist a candidate in establishing a research problem with an appropriate scope, to suggest alternative general approaches to the solution of a problem and to provide general advice on the structure and content of a thesis. It is imperative that the engineering code of ethics be strictly observed in the supervisor-candidate relationship.
- The PhD degree in the Faculty of Engineering is awarded to a candidate who has successfully completed a program of advanced study and conducted original research. The program of research and its findings must be presented in the form of a thesis and submitted to the University for public examination prior to its oral defence.
- Before the thesis is submitted for public examination, the candidate must submit a graphical abstract for their thesis to the Department. Guidelines for the graphical abstract are available from the Department.
- The writer of a thesis must demonstrate a critical awareness and understanding of the literature in the research field, exhibit a capability of defining original and useful research problems and a capability of independent thought in solving a research problem. An ability to communicate research results verbally and in writing must be shown. The University of Waterloo allows students to submit theses in English or in French, the latter being governed by certain important constraints. The principles governing the submission of theses in French are specified in the Graduate Studies Academic Calendar. The oral examination of a thesis will assess the ability of a candidate to communicate orally the results of the research and to defend the contents of the thesis.
- Originality in a thesis may be reflected in a number of ways. A candidate may have posed and solved an important new problem or have formulated an existing problem in a novel and useful way. A candidate may offer new and significant insights into problems examined previously by other researchers. Replications of previous investigations may be acceptable if, and only if, they incorporate [significantly new] elements in the design or execution of an experiment.
- Objective criteria describing what is meant by a significant contribution to knowledge are difficult to specify. One way of gauging a candidate's contribution is to consider the extent to which parts of the thesis might be published in peer-reviewed technical journals with an international stature or as a monograph by an acceptable publisher. The ultimate test of the acceptability of a thesis is the ability of a candidate to satisfy, through an oral examination, to a University-appointed committee of research specialists in the general field of study, that a significant research contribution has been made and communicated adequately.

Notes ?

- Systems Design Engineering website
- Doctor of Philosophy (PhD) in Systems Design Engineering - Nanotechnology future students program page

Workflow Information

Workflow Path ?

Committee approvals

Faculty/AFIW Path(s) for Workflow ?

Faculty of Engineering

Senate Workflow

No Senate

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

MAsc in Systems Design Engineering **Master of Applied Science (MAsc) in Systems Design Engineering**

Under Review | Winter 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Changes

- Admission Requirements: Minimum Requirements
- Effective Term and Year
- Admin Notes

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Winter 2025

Existing

Effective Term and Year ⓘ

Fall 2024

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

01/11/2024

Quality Assurance Designation ⓘ

Minor Modification

Is there an impact to existing students? ⓘ

No

Is the credential name changing?

No

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

Change the minimum admission requirements for the MAsc programs in Systems Design Engineering: In order to streamline applications for the MAsc programs in Systems Design Engineering the Department wants to impose more rigorous admission criteria to ensure that incoming students have the necessary mathematical background to be successful in an engineering graduate level program.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Systems Design Engineering

Graduate Field of Study

Systems Design Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Master of Applied Science (MAsc) in Systems Design Engineering

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Thesis

Program Types**Admit Term(s)**

Fall
Winter
Spring

Delivery Mode

On-campus

Delivery Mode Information**Length of Program**

- Students are required to complete the program in accordance with the University program time limits.

Registration Option(s)

Full-time

Part-time

Registration Options Information**Graduate Research Fields**

- Biomedical Engineering
- Human Factors and Ergonomics
- Machine Learning and Intelligence
- Mechatronic and Physical Systems
- Modelling, Simulation and Systems Theory
- Optimization and Decision Making
- Societal and Environmental Systems
- Vision, Image and Signal Processing

Graduate Specializations**Additional Program Information**

Admissions

Proposed

Admission Requirements: Minimum Requirements ⓘ

- A 4-year Honours Bachelor's degree in engineering or a Honours Bachelor of Applied Science (or equivalent) that includes the following courses or equivalent:
 - Calculus II (SYDE 112)
 - Matrices and Linear Systems (SYDE 114)
- And one of the following two courses or equivalent:
 - Probability and Statistics (SYDE 212)
 - Calculus 3 (SYDE 211)
- At least an overall 75% (or equivalent) standing from a recognized university.
- For applicants whose previous degree was completed in Canada, a 75% overall standing in the last two years, or equivalent (at the sole discretion of the University of Waterloo, in all cases), in a four-year Honours Bachelor's degree or Honours Bachelor of Applied Science is the minimum requirement for admission to a Master's program.
- Due to the variable nature of international credentials, for applicants whose previous degree was completed outside of Canada, a 75% overall standing in a four-year Honours Bachelor's degree or Honour's Bachelor of Applied Science is the minimum requirement for admission.
- English language proficiency (ELP) (if applicable)

Existing

Admission Requirements: Minimum Requirements ⓘ

- An Honours Bachelor's degree (or equivalent) with at least an overall 75% standing from a recognized university.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 2
- Type of references: academic. Applicants who completed their degree five or more years before the application date may submit 1 academic and 1 professional reference.

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).

Thesis Option: Course Requirements

No Rules

Thesis Option: Course Requirements

- Students must successfully complete 4 graduate courses (0.50 unit weight per course) counting towards degree credit from the University of Waterloo satisfying the following criteria:
 - At least 2 courses from Systems Design Engineering at the 500, 600 or 700 level.
 - At least 1 course from the Systems Design Engineering core methods courses list.
 - A maximum of 2 courses may be taken from outside the Faculty of Engineering but must be from the Faculties of Mathematics, Health, Environment and/or Science.
 - At most 1 course at the 500 level.
- Systems Design Engineering core methods courses:
 - SYDE 600 Systems Theory, Models, Research & Design
 - SYDE 620 Fundamentals of Continuous System Models
 - SYDE 631 Time Series Modelling
 - SYDE 640 Experimental Design
 - SYDE 675 Pattern Recognition
- All course selections are arranged by the supervisor(s) in consultation with the student and are subject to the approval of the Associate Chair for Graduate Studies. Students pursuing one the program's Graduate Research Fields, should inform their supervisor(s) of their chosen field(s) to ensure appropriate course selection.
- Note: these requirements are in addition to satisfactory completion of any transitional courses that may be specified at the time of admission.
- Note: the Faculty of Engineering requires that no more than one-half of the courses used for credit toward a graduate degree may be taught by a candidate's supervisor(s). In the case of co-supervision in small research groups, it may be necessary to relax this rule; however, the student's file must contain a statement of formal approval from the Department and endorsement from the Associate Dean for Graduate Studies and Research in the Faculty of Engineering.

Thesis Option: Milestone Requirements**Master's Seminar**

- Students are required to present a research seminar based on their thesis at the Systems Design Engineering Graduate Colloquium or at a publicly attended seminar administered by their supervisor and advertised by the Department. The thesis readers should be invited to attend the seminar.

Seminar Attendance

- Students are required to attend an average of four University of Waterloo research seminars per full-time term and two per part-time term. It is the student's responsibility to attach a list of seminars attended to their activity report.
- To earn the seminar attendance milestone, the Department records should show that the number of seminars a student has attended is, at least, four times the number of terms the student has been registered as a full-time student in the Department.

Master's Thesis

- Students must submit a thesis embodying the results of independent research work to the satisfaction of an Examining Committee. The topic of the thesis is arranged by the supervisor(s) and the student. The composition of the Examining Committee must be as follows:
 - The student's supervisor(s).
 - At least one faculty member from within the Department of Systems Design Engineering.
 - At least one faculty member from outside the Department of Systems Design Engineering.

- No more than one adjunct faculty member (including Professors Emeriti) may serve on the Examining Committee. Adjunct appointments require the approval of the Associate Dean, Graduate from the student's home Faculty.
 - At least two of the faculty members on the committee must be tenure or tenure-track.
- Before submitting their thesis for display, students must submit a graphical abstract for their thesis to the Department. Guidelines for the graphical abstract are available from the Department.
- Students may choose to pursue up to 2 of the following Graduate Research Fields:
 - Biomedical Engineering
 - Human Factors and Ergonomics
 - Machine Learning and Intelligence
 - Mechatronic and Physical Systems
 - Modelling, Simulation and Systems Theory
 - Optimization and Decision Making
 - Societal and Environmental Systems
 - Vision, Image and Signal Processing
- A Graduate Research Field is a University credential that is recognized on the student's transcript and is intended to reflect that a student has successfully completed research concentrated in the area of the Graduate Research Field. The Department, represented by the student's supervisor and thesis readers, must assess whether a student's completed research warrants the field designation at the time of degree completion. To obtain the Graduate Research Field designation, a student must also complete the requirements associated with the MASc degree. Students can choose to pursue a maximum of 2 Graduate Research Field designations (1 methodology field and 1 application field) for their degree.

Notes ⓘ

- Systems Design Engineering website
- Master of Applied Science (MASc) in Systems Design Engineering future students program page

Workflow Information

Workflow Path ⓘ

Committee approvals

Faculty/AFIW Path(s) for Workflow ⓘ

Faculty of Engineering

Senate Workflow

No Senate

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

MASc in Systems Design Engineering-Aeronautics **Master of Applied Science (MASc) in Systems Design** **Engineering - Aeronautics**

Under Review | Winter 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Changes

- Admission Requirements: Minimum Requirements
- Effective Term and Year
- Admin Notes

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Winter 2025

Existing

Effective Term and Year ⓘ

Fall 2024

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

01/11/2024

Quality Assurance Designation ⓘ

Minor Modification

Is there an impact to existing students? ⓘ

No

Is the credential name changing?

No

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

Change the minimum admission requirements for the MASc programs in Systems Design Engineering: In order to streamline applications for the MASc programs in Systems Design Engineering the Department wants to impose more rigorous admission criteria to ensure that incoming students have the necessary mathematical background to be successful in an engineering graduate level program.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Systems Design Engineering

Graduate Field of Study

Systems Design Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Master of Applied Science (MASc) in Systems Design Engineering - Aeronautics

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Thesis

Program Types

Collaborative

Admit Term(s)

Fall
Winter
Spring

Delivery Mode

On-campus

Delivery Mode Information

Length of Program

- Students are required to complete the program in accordance with the University program time limits.

Registration Option(s)

Full-time

Part-time

Registration Options Information

Graduate Research Fields

Graduate Specializations

Additional Program Information

Admissions

Proposed

Admission Requirements: Minimum Requirements ⓘ

- A 4-year Honours Bachelor's degree in engineering or a Honours Bachelor of Applied Science (or equivalent) that includes the following courses or equivalent:
 - Calculus II (SYDE 112)
 - Matrices and Linear Systems (SYDE 114)
- And one of the following two courses or equivalent:
 - Probability and Statistics (SYDE 212)
 - Calculus 3 (SYDE 211)
- At least an overall 75% (or equivalent) standing from a recognized university.
- For applicants whose previous degree was completed in Canada, a 75% overall standing in the last two years, or equivalent (at the sole discretion of the University of Waterloo, in all cases), in a four-year Honours Bachelor's degree or Honours Bachelor of Applied Science is the minimum requirement for admission to a Master's program.
- Due to the variable nature of international credentials, for applicants whose previous degree was completed outside of Canada, a 75% overall standing in a four-year Honours Bachelor's degree or Honour's Bachelor of Applied Science is the minimum requirement for admission.
- English language proficiency (ELP) (if applicable)

Existing

Admission Requirements: Minimum Requirements ⓘ

- An Honours Bachelor's degree (or equivalent) with at least an overall 75% standing from a recognized university.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 2
- Type of references: academic. Applicants who completed their degree five or more years before the application date may submit 1 academic and 1 professional reference.

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).

Thesis Option: Course Requirements

No Rules

Thesis Option: Course Requirements

- Students must successfully complete AVIA 601 Interdisciplinary Aeronautics, AVIA 602 Interdisciplinary Aeronautics Project, and 3 graduate courses (0.50 unit weight per course) counting towards degree credit from the University of Waterloo satisfying the following criteria:
 - At least 2 courses from Systems Design Engineering at the 500, 600 or 700 level.
 - At least 1 course from the Systems Design Engineering core methods courses list.
 - A maximum of 1 course may be taken from outside the Faculty of Engineering but must be from the Faculties of Mathematics, Health, Environment or Science.
 - At most 1 course at the 500 level.
- Systems Design Engineering core methods courses:
 - SYDE 600 Systems Theory, Models, Research & Design
 - SYDE 620 Fundamentals of Continuous System Models
 - SYDE 631 Time Series Modelling
 - SYDE 640 Experimental Design
 - SYDE 675 Pattern Recognition
- This degree is offered through the Collaborative Aeronautics Program. This program, jointly offered by a range of departments/schools across several academic faculties, promotes the development of interdisciplinary perspectives on aeronautics. Collaborative Aeronautics Program students complete their specialist training in their respective home departments/schools, while working with colleagues from a variety of other departments/schools in core interdisciplinary courses (AVIA 601 and AVIA 602).
- All course selections are arranged by the supervisor(s) in consultation with the student and are subject to the approval of the Associate Chair for Graduate Studies.
- Note: these requirements are in addition to satisfactory completion of any transitional courses that may be specified at the time of admission.
- Note: the Faculty of Engineering requires that no more than one-half of the courses used for credit toward a graduate degree may be taught by a candidate's supervisor(s). In the case of co-supervision in small research groups, it may be necessary to relax this rule; however, the student's file must contain a statement of formal approval from the Department and endorsement from the Associate Dean for Graduate Studies and Research in the Faculty of Engineering.

Thesis Option: Milestone Requirements**Master's Seminar**

- Students are required to present a research seminar based on their thesis at the Systems Design Engineering Graduate Colloquium or at a publicly attended seminar administered by their supervisor and advertised by the Department. The thesis readers should be invited to attend the seminar.

Seminar Attendance

- Students are required to attend an average of four University of Waterloo research seminars per full-time term and two per part-time term. It is the student's responsibility to attach a list of seminars attended to their activity report.
- To earn the seminar attendance milestone, the Department records should show that the number of seminars a student has attended is, at least, four times the number of terms the student has been registered as a full-time student in the Department.

Master's Thesis

- Students must submit a thesis embodying the results of independent research work to the satisfaction of an Examining Committee. The topic of the thesis must be applicable to Systems Design Engineering and Aeronautics and

is arranged by the supervisor(s) and the student. The composition of the Examining Committee must be as follows:

- The student's supervisor(s).
- At least one faculty member from within the Department of Systems Design Engineering.
- At least one faculty member from outside the Department of Systems Design Engineering.
- No more than one adjunct faculty member (including Professors Emeriti) may serve on the Examining Committee. Adjunct appointments require the approval of the Associate Dean, Graduate from the student's home Faculty.
- At least two of the faculty members on the committee must be tenure or tenure-track.
- Before submitting their thesis for display, students must submit a graphical abstract for their thesis to the Department. Guidelines for the graphical abstract are available from the Department.

Notes

- Systems Design Engineering website
- Master of Applied Science (MASc) in Systems Design Engineering - Aeronautics future students program page

Workflow Information

Workflow Path

Committee approvals

Faculty/AFIW Path(s) for Workflow

Faculty of Engineering

Senate Workflow

No Senate

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

MASc in Systems Design Engineering-Nanotechnology **Master of Applied Science (MASc) in Systems Design** **Engineering - Nanotechnology**

Under Review | Winter 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Changes

- Admission Requirements: Minimum Requirements
- Effective Term and Year
- Admin Notes

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Winter 2025

Existing

Effective Term and Year ⓘ

Fall 2024

Proposal Details

Proposal Type

 ⓘ

Change

Academic Unit Approval

01/11/2024

Quality Assurance Designation

 ⓘ

Minor Modification

Is there an impact to existing students? ⓘ

No

Is the credential name changing?

No

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

Change the minimum admission requirements for the MAsc programs in Systems Design Engineering: In order to streamline applications for the MAsc programs in Systems Design Engineering the Department wants to impose more rigorous admission criteria to ensure that incoming students have the necessary mathematical background to be successful in an engineering graduate level program.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Systems Design Engineering

Graduate Field of Study

Systems Design Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Master of Applied Science (MAsc) in Systems Design Engineering - Nanotechnology

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Thesis

Program Types

Collaborative

Admit Term(s)

Fall
Winter
Spring

Delivery Mode

On-campus

Delivery Mode Information

Length of Program

- Students are required to complete the program in accordance with the University program time limits.

Registration Option(s)

Full-time

Registration Options Information

Graduate Research Fields

Graduate Specializations

Additional Program Information

Admissions

Proposed

Admission Requirements: Minimum Requirements ⓘ

- A 4-year Honours Bachelor's degree in engineering or a Honours Bachelor of Applied Science (or equivalent) that includes the following courses or equivalent:
 - Calculus II (SYDE 112)
 - Matrices and Linear Systems (SYDE 114)
- And one of the following two courses or equivalent:
 - Probability and Statistics (SYDE 212)
 - Calculus 3 (SYDE 211)
- At least an overall 75% (or equivalent) standing from a recognized university.
- For applicants whose previous degree was completed in Canada, a 75% overall standing in the last two years, or equivalent (at the sole discretion of the University of Waterloo, in all cases), in a four-year Honours Bachelor's degree or Honours Bachelor of Applied Science is the minimum requirement for admission to a Master's program.
- Due to the variable nature of international credentials, for applicants whose previous degree was completed outside of Canada, a 75% overall standing in a four-year Honours Bachelor's degree or Honour's Bachelor of Applied Science is the minimum requirement for admission.
- English language proficiency (ELP) (if applicable)

Existing

Admission Requirements: Minimum Requirements ⓘ

- An Honours Bachelor's degree (or equivalent) with at least an overall 75% standing from a recognized university.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 2
- Type of references: academic. Applicants who completed their degree five or more years before the application date may submit 1 academic and 1 professional reference.

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).

Thesis Option: Course Requirements

No Rules

Thesis Option: Course Requirements

- Students must successfully complete NANO 600 Introduction to Nanotechnology, and 3 graduate courses (0.50 unit weight per course) counting towards degree credit from the University of Waterloo satisfying the following criteria:
 - At least 2 courses from Systems Design Engineering at the 500, 600 or 700 level.
 - At least 1 course from the Nanotechnology core course list.
 - At least 1 course from the Systems Design Engineering core methods courses list.
 - A maximum of 2 courses may be taken from outside the Faculty of Engineering but must be from the Faculties of Mathematics, Health, Environment and/or Science.
 - At most 1 course at the 500 level.
- Note: it is possible that some students may need to take additional courses to meet the specific course requirements of the collaborative program.
- Nanotechnology core courses:
 - NANO 601 Characterization of Nanomaterials
 - NANO 602 Structure and Spectroscopy of Nanoscale Materials
 - NANO 603 Nanocomposites
 - NANO 604 Nanomechanics and Molecular Dynamics Simulations
 - NANO 605/SYDE 683 Design of MEMS & NEMS
 - NANO 606/SYDE 682 Advanced MicroElectroMechanical Systems: Physics, Design & Fabrication
 - NANO 707 From Atoms to Crystals, Quantum Wells, Wires and Dots
- Systems Design Engineering core methods courses:
 - SYDE 600 Systems Theory, Models, Research & Design
 - SYDE 620 Fundamentals of Continuous System Models
 - SYDE 631 Time Series Modelling
 - SYDE 640 Experimental Design
 - SYDE 675 Pattern Recognition
- Core courses are designed to provide the base knowledge and skill set required to prepare students for more specialized courses and to conduct interdisciplinary nanoscale research.
- Students holding a Bachelor of Applied Science (BASc) degree in Nanotechnology Engineering or Master's degree in Nanotechnology at the University of Waterloo can not take NANO 600. Instead, they can choose 1 course from the list of nanotechnology core courses.
- All course selections are arranged by the supervisor(s) in consultation with the student and are subject to the approval of the Associate Chair for Graduate Studies.
- Note: these requirements are in addition to satisfactory completion of any transitional courses that may be specified at the time of admission.
- Note: the Faculty of Engineering requires that no more than one-half of the courses used for credit toward a graduate degree may be taught by a candidate's supervisor(s). In the case of co-supervision in small research groups, it may be necessary to relax this rule; however, the student's file must contain a statement of formal approval from the Department and endorsement from the Associate Dean for Graduate Studies and Research in the Faculty of Engineering.

Thesis Option: Milestone Requirements**Nanotechnology Seminar**

- This seminar is a forum for student presentation of research results or proposals. Invited speakers from academia and industry will also present results of research from time to time. The range of topics that will be addressed in the seminar crosses all areas of research in the collaborative program. Each student is required to present at least one research seminar. To receive credit, students are required to attend seminars according to the Department's Seminar Policy posted on the Department of Systems Design Engineering website.

Master's Seminar

- Students are required to present a research seminar based on their thesis at the Systems Design Engineering Graduate Colloquium or at a publicly attended seminar administered by their supervisor and advertised by the Department. The thesis readers should be invited to attend the seminar.
- Note: The MASc Seminar may simultaneously count towards the Nanotechnology Seminar requirement of the Systems Design Engineering Department.

Seminar Attendance

- Students are required to attend an average of four University of Waterloo research seminars per full-time term and two per part-time term. It is the student's responsibility to attach a list of seminars attended to their activity report.
- To earn the seminar attendance milestone, the Department records should show that the number of seminars a student has attended is, at least, four times the number of terms the student has been registered as a full-time student in the Department.

Master's Thesis

- Students must submit a thesis embodying the results of independent research work to the satisfaction of an Examining Committee. The topic of the thesis is arranged by the supervisor(s) and the student. The composition of the Examining Committee must be as follows:
 - The student's supervisor(s).
 - At least one faculty member from within the Department of Systems Design Engineering.
 - At least one faculty member from outside the Department of Systems Design Engineering.
 - No more than one adjunct faculty member (including Professors Emeriti) may serve on the Examining Committee. Adjunct appointments require the approval of the Associate Dean, Graduate from the student's home Faculty.
 - At least two of the faculty members on the committee must be tenure or tenure-track.
- Before submitting their thesis for display, students must submit a graphical abstract for their thesis to the Department. Guidelines for the graphical abstract are available from the Department.

Notes

- Systems Design Engineering website
- Master of Applied Science (MASc) in Systems Design Engineering - Nanotechnology future students program page

Workflow Information

Workflow Path

Committee approvals

Faculty/AFIW Path(s) for Workflow

Faculty of Engineering

Senate Workflow

No Senate

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

MEng in Systems Design Engineering Master of Engineering (MEng) in Systems Design Engineering

Under Review | Winter 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC) expand ▲

Waiting for Approval | Approval Delegate(s)

- Mike Grivicic
- Tim Weber-Kraljevski
- Diana Goncalves
- Melanie Figueiredo
- Ashley Day

Changes

- Effective Term and Year
- Admission Requirements: Minimum Requirements

Effective Date and Career

Career

Graduate

Important!

Proposed
Effective Term and Year ⓘ
Winter 2025

Existing
Effective Term and Year ⓘ
Fall 2023

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

01/11/2024

Quality Assurance Designation ⓘ

Minor Modification

Is there an impact to existing students? ⓘ

No

Is the credential name changing?

No

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

Change the minimum admission requirements for the Master of Engineering program in Systems Design Engineering: In order to streamline applications for the MEng program in Systems Design Engineering the Department wants to impose more rigorous admission criteria to ensure that incoming students have the necessary engineering background to be successful in an engineering graduate level program.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Systems Design Engineering

Graduate Field of Study

Systems Design Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Master of Engineering (MEng) in Systems Design Engineering

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Coursework

Program Types**Admit Term(s)**

Fall
Winter
Spring

Delivery Mode

On-campus

Delivery Mode Information**Length of Program**

- Full-time: 4 terms (16 months)
- Part-time: 8 terms (32 months)

Registration Option(s)

Full-time

Part-time

Registration Options Information**Graduate Research Fields****Graduate Specializations**

- Artificial Intelligence and Machine Learning
- Biomedical Systems
- Human Factors
- Mechatronics and Physical Systems
- Vision, Image and Signal Processing

Additional Program Information

Admissions

Proposed

Admission Requirements: Minimum Requirements ⓘ

- A 4-year Honours Bachelor's degree in engineering. For applicants whose previous degree was completed in Canada, a 75% overall standing in the last two years, or equivalent (at the sole discretion of the University of Waterloo, in all cases), in a four-year Honour's Bachelor's degree in engineering is the minimum requirement for admission to a Master's program.
- Due to the variable nature of international credentials, for applicants whose previous degree was completed outside of Canada, a 75% overall standing in a four-year Honours Bachelor's degree in engineering or equivalent is the minimum requirement for admission.
- Applicants who do not hold a Honours Bachelor's degree in engineering must justify their suitability by demonstrating formal or informal training in engineering through the supplementary information form (SIF), their resume/CV, or other supporting material.
- English language proficiency (ELP) (if applicable)

Existing

Admission Requirements: Minimum Requirements ⓘ

- An Honours Bachelor's degree (or equivalent) with at least an overall 75% standing from a recognized university.
- A Graduate Record Examination (GRE) score is required for all students whose undergraduate degree is not from Canada or the USA.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 2
- Type of references: a minimum of 1 academic reference. Applicants who complete their degree five or more years before the application date may submit 2 professional references.

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).

Coursework Option: Course Requirements

No Rules

Coursework Option: Course Requirements

- Students must complete the following 2 core Systems Design Engineering graduate courses:
 - SYDE 600 Systems Theory, Models, Research & Design
 - 1 of:
 - SYDE 660A Systems Design Graduate Workshop 1 - AI and Machine Learning,
 - SYDE 660B Systems Design Graduate Workshop 1 - Biomedical Systems,
 - SYDE 660C Systems Design Graduate Workshop 1 - Human Factors,
 - SYDE 660D Systems Design Graduate Workshop 1 - Mechatronic & Physical Systems,
 - SYDE 660E Systems Design Graduate Workshop 1 - Vision, Image & Signal Processing, or
 - SYDE 660 Systems Design Graduate Workshop 1
- In addition to the 2 core courses, students must complete 6 Engineering graduate courses (0.50 unit weight per course) counting towards degree credit from the University of Waterloo satisfying the following criteria:
 - At least 2 Systems Design Engineering courses at the 500, 600 or 700 level.
 - At most 2 courses at the 500 level.
- Students in the MEng in Systems Design Engineering program may also choose to pursue one of the following five Graduate Specializations:
 1. Artificial Intelligence and Machine Learning
 2. Biomedical Systems
 3. Human Factors
 4. Mechatronics and Physical Systems
 5. Vision, Image and Signal Processing
- A Graduate Specialization is a University credential that is recognized on the student's transcript but not on the diploma and is intended to reflect that a student has successfully completed a set of courses that together provide an in-depth study in the area of the Graduate Specialization. A student will only obtain the Graduate Specialization on their transcript if they have completed the requirements associated with the MEng degree and the requirements associated with the Graduate Specialization.
- All MEng Graduate Specializations in Systems Design Engineering consist of a set of 4 graduate (0.50 weight) level courses and this set is comprised of a mix of specified and elective courses. Specified courses are those that are prescribed as part of the Graduate Specialization. Elective courses are those that are on a list of courses designated as electives for a given Graduate Specialization. The requirements for each of the five Graduate Specializations are described below.

1. Graduate Specialization in Artificial Intelligence and Machine Learning

- Students must satisfy the following:
- 3 Specified courses:
 - SYDE 522 Machine Intelligence or SYDE 552 Computational Neurosciences
 - SYDE 660A Systems Design Graduate Workshop 1 – AI and Machine Learning
 - SYDE 675 Pattern Recognition
- Elective courses (at least 1 course from the following list):
 - SYDE 662 Systems Design Graduate Workshop 2
 - SYDE 671 Advanced Image Processing
 - SYDE 672 Statistical Image Processing
 - SYDE 673 Video Processing & Analytics
 - SYDE 674 3D Computer Vision & Imaging

2. Graduate Specialization in Biomedical Systems

- Students must satisfy the following:
- 3 Specified courses:
 - SYDE 660B Systems Design Graduate Workshop 1 – Biomedical Systems
 - At least 2 from the following list:

- SYDE 544 Biomed Measure & SIP
 - SYDE 684 Materials Biocompatibility
 - SYDE 750 Topic 20 Topics in Systems Modelling: Modeling of Biomechanical Systems
 - SYDE 750 Topic 36 Topics in Systems Modelling: Assistive Tech and Rehab Eng
- Elective courses (at least 1 from the following list or an additional course from the Specified course list)
 - SYDE 552 Computational Neurosciences
 - SYDE 556 Simulating Neurobiological Systems
 - SYDE 652 Dynamics of Multibody Systems
 - SYDE 662 Systems Design Graduate Workshop 2
 - SYDE 677 Medical Imaging
- Note that only one 500 level course may be used to satisfy the requirements of a Graduate Specialization. Therefore, if SYDE 544 is taken as a Specified course, then SYDE 552 and SYDE 556 cannot be taken to satisfy the Elective course requirement.

3. Graduate Specialization in Human Factors

- Students must satisfy the following:
- 3 Specified courses:
 - SYDE 660C Systems Design Graduate Workshop 1 – Human Factors
 - At least 2 from the following list:
 - SYDE 542 Interface Design or SYDE 543 Cognitive Ergonomics
 - SYDE 642 Cognitive Engineering Methods
 - SYDE 644 Human Factors Testing
- Elective courses (at least 1 from the following list or an additional course from the Specified course list):
 - SYDE 533 Conflict Resolution
 - SYDE 662 Systems Design Graduate Workshop 2
 - SYDE 740 Advanced Cognitive Ergonomics
- Note that only one 500 level course may be used to satisfy the requirements of a Graduate Specialization. Therefore, if SYDE 542 or SYDE 543 is taken as a Specified course, then SYDE 533 cannot be taken to satisfy the Elective course requirement.

4. Graduate Specialization in Mechatronic and Physical Systems

- Students must satisfy the following:
- 3 Specified courses:
 - SYDE 660D Systems Design Graduate Workshop 1 - Mechatronic & Physical Systems
 - At least 2 from the following list:
 - SYDE 553 Advanced Dynamics
 - SYDE 652 Dynamics of Multibody Systems
 - SYDE 655 Optimal Control
 - SYDE 682 Advanced MEMS, Physics, Design & Fabrication
 - SYDE 683 Modelling, Simulation & Design of MEMS
 - SYDE 750 Modelling Continuum Systems
- Elective courses (at least 1 from the following list or an additional course from the Specified course list):
 - SYDE 531 Design Opt. under Probabilistic Uncertainty
 - SYDE 631 Time Series Modelling
 - SYDE 661 Model-based robust design
 - SYDE 662 Systems Design Graduate Workshop 2
- Note that only one 500 level course may be used to satisfy the requirements of a Graduate Specialization. Therefore, if SYDE 553 is taken as a Specified course, then SYDE 531 cannot be taken to satisfy the Elective course requirement.

5. Graduate Specialization in Vision, Image and Signal Processing

- Students must satisfy the following:
- 3 Specified courses:
 - SYDE 660E Systems Design Graduate Workshop 1 - Vision, Image & Signal Processing

- At least 2 from the following list:
 - SYDE 575 Image Processing
 - SYDE 671 Advanced Image Processing
 - SYDE 677 Medical Imaging
- Elective courses (at least 1 from the following list or an additional course from the Specified course list):
 - SYDE 544 Biomed Measure & SIP
 - SYDE 633 Remote Sensing Systems
 - SYDE 662 Systems Design Graduate Workshop 2
 - SYDE 672 Statistical Image Processing
 - SYDE 673 Video Processing & Analytics
 - SYDE 674 3D Computer Vision & Imaging
 - SYDE 675 Pattern Recognition
- Note that only one 500 level course may be used to satisfy the requirements of a Graduate Specialization. Therefore, if SYDE 575 is taken as a specified course, then SYDE 544 cannot be taken to satisfy the Elective course requirement.
- All course selections are arranged by the student.
- Note: these requirements are in addition to satisfactory completion of any transitional courses that may be specified at the time of admission.

Coursework Option: Milestone Requirements

Notes ⓘ

- Systems Design Engineering website
- Master of Engineering (MEng) in Systems Design Engineering future students program page

Workflow Information

Workflow Path ⓘ

Committee approvals

Faculty/AFIW Path(s) for Workflow ⓘ

Faculty of Engineering

Senate Workflow

No Senate

Dependencies

Dependent Courses and Programs/Plans

PREREQUISITES

✓ BE 605 - Project Management	View Courses >
✓ BE 603 - Operations and Supply Chain Management	View Courses >
✓ BE 602 - Data Analysis and Management	View Courses >
✓ BE 606 - Entrepreneurship and Innovation	View Courses >
✓ BE 601 - Introduction to Financial and Managerial Accounting	View Courses >
✓ BE 604 - Marketing Management	View Courses >
✓ BE 600 - Management and Leadership	View Courses >
✓ BE 610 - Special Topics in Business and Entrepreneurship	View Courses >
✓ SYDE 600 - Systems Theory, Models, Research & Design	View Courses >

FACULTY OF ENVIRONMENT - GRADUATE STUDIES COMMITTEE REPORT

TO SENATE GRADUATE & RESEARCH COUNCIL

November 2024

1. Program/Course Changes
 - a. GEM
 - i. MCC - to update the wording to accommodate the transition to GradWIL processes.
 - b. SEED
 - i. INDEV courses - code change for all International Development (INDEV) courses to Development Practice (DEVP).

Prior to form submission, review the [content revision instructions](#) and information regarding [major/minor modifications](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Environment

Program: Master of Climate Change (MCC)

Program contact name(s): Dan Scott

Form completed by: Teresa Wilson

Description of proposed changes:

Note: changes to courses and milestones also require the completion/submission of the [SGRC Graduate Studies Course/Milestone Form](#).

Update the requirements of the Graduate Studies Internship milestone.

Is this a [major modification](#) to the program? No

Rationale for change(s):

*To update the wording to accommodate the transition to GradWIL processes.
To better align the wording with that of other graduate programs that include internships.*

Proposed effective date: Term: Winter Year: 2025

Current [Graduate Studies Academic Calendar \(GSAC\)](#) page (include the link to the web page where the changes are to be made):

<https://uwaterloo.ca/graduate-studies-academic-calendar/environment/department-geography-and-environmental-management/master-climate-change-mcc#coursework>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> • Graduate Studies Internship • A Graduate Studies Internship is available for students to integrate theoretical and practical knowledge and experience they gain and reflect upon it in a written report that will be evaluated by the Program Director. Students normally complete their internship over 1 term (4 months) but can complete it over 2 terms if the employment dates (e.g., start 1 July – end 30 Oct) do not align with academic terms. The program does not require internships longer than 4 months and does not approve requests for additional internships beyond 4 months 	<ul style="list-style-type: none"> • Graduate Studies Internship • <u>All internship students are required to spend the equivalent of one academic term as an intern working on climate change in the public or private sector, at a research institute, or for a non-governmental organization. It is the student's primary responsibility to identify potential organizations with which to undertake their internship, although some employers recruit for positions through the program. The work-term will normally take place in the third term of the program. The internship must be approved as being a suitable practical learning experience having sufficient climate change</u>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>needed to achieve this program milestone. Requests to undertake the four-month internship must be approved by the Program Director. It is the student's responsibility to identify potential organizations with which to undertake their internship. Students will prepare an internship proposal, outlining how the work of the organization relates to the Master of Climate Change program and the professional experience sought through the internship. A letter of support from the organization indicating the role and location of the internship and willingness of the direct supervisor to mentor the intern will be submitted to the Program Director. Upon completion of the internship, the student will submit a written report (no more than 25 pages) to the Program Director that summarizes the work experience gained (day to day activities, specific projects and key accomplishments) and reflects on linkage to the program curriculum and professional development goals.</p>	<p><u>focus to be eligible. Students will be required to submit a short proposal outlining how the work of the organization and the internship position relates to the climate change program curriculum, the student's professional interests, and the professional experience sought through the internship. A final written report arising out of the internship experience will be required and will be evaluated.</u></p>

How will students currently registered in the program be impacted by these changes?

There is no significant impact on currently registered students. The process still requires that the internship have climate change focus and be approved, a proposal will still be submitted, the formal GradWIL/WaterlooWorks job posting process will replace the letter of support from the organization, and a final internship report will still be submitted.

Department/School approval date (mm/dd/yy): 01/26/24

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 02/01/24

Faculty approval date (mm/dd/yy): 03/14/24

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate approval date (mm/dd/yy) (if applicable):

Prior to form submission, review the [content revision instructions](#) and information regarding [major/minor modifications](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Environment

Program: Master of Development Practice (MDP)

Program contact name(s): Cameron McCordic, Heather Hall

Form completed by: Cameron McCordic, Heather Hall

Description of proposed changes:

Note: changes to courses and milestones also require the completion/submission of the [SGRC Graduate Studies Course/Milestone Form](#).

Changing the subject name and code for all International Development (INDEV) courses to Development Practice (DEVP). No other elements of the courses will change. All INDEV subject code references in the GSAC will be updated to reflect the new subject code.

Is this a [major modification](#) to the program? No

Rationale for change(s):

Given the uncertain future of the undergraduate INDEV program, it was no longer deemed strategic to maintain the INDEV course codes for the Master of Development Practice (MDP) program. Instead, changing the course codes to DEVP would better represent the program to which these courses are aligned.

Proposed effective date: Term: Spring Year: 2025

Current [Graduate Studies Academic Calendar \(GSAC\)](#) page (include the link to the web page where the changes are to be made):

[https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/courses?group=International%20Development%20\(INDEV\)](https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/courses?group=International%20Development%20(INDEV))

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
INDEV 601	<u>DEVP</u> 601
INDEV 602	<u>DEVP</u> 602
INDEV 603	<u>DEVP</u> 603
INDEV 604	<u>DEVP</u> 604
INDEV 605	<u>DEVP</u> 605
INDEV 606	<u>DEVP</u> 606
INDEV 607	<u>DEVP</u> 607
INDEV 608	<u>DEVP</u> 608
INDEV 609	<u>DEVP</u> 609
INDEV 611	<u>DEVP</u> 611
INDEV 612	<u>DEVP</u> 612
INDEV 613	<u>DEVP</u> 613

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
INDEV 614 INDEV 615 INDEV 616 INDEV 617	<u>DEVP 614</u> <u>DEVP 615</u> <u>DEVP 616</u> <u>DEVP 617</u>

How will students currently registered in the program be impacted by these changes?

There will be no impact on the students' requirements and the school/program will inform registered students of the subject code change.

Department/School approval date (mm/dd/yy): 09/13/2024

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 09/12/24

Faculty approval date (mm/dd/yy): 10/24/24

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate approval date (mm/dd/yy) (if applicable):

Faculty of Science

SGRC submission

MEMORANDUM

To: Tim Weber-Kraljevski and Ashley Day

From: Martin Ross, Associate Dean Graduate Studies – Faculty of Science

Date: November 05, 2024

Re: Science Graduate and Research Council Agenda

I would ask that the motions below be placed on the agenda of the **Nov. 18 SGRC meeting**.
The motions were all approved at the Science Faculty Council (Nov. 04, 2024).

Motions from Earth and Environmental Sciences

1. Inactivate 12 EARTH courses
 - a. List of courses listed on the Graduate Studies Course/Milestone Form

Motions from Chemistry

1. Update the course requirements for the MSc in Chemistry – Quantum Information program to include CHEM 784 as a required course so the Chemistry specific course requirements are consistent with the MSc in Chemistry programs.

Motions from Optometry

1. Revise the Accelerated Master's Program information in the Calendar for consistency and to improve the internal application process.
2. Update the length of program information in the Calendar

Motions from Pharmacy

1. Inactivate PHARM 603 and 606
2. Update the description and delivery mode of PHARM 657

Motions from Physics

1. Update the MSc in Physics program page in the Graduate Studies Academic Calendar (GSAC) to include the Perimeter Scholars International (PSI) Master's Research Paper study option.
2. Add a new course, PHYS 612 - Perimeter Scholars International Classical Physics, to the PSI curriculum

Prior to form submission, review the [content revision instructions](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Science

Effective date: Term: Winter Year: 2025

Milestone

Note: milestone changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Choose an item.
- Inactivate: Choose an item.
- Revise: from Choose an item. to Choose an item.

Course

Note: some course changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Complete all course elements below
- Inactivate: Complete the following course elements:
Course subject code, Course number, Course ID, Course title
- Revise: Complete all course elements below to reflect the proposed change(s) and identify the course elements being revised (*e.g. Course description, Course title*):

Course elements (complete as indicated above. Review the [glossary of terms](#) for details on course elements)

Course subject code: EARTH

Course numbers and titles:

- 1) 606 Principles of Palynology
- 2) 610 Sedimentology – Recent Sediments
- 3) 623 Geochemistry of Hydrothermal Ore Deposits
- 4) 630 Genesis of Metalliferous Ore Deposits
- 5) 631 Field Methods in Soil and Rock Mechanics
- 6) 632 Geology of Industrial Minerals
- 7) 635 Clay Mineralogy
- 8) 640 Quaternary Geology of North America
- 9) 641 Advanced Quaternary Ecology
- 10) 645 Geology of the Great Lakes Region
- 11) 661 Analytical Methods in Mathematical Geology
- 12) 690 Current Problems in Geology

Course IDs:

- 1) 000879

- 2) 000880
- 3) 000886
- 4) 000889
- 5) 000890
- 6) 010450
- 7) 000892
- 8) 000894
- 9) 000895
- 10) 000898
- 11) 000907
- 12) 000911

Grading basis: Choose an item.

Course credit weight: Choose an item.

Course consent required: Choose an item.

Course description:

Meet type(s): Choose an item. Choose an item. Choose an item. Choose an item.

Primary meet type: Choose an item.

Delivery mode: Choose an item.

Requisites:

Special topics course: Yes No

Cross-listed course: Yes No

Course subject code(s) and number(s) to be cross-listed with and approval status:

Sections combined/held with:

Rationale for request:

These EARTH courses are being inactivated as they have not been taught in over 10 years. There are currently no faculty that teach these courses.

Form completed by: Sue Fisher

Department/School approval date (mm/dd/yy): 06/03/2024

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 08/23/24

Faculty approval date (mm/dd/yy): 11/04/2024

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Prior to form submission, review the [content revision instructions](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Science

Effective date: Term: Winter Year: 2025

Milestone

Note: milestone changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Choose an item.
- Inactivate: Choose an item.
- Revise: from Choose an item. to Choose an item.

Course

Note: some course changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Complete all course elements below
- Inactivate: Complete the following course elements:
Course subject code, Course number, Course ID, Course title
- Revise: Complete all course elements below to reflect the proposed change(s) and identify the course elements being revised (*e.g. Course description, Course title*):

Course elements (complete as indicated above. Review the [glossary of terms](#) for details on course elements)

Course subject code: PHARM

Course number: 603

Course ID: 013818

Course title (max. 100 characters including spaces): Selected Topics in Medicinal Chemistry

Course short title (max. 30 characters including spaces):

Grading basis: Choose an item.

Course credit weight: Choose an item.

Course consent required: Choose an item.

Course description:

Meet type(s): Choose an item. Choose an item. Choose an item. Choose an item.

Primary meet type: Choose an item.

Delivery mode: Choose an item.

Requisites:

Special topics course: Yes No

Cross-listed course: Yes No

Course subject code(s) and number(s) to be cross-listed with and approval status:

Sections combined/held with:

Rationale for request: This course has not ever been offered and the instructor who created the course has requested it to be deactivated as it is no longer relevant.

Form completed by: Melinda Recchia

Department/School approval date (mm/dd/yy): 09/19/2024

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 09/06/24

Faculty approval date (mm/dd/yy): 11/04/2024

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Prior to form submission, review the [content revision instructions](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Science

Effective date: Term: Winter Year: 2025

Milestone

Note: milestone changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Choose an item.
- Inactivate: Choose an item.
- Revise: from Choose an item. to Choose an item.

Course

Note: some course changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Complete all course elements below
- Inactivate: Complete the following course elements:
Course subject code, Course number, Course ID, Course title
- Revise: Complete all course elements below to reflect the proposed change(s) and identify the course elements being revised (*e.g. Course description, Course title*):

Course elements (complete as indicated above. Review the [glossary of terms](#) for details on course elements)

Course subject code: PHARM

Course number: 606

Course ID: 013821

Course title (max. 100 characters including spaces): Neuroscience in the 21st Century

Course short title (max. 30 characters including spaces):

Grading basis: Choose an item.

Course credit weight: Choose an item.

Course consent required: Choose an item.

Course description:

Meet type(s): Choose an item. Choose an item. Choose an item. Choose an item.

Primary meet type: Choose an item.

Delivery mode: Choose an item.

Requisites:

Special topics course: Yes No

Cross-listed course: Yes No

Course subject code(s) and number(s) to be cross-listed with and approval status:

Sections combined/held with:

Rationale for request: This course has not ever been offered and there is no intention of offering it in the future as it is no longer relevant.

Form completed by: Melinda Recchia

Department/School approval date (mm/dd/yy): 09/19/2024

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 09/06/24

Faculty approval date (mm/dd/yy): 11/04/2024

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Prior to form submission, review the [content revision instructions](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Science

Effective date: Term: Winter Year: 2025

Milestone

Note: milestone changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Choose an item.
- Inactivate: Choose an item.
- Revise: from Choose an item. to Choose an item.

Course

Note: some course changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Complete all course elements below
- Inactivate: Complete the following course elements:
Course subject code, Course number, Course ID, Course title
- Revise: Complete all course elements below to reflect the proposed change(s) and identify the course elements being revised (*e.g. Course description, Course title*):

*Updating the **course description** and **delivery mode**.*

Course elements (complete as indicated above. Review the [glossary of terms](#) for details on course elements)

Course subject code: PHARM

Course number: 657

Course ID: 016435

Course title (max. 100 characters including spaces): Substance Use in Primary and Community Care

Course short title (max. 30 characters including spaces): Substance Use Prim & Comm Care

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Instructor

Course description:

Current description: In Pharmacy and other health care professions mental health and addictions work is often carried out in specialized settings and is focused on pathological substance use and use disorder. Addictions research is also almost entirely dedicated to substance use disorder and treatment. In most community and primary settings, stigma about substance use presents an additional barrier to addressing the impacts of substance use on disease and medication management. This course focuses on substance use in any form and how it affects disease progression, pharmaceutical care including drug interactions, and public health. We identify traditional and emerging types of research and information, including data from non-medical research sources. Community engagement and the pharmacists becoming a community substance educator will be explored. Drug and drug classes covered include opioids, methamphetamine, cocaine, prescription and other stimulants, GABAergic drugs, serotonergic, glutamatergic, and cholinergic hallucinogens, entactogens, alcohol, nicotine, and cannabis.

Revised description: Mental health and addictions work is often carried out in specialized settings, focused on pathological substance use and use disorder. Addictions research is also almost entirely dedicated to substance use disorder and treatment. This course if focused on understanding substance use and addiction in community-based settings that are not necessarily addictions-focused. This course focuses on substance use in any form and how it affects health, public health, disease progression, and pharmaceutical care including drug interactions. We identify traditional and emerging types of research and information, including data from non-medical research sources and the grey literature. Community engagement and how to effectively educate policy makers, decision makers, stakeholders, service providers, and the public will be explored. Drug and drug classes covered include opioids, methamphetamine, cocaine, prescription and other stimulants, GABAergic drugs, serotonergic, glutamatergic, and cholinergic hallucinogens, entactogens, alcohol, nicotine, and cannabis.

Meet type(s): Online activities Discussion Choose an item. Choose an item.

Primary meet type: Online activities

Delivery mode: Online

Requisites: None

Special topics course: Yes No

Cross-listed course: Yes No

Course subject code(s) and number(s) to be cross-listed with and approval status: N/A

Sections combined/held with: N/A

Rationale for request:

This course was originally designed as an elective to the MPharm program at the School of Pharmacy. MPharm students are all pharmacy graduates and practicing pharmacists. That program no longer requires electives courses. The course is readily modifiable to be suitable for a much broader audience – essentially any graduate student from any background with an interest in substance use or engaged in substance use research (while still retaining enough clinical content to interest graduate students with a clinical health background).

Form completed by: Melinda Recchia

Department/School approval date (mm/dd/yy): 05/30/2024

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 04/24/24

Faculty approval date (mm/dd/yy): 11/04/2024

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Prior to form submission, review the [content revision instructions](#) and information regarding [major/minor modifications](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Science

Program: Master of Science (MSc) in Chemistry - Quantum Information

Program contact name(s): Thorsten Dieckmann, Catherine Van Esch, Kim Rawson

Form completed by:

Description of proposed changes:

Note: changes to courses and milestones also require the completion/submission of the [SGRC Graduate Studies Course/Milestone Form](#).

Updating the course requirements for the MSc in Chemistry – Quantum Information program to include CHEM 784 as a required course so the Chemistry specific course requirements are consistent with the MSc in Chemistry programs.

Is this a [major modification](#) to the program? No

Rationale for change(s):

After updating the MSc in Chemistry - Nanotechnology program requirements, we also discussed applying the same principles to the MSc in Chemistry - Quantum Information program in order to incorporate the CHEM 784 course and have all Chemistry sub-programs consistent.

Proposed effective date: Term: Winter Year: 2023

Current [Graduate Studies Academic Calendar \(GSAC\)](#) page (include the link to the web page where the changes are to be made):

<https://uwaterloo.ca/graduate-studies-academic-calendar/science/department-chemistry/master-science-msc-chemistry-quantum-information>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>Degree requirements</p> <ul style="list-style-type: none"> • Courses <ul style="list-style-type: none"> ○ Students must successfully complete at least 4 one-term graduate courses (0.50 unit weight) including CHEM 794 Master's Seminar and the 2 Quantum Information core courses. ○ Quantum Information core courses: these interdisciplinary courses provide 	<p>Degree requirements</p> <ul style="list-style-type: none"> • Courses <ul style="list-style-type: none"> ○ Students must successfully complete at least 4 one-term graduate courses (0.50 unit weight) including <u>CHEM 784 Foundations of Literature Review</u>, CHEM 794 Master's Seminar and the 2 Quantum Information core courses. ○ Quantum Information core courses: these interdisciplinary courses provide

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>a strong foundation in quantum information science:</p> <ul style="list-style-type: none"> ▪ QIC 710 Quantum Information Processing ▪ QIC 750 Implementation of Quantum Information Processing <p>○ Students must complete 1 of the following courses:</p> <ul style="list-style-type: none"> ▪ CHEM 713 Chemistry of Inorganic Solid Materials ▪ CHEM 745 Statistical Mechanics ▪ CHEM 746 Quantum Chemistry ▪ CHEM 756 Spectroscopy ▪ CHEM 769 Physical Organic Chemistry 	<p>a strong foundation in quantum information science:</p> <ul style="list-style-type: none"> ▪ QIC 710 Quantum Information Processing ▪ QIC 750 Implementation of Quantum Information Processing

How will students currently registered in the program be impacted by these changes?

This will not affect any current students as they just started in Fall 2022 and were made aware there may be changes.

Department/School approval date (mm/dd/yy):

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 10/14/22

Faculty approval date (mm/dd/yy): 11/04/2024

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate approval date (mm/dd/yy) (if applicable):

Prior to form submission, review the [content revision instructions](#) and information regarding [major/minor modifications](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Science

Program: Master of Science (MSc) in Physics

Program contact name(s): Jan Kycia, Kayla Sutton, Sophie Gagnon, Maité Dupuis

Form completed by: Jan Kycia, Kayla Sutton, Sophie Gagnon, Maité Dupuis

Description of proposed changes:

Note: changes to courses and milestones also require the completion/submission of the [SGRC Graduate Studies Course/Milestone Form](#).

Updating the MSc in Physics program page in the Graduate Studies Academic Calendar (GSAC) to include the Perimeter Scholars International (PSI) Master's Research Paper study option. This update will align with the current practice and articulate the requirements of the program's study options more clearly.

Is this a [major modification](#) to the program? No

Rationale for change(s):

The Perimeter Scholars International (PSI) Master's Research Paper study option has been a program option offered in partnership with the Perimeter Institute for many years and operating within the program requirements of the traditional Master's Research Paper study option of the MSc in Physics program. Up to this point, there are a few key differences between the traditional Master's Research Paper study option and the PSI study option that have been implemented in practice but not specified in the GSAC, including differences in the admission process and course requirements. We are updating the GSAC to accurately reflect these differences and to add clarity surrounding the requirements for incoming students, current students, staff, faculty, and others.

In addition to clarifying admission and course requirement details, we are specifying that the courses completed by students in the PSI program option are all graded on a credit granted/no credit granted (CR/NCR) basis. The grade received involves assessment throughout the year conducted by PSI academic staff and students must obtain an average of at least 80% to earn the CR designation. The goal in utilizing the CR/NCR grading basis is to encourage collaboration among students so that they achieve their potential and avoid grade-focused competition. The CR/NCR grading basis on student transcripts has never presented a disadvantage for students to be successfully admitted into UW PhD programs and other prestigious graduate programs around the world. Over the last 15 years of this program option, more than 89% of the students who completed the program option have completed or are currently doing a PhD (the other 11% of students did not enroll in a PhD program or their PhD institution is unknown). Many students received prestigious awards and scholarships (such as the Vanier scholarship) during their graduate studies.

Proposed effective date: Term: Winter Year: 2025

Current [Graduate Studies Academic Calendar \(GSAC\)](#) page (include the link to the web page where the changes are to be made):

<https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/programs/BkfbJCRsn>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>Graduate research fields</p> <ul style="list-style-type: none"> • Astrophysics and Gravitation • Atomic Molecular and Optical Physics • Biophysics • Chemical Physics • Condensed Matter and Materials Physics • Industrial and Applied Physics • Quantum Computing • Subatomic Physics <p>Graduate specializations</p> <ul style="list-style-type: none"> • Quantum Technology <p>Program information</p> <ul style="list-style-type: none"> • Admit term(s) <ul style="list-style-type: none"> ○ Fall ○ Winter ○ Spring • Delivery mode <ul style="list-style-type: none"> ○ On-campus • Program type <ul style="list-style-type: none"> ○ Joint ○ Master's ○ Research • Registration option(s) <ul style="list-style-type: none"> ○ Full-time ○ Part-time • Study option(s) <ul style="list-style-type: none"> ○ Thesis ○ Master's Research Paper ○ Coursework • Additional program information <ul style="list-style-type: none"> ○ Note: the coursework study option is only open to students at the University of Waterloo. <p>Admission requirements</p> <ul style="list-style-type: none"> • Minimum requirements <ul style="list-style-type: none"> ○ An Honours Bachelor's degree (or equivalent) in Science with at least a 	<p>Graduate research fields</p> <ul style="list-style-type: none"> • Astrophysics and Gravitation • Atomic Molecular and Optical Physics • Biophysics • Chemical Physics • Condensed Matter and Materials Physics • Industrial and Applied Physics • Quantum Computing • Subatomic Physics <p>Graduate specializations</p> <ul style="list-style-type: none"> • Quantum Technology <p>Program information</p> <ul style="list-style-type: none"> • Admit term(s) <ul style="list-style-type: none"> ○ Fall ○ Winter ○ Spring • Delivery mode <ul style="list-style-type: none"> ○ On-campus • Program type <ul style="list-style-type: none"> ○ Joint ○ Master's ○ Research • Registration option(s) <ul style="list-style-type: none"> ○ Full-time ○ Part-time • Study option(s) <ul style="list-style-type: none"> ○ Thesis ○ Master's Research Paper ○ Coursework • Additional program information <ul style="list-style-type: none"> ○ Note: the coursework study option is only open to students at the University of Waterloo. ○ <u>Note: students interested in the Perimeter Scholars International (PSI) Master's Research Paper study option must first apply directly to the Perimeter Institute, before the University of Waterloo. Application details and deadlines are available on the Perimeter Institute website</u>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>75% standing.</p> <ul style="list-style-type: none"> • Application materials <ul style="list-style-type: none"> ○ Graduate Record Examination (GRE) Physics subject test scores for all students who have completed their post-secondary education outside of Canada. ○ Supplementary information form ○ Transcript(s) • References <ul style="list-style-type: none"> ○ Number of references: 3 ○ Type of references: 2 of which are normally from academic sources • English language proficiency (ELP) (if applicable) <p>Degree requirements</p> <p>Thesis option:</p> <ul style="list-style-type: none"> • Graduate Academic Integrity Module (Graduate AIM) • Courses <ul style="list-style-type: none"> ○ Students must complete the following 4 one-term courses (0.50 unit weight): <ul style="list-style-type: none"> ▪ 1 Physics core course ▪ 2 graduate level courses ▪ 1 graduate level or 300 or 400 level undergraduate course. Undergraduate courses must be approved by the student's supervisor, the Associate Chair of Graduate Studies, Department of Physics and Astronomy and the Associate Dean of Science for Graduate Studies prior to enrolment in the course. ▪ Physics core courses: <ul style="list-style-type: none"> ▪ PHYS 701 Quantum Mechanics 1 ▪ PHYS 703 Introduction to Quantum Field Theory ▪ PHYS 704 Statistical Physics 1 ▪ PHYS 706 Electromagnetic Theory ▪ PHYS 767 Quantum Information Processing 	<p>https://perimeterinstitute.ca/psi-masters-program.</p> <p>Admission requirements</p> <ul style="list-style-type: none"> • Minimum requirements <ul style="list-style-type: none"> ○ An Honours Bachelor's degree (or equivalent) in Science with at least a 75% standing. • Application materials <ul style="list-style-type: none"> ○ Supplementary information form ○ Transcript(s) • References <ul style="list-style-type: none"> ○ Number of references: 3 ○ Type of references: 2 of which are normally from academic sources • English language proficiency (ELP) (if applicable) <p>Degree requirements</p> <p>Thesis option:</p> <ul style="list-style-type: none"> • Graduate Academic Integrity Module (Graduate AIM) • Courses <ul style="list-style-type: none"> ○ Students must complete the following 4 one-term courses (0.50 unit weight): <ul style="list-style-type: none"> ▪ 1 Physics core course ▪ 2 graduate level courses ▪ 1 graduate level or 300 or 400 level undergraduate course. Undergraduate courses must be approved by the student's supervisor, the Associate Chair of Graduate Studies, Department of Physics and Astronomy and the Associate Dean of Science for Graduate Studies prior to enrolment in the course. ▪ Physics core courses: <ul style="list-style-type: none"> ▪ PHYS 701 Quantum Mechanics 1 ▪ PHYS 703 Introduction to Quantum Field Theory ▪ PHYS 704 Statistical Physics 1 ▪ PHYS 706 Electromagnetic Theory

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> <ul style="list-style-type: none"> ▪ PHYS 781 Fundamentals of Astrophysics ▪ PHYS 782 Fundamentals of Astrophysics II: Observational Techniques and Data Analysis ○ An average of at least 70% must be obtained in the required courses. A minimum grade of 65% is required for a pass in each course. If a student does not meet these minimum grade requirements, or receives a failing grade in any course, the student may be required to withdraw from the program. • Master's Thesis <ul style="list-style-type: none"> ○ Students must complete a thesis based on original research. The subject of research must be approved by the candidate's supervisor. ○ Acceptance of the thesis requires the approval by an Examining Committee following an oral defence of the thesis. • Other requirements <ul style="list-style-type: none"> ○ Advisory Committee meetings: it is required that the student meet formally with their Advisory Committee within the first six months of registration and subsequently at least once per year. If the student receives more than one unsatisfactory evaluation from an Advisory Committee meeting, they may be required to withdraw from the program. ○ The MSc Advisory Committee must consist of at least three members, including: <ul style="list-style-type: none"> ▪ The student's supervisor(s); the primary supervisor acts as the Committee Chair. ▪ At least one Committee member that is a regular faculty member of the Department of Physics and Astronomy at the University of Waterloo. Note: This requirement does not apply for MSc students who are supervised by a Perimeter 	<ul style="list-style-type: none"> <ul style="list-style-type: none"> ▪ PHYS 767 Quantum Information Processing ▪ PHYS 781 Fundamentals of Astrophysics ▪ PHYS 782 Fundamentals of Astrophysics II: Observational Techniques and Data Analysis ○ An average of at least 70% must be obtained in the required courses. A minimum grade of 65% is required for a pass in each course. If a student does not meet these minimum grade requirements, or receives a failing grade in any course, the student may be required to withdraw from the program. • Master's Thesis <ul style="list-style-type: none"> ○ Students must complete a thesis based on original research. The subject of research must be approved by the candidate's supervisor. ○ Acceptance of the thesis requires the approval by an Examining Committee following an oral defence of the thesis. • Other requirements <ul style="list-style-type: none"> ○ Advisory Committee meetings: it is required that the student meet formally with their Advisory Committee within the first six months of registration and subsequently at least once per year. If the student receives more than one unsatisfactory evaluation from an Advisory Committee meeting, they may be required to withdraw from the program. ○ The MSc Advisory Committee must consist of at least three members, including: <ul style="list-style-type: none"> ▪ The student's supervisor(s); the primary supervisor acts as the Committee Chair. ▪ At least one Committee member that is a regular faculty member of the Department of Physics and Astronomy at the University of Waterloo. Note: This requirement does not apply for MSc students who are

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>Institute faculty member with ADDS status.</p> <ul style="list-style-type: none"> ▪ At least two Committee members that are regular, adjunct, or cross-listed faculty members of the Department of Physics and Astronomy at the University of Waterloo or the Department of Physics at the University of Guelph. <ul style="list-style-type: none"> ○ The MSc Defence Committee must consist of a minimum of three voting faculty members, including: <ul style="list-style-type: none"> ▪ The supervisor(s). ▪ Two other faculty members, of which one must be a regular faculty member of the Department of Physics and Astronomy at the University of Waterloo. <p>Master's Research Paper option:</p> <ul style="list-style-type: none"> • Graduate Academic Integrity Module (Graduate AIM) • Courses <ul style="list-style-type: none"> ○ Students must complete 7 one-term courses (0.50 unit weight) acceptable for graduate credit. ○ At least 4 courses must be PHYS graduate level courses. ○ 2 of the courses may be upper level undergraduate courses. The supervisor must submit a memo justifying why the undergraduate course(s) are acceptable for graduate credit, and approval must be received from the Physics and Astronomy Graduate Officer and the Associate Dean of Science for Graduate Studies prior to enrolment in the course. ○ An average of at least 70% must be obtained in the required courses. A minimum grade of 65% is required for a pass in each course. If a student does not meet these minimum grade requirements, or receives a failing grade in any course, the student may be required to withdraw from the program. • Master's Research Paper 	<p>supervised by a Perimeter Institute faculty member with ADDS status.</p> <ul style="list-style-type: none"> ▪ At least two Committee members that are regular, adjunct, or cross-listed faculty members of the Department of Physics and Astronomy at the University of Waterloo or the Department of Physics at the University of Guelph. <ul style="list-style-type: none"> ○ The MSc Defence Committee must consist of a minimum of three voting faculty members, including: <ul style="list-style-type: none"> ▪ The supervisor(s). ▪ Two other faculty members, of which one must be a regular faculty member of the Department of Physics and Astronomy at the University of Waterloo. <p>Master's Research Paper option:</p> <ul style="list-style-type: none"> • Graduate Academic Integrity Module (Graduate AIM) • Courses <ul style="list-style-type: none"> ○ Students must complete 7 one-term courses (0.50 unit weight) acceptable for graduate credit. ○ At least 4 courses must be PHYS graduate level courses. ○ 2 of the courses may be upper level undergraduate courses. The supervisor must submit a memo justifying why the undergraduate course(s) are acceptable for graduate credit, and approval must be received from the Physics and Astronomy Graduate Officer and the Associate Dean of Science for Graduate Studies prior to enrolment in the course. ○ An average of at least 70% must be obtained in the required courses. A minimum grade of 65% is required for a pass in each course. If a student does not meet these minimum grade requirements, or receives a failing grade in any course, the student may be required to withdraw from the program. • Master's Research Paper

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> ○ The Master's Research Paper will have to be approved by the candidate's Supervisory Committee. • Other requirements <ul style="list-style-type: none"> ○ Progress report: At least once per academic year, students must complete an activity progress report. The report will contain an account of past achievements, and an outline of the work to be completed in the period between this and the subsequent submission. The activity report is reviewed and evaluated by the student's supervisor and the Graduate Officer. <p>Coursework option:</p> <ul style="list-style-type: none"> • Graduate Academic Integrity Module (Graduate AIM) • Courses <ul style="list-style-type: none"> ○ At this time, the only MSc in Physics coursework option includes a Graduate Specialization in Quantum Technology. ○ A Graduate Specialization is a University credential that is recognized on the student's transcript but not on the diploma and is intended to reflect that a student has successfully completed a set of courses that together provide an in-depth study in the area of the Graduate Specialization. Students must complete the following 8 one-term courses (0.50 unit weight) acceptable for graduate credit in order to obtain the Graduate Specialization in Quantum Technology on their transcript: <ul style="list-style-type: none"> ▪ PHYS 701 Quantum Mechanics 1 ▪ PHYS 760/QIC 860 Laboratory on Control of Quantum Technology ▪ PHYS 761/QIC 861 Laboratory on Photonic Quantum Technology ▪ PHYS 762/QIC 862 Laboratory on Low Temperature Quantum Technology and Nanofabrication ▪ PHYS 763/QIC 863 Independent Project in 	<ul style="list-style-type: none"> ○ The Master's Research Paper will have to be approved by the candidate's Supervisory Committee. • Other requirements <ul style="list-style-type: none"> ○ Progress report: At least once per academic year, students must complete an activity progress report. The report will contain an account of past achievements, and an outline of the work to be completed in the period between this and the subsequent submission. The activity report is reviewed and evaluated by the student's supervisor and the Graduate Officer. <p><u>Perimeter Scholars International (PSI) Master's Research Paper option:</u></p> <ul style="list-style-type: none"> • <u>Graduate Academic Integrity Module (Graduate AIM)</u> • <u>Courses</u> <ul style="list-style-type: none"> ○ <u>Students must complete a total of 3.50 units of courses (equivalent to 7 one-term courses at 0.50 unit weight) acceptable for graduate credit.</u> ○ <u>As a part of the PSI Master's Research Paper option, students must complete at least 4 of the following 6 core courses (minimum of 2.00 units total):</u> <ul style="list-style-type: none"> ▪ <u>PHYS 601 Perimeter Scholars International Quantum Field Theory 1</u> ▪ <u>PHYS 602 Perimeter Scholars International Statistical Physics</u> ▪ <u>PHYS 603 Perimeter Scholars International Quantum Field Theory 2</u> ▪ <u>PHYS 604 Perimeter Scholars International Relativity</u> ▪ <u>PHYS 605 Perimeter Scholars International Quantum Theory</u> ▪ <u>PHYS 612 Perimeter Scholars International Classical Physics</u> ○ <u>The additional 1.50 units of courses must be approved by the Perimeter Institute Director or Associate Director, Training Programs.</u> ○ <u>Students in the PSI Master's Research Paper option may complete all course requirements with courses that have a Credit/No Credit (CR/NCR) grading</u>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>Quantum Technology or 1 QIC 800 level elective</p> <ul style="list-style-type: none"> ▪ PHYS 767/QIC 710 Quantum Information Processing ▪ QIC 750 Quantum Information Processing Devices ▪ 1 PHYS 700 level or QIC 800 level elective <ul style="list-style-type: none"> ○ Substitutions of courses are possible subject to approval from the Graduate Officer. ○ It is recommended that students who wish to go on to PhD programs choose the PHYS 763/QIC 863 Independent Project in Quantum Technology course to develop their research capabilities. ○ An average of at least 70% must be obtained in the required courses. A minimum grade of 65% is required for a pass in each course. No more than 2 courses, of the first 4 taken, can have averages of less than 70%. If a student does not meet these minimum grade requirements, or receives a failing grade in any course, the student may be required to withdraw from the program. 	<p><u>basis.</u></p> <ul style="list-style-type: none"> • <u>Master's Research Paper</u> <ul style="list-style-type: none"> ○ <u>The Master's Research Paper (MRP) will have to be approved by the candidate's supervisor who is with Physics (a regular faculty member, adjunct or cross-appointed faculty member) and holds sole-supervisory privilege status 1 (SSPS1). Note: in cases when a supervisor does not have SSPS1 they must co-supervise with a colleague who holds SSPS1. The MRP must also be approved by another reader who is a regular faculty member, adjunct or cross-appointed faculty or another reader approved by the Graduate Officer (note: the reader must not be the student's co-supervisor).</u> <p>Coursework option:</p> <ul style="list-style-type: none"> • Graduate Academic Integrity Module (Graduate AIM) • Courses <ul style="list-style-type: none"> ○ At this time, the only MSc in Physics coursework option includes a Graduate Specialization in Quantum Technology. ○ A Graduate Specialization is a University credential that is recognized on the student's transcript but not on the diploma and is intended to reflect that a student has successfully completed a set of courses that together provide an in-depth study in the area of the Graduate Specialization. Students must complete the following 8 one-term courses (0.50 unit weight) acceptable for graduate credit in order to obtain the Graduate Specialization in Quantum Technology on their transcript: <ul style="list-style-type: none"> ▪ PHYS 701 Quantum Mechanics 1 ▪ PHYS 760/QIC 860 Laboratory on Control of Quantum Technology ▪ PHYS 761/QIC 861 Laboratory on Photonic Quantum Technology ▪ PHYS 762/QIC 862 Laboratory on Low Temperature Quantum

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
	<p>Technology and Nanofabrication</p> <ul style="list-style-type: none"> ▪ PHYS 763/QIC 863 Independent Project in Quantum Technology or 1 QIC 800 level elective ▪ PHYS 767/QIC 710 Quantum Information Processing ▪ QIC 750 Quantum Information Processing Devices ▪ 1 PHYS 700 level or QIC 800 level elective <ul style="list-style-type: none"> ○ Substitutions of courses are possible subject to approval from the Graduate Officer. ○ It is recommended that students who wish to go on to PhD programs choose the PHYS 763/QIC 863 Independent Project in Quantum Technology course to develop their research capabilities. ○ An average of at least 70% must be obtained in the required courses. A minimum grade of 65% is required for a pass in each course. No more than 2 courses, of the first 4 taken, can have averages of less than 70%. If a student does not meet these minimum grade requirements, or receives a failing grade in any course, the student may be required to withdraw from the program.

How will students currently registered in the program be impacted by these changes?

Students currently registered in the program will not be impacted by these changes. The changes accurately represent the current way the program is being implemented.

Department/School approval date (11/25/24):

Reviewed by GSPA (for GSPA use only) date (11/25/24):

Faculty approval date (mm/dd/yy): 11/04/2024

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate approval date (mm/dd/yy) (if applicable):

Prior to form submission, review the [content revision instructions](#) and information regarding [major/minor modifications](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Science

Program: OD-Accelerated Master's Program in Vision Science

Program contact name(s): Optometry Graduate and Research Coordinator (Angela Hare)

Form completed by: Paul Murphy, Kristine Dalton, Angela Hare

Description of proposed changes:

Note: changes to courses and milestones also require the completion/submission of the [SGRC Graduate Studies Course/Milestone Form](#).

Revising the Accelerated Master's Program, for consistency and to improve the internal application process.

Is this a [major modification](#) to the program? No

Rationale for change(s):

The School has clarified the operation of the Accelerated Master's program, which is usually taken by Doctor of Optometry (OD) students who are hoping to obtain both an OD and an MSc degree, by updating the internal application process for the program. The updates to the Calendar reflect the streamlining that has been done to this process and the clarified program requirements. The name of the program has also been updated to the OD-Accelerated Master's Program to clarify that this program is for OD students only.

Proposed effective date: Term: Winter Year: 2025

Current [Graduate Studies Academic Calendar \(GSAC\)](#) page (include the link to the web page where the changes are to be made):

<https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/programs/r1bWXmh46>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>The School of Optometry and Vision Science offers an Accelerated Master's Program for professional optometry students. This program provides an introduction to postgraduate study, academic enrichment and recognition of the contributions research for outstanding optometry students who might otherwise overlook the opportunity of graduate studies. The accelerated program provides a quicker route to the Master of Science (MSc) for outstanding students who will obtain graduate training, an increased scientific component along with the clinical</p>	<p>The School of Optometry and Vision Science offers an <u>OD-Accelerated Master's Program</u> for professional optometry students. This program provides an introduction to postgraduate study, academic enrichment and recognition of the contributions research for outstanding optometry students who might otherwise overlook the opportunity of graduate studies. The accelerated program provides a quicker route to the Master of Science (MSc) for outstanding students who will obtain graduate training, an increased scientific component along with the clinical</p>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>training and a further specialization in an area of Vision Science.</p> <p>General Principles of the Accelerated Master's Program An Accelerated Master's Program is one in which the educational process leading through the Doctor of Optometry (OD) to the MSc degree is considered as a continuous unit. The accelerated program also provides the opportunity for mutual enrichment of both programs. The Vision Science background of the OD program serves as a solid precursor to research at the MSc level. The research at the MSc level broadens the application of the Vision Science component beyond that of the OD program and provides an increased scientific component to clinical training. This program provides an alternative scheduling of the requirements of both degrees to that used when the OD is considered a terminal degree.</p> <p>Conditions The following are general conditions that all such Accelerated Master's degree programs satisfy:</p> <ol style="list-style-type: none"> 1. Nine terms of full-time enrolment at the undergraduate level and at least two terms of full-time enrolment at the graduate level are mandatory; 2. The graduate program must include at least 4 graduate courses and a thesis. <p>Students in the Accelerated Master's program will fulfill the degree requirements of both the OD program and the MSc program.</p> <p>The culmination of the accelerated program is the Master's degree; this will be achieved through the completion of a research thesis and 4 graduate courses (0.50 unit weight each).</p> <p>Identification of a supervisor and conditional acceptance for the accelerated Master's program may occur as early as the term following completion of the first year of the OD program. Formal acceptance and registration for the MSc component will occur during the third year of the Optometry program.</p> <p>An accelerated Master's degree program must have the flexibility to satisfy the requirements of individual students; at the same time it must have coherence - each student's program must be focused on a well-defined area of specialization in Vision Science.</p> <p>Structure of the Accelerated Master's Program</p>	<p>training, and a further specialization in an area of Vision Science.</p> <p>General Principles of the <u>OD-Accelerated Master's Program</u> <u>The OD-Accelerated Master's Program</u> is one in which the educational process leading through the Doctor of Optometry (OD) to the MSc degree is considered as a continuous unit. The accelerated program also provides the opportunity for mutual enrichment of both programs. The Vision Science background of the OD program serves as a solid precursor to research at the MSc level. The research at the MSc level broadens the application of the Vision Science component beyond that of the OD program and provides an increased scientific component to clinical training. This program provides an alternative scheduling of the requirements of both degrees to that used when the OD is considered a terminal degree.</p> <p>Conditions The following are general conditions that all <u>OD-Accelerated Master's</u> degree programs satisfy:</p> <ol style="list-style-type: none"> 1. Nine terms of full-time enrolment at the undergraduate level <u>in the OD program</u> and at least two terms of full-time enrolment at the graduate level are mandatory; 2. The graduate program must include at least 4 graduate courses and a thesis; 3. <u>Complete additional program requirements including, but not limited to, a thesis proposal, seminar presentation, and seminar attendance.</u> <p>Students in the <u>OD-Accelerated Master's</u> program will fulfill the degree requirements of both the OD program and the MSc program.</p> <p>The culmination of the accelerated program is the <u>Master of Science</u> degree; this will be achieved through the completion of a research thesis, <u>4 graduate courses (0.50 unit weight each), and all other program requirements.</u></p> <p>Identification of a supervisor and provisional acceptance for the <u>OD-Accelerated Master's</u> program may occur as early as <u>the Winter term (second term) of the first year</u> of the OD program. Formal acceptance and registration for the MSc component will occur during the third year of the <u>OD</u> program.</p> <p><u>The OD-Accelerated</u> Master's degree program must have the flexibility to satisfy the requirements of individual students; at the same time it must have coherence - each student's program must be focused</p>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>Admission requirements Admission to the Accelerated Master's degree program is restricted to students with a consistently good academic record at the end of the first year and who are granted "conditional admission to the MSc program". The condition to be fulfilled is "satisfactory completion of the requirements for admission to the MSc program and a cumulative 75% average within the Optometry program". In granting admission to the program both the academic record in the OD program and in the preoptometry program and any research experience will be considered. Students must have a minimum 73-76% average within the optometry program to be eligible for admission, and would normally have an 85-89% standing in their preoptometry program. Students must have completed their application and be conditionally accepted into the accelerated program by the beginning of the 4th year. As in any program culminating in a Master's degree, a faculty supervisor is appointed on admission. Students are encouraged to consult faculty members regarding their research interests.</p> <p>Course programs Although the supervisor advises students, all course selections and other academic administrative matters concerning each student are subject to the approval of the School's Undergraduate Officer and the Graduate and Research Committee. The courses chosen by the student (with the advice of the supervisor and approval of the Undergraduate Officer and Graduate and Research Committee) should form a coherent series which (together with the thesis) complete the requirements of the OD and, ultimately, the Master's degrees.</p> <p>A minimum of 4 one-term (0.50 unit weight) graduate courses (600 level or equivalent) is required to complete the Master's degree requirements. 3 of these must be selected from the Vision Science Core Course Streams, with at least 1 course from Core Stream A – Scientific Methods (OPTOM 650 – OPTOM 669) and at least 1 course from Core Stream B – Vision Science (OPTOM 670 – OPTOM 689).</p> <p>Normally only 1 course may be an independent study course (OPTOM 608). In 3rd or 4th year, 600 level courses may be chosen for credit to the MSc degree. These courses are in addition to the normal academic program for the OD level. Technically, it is necessary for students to register for these courses as "extras" in order to avoid counting them towards the requirements of the OD degree. Advanced standing in these courses will be granted following acceptance to</p>	<p>on a well-defined area of specialization in Vision Science.</p> <p>Structure of the <u>OD-Accelerated Master's Program</u></p> <p>Admission requirements Admission to the OD-Accelerated Master's degree <u>program</u> is restricted to students with a consistently good academic record in the OD <u>program</u> and who are granted "<u>provisional acceptance to the OD-Accelerated MSc program</u>". The <u>provisions to be fulfilled for acceptance to the OD-Accelerated Master's program</u> are satisfactory completion of the requirements for admission to the MSc program and a <u>minimum cumulative average of 75% across their pre-optometry and Optometry programs</u>. In granting admission to the <u>OD-Accelerated Master's program</u> both the academic record in the OD program and in the <u>pre-optometry</u> program, and any research experience will be considered. Students must have a minimum 73-76% average within the <u>OD</u> program to be eligible for admission and would normally have an 85-89% standing in their <u>pre-optometry</u> program. Students must have completed their application to the <u>OD-Accelerated Master's program</u> and be conditionally accepted <u>into the program</u> by the beginning of the 4th year. As in any program culminating in an MSc degree, a faculty supervisor is appointed on admission. Students are encouraged to consult faculty members regarding their research interests.</p> <p>Course programs Although the supervisor advises students, all course selections and other academic administrative matters concerning each student are subject to the approval of the School's <u>Graduate Studies Office and Undergraduate Studies Committee while enrolled in the OD program. Once enrolled as a graduate student in the MSc program, all course selections and other academic administrative matters concerning each student are subject to the approval of the School's Graduate Studies Office only.</u></p> <p><u>The courses chosen by the student (with the advice of the supervisor and approval of Graduate Studies Office and Undergraduate Studies Committee) should form a coherent series which (together with the thesis) complete the requirements of the MSc degree.</u></p> <p>A minimum of 4 one-term (0.50 unit weight) graduate courses (600 level or equivalent) <u>are</u> required to complete the <u>MSc</u> degree requirements. 3 of these must be selected from the Vision Science Core</p>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>the graduate program. Students will be encouraged to register in OPTOM 441/451 Research Project. A student proceeding to an MSc will normally complete the balance of the 4 required graduate courses in the one or two terms following 4th year.</p> <p>Summer research terms It is expected that most of the students proceeding to the MSc degree will be involved in summer research terms following first and second years of the Optometry program. During these summer terms they are not required to register and they may be hired as associate/assistant researchers for the purposes of various research grants, without the restriction of student salaries. This combination can be attractive from the points of view of available research time, income generation for the student and total research cost from a grant. Work done during these summer research terms may be included in the thesis. During summer research terms, students may register as part-time undergraduate students, or, if all requirements for enrolment in an MSc program are met, as graduate students, if they wish to pursue a graduate level course for which they are deemed to have adequate undergraduate preparation.</p> <p>Fourth-year projects For students in the accelerated Master's program, OPTOM 441/451 (Research Projects) may be integrated with their summer terms as well as with their work following 4th year. The thesis must contain a substantial research contribution in addition to that submitted for credit in OPTOM 441/451, such that the total normal research requirements of OPTOM 441/451 and the MSc thesis are met.</p> <p>Granting of degrees The OD degree will be granted at the normal time, i.e. at the Spring Convocation following the 4th year. The program, however, culminates in the MSc. A minimum of two terms full-time enrolment in the MSc is required in addition to those required for the OD Degree. It is expected that the MSc degree will be completed more quickly than in the regular MSc program. Additional time may be required to complete the thesis or coursework.</p> <p>Postgraduate scholarships Students in the accelerated Master's program may apply for graduate scholarships at the same time as their colleagues in the regular programs. They are also eligible for Optometry undergraduate scholarships during the summer terms.</p>	<p>Course Streams, with at least 1 course from Core Stream A – Scientific Methods (OPTOM 650 – OPTOM 669) and at least 1 course from Core Stream B – Vision Science (OPTOM 670 – OPTOM 689). Normally only 1 course may be an independent study course (OPTOM 608).</p> <p><u>During the OD program at least one 600 level course must be taken that will count for credit to the OD-Accelerated Master's degree.</u> These courses are in addition to the normal academic program for the OD degree. Technically, it is necessary for students to register for these courses as "extras" to avoid <u>them being counted</u> towards the requirements of the OD degree. Advanced standing in these courses will be granted following acceptance to the graduate program. A student proceeding to an <u>OD-Accelerated Master's degree</u> will normally complete the balance of the 4 required graduate courses in the one or two terms following <u>the final year of the OD program.</u></p> <p>OD-Accelerated Master's research terms It is expected that most of the students proceeding to the MSc degree will <u>engage in research during the spring academic term of the first and second years of the OD program.</u> They are not required to register <u>for these terms</u> and they may be hired as associate/assistant researchers for the purposes of various research grants, without the restriction of student salaries. This combination can be attractive from the points of view of available research time, income generation for the student, and total research cost from a grant. Work done during <u>the</u> research terms may be included in the <u>MSc</u> thesis.</p> <p><u>The spring academic terms are also the optimal time for students to take the required 600 level course for the OD-Accelerated Master's. Registration for a 600 level course requires that the student have adequate undergraduate preparation for the desired course, and they have received approval to enroll in the course from both the School's Graduate Studies Office and the Undergraduate Studies Committee.</u></p> <p>Granting of degrees The OD degree will be granted at the normal time, i.e. at the Spring Convocation following the <u>4th year of the OD program.</u> The <u>OD-Accelerated Master's program,</u> however, culminates in the MSc. <u>To complete the OD-Accelerated Master's program,</u> a minimum of two terms full-time enrolment in the MSc <u>program is required after completion of the OD degree.</u> It is expected that the <u>OD-Accelerated Master's degree</u> will be completed more quickly than the regular MSc</p>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>Withdrawal or failure Students may remain in the accelerated Master's program provided they maintain sufficiently high academic standards. The minimum is a cumulative 75% average (70% in undergraduate courses to the end of 4th year, 70% in graduate courses) and no conditional standing.</p> <p>A student who fails to maintain this standard will be required to withdraw from the accelerated degree program. In such a case, all courses taken up to the end of 4th year, including those originally intended to fulfill part of the Master's degree requirements, will be counted towards the OD degree program elective course requirements and these marks included in the 4th year averages as appropriate. Should the student have then satisfied the requirements for the OD degree, it will be granted at the next Convocation. Such students will not be permitted to enter the regular MSc program.</p> <p>If a student maintains at least the minimum standard mentioned above, but decides to withdraw voluntarily from the accelerated Master's program, the student may choose to count courses towards the OD degree which were originally intended to fulfill part of the Master's degree requirements. When the requirements for the OD degree have been satisfied, the OD will be granted at the next Convocation. Such a student will be allowed (at a later date) to enter the regular MSc program. For these students, graduate courses counted towards the OD degree may not be applied to the Master's degree, but graduate courses not previously counted towards the OD degree may be counted towards the MSc with the approval of the Graduate and Research Committee</p> <p>Transfer to the PhD program Following completion of the OD program, an accelerated Master's student will be eligible for transfer to the PhD program on the same basis as a regular MSc student.</p>	<p>program <u>due to progress achieved in the OD-Accelerated Master's research terms.</u> Additional time (i.e., <u>more than two terms post-OD</u>) may be required to complete the thesis or coursework.</p> <p>Postgraduate scholarships Students in the OD-Accelerated Master's program may apply for graduate scholarships at the same time as their colleagues in the <u>regular graduate programs.</u> They are also eligible for Optometry undergraduate scholarships during <u>the OD-Accelerated Master's research terms.</u></p> <p>Withdrawal or failure Students may remain in the <u>OD-Accelerated Master's</u> program provided they maintain sufficiently high academic standards. The minimum is a cumulative 75% average (<u>73 to 76% in undergraduate courses to the end of 4th year, 70% in graduate courses</u>) and no conditional standing <u>or undergraduate course failures.</u></p> <p>A student who fails to maintain this standard will be required to <u>withdraw from the OD-Accelerated Master's</u> degree program. In such a case, all courses taken up to the end of 4th year, including those originally intended to fulfill part of the <u>MSc</u> degree requirements, will be <u>included on the student transcripts.</u> Such students <u>are still eligible to apply to the regular MSc program.</u></p> <p>If a student maintains at least the minimum standard mentioned above, but decides to withdraw voluntarily from the <u>OD-Accelerated Master's</u> program, <u>all graduate courses taken, will be included on the student transcripts.</u> Such a student will be allowed (at a later date) to <u>apply to the regular MSc program.</u> For these students, graduate courses <u>completed during the OD degree may be applied to the regular MSc degree with approval of the School's Graduate Studies Office.</u></p> <p>Transfer to the PhD program Following completion of the OD program, an <u>OD-Accelerated Master's</u> student will be eligible for transfer to the PhD program on the same basis as a regular MSc student.</p>

How will students currently registered in the program be impacted by these changes?

There will be no effect on students currently registered in the program.

Department/School approval date (mm/dd/yy): 09/30/24

Reviewed by GSPA (for GSPA use only) **date** (mm/dd/yy): 09/26/24

Faculty approval date (mm/dd/yy): 11/04/2024

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate approval date (mm/dd/yy) (if applicable):

Prior to form submission, review the [content revision instructions](#) and information regarding [major/minor modifications](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Science

Programs:

1. Doctor of Philosophy (PhD) in Vision Science
2. Doctor of Philosophy (PhD) in Vision Science - Aeronautics
3. Master of Science (MSc) in Vision Science
4. Master of Science (MSc) in Vision Science - Aeronautics

Program contact name(s): Paul Murphy

Form completed by: Paul Murphy

Description of proposed changes:

Note: changes to courses and milestones also require the completion/submission of the [SGRC Graduate Studies Course/Milestone Form](#).

Updating the length of program information in the GSAC.

Is this a [major modification](#) to the program? No

Rationale for change(s):

This change achieves greater clarity on program length for programs in the GSAC which has benefits for students in terms of immigration and program administration. This change also aligns the program's residence requirements with the University regulations.

Proposed effective date: Term: Winter Year: 2025

Current [Graduate Studies Academic Calendar \(GSAC\)](#) page (include the link to the web page where the changes are to be made):

<https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/programs/S1WMZJRCjn>

<https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/programs/S1MbkRAi3>

<https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/programs/SyIMZ10Ai3>

<https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/programs/B1eGb1A0o3>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>Doctor of Philosophy (PhD) in Vision Science Doctor of Philosophy (PhD) in Vision Science - Aeronautics</p> <p>Program information</p> <ul style="list-style-type: none"> • Length of program <ul style="list-style-type: none"> ○ The minimum number of terms during which a student must register full-time is four (from a Master of Science (MSc) degree). The terms of full-time registration do not have to be consecutive. 	<p>Doctor of Philosophy (PhD) in Vision Science Doctor of Philosophy (PhD) in Vision Science - Aeronautics</p> <p>Program information</p> <ul style="list-style-type: none"> • Length of program <ul style="list-style-type: none"> ○ The minimum number of terms during which a student must register full-time is <u>six</u> (from a Master of Science (MSc) degree). The terms of full-time registration do not have to be consecutive. ○ <u>Students are required to complete the program in accordance with the University program time limits.</u>
<p>Master of Science (MSc) in Vision Science Master of Science (MSc) in Vision Science - Aeronautics</p> <p>Program information</p> <ul style="list-style-type: none"> • Length of program <ul style="list-style-type: none"> ○ The minimum number of terms during which a student must register full-time for an MSc is two. The terms of full-time enrolment do not have to be consecutive. 	<p>Master of Science (MSc) in Vision Science Master of Science (MSc) in Vision Science - Aeronautics</p> <p>Program information</p> <ul style="list-style-type: none"> • Length of program <ul style="list-style-type: none"> ○ The minimum number of terms during which a student must register full-time for an MSc is <u>three</u>. The terms of full-time enrolment do not have to be consecutive. ○ <u>Students are required to complete the program in accordance with the University program time limits.</u>

How will students currently registered in the program be impacted by these changes?

This change will not impact currently registered students, it will provide transparency on the duration of the program.

Department/School approval date (mm/dd/yy): 09/30/24

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 08/23/24

Faculty approval date (mm/dd/yy): 11/04/2024

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate approval date (mm/dd/yy) (if applicable):

Prior to form submission, review the [content revision instructions](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Science

Effective date: Term: Winter Year: 2025

Milestone

Note: milestone changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Choose an item.
- Inactivate: Choose an item.
- Revise: from Choose an item. to Choose an item.

Course

Note: some course changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Complete all course elements below
- Inactivate: Complete the following course elements:
Course subject code, Course number, Course ID, Course title
- Revise: Complete all course elements below to reflect the proposed change(s) and identify the course elements being revised (*e.g. Course description, Course title*):

Course elements (complete as indicated above. Review the [glossary of terms](#) for details on course elements)

Course subject code: PHYS

Course number: 612

Course ID: TBD

Course title (max. 100 characters including spaces): Perimeter Scholars International Classical Physics

Course short title (max. 30 characters including spaces): Classical Physics

Grading basis: Credit/No Credit

Course credit weight: 0.50

Course consent required: Department

Course description: This is a theoretical physics course that aims to review the basics of theoretical mechanics, special relativity, and classical field theory, with the emphasis on geometrical notions and relativistic formalism.

Meet type(s): Lecture Tutorial Choose an item. Choose an item.

Primary meet type: Lecture

Delivery mode: On-campus

Anti-requisites: PHYS 776 Topic 29 Classical Physics

Special topics course: Yes No

Cross-listed course: Yes No

Course subject code(s) and number(s) to be cross-listed with and approval status:

Sections combined/held with:

Rationale for request:

This course has been offered as PHYS 776 Special Topics in Physics: Topic 29 Classical Physics for the last four years as part of the PSI curriculum. The course covers important material for students to learn in preparation for research in theoretical physics and the course topics are essential for other courses offered later in the PSI curriculum.

Form completed by: Maïté Dupuis

Department/School approval date (mm/dd/yy):

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 10/24/24

Faculty approval date (mm/dd/yy): 11/04/2024

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Mathematics Graduate Studies Report

Motion 1: Calendar changes to Applied Mathematics

1.1 Revise the following courses (revise course description): AMATH 642, 651, 653, 655, 656, 663, 673, 674, 675, 677.

1.2 Create the course AMATH 645 Scientific Machine Learning

1.3 Change program requirements (remove breadth requirement) for:

- Doctor of Philosophy (PhD) in Applied Mathematics
- Doctor of Philosophy (PhD) in Applied Mathematics - Aeronautics
- Doctor of Philosophy (PhD) in Applied Mathematics - Water
- Master of Mathematics (MMath) in Applied Mathematics
- Master of Mathematics (MMath) in Applied Mathematics - Aeronautics
- Master of Mathematics (MMath) in Applied Mathematics - Co-operative Program
- Master of Mathematics (MMath) in Applied Mathematics - Quantum Information
- Master of Mathematics (MMath) in Applied Mathematics – Water

1.4 Change program requirements (increase the number of allowed 400/600 courses) for:

- Doctor of Philosophy (PhD) in Applied Mathematics
- Doctor of Philosophy (PhD) in Applied Mathematics - Aeronautics
- Doctor of Philosophy (PhD) in Applied Mathematics - Quantum Information
- Doctor of Philosophy (PhD) in Applied Mathematics - Water
- Master of Mathematics (MMath) in Applied Mathematics
- Master of Mathematics (MMath) in Applied Mathematics - Aeronautics
- Master of Mathematics (MMath) in Applied Mathematics - Co-operative Program
- Master of Mathematics (MMath) in Applied Mathematics - Quantum Information
- Master of Mathematics (MMath) in Applied Mathematics – Water

Motion 2: Calendar changes to Computer Science

2.1 Create the course CS 738 Data Engineering for Data Science

Motion 3: Calendar Changes to Statistics & Actuarial Science

3.1 Revise the following courses (requisite change): STAT 932, 936

3.2 Change program description (thesis option transfer in-only):

- Master of Mathematics (MMath) in Actuarial Science
- Master of Mathematics (MMath) in Statistics
- Master of Quantitative Finance (MQF)

3.3 Change program description (co-op option transfer in-only)

- Master of Mathematics (MMath) in Biostatistics – Co-operative Program
- Master of Mathematics (MMath) in Statistics – Co-operative Program

3.4 Revise admissions requirement (align ELP requirements with standard):

- Master of Quantitative Finance (MQF)

3.5 Inactivate course: STAT 814 Systematic Review and Meta-Analysis

These have been approved by the Mathematics Faculty Council on October 22 2024

Motion 4: Calendar Changes to Statistics & Actuarial Science

4.1 Change in name of PhD program

- Change from Doctor of Philosophy (PhD) in Actuarial Science to PhD in Actuarial Science and Quantitative Finance.

4.2 Remove/inactivate the Graduate Skills Workshop milestone for several programs

These have been approved by the Mathematics Faculty Council on March 19, 2024

Prior to form submission, review the [content revision instructions](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Effective date: Term: Winter Year: 2025

Milestone

Note: milestone changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Choose an item.
- Inactivate: Choose an item.
- Revise: from Choose an item. to Choose an item.

Course

Note: some course changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Complete all course elements below
- Inactivate: Complete the following course elements:
Course subject code, Course number, Course ID, Course title
- Revise: Complete all course elements below to reflect the proposed change(s) and identify the course elements being revised (*e.g. Course description, Course title*):

Updating course descriptions.

In the Department of Applied Mathematics all 600-level graduate courses are co-taught/held with a 400-level undergraduate course. We propose to modify the descriptions of the 6xx courses listed below to include the following statement at the end of the course description: "(Held with AMATH 4xx. Students in AMATH 6xx will be expected to meet some additional learning objectives.)"

Course elements (complete as indicated above. Review the [glossary of terms](#) for details on course elements)

Course subject code: AMATH

Course numbers:

- 1) 642
- 2) 651
- 3) 653
- 4) 655
- 5) 656
- 6) 663
- 7) 673
- 8) 674

9) 675

10) 677

Course ID:

Course titles (max. 100 characters including spaces):

- 1) Computational Methods for Partial Differential Equations
- 2) Introduction to Dynamical Systems
- 3) Partial Differential Equations 2
- 4) Control Theory
- 5) Calculus of Variations
- 6) Fluid Mechanics
- 7) Quantum Theory 2
- 8) Quantum Theory 3: Quantum Information and Foundations
- 9) Introduction to General Relativity
- 10) Stochastic Processes for Applied Mathematics

Course short title (max. 30 characters including spaces):

Grading basis: Choose an item.

Course credit weight: Choose an item.

Course consent required: Choose an item.

Course description: Add the following statement to the end of the existing course description for the courses listed above: "(Held with AMATH 4xx. Students in AMATH 6xx will be expected to meet some additional learning objectives.)"

Meet type(s): Choose an item. Choose an item. Choose an item. Choose an item.

Primary meet type: Choose an item.

Delivery mode: Choose an item.

Requisites:

Special topics course: Yes No

Cross-listed course: Yes No

Course subject code(s) and number(s) to be cross-listed with and approval status:

Sections combined/held with:

Rationale for request: Course descriptions for some 6xx courses contain the statement 'Held with AMATH 4xx' and some do not. For consistency we want all course descriptions for 600-level courses to include this statement. We also want to add the statement 'Students in AMATH 6xx will be expected to meet some additional learning objectives'. This will make it clear that there are additional requirements for the 6xx course while providing flexibility to the instructors in how this is done.

Form completed by: Kevin Lamb

Department/School approval date (mm/dd/yy): 03/08/24

Reviewed by GSPA (for GSPA use only) **date** (mm/dd/yy): 05/07/24

Faculty approval date (mm/dd/yy): 10/22/24

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Prior to form submission, review the [content revision instructions](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Effective date: Term: Winter Year: 2025

Milestone

Note: milestone changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Choose an item.
- Inactivate: Choose an item.
- Revise: from Choose an item. to Choose an item.

Course

Note: some course changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Complete all course elements below
- Inactivate: Complete the following course elements:
Course subject code, Course number, Course ID, Course title
- Revise: Complete all course elements below to reflect the proposed change(s) and identify the course elements being revised (*e.g. Course description, Course title*):

Course elements (complete as indicated above. Review the [glossary of terms](#) for details on course elements)

Course subject code: AMATH

Course number: 645

Course ID:

Course title (max. 100 characters including spaces): Scientific Machine Learning

Course short title (max. 30 characters including spaces): Scientific Machine Learning

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: The course provides an in-depth exploration of how deep learning techniques are applied in various scientific and medical domains. The course introduces basic concepts of deep learning, explores different deep learning architectures and algorithms, and focuses on their applications in scientific and biomedical research. The integration of scientific knowledge with machine learning techniques is emphasized throughout the course. Students will gain hands-on experience by executing the acquired concepts using Python. (Held with AMATH 445. Students in AMATH 645 will be expected to meet some additional learning objectives.)

Meet type(s): Lecture Tutorial Choose an item. Choose an item.

Primary meet type: Lecture

Delivery mode: On-campus

Requisites:

Anti-requisite: AMATH 445.

Special topics course: Yes No

Cross-listed course: Yes No

Course subject code(s) and number(s) to be cross-listed with and approval status: AMATH 445. Approved by Senate Undergraduate Council February 5.

Sections combined/held with:

Rationale for request: As data-driven methodologies become increasingly indispensable for the scientific community, deep learning emerges as a transformative tool, capable of modelling complex systems and phenomena that are often challenging for classical methods. For students of applied mathematics, mastering these computational techniques enriches their analytical toolkit, enabling them to remain at the forefront of research and innovation. By integrating deep learning into their curriculum, they not only enhance their employability in diverse sectors but also become better prepared to contribute to advancements in science and technology.

This course is structured to introduce beginning graduate students in applied mathematics to the emerging field of scientific machine learning. There is a wide area of applications where deep learning has become essential in applied mathematics research and applications. As such, deep learning knowledge applied to problems from science and medicine is becoming indispensable for applied mathematics students. The course is divided into three parts. The first part provides a short and non-technical introduction to machine learning, and the second part introduces standard and more advanced deep learning approaches. The third and main part of the course covers the application of deep learning to several disciplines, such as the biomedical sciences, fluid mechanics, and quantum physics.

There is limited overlap with CS 480/680, CS 485/685, and STAT 940, but these courses do not focus on scientific applications of machine learning. Also, CS 480/680 and CS 485/685 are primarily targeted at 4th-year and graduate students in CS and Data Science. CS 480 is only open to CS and Data Science students.

Form completed by: Kevin Lamb

Department/School approval date (mm/dd/yy): 11/06/23

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 02/16/24

Faculty approval date (mm/dd/yy): 10/22/24

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Prior to form submission, review the [content revision instructions](#) and information regarding [major/minor modifications](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Programs: 1) Doctor of Philosophy (PhD) in Applied Mathematics
2) Doctor of Philosophy (PhD) in Applied Mathematics - Aeronautics
3) Doctor of Philosophy (PhD) in Applied Mathematics - Water
4) Master of Mathematics (MMath) in Applied Mathematics
5) Master of Mathematics (MMath) in Applied Mathematics - Aeronautics
6) Master of Mathematics (MMath) in Applied Mathematics - Co-operative Program
7) Master of Mathematics (MMath) in Applied Mathematics - Quantum Information
8) Master of Mathematics (MMath) in Applied Mathematics - Water

Program contact name(s): Kevin Lamb, Associate Chair, Graduate Studies, Applied Math

Form completed by: Kevin Lamb, Associate Chair, Graduate Studies, Applied Math

Description of proposed changes:

Note: changes to courses and milestones also require the completion/submission of the [SGRC Graduate Studies Course/Milestone Form](#).

Remove the breadth requirement from all Applied Mathematics graduate programs except for the Doctor of Philosophy (PhD) in Applied Mathematics - Quantum Information program as it does not have a breadth requirement. The breadth requirement will be replaced by a requirement to take two AMATH courses in all Master's programs with the thesis study option, four AMATH courses in the Master's Research Paper study option and three AMATH courses in all PhD programs with the exception of the QI program. Note that the current requirement of three breadth courses for PhD students includes the two courses taken during their Master's program.

Is this a [major modification](#) to the program No

Rationale for change(s):

The current breadth requirement does not treat students in all research areas equally and with the wide range of research areas in the Department it is difficult to rectify this problem. The Department feels the breadth requirement is no longer useful. The proposed change will be more equitable and it will provide graduate students with more flexibility in the courses they take.

Proposed effective date: Term: Winter Year: 2025

Current [Graduate Studies Academic Calendar \(GSAC\)](#) page (include the link to the web page where the changes are to be made):

<https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/programs?group=Applied%20Mathematics>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>Doctor of Philosophy (PhD) in Applied Mathematics Doctor of Philosophy (PhD) in Applied Mathematics- Aeronautics Doctor of Philosophy (PhD) in Applied Mathematics – Water</p> <p>Course requirements</p> <p><input type="checkbox"/> Students must complete 4 one-term (0.50 unit) graduate courses after the Master's degree, satisfying a breadth requirement, or 8 one-term (0.50 unit) graduate courses after the Bachelor's degree, satisfying a breadth requirement. Candidates for the PhD degree must maintain a grade point average of at least 70% in their coursework. Besides the breadth requirement, there are no other constraints on course selection.</p> <p><input type="checkbox"/> Breadth requirement: to satisfy the breadth requirement, students are required to complete 3 courses from the following lists, with no more than 1 course from each list:</p> <ul style="list-style-type: none"> ● Applications: <ul style="list-style-type: none"> ○ AMATH 663 Fluid Mechanics ○ AMATH 673 Quantum Theory 2 ○ AMATH 674 Quantum Theory 3: Quantum Information and Foundations ○ AMATH 675 Introduction to General Relativity ○ AMATH 875 Introduction to General Relativity with Applications to Cosmology ○ AMATH 882 Mathematical Cell Biology ● Computation: <ul style="list-style-type: none"> ○ AMATH 642 Computational Methods for Partial Differential Equations ○ AMATH 740 Numerical Analysis ○ AMATH 741 Numerical Solution of Partial Differential Equations ● Differential Equations: <ul style="list-style-type: none"> ○ AMATH 651 Introduction to Dynamical Systems ○ AMATH 653 Partial Differential Equations 2 ○ AMATH 655 Control Theory ○ AMATH 751 Advanced Ordinary Differential Equations ○ AMATH 753 Advanced Partial Differential Equations ● Techniques: <ul style="list-style-type: none"> ○ AMATH 656 Calculus of Variations <input type="checkbox"/> 	<p>Doctor of Philosophy (PhD) in Applied Mathematics Doctor of Philosophy (PhD) in Applied Mathematics- Aeronautics Doctor of Philosophy (PhD) in Applied Mathematics - Water</p> <p>Course requirements</p> <p><input type="checkbox"/> Students must complete 4 one-term (0.50 unit) graduate courses after the Master's degree, <u>at least one of which must be an AMATH course</u>, or 8 one-term (0.50 unit) graduate courses after the Bachelor's degree, <u>at least three of which must be AMATH courses</u>. Candidates for the PhD degree must maintain a grade point average of at least 70% in their coursework.</p>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> ○ AMATH 677 Stochastic Processes for Applied Mathematics ○ AMATH 731 Applied Functional Analysis ○ AMATH 732 Asymptotic Analysis and Perturbation Theory ○ AMATH 777 Stochastic Processes in the Physical Sciences ● Note: students may submit requests to substitute breadth requirement courses for other related courses. These requests must be approved by the Associate Chair, Graduate Studies. <p>Master of Mathematics (MMath) in Applied Mathematics</p> <p>Master of Mathematics (MMath) in Applied Mathematics – Aeronautics</p> <p>Master of Mathematics (MMath) in Applied Mathematics – Water</p> <p>Master of Mathematics (MMath) in Applied Mathematics – Co-operative Program</p> <p>Master of Mathematics (MMath) in Applied Mathematics – Quantum Information</p> <p style="text-align: center;">Thesis option: Course requirements</p> <p><input type="checkbox"/> Students must complete 4 one-term (0.50 unit) graduate courses, satisfying a breadth requirement. Candidates for the MMath (thesis) degree must maintain a grade point average of at least 70% in their coursework. Besides the breadth requirement, there are no other constraints on course selection.</p> <p><input type="checkbox"/> Breadth requirement: to satisfy the breadth requirement, students are required to complete 2 courses from the following lists, with no more than 1 course from each list:</p> <ul style="list-style-type: none"> ● <input type="checkbox"/> Applications: <ul style="list-style-type: none"> ○ AMATH 663 Fluid Mechanics ○ AMATH 673 Quantum Theory 2 ○ AMATH 674 Quantum Theory 3: Quantum Information and Foundations ○ AMATH 675 Introduction to General Relativity ○ AMATH 875 Introduction to General Relativity with Applications to Cosmology ○ AMATH 882 Mathematical Cell Biology ● Computation: <ul style="list-style-type: none"> ○ AMATH 642 Computational Methods for Partial Differential Equations ○ AMATH 740 Numerical Analysis 	<p>Master of Mathematics (MMath) in Applied Mathematics</p> <p>Master of Mathematics (MMath) in Applied Mathematics – Aeronautics</p> <p>Master of Mathematics (MMath) in Applied Mathematics – Water</p> <p>Master of Mathematics (MMath) in Applied Mathematics – Co-operative Program</p> <p>Master of Mathematics (MMath) in Applied Mathematics – Quantum Information</p> <p style="text-align: center;">Thesis option: Course requirements</p> <p><input type="checkbox"/> Students must complete 4 one-term (0.50 unit) graduate courses, satisfying a breadth requirement. Candidates for the MMath (thesis) degree must maintain a grade point average of at least 70% in their coursework.</p> <p><input type="checkbox"/> <u>Students must complete 4 one-term (0.50 unit) graduate courses, at least two of which must be AMATH courses.</u> Candidates for the MMath (thesis) degree must maintain a grade point average of at least 70% in their coursework.</p>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> ○ AMATH 741 Numerical Solution of Partial Differential Equations ● Differential Equations: <ul style="list-style-type: none"> ○ AMATH 651 Introduction to Dynamical Systems ○ AMATH 653 Partial Differential Equations 2 ○ AMATH 655 Control Theory ○ AMATH 751 Advanced Ordinary Differential Equations ○ AMATH 753 Advanced Partial Differential Equations ● Techniques: <ul style="list-style-type: none"> ○ AMATH 656 Calculus of Variations ○ AMATH 677 Stochastic Processes for Applied Mathematics ○ AMATH 731 Applied Functional Analysis ○ AMATH 732 Asymptotic Analysis and Perturbation Theory ○ AMATH 777 Stochastic Processes in the Physical Sciences ● Note: students may submit requests to substitute breadth requirement courses for other related courses. These requests must be approved by the Associate Chair, Graduate Studies. <p>Master's Research Paper option: Course requirements</p> <ul style="list-style-type: none"> ● Students must complete 7 one-term (0.50 unit) graduate courses, satisfying a breadth requirement. Candidates for the MMath (Research paper) degree must maintain a grade point average of at least 70% in their coursework. Besides the breadth requirement, there are no other constraints on course selection. ● Breadth requirement: to satisfy the breadth requirement, students are required to complete 2 courses from the following lists, with no more than 1 course from each list: <ul style="list-style-type: none"> ○ Applications: <ul style="list-style-type: none"> ● AMATH 663 Fluid Mechanics ● AMATH 673 Quantum Theory 2 ● AMATH 674 Quantum Theory 3: Quantum Information and Foundations ● AMATH 675 Introduction to General Relativity ● AMATH 875 Introduction to General Relativity with Applications to Cosmology 	<p>Master's Research Paper option: Course requirements</p> <ul style="list-style-type: none"> ● Students must complete 7 one-term (0.50 unit) graduate courses, <u>at least four of which must be AMATH courses</u>. Candidates for the MMath (Research paper) degree must maintain a grade point average of at least 70% in their coursework.

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> • AMATH 882 Mathematical Cell Biology ○ Computation: <ul style="list-style-type: none"> • AMATH 642 Computational Methods for Partial Differential Equations • AMATH 740 Numerical Analysis • AMATH 741 Numerical Solution of Partial Differential Equations ○ Differential Equations: <ul style="list-style-type: none"> • AMATH 651 Introduction to Dynamical Systems • AMATH 653 Partial Differential Equations 2 • AMATH 655 Control Theory • AMATH 751 Advanced Ordinary Differential Equations • AMATH 753 Advanced Partial Differential Equations ○ Techniques: <ul style="list-style-type: none"> • AMATH 656 Calculus of Variations • AMATH 677 Stochastic Processes for Applied Mathematics • AMATH 731 Applied Functional Analysis • AMATH 732 Asymptotic Analysis and Perturbation Theory • AMATH 777 Stochastic Processes in the Physical Sciences ○ Note: students may submit requests to substitute breadth requirement courses for other related courses. These requests must be approved by the Associate Chair, Graduate Studies. 	

How will students currently registered in the program be impacted by these changes?

Current students will be positively affected because it increases their flexibility in choosing courses.

Department/School approval date: March 8, 2024

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 05/07/24

Faculty approval date (mm/dd/yy): 10/22/24

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate approval date (mm/dd/yy) (if applicable):

Prior to form submission, review the [content revision instructions](#) and information regarding [major/minor modifications](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

- Programs:**
- 1) Doctor of Philosophy (PhD) in Applied Mathematics
 - 2) Doctor of Philosophy (PhD) in Applied Mathematics - Aeronautics
 - 3) Doctor of Philosophy (PhD) in Applied Mathematics - Quantum Information
 - 4) Doctor of Philosophy (PhD) in Applied Mathematics - Water
 - 5) Master of Mathematics (MMath) in Applied Mathematics
 - 6) Master of Mathematics (MMath) in Applied Mathematics - Aeronautics
 - 7) Master of Mathematics (MMath) in Applied Mathematics - Co-operative Program
 - 8) Master of Mathematics (MMath) in Applied Mathematics - Quantum Information
 - 9) Master of Mathematics (MMath) in Applied Mathematics - Water

Program contact name(s): Kevin Lamb, Associate Chair, Graduate Studies, Applied Math

Form completed by: Kevin Lamb, Associate Chair, Graduate Studies, Applied Math

Description of proposed changes:

Note: changes to courses and milestones also require the completion/submission of the [SGRC Graduate Studies Course/Milestone Form](#).

Increase the number of courses students can take that are cross-listed/held with undergraduate courses: 1) Master's thesis study option: increase from one to two, 2) Master's Research Paper study option: increase from three to four; 3) PhD programs: increase from one to two (after Master's program) or from two to four (from undergraduate degree).

Is this a [major modification](#) to the program? No

Rationale for change(s):

This change will benefit students by allowing additional access to a broader set of courses. This change is made along with implementation of explicit statements that students in all AMATH 6xx courses will be expected to meet additional learning objectives relative to the held-with AMATH 4xx. As confirmed by consultations with the VPA GSPA, the proposed change is consistent with requirements of the Ontario Universities Council on Quality Assurance on graduate-level courses, and is similar to requirements in a variety of other graduate programs at the University. The main criterion, regardless of whether a program allows more than 1 in 4 'held-with' courses, is that students are achieving the program learning outcomes at levels that are consistent with the Graduate Degree Level Expectations (GDLEs). The restriction of taking at most 2 out of 4 held-with courses combined with appropriate extra learning objectives for AMATH 6xx courses ensure that the program course requirements, in total, present materials that are at an appropriate level for graduate students.

Proposed effective date: Term: Winter Year: 2025

Current [Graduate Studies Academic Calendar \(GSAC\)](#) page (include the link to the web page where the changes are to be made):

<https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/programs?group=Applied%20Mathematics>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>PhD programs:</p> <p>Students may not count more than <u>4</u> graduate course that is cross-listed with an undergraduate course for credit towards their PhD degree. This restriction applies to all 600-level AMATH courses and any cross-listed courses offered by other departments. Note: students who transfer directly into the PhD program (without completing the Master's degree) may take up to <u>2</u> cross-listed courses.</p> <p>Master's programs:</p> <p>Thesis option: Course requirements</p> <p>Students may not count more than <u>4</u> graduate course that is cross-listed with an undergraduate course for credit towards their MMath (thesis) degree. This restriction applies to all 600-level AMATH courses and any cross-listed courses offered by other departments.</p> <p>Master's Research Paper option: Course requirements</p> <p>Students may not count more than three <u>4</u> graduate courses that are cross-listed with undergraduate courses for credit towards their MMath (thesis) degree. This restriction applies to all 600-level AMATH courses and any cross listed courses offered by other departments.</p>	<p>PhD programs:</p> <p>Students may not count more than <u>2</u> graduate courses that <u>are</u> cross-listed/<u>held with</u> undergraduate courses for credit towards their PhD degree. This restriction applies to all 600-level AMATH courses and any cross-listed/<u>held with</u> courses offered by other departments. Note: students who transfer directly into the PhD program (without completing the Master's degree) may take up to <u>4</u> graduate courses that are cross-listed/<u>held with</u> undergraduate courses.</p> <p>Master's programs:</p> <p>Thesis option: Course requirements</p> <p>Students may not count more than <u>2</u> graduate courses that <u>are</u> cross-listed/<u>held with</u> undergraduate courses for credit towards their MMath (thesis) degree. This restriction applies to all 600-level AMATH courses and any cross-listed/<u>held with</u> courses offered by other departments.</p> <p>Master's Research Paper option: Course requirements</p> <p>Students may not count more than <u>4</u> graduate courses that are cross-listed/<u>held with</u> with undergraduate courses for credit towards their MMath (<u>research paper</u>) degree. This restriction applies to all 600-level AMATH courses and any cross listed/<u>held with</u> courses offered by other departments.</p>

How will students currently registered in the program be impacted by these changes?

Current students will be positively affected because it makes more courses available to them.

Department/School approval date: March 8, 2024

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 05/07/24

Faculty approval date (mm/dd/yy): 10/22/24

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate approval date (mm/dd/yy) (if applicable):

Prior to form submission, review the [content revision instructions](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Effective date: Term: Winter Year: 2025

Milestone

Note: milestone changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Choose an item.
- Inactivate: Choose an item.
- Revise: from Choose an item. to Choose an item.

Course

Note: some course changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Complete all course elements below
- Inactivate: Complete the following course elements:
Course subject code, Course number, Course ID, Course title
- Revise: Complete all course elements below to reflect the proposed change(s) and identify the course elements being revised (*e.g. Course description, Course title*):

Course elements (complete as indicated above. Review the [glossary of terms](#) for details on course elements)

Course subject code: CS

Course number: 738

Course ID:

Course title (max. 100 characters including spaces): Data Engineering for Data Science

Course short title (max. 30 characters including spaces): Data Engineering for Data Sci

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Instructor

Course description: Introduction to data engineering issues in data science. Data management technology objectives. Relational database technology, relational algebra, SQL, transactions, data modelling methodology, entity-relationship models. NoSQL databases including key-value stores, document databases, wide-column stores, graph databases. Overview of big data processing platforms. Data integration including data warehousing, data lakes, ETL and ELT approaches. Data preparation for analysis, data quality, data cleaning. Introduction to

several current topics in database research, such as data mining, managing data streams, distributed/parallel databases, HTAP architectures.

Open to Master of Data Science and Artificial Intelligence (MDSAI) students as well as Master of Mathematics in Data Science (MMath in DS) students.

Meet type(s): Lecture Choose an item. Choose an item. Choose an item.

Primary meet type: Lecture

Delivery mode: On-campus

Requisites:

Special topics course: Yes No

Cross-listed course: Yes No

Course subject code(s) and number(s) to be cross-listed with and approval status:

Sections combined/held with:

Rationale for request:

The proposal is to create a new course for the Master of Data Science and Artificial Intelligence (MDSAI) as well as the MMath Data Science programs. Currently, the DS students are asked to take CS638 if they lack data management background. CS638 would be removed and the current "one of CS 631/651" core requirement would be replaced with CS738.

CS738 is designed as a modern data engineering course that covers the issues that DS students should know. Its design has been vetted by the Data Systems Group and multiple people can teach it. Some have offered to cover some of the topics as guest lectures.

CS768 can also be offered as a modern graduate data engineering course for CS students who do not have sufficient data management background in their undergrad studies. The content can be enhanced for these students by special assignments (more implementation focused) and term projects.

Form completed by:

Department/School approval date (05/08/24):

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 04/10/24

Faculty approval date (mm/dd/yy): 10/22/24

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

CS 738 – Data Engineering for Data Science

Syllabus

Week	Lecture	Topic
1	1	Course introduction and scoping
	2	Relational model of data
2	1	SQL
	2	Advanced SQL, Relational algebra & calculus
3	1	Data modeling
	2	Relational DBMS internals (query processing)
4	1	Relational DBMS internals (transaction processing)
	2	Big data and NoSQL
5	1	Big data and text processing
	2	Big data and data streams
6	1	Big data and graph processing
	2	Big data and scaling: Classical relational distributed DBMS
7	1	Big data processing platforms: MapReduce
	2	Big data processing platforms: MapReduce/Spark
8	1	Cloud computing & cloud-native data management
	2	Privacy in big data
9	1	Data integration: Data warehouses
	2	Data integration: Data lakes
10	1	OLAP & OLTP: HTAP systems
	2	Data mining
11	1	Data preparation: the pipeline
	2	Data quality & data cleaning
12	1	Data quality & data cleaning
	2	Data provenance

Prior to form submission, review the [content revision instructions](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Effective date: Term: Winter Year: 2025

Milestone

Note: milestone changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Choose an item.
- Inactivate: Choose an item.
- Revise: from Choose an item. to Choose an item.

Course

Note: some course changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Complete all course elements below
- Inactivate: Complete the following course elements:
Course subject code, Course number, Course ID, Course title
- Revise: Complete all course elements below to reflect the proposed change(s) and identify the course elements being revised (*e.g. Course description, Course title*):

Removing STAT 431/831 as requisites.

Course elements (complete as indicated above. Review the [glossary of terms](#) for details on course elements)

Course subject code: STAT

Course number: 932

Course ID: 014342

Course title (max. 100 characters including spaces): Classification and Prediction in High Dimensional Analysis in Health Research

Course short title (max. 30 characters including spaces): Prediction in Health

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: In this course, we will cover classification and prediction in health research with a view to applications to screening and diagnosis of disease. This will lead to methods for evaluating the performance of various types of statistical models and learning techniques/algorithms. Cross-validation and bootstrap approaches

will be introduced for model performance evaluation, and we will discuss discrimination and calibration as different components of prediction performance. We will cover variable selection techniques, including for high-dimensional data, with an emphasis on regularization techniques such as the LASSO and its variants. Model validation, both internal and external, and model updating will be covered, and we will also discuss post-model selection inference. An important focus will be on biomarker evaluation for a given disease, potentially connected to therapy, and leading to coverage of precision/personalized medicine. Finally, there will be coverage on the importance of reproducible and replicable research. Examples from different problems in health, including genetics, will be presented, and software (e.g. R or SAS) will be used throughout the course.

Meet type(s): Lecture Choose an item. Choose an item. Choose an item.

Primary meet type: Lecture

Delivery mode: On-campus

Requisites: none

Special topics course: Yes No

Cross-listed course: Yes No

Course subject code(s) and number(s) to be cross-listed with and approval status:

Sections combined/held with:

Rationale for request:

Maintaining a prerequisite for this course was deemed unnecessary. Like most graduate courses within the department, the required background knowledge for the course is well advertised, and graduate students are in a position to decide for themselves whether they have sufficient background to take the course.

Form completed by: Heather McLaughlin

Department/School approval date (mm/dd/yy): 03/01/2024

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 02/06/24

Faculty approval date (mm/dd/yy): 10/22/24

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Prior to form submission, review the [content revision instructions](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Effective date: Term: Winter Year: 2025

Milestone

Note: milestone changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Choose an item.
- Inactivate: Choose an item.
- Revise: from Choose an item. to Choose an item.

Course

Note: some course changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Complete all course elements below
- Inactivate: Complete the following course elements:
Course subject code, Course number, Course ID, Course title
- Revise: Complete all course elements below to reflect the proposed change(s) and identify the course elements being revised (*e.g. Course description, Course title*):

Removing STAT 437 from the list of anti-requisites and STAT 431/831 from pre-requisites.

Course elements (complete as indicated above. Review the [glossary of terms](#) for details on course elements)

Course subject code: STAT

Course number: 936

Course ID: 013084

Course title (max. 100 characters including spaces): Analysis of Longitudinal Data

Course short title (max. 30 characters including spaces): Analysis of Longitudinal Data

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: This course covers methods for analyzing data in which repeated measures have been obtained for individuals in health studies over time. Different methods will be discussed to handle both continuous and discrete longitudinal response data, with examples from biomedical and population health datasets. Some of the approaches covered will include linear, non-linear, and generalized linear mixed effects models, as well as

generalized estimating equations and transition models, with distinctions drawn between subject-specific and population averaged approaches for generalized linear longitudinal response data. Also, there will be coverage of exploratory methods, evaluation of model assumptions and adapting to assumption violations, approaches for handling missing data, and treatment of advanced topics such as semiparametric and nonparametric models for longitudinal data. Software (e.g. R or SAS) will be used throughout the course.

Meet type(s): Lecture Choose an item. Choose an item. Choose an item.

Primary meet type: Lecture

Delivery mode: On-campus

Requisites: none

Special topics course: Yes No

Cross-listed course: Yes No

Course subject code(s) and number(s) to be cross-listed with and approval status:

Sections combined/held with:

Rationale for request:

STAT 437 was listed as an anti-requisite when it was a Longitudinal Data Analysis class. Since the course was changed to "Statistical Methods for Life History Analysis" the content no longer overlaps. At this point there should no longer be students that took the course prior to the change so the anti-requisite is no longer required. The content of the course was deemed sufficiently separate from STAT 431/831 that a formal antireq is inappropriate

Form completed by: Heather McLaughlin

Department/School approval date (mm/dd/yy): 03/01/2024

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 02/06/24

Faculty approval date (mm/dd/yy): 10/22/24

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Prior to form submission, review the [content revision instructions](#) and information regarding [major/minor modifications](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Programs: 1) Master of Mathematics (MMath) in Actuarial Science
 2) Master of Mathematics (MMath) in Statistics
 3) Master of Quantitative Finance (MQF)

Program contact name(s): Greg Rice, Alex Scheid, Heather McLaughlin

Form completed by: Heather McLaughlin

Description of proposed changes:

Note: changes to courses and milestones also require the completion/submission of the [SGRC Graduate Studies Course/Milestone Form](#).

Amend the GSAC to reflect that the Thesis study option is transfer-in only.

Is this a [major modification](#) to the program? No

Rationale for change(s):

Current practice is for all students to be admitted to the Master's Research Paper study option. Those interested in the Thesis option can request to switch after the first term. Current practice is for all students to be admitted to the Master's Research Paper study option. Those interested in the Thesis option can request to switch after the first term. GSPA has recently changed the program codes to differentiate the MRP and thesis options. With the new program plan codes in effect, we need to update the Graduate Calendar to ensure students cannot apply directly to the thesis option.

Proposed effective date: Term: Winter Year: 2025

Current [Graduate Studies Academic Calendar \(GSAC\)](#) page (include the link to the web page where the changes are to be made):

<https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-statistics-and-actuarial-science/master-mathematics-mmath-actuarial-science>

<https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-statistics-and-actuarial-science/master-mathematics-mmath-statistics>

<https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-statistics-and-actuarial-science/master-quantitative-finance-mqf>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p><i>MMath in Actuarial Science</i></p> <p>Degree requirements</p> <ul style="list-style-type: none"> Students can select the Thesis or Master's Research Paper option while in the program. 	<p><i>MMath in Actuarial Science</i></p> <p><i>MMath in Statistics</i></p> <p><i>MQF</i></p> <p>Degree Requirements</p>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p><i>MMath in Statistics*</i> <i>MQF*</i></p> <p><i>*No current content about transferring between study options</i></p>	<p><u>All students are admitted to the Master's Research Paper study option. Students can apply to transfer to the Thesis study option after completing at least one academic term. The transfer must be approved by the student's supervisor and the Graduate Chair.</u></p>

How will students currently registered in the program be impacted by these changes?

Current students will not be impacted.

Department/School approval date (mm/dd/yy): 03/01/2024

Reviewed by GSPA (for GSPA use only) **date** (mm/dd/yy): 01/22/24

Faculty approval date (mm/dd/yy): 10/22/24

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate approval date (mm/dd/yy) (if applicable):

Prior to form submission, review the [content revision instructions](#) and information regarding [major/minor modifications](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Programs: 1) Master of Mathematics (MMath) in Biostatistics – Co-operative Program
2) Master of Mathematics (MMath) in Statistics – Co-operative Program

Program contact name(s): Greg Rice and Heather McLaughlin

Form completed by: Heather McLaughlin

Description of proposed changes:

Note: changes to courses and milestones also require the completion/submission of the [SGRC Graduate Studies Course/Milestone Form](#).

Updating the GSAC to reflect that the co-op option/program is transfer entry only.

Is this a [major modification](#) to the program? No

Rationale for change(s):

Students have never been able to enroll directly in the co-op option/program. They must apply to transfer into the option after first term grades are posted. They must also have the approval of their supervisor, the Department, and a research-based co-op lined up. GSPA has recently changed the program codes to differentiate the co-op option. With these new program plan codes in effect we need to ensure that this is clearly marked as a transfer entry option/program so that students cannot select it during the application process.

Proposed effective date: Term: Winter Year: 2025

Current [Graduate Studies Academic Calendar \(GSAC\)](#) page (include the link to the web page where the changes are to be made):

<https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-statistics-and-actuarial-science/master-mathematics-mmath-biostatistics-co-operative-program>

<https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-statistics-and-actuarial-science/master-mathematics-mmath-statistics-co-operative-program>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>Admission requirements</p> <p>Minimum requirements</p> <ul style="list-style-type: none"> ● A four-year Honours Bachelor degree with a significant statistics and/or actuarial science component. ● An overall 78% average from a Canadian university (or its equivalent). ● An interview may be required. <p>Application materials</p> <ul style="list-style-type: none"> ● Résumé ● Supplementary information form ● Transcript(s) <p>References</p> <ul style="list-style-type: none"> ● Number of references: 3 ● Type of references: normally from academic sources <p>English language proficiency (ELP) (if applicable)</p>	<p>Admission requirements</p> <p>Minimum requirements</p> <ul style="list-style-type: none"> ● <u>Admission to the co-operative program is competitive. Students in the MMath in Statistics/Biostatistics program can apply to transfer into the MMath in Statistics/Biostatistics Co-operative Program after completing at least one academic term. Admittance will be decided based on the student's progress to date, appropriateness of proposed co-op position, and is subject to approval by the student's research supervisor and the Department graduate committee.</u>

How will students currently registered in the program be impacted by these changes?

Current students will not be impacted.

Department/School approval date (mm/dd/yy): 03/01/2024

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 01/22/24

Faculty approval date (mm/dd/yy): 10/22/24

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate approval date (mm/dd/yy) (if applicable):

Prior to form submission, review the [content revision instructions](#) and information regarding [major/minor modifications](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Program: Master of Quantitative Finance (MQF)

Program contact name(s): Heather McLaughlin, Alexander Schied

Form completed by: Heather McLaughlin

Description of proposed changes:

Note: changes to courses and milestones also require the completion/submission of the [SGRC Graduate Studies Course/Milestone Form](#).

Amend the English language proficiency requirements for the MQF program to align with the rest of the Department of Statistics and Actuarial Science and use the standard required scores instead of the alternative higher scores.

Is this a [major modification](#) to the program? No

Rationale for change(s):

Every applicant must participate in an interview which allows the Department to appropriately assess their communication skills. The higher ELP requirement may prevent qualified applicants from applying to the program. Using the standard required scores will bring the program in line with the rest of the Department and potentially improve the pool of applicants.

Proposed effective date: Term: Winter Year: 2025

Current [Graduate Studies Academic Calendar \(GSAC\)](#) page (include the link to the web page where the changes are to be made):

<https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/policy/SJDLMPJAa>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>Graduate Studies accepted examinations and alternative higher scores</p> <ul style="list-style-type: none"> • TOEFL: 100 (writing 26, speaking 26) • IELTS: 7.5 (writing 7.0, speaking 7.0) • Cambridge English test (C1 Advanced or C2 Proficiency): 191 (minimum 185 in each area) 	<p><u>Graduate Studies accepted examinations and required scores</u></p> <ul style="list-style-type: none"> • TOEFL 90 (writing 25, speaking 25) • IELTS 7.0 (writing 6.5, speaking 6.5) • Cambridge English test (C1 Advanced or C2 Proficiency): 185 (minimum 176 in each area) • CAEL: 70 (60 per band, 70 writing, 70 speaking)

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> • CAEL: 70 (60 per band, 70 writing, 70 speaking) • PTE (Academic): 68 (writing 65, speaking 65) • EFAS: 80% (overall in level 400 with at least 75% in writing, oral and academic skills) 	<ul style="list-style-type: none"> • <u>PTE (Academic): 63 (writing 65, speaking 65)</u> • <u>EFAS: 75% (overall in level 400 with at least 75% in writing, oral and academic skills)</u>

How will students currently registered in the program be impacted by these changes?

Current students will not be impacted.

Department/School approval date (mm/dd/yy): 05/17/2024

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 04/30/24

Faculty approval date (mm/dd/yy): 10/22/24

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate approval date (mm/dd/yy) (if applicable):

Prior to form submission, review the [content revision instructions](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Effective date: Term: Winter Year: 2025

Milestone

Note: milestone changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Choose an item.
- Inactivate: Choose an item.
- Revise: from Choose an item. to Choose an item.

Course

Note: some course changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Complete all course elements below
- Inactivate: Complete the following course elements:
Course subject code, Course number, Course ID, Course title
- Revise: Complete all course elements below to reflect the proposed change(s) and identify the course elements being revised (*e.g. Course description, Course title*):

Course elements (complete as indicated above. Review the [glossary of terms](#) for details on course elements)

Course subject code: STAT

Course number: 814

Course ID: 014953

Course title (max. 100 characters including spaces): Systematic Review and Meta-Analysis

Course short title (max. 30 characters including spaces):

Grading basis: Choose an item.

Course credit weight: Choose an item.

Course consent required: Choose an item.

Course description:

Meet type(s): Choose an item. Choose an item. Choose an item. Choose an item.

Primary meet type: Choose an item.

Delivery mode: Choose an item.

Requisites:

Special topics course: Yes No

Cross-listed course: Yes No

Course subject code(s) and number(s) to be cross-listed with and approval status: PHARM 614 (course revision request to inactivate the PHARM cross-listed course to be submitted by PHARM)

Sections combined/held with:

Rationale for request: This cross-listed STAT/PHARM course is being inactivated since it has only run twice and has not been taught since 2015.

Form completed by: Heather McLaughlin

Department/School approval date (mm/dd/yy): 05/17/2024

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 05/07/24

Faculty approval date (mm/dd/yy): 10/22/24

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Prior to form submission, review the [content revision instructions](#) and information regarding [major/minor modifications](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Program: Doctor of Philosophy (PhD) in Actuarial Science

Program contact name(s): Greg Rice

Form completed by: Heather McLaughlin

Description of proposed changes:

Note: changes to courses and milestones also require the completion/submission of the [SGRC Graduate Studies Course/Milestone Form](#).

Changing the program name to PhD in Actuarial Science and Quantitative Finance.

Is this a [major modification](#) to the program? Yes

Rationale for change(s):

The current name does not accurately reflect the content of the program or research being conducted by students. The proposed change would align with the breadth of research conducted by faculty members, which could assist with recruitment of future/prospective graduate students. There are no changes to the program learning outcomes. Students and faculty were consulted on the change and the response was positive.

Proposed effective date: Term: Winter Year: 2025

Current [Graduate Studies Academic Calendar \(GSAC\)](#) page (include the link to the web page where the changes are to be made):

<https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-statistics-and-actuarial-science/doctor-philosophy-phd-actuarial-science>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>Doctor of Philosophy (PhD) in Actuarial Science</p>	<p>Doctor of Philosophy (PhD) in Actuarial Science <u>and Quantitative Finance</u></p>

How will students currently registered in the program be impacted by these changes?

All currently registered students will have the option of graduating with either the original or revised program name. Details of the program name change will be communicated to them by the Associate Chair, Graduate Studies, via email. By default, students will retain the original program name. Students who wish to change to the revised program name will need indicate this to the Associate Chair, Graduate Studies.

Department/School approval date (mm/dd/yy): 01/26/24

Reviewed by GSPA (for GSPA use only) **date** (mm/dd/yy): 10/27/23

Faculty approval date (mm/dd/yy): 03/19/24

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate approval date (mm/dd/yy) (if applicable):

Prior to form submission, review the [content revision instructions](#) and information regarding [major/minor modifications](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Programs: 1) Doctor of Philosophy (PhD) in Actuarial Science
2) Doctor of Philosophy (PhD) in Statistics
3) Doctor of Philosophy (PhD) in Statistics - Biostatistics
4) Master of Mathematics (MMath) in Actuarial Science
5) Master of Mathematics (MMath) in Biostatistics
6) Master of Mathematics (MMath) in Biostatistics - Co-operative Program
7) Master of Mathematics (MMath) in Statistics
8) Master of Mathematics (MMath) in Statistics - Co-operative Program

Program contact name(s): Greg Rice

Form completed by: Heather McLaughlin

Description of proposed changes:

Note: changes to courses and milestones also require the completion/submission of the [SGRC Graduate Studies Course/Milestone Form](#).

Removing the Graduate Skills Workshop milestone

Is this a [major modification](#) to the program? No

Rationale for change(s):

The Graduate Skills Workshop milestone previously consisted of TA training sessions and an English skills workshop. The English workshop was found to be of minimal benefit and has been discontinued. The only remaining requirement is the TA training which only discusses how to TA and has no other learning outcomes. Only full-time students that will be TAing are required to complete the training, so the milestone is being removed as it is not applicable to all students. Students will still be required to attend the TA workshops to be assigned a TA position.

Proposed effective date: Term: Winter Year: 2025

Current [Graduate Studies Academic Calendar \(GSAC\)](#) page (include the link to the web page where the changes are to be made):

<https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-statistics-and-actuarial-science/doctor-philosophy-phd-actuarial-science>

<https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-statistics-and-actuarial-science/doctor-philosophy-phd-statistics>

<https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-statistics-and-actuarial-science/doctor-philosophy-phd-statistics-biostatistics>

<https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-statistics-and-actuarial-science/master-mathematics-mmath-actuarial-science>

<https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-statistics-and-actuarial-science/master-mathematics-mmath-biostatistics>

<https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-statistics-and-actuarial-science/master-mathematics-mmath-biostatistics-co-operative-program>

<https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-statistics-and-actuarial-science/master-mathematics-mmath-statistics>

<https://uwaterloo.ca/graduate-studies-academic-calendar/mathematics/department-statistics-and-actuarial-science/master-mathematics-mmath-statistics-co-operative-program>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>MMath Degree requirements</p> <p>Thesis option:</p> <ul style="list-style-type: none"> • Graduate Academic Integrity Module (Graduate AIM) • Courses • Graduate Skills Workshop • Master's Thesis <p>Master's Research Paper option:</p> <ul style="list-style-type: none"> • Graduate Academic Integrity Module (Graduate AIM) • Courses • Graduate Skills Workshop • Master's Research Paper <p>PhD Degree requirements</p> <ul style="list-style-type: none"> • Graduate Academic Integrity Module (Graduate AIM) • Courses • Graduate Skills Workshop • Research Presentation • PhD Comprehensive Examination I • PhD Comprehensive Examination II • PhD Thesis 	<p>MMath Degree requirements</p> <p>Thesis option</p> <ul style="list-style-type: none"> • Graduate Academic Integrity Module (Graduate AIM) • Courses • Master's Thesis <p>Master's Research Paper option:</p> <ul style="list-style-type: none"> • Graduate Academic Integrity Module (Graduate AIM) • Courses • Master's Research Paper <p>PhD Degree requirements</p> <ul style="list-style-type: none"> • Graduate Academic Integrity Module (Graduate AIM) • Courses • Research Presentation • PhD Comprehensive Examination I • PhD Comprehensive Examination II • PhD Thesis

How will students currently registered in the program be impacted by these changes?

Current students will not be impacted.

Department/School approval date (mm/dd/yy): 01/26/24

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 11/08/23

Faculty approval date (mm/dd/yy): 03/19/24

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate approval date (mm/dd/yy) (if applicable):

Prior to form submission, review the [content revision instructions](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Mathematics

Effective date: Term: Winter Year: 2025

Milestone

Note: milestone changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Choose an item.
- Inactivate: Graduate Skills Workshop
- Revise: from Choose an item. to Choose an item.

Course

Note: some course changes also require the completion/submission of the [Graduate Studies Program Revision Template](#).

- New: Complete all course elements below
- Inactivate: Complete the following course elements:
Course subject code, Course number, Course ID, Course title
- Revise: Complete all course elements below to reflect the proposed change(s) and identify the course elements being revised (*e.g. Course description, Course title*):

Course elements (complete as indicated above. Review the [glossary of terms](#) for details on course elements)

Course subject code: Choose an item.

Course number:

Course ID:

Course title (max. 100 characters including spaces):

Course short title (max. 30 characters including spaces):

Grading basis: Choose an item.

Course credit weight: Choose an item.

Course consent required: Choose an item.

Course description:

Meet type(s): Choose an item. Choose an item. Choose an item. Choose an item.

Primary meet type: Choose an item.

Delivery mode: Choose an item.

Requisites:

Special topics course: Yes No

Cross-listed course: Yes No

Course subject code(s) and number(s) to be cross-listed with and approval status:

Sections combined/held with:

Rationale for request:

The Graduate Skills Workshop milestone previously consisted of TA training sessions and an English skills workshop. The English workshop was found to be of minimal benefit and has been discontinued. The only remaining requirement is the TA training which only discusses how to TA and has no other learning outcomes. Only full-time students that will be TAing are required to complete the training, so the milestone is being removed as it is not applicable to all students.

The milestone should be removed from the following programs:

- 1) Doctor of Philosophy (PhD) in Actuarial Science*
- 2) Doctor of Philosophy (PhD) in Statistics*
- 3) Doctor of Philosophy (PhD) in Statistics - Biostatistics*
- 4) Master of Mathematics (MMath) in Actuarial Science*
- 5) Master of Mathematics (MMath) in Biostatistics*
- 6) Master of Mathematics (MMath) in Biostatistics - Co-operative Program*
- 7) Master of Mathematics (MMath) in Statistics*
- 8) Master of Mathematics (MMath) in Statistics - Co-operative Program*

Form completed by: Trevor Clews

Department/School approval date (mm/dd/yy): 01/26/24

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 11/08/23

Faculty approval date (mm/dd/yy): 03/19/24

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Academic Calendar Dates, 2025-2026

	Fall 2025	Winter 2026	Spring 2026
Co-operative Work Term Begins	Sept. 2 (T)	Jan. 5 (M)	May 11 (M)
Classes Begin	Sept. 3 (W)	Jan. 5 (M)	May 11 (M)
Holidays	Oct. 13 (M)	Feb. 16 (M) Apr. 3 (F)	May 18 (M) July 1 (W) Aug. 3 (M)
Reading Week	Oct. 11-19 (S-U)	Feb. 14-22 (S-U)	N/A
Convocation	Oct. 24, 25 (F,S)	N/A	June 16-20 (T-S)
Classes End	Dec. 2 (T)	Apr. 6 (M)	August 5 (W)
Make-up Day(s) for in-term holidays	N/A	Apr. 6 (M) for Apr. 3 (F schedule)	Aug. 4 (T) for May 18 (M schedule) Aug. 5 (W) for July 1 (W schedule)
Pre-Examination Study Day(s)	Dec. 3, 4 (W, R)	Apr. 7, 8 (T,W)	Aug. 6 (R)
Examinations Begin	Dec. 5 (F)	Apr. 9 (R)	Aug. 7 (F)
In-Person Exam Days for Online Courses	Dec. 5, 6 (F,S) Dec. 10, 13 (W,S)	Apr. 10, 11 (F,S) Apr. 15, 18 (W,S)	Aug. 7, 8 (F,S) Aug. 12, 15 (W,S)
Examinations on Sunday	Dec. 7 (U)	N/A	N/A
No Exams on the Following Days	Dec. 14 (U)	April 12 (U) Apr. 19 (U)	Aug. 9 (U) Aug. 16 (U)
Examinations End (including Emergency Day)	Dec. 19 (F)	Apr. 24 (F)	Aug. 20 (R)
Co-operative Work Term Ends	Dec. 19 (F)	Apr. 24 (F)	Aug. 21 (F)
Teaching days	60	60	60
Pre-examination Study Day(s)	2	2	1
Examination days	13 (+1 Emergency Day)	13 (+1 Emergency Day)	11 (+1 Emergency Day)

Symbols and abbreviations:

(M) Monday, (T) Tuesday, (W) Wednesday, (R) Thursday, (F) Friday, (S) Saturday, (U) Sunday, N/A – Not Applicable

Guidelines for Determining Academic Calendar of Dates

The following are principles and guidelines either formally agreed upon by Senate or adopted as common practice in determining the dates for the academic year.

1. That the practice of setting dates for each academic year continues to be an annual exercise.
2. That there be no fewer than 60 teaching days (12 weeks) in a term. A clear rationale for fewer than 60 teaching days must be communicated to Senate at the time calendar dates are approved. In calculating teaching days in a term, Saturdays, Sundays, and statutory or University holidays are excluded.
3. That attention be given to balancing the number of meets in courses. Where an imbalance may occur because of statutory holidays, the class schedule for a day different than the calendar day can be used to balance the number of course meets.
4. That Fall Convocation be the Friday and Saturday that fall in the third full week (beginning Sunday) of October.
5. That Spring Convocation be the Tuesday to Saturday in the second full week (beginning Sunday) in June.
6. That the Reading Weeks occur in all Faculties in the fall and winter terms. They must begin on the Saturday before the public holidays of Thanksgiving Day and Family Day and will end on the following Sunday.
7. That Fall Term classes in September begin on the Wednesday following the Labour Day holiday.
Exception: The Fall Term begins on Tuesday, September 8th when Labour Day is September 7th.
8. That the start date for Winter Term be set as follows:
 - If January 1st is a Sunday, then start of classes is Monday, January 9th.
 - If January 1st is a Monday, then start of classes is Monday, January 8th.
 - If January 1st is a Tuesday, then start of classes is Monday, January 7th.
 - If January 1st is a Wednesday, then start of classes is Monday, January 6th.
 - If January 1st is a Thursday, then start of classes is Monday, January 5th.
 - If January 1st is a Friday, then start of classes is Monday, January 11th.
 - If January 1st is a Saturday, then start of classes is Monday, January 10th.
9. The start date for Spring Term be set as follows:
 - If May 1st is a Sunday, then start of classes is Monday, May 9th.
 - If May 1st is a Monday, then start of classes is Monday, May 8th.
 - If May 1st is a Tuesday, then start of classes is Monday, May 7th.

- If May 1st is a Wednesday, then start of classes is Monday, May 6th.
 - If May 1st is a Thursday, then start of classes is Monday, May 5th.
 - If May 1st is a Friday, then start of classes is Monday, May 11th.
 - If May 1st is a Saturday, then start of classes is Monday, May 10th.
10. That there be no fewer than one pre-examination study day and when possible, two pre-examination study days (excluding Saturday, Sunday, and holidays) between the end of classes and the beginning of examinations. A clear rationale for using fewer than 2 days or Saturday, Sunday, and holidays as pre-examination study days, must be communicated to Senate at the time calendar dates are approved.
 11. That there be no fewer than 13 examination days in the Fall and Winter Terms, and 11 examination days in the Spring Term. In addition, one Emergency Day with no scheduled examinations is added to the end of the examination period.
 12. In calculating examination days, Saturdays which fall within the period are included, whereas Sundays and statutory or University holidays are excluded.
Exceptions:
 Examinations will not be scheduled on the Saturday following Good Friday when that day falls within the examination schedule or the Saturday of the Civic Day weekend.
 The first Sunday within the examination period may be used when required to accommodate the prescribed number of examination days in the Fall Term.
 13. That in the Fall Term no examinations be scheduled beyond December 22nd. The Emergency Day cannot be scheduled beyond December 23rd.
 14. That Online Course Examination Days in each term be the first consecutive Friday and Saturday and the second consecutive Wednesday and Saturday in the examination period.
 15. Grades due dates for on campus courses that have a scheduled final examination are normally scheduled seven days from the date of the final examination. Grades for online courses that have a scheduled final examination are due on the last day of the grades submission period. Grades for all courses without a scheduled final examination are normally due 14 days after the start of examinations.
 16. Co-op work terms are expected to be 16 week in duration. Actual start and end dates may vary depending on employer or student requirements in consultation with Co-operative Education.

Rules that Require Exceptions with Rationale:

Rule 10

...That there be no fewer than one pre-examination study day and when possible, two pre-examination study days (excluding Saturday, Sunday, and holidays) between the end of classes and the beginning of examinations. A clear rationale for using fewer than 2 days or Saturday, Sunday, and holidays as pre-examination study days, must be communicated to Senate at the time calendar dates are approved.

In order to accommodate Online Course Examination Days early in the spring term exam schedule to ensure that grades from online courses are submitted before or on the deadline, only one study day is possible for the 2026 spring term.

Rule 12

... The first Sunday within the examination period may be used when required to accommodate the prescribed number of examination days in the Fall Term.

With fall term classes beginning September 3, 2025, and the scheduling of two study days prior to the fall final exam period, the first Sunday within the exam period was required for scheduling exams to accommodate the prescribed number of examination days.

Prepared by:
C. Newell Kelly, Registrar
July 2024

Memo

DATE: November 4, 2024

TO: Ashley Day, Governance Officer, Senate Graduate and Research Council

FROM: Clarence Woudsma, Interim Co-Associate Vice-President, Graduate Studies and Postdoctoral Affairs (GSPA)
Justin Wan, Interim Co-Associate Vice-President, GSPA
Marianne Simm, Director, GSPA

RE: Graduate Studies Academic Calendar (GSAC) updates

Items for approval:

- 1) International Visiting Graduate Student (IVGS) program
- 2) Dual PhD degrees (Cotutelle agreements)
- 3) Graduate Certificate of Participation
- 4) Collaborative programs
- 5) Student accommodations and accessibility supports

Items for information:

- 6) Canadian Universities Graduate Transfer Agreement (CUGTA)
- 7) Non-degree admission
- 8) Graduate research fields

Description and rationale for proposed changes:

The process of reviewing and renewing the GSAC began in the Fall 2023 term, with a number of sections coming forward to SGRC/Senate. This work continues, with the intent of reviewing all “Regulations” sections within the GSAC.

As described in Fall 2023, like many University of Waterloo governance documents, the GSAC has evolved over time. Despite the regular modifications to the GSAC, and its importance, the GSAC has not been holistically reviewed or updated for some time.

Increasingly students, and administrators are relying on the GSAC, and so the re-write is intended to present the GSAC elements in language that is accessible to both audiences.

This work has been done collaboratively and in partnership with the Faculties and other Academic Support Units that have expertise in the content (e.g., AccessAbility Services, Academic Quality Enhancement). The proposed changes have been reviewed and endorsed by the Graduate Operations Committee.

Proposed effective date: Term: Winter Year: 2025

Current **Graduate Studies Academic Calendar (GSAC)** page:

1) International Visiting Graduate Student (IVGS) program

IVGS information is being added to the GSAC as it has historically only appeared on the GSPA website. The GSPA website will continue to include procedural materials and the GSAC will contain regulatory information.

Current Calendar copy	Proposed Calendar copy
<p>No equivalent section</p>	<p><u>12.4 International Visiting Graduate Student (IVGS) Program</u></p> <p><u>Graduate students from around the world are welcome to enhance their research opportunities at the University of Waterloo, by participating in the International Visiting Graduate Student (IVGS) program.</u></p> <p><u>The IVGS program allows graduate students enrolled in research-based programs at non-Canadian universities to undertake research at the University of Waterloo under the supervision or co-supervision of a University of Waterloo faculty member.</u></p> <p><u>Under the IVGS program, students from universities approved by the University of Waterloo may come to the University of Waterloo in the absence of a formal institution-to-institution exchange agreement. Internationally registered students benefit from the expertise, resources, and facilities offered at the University of Waterloo, while enriching the intellectual community of the host department.</u></p> <p><u>In pursuit of an IVGS placement, a proposed agreement is endorsed by the student's supervisor and department at the student's home university. The proposed agreement is then endorsed by the intended University of Waterloo supervisor and department Chair/school Director. Approvals for IVGS are granted by the Associate Vice-President Graduate Studies and Postdoctoral Affairs.</u></p> <p><u>Students in the IVGS program are not permitted to enrol in courses for credit but, with permission from their graduate unit and the course instructor, IVGS program students may be allowed to informally audit classes.</u></p>

	<p>The IVGS program is open to students who:</p> <ol style="list-style-type: none"> 1. <u>are currently enrolled in a graduate degree program at a non-Canadian institution;</u> 2. <u>remain an active graduate student at their home university during the duration of their research engagement at the University of Waterloo (i.e., have not officially completed their degree);</u> 3. <u>hold a valid Canadian work permit (where applicable) during the duration of their IVGS experience. Note, during the approval process appropriate documentation and support will be provided to obtain the necessary immigration status.</u> <p><u>Exceptions to requirement 2 may be considered in extraordinary cases. Consult with the Associate Director, Graduate Admissions.</u></p> <p><u>Students participating in the IVGS program do not pay academic tuition to the University of Waterloo but are required to pay the insurance premiums in the University Health Insurance Plan (UHIP) if they do not hold Canadian health insurance.</u></p> <p><u>For eligibility requirements, application process and further details, please refer to the Graduate Studies and Postdoctoral Affairs website.</u></p>
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2) Dual PhD degrees (Cotutelle agreements)

Dual PhD degrees (Cotutelle agreements) information is being added to the GSAC as it has historically only appeared on the GSPA website. The GSPA website will continue to include procedural materials and the GSAC will contain regulatory information.

Current Calendar copy	Proposed Calendar copy
No equivalent section	<p><u>12.5 Dual PhD degrees (Cotutelle agreements)</u></p> <p><u>Cotutelles (a French term for “joint enrolment”) can be sought as academic opportunities for PhD students in instances where research relationships between the</u></p>

University of Waterloo and the partner institution can be advanced through the student's engagement with both institutions, to the betterment of the student and their areas of research.

PhD students studying under a cotutelle agreement are concurrently enrolled at the University of Waterloo and an approved non-Canadian partner university.

The Associate Vice-President Graduate Studies and Postdoctoral Affairs (GSPA) is the approving authority for any proposed cotutelle agreements. For further information on establishing a cotutelle agreement, refer to the [Dual degrees program agreements \(Cotutelle\)](#).

A cotutelle agreement has the following requirements:

Co-supervision: the PhD student's training and research activities are supervised by qualified faculty members at the University of Waterloo and at the partner institution.

Distinct degree requirements: students, with their academic supervisors, compose a customized program for the individual student that when successfully completed, will be deemed to have fulfilled all requirements for the degree at both institutions. Elements normally to be considered in the individual program include required coursework, residency, comprehensive examinations, and milestones.

Enrolment and research plan: the time spent on doctoral studies at each university is to be balanced as equally as possible; the mobility schedule is jointly planned by the two supervisors. The University of Waterloo's residency requirements must be satisfied for students in cotutelle agreements.

Funding: the University of Waterloo's [minimum funding requirements](#) must be satisfied for cotutelle students in the terms in which they are in residence (i.e., assessed tuition and fees) at Waterloo.

	<p>PhD thesis defence: <u>the PhD candidate normally satisfies the requirements for the PhD thesis defense concurrently, through a single process, for both the University of Waterloo and the partner institution. The process is administered at a location and in a language specified in the cotutelle agreement. The composition of the examination committee must satisfy the University of Waterloo's PhD examining committee requirements. In practice, the examining committee is normally equally balanced with representation from the University of Waterloo and the partner institution.</u></p> <p>Outcomes: <u>students successfully completing a cotutelle agreement receive two PhD diplomas, one from the University of Waterloo and one from the partner institution; the diplomas indicate that the degrees are awarded through a cotutelle.</u></p>
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3) Graduate Certificate of Participation

Graduate Certificate of Participation information is being reinstated in conjunction with recent GSAC changes to section 11.1 Graduate Certificates in Spring 2024. This provides a transitional option for current unit efforts to recognize engagement with non-degree activities.

Current Calendar copy	Proposed Calendar copy
<p>No current equivalent section (note: the following content appeared in the Winter 2024 GSAC)</p> <p>Graduate Certificate of Participation/Completion</p> <p>A Graduate Certificate of Participation or Completion is prepared and awarded by the Department/Faculty to acknowledge participation or completion of one or more courses, seminars or workshops. Awarding of a Graduate Certificate of Participation or Completion is not recorded on the official University record and academic transcript.</p> <p>Proposals for Graduate Certificates of Participation/Completion require Department and Faculty approval and are normally completed in conjunction with a master's or doctoral program, or non-degree graduate</p>	<p><u>11.2</u> Graduate Certificate of Participation</p> <p><u>In contrast to the Graduate Certificates as identified in section 11.1</u>, a Graduate Certificate of Participation is prepared and awarded by the Department/Faculty to acknowledge participation or completion of one or more courses, seminars or workshops. Awarding of a Graduate Certificate of Participation is not recorded on the official University record and academic transcript.</p> <p>Proposals for Graduate Certificates of Participation require Department and Faculty approval and are normally completed in conjunction with a master's or doctoral program, or non-degree graduate enrolment. All <u>Graduate</u> Certificates of Participation approved by a Department and Faculty must be reported to SGRC for information.</p>

enrolment. All Certificates of Participation/Completion approved by a Department and Faculty must be reported to SGRC for information.	
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4) Collaborative programs

Collaborative program requirements are being added to the GSAC to reflect our development of collaborative programs and to align with the Ontario Universities Council on Quality Assurance definition.

Current Calendar copy	Proposed Calendar copy
<p>No equivalent section</p>	<p><u>9.2 Collaborative programs</u></p> <p><u>The University of Waterloo strongly endorses interdisciplinary academic programs that advance novel curricula and research opportunities. To this end, the University supports the development of Collaborative Programs where students obtain disciplinary expertise in their primary program with specific application to the collaborative theme.</u></p> <p><u>In addition to generating diverse learning outcomes, these collaborative programs are structured to promote communities of scholars – students, faculty members, and external partners – in the thematic area of the collaborative program.</u></p> <p><u>The requirements for collaborative programs differ by academic program structure/study option:</u> <u>For research collaborative programs:</u></p> <ol style="list-style-type: none"> 1. <u>Prospective students apply to the collaborative program. Applications will be assessed both in terms of the admission requirements for the primary program and the applicant’s potential for successful completion of the collaborative elements of the program.</u> 2. <u>As with all graduate research programs, admission to collaborative programs is dependent on the availability of an appropriate supervisor (or supervisors) and funding, as appropriate.</u> 3. <u>Course requirements must include the required courses in the student’s</u>

primary program and the required courses from the collaborative program. The required collaborative courses cannot be required courses in the primary program and must be foundational to the collaborative theme. Normally, not fewer than two (0.5 unit weight) courses will be required from the primary program and not fewer than two (0.5 unit weight) courses will be required for the collaborative program – four (0.5 unit weight) courses in total. Additional required courses may be included.

4. Student's research, conducted to satisfy collaborative program requirements, must demonstrate the application of skills and knowledge from the primary program to the theme of the collaborative program. The student's examining committee shall consider this requirement when evaluating a student's Master's Research Paper, Master's Thesis or Doctoral Dissertation.

For course-based, collaborative Master's programs:

1. Prospective students apply to the collaborative program. Applications will be assessed both in terms of the admission requirements for the primary program and the applicant's potential for successful completion of the collaborative elements of the program.
2. Course requirements must include the required courses in the student's primary program and the required courses from the collaborative program. The required collaborative courses cannot be required courses in the primary program and must be foundational to the collaborative theme. Normally, not less than half the total courses will be required from the primary program, and not less than four (0.5 unit weight) courses will be required for the collaborative program. A concluding, capstone course can be included and will satisfy

	<p><u>one of the four collaborative course requirements.</u></p> <p><u>For all collaborative programs, the University requires the creation of an oversight committee that will be responsible for regular monitoring of the program, with specific focus on those elements included in the University's Institutional Quality Assurance Framework.</u></p> <p><u>Collaborative programs should normally be associated with primary programs from at least two Faculties, with more Faculties' engagement being preferred.</u></p> <p><u>Note: graduate research fields or graduate specializations associated with participating programs are not applicable to collaborative programs.</u></p> <p><u>Approval process</u> <u>All new collaborative programs require Department/School, Faculty, Senate Graduate and Research Council (SGRC) and Senate approval. Further details regarding the approval process are available on the Academic Quality Enhancement website.</u></p>
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5) Student accommodations and accessibility supports

Student accommodations and accessibility supports information is being added to the GSAC to reflect current practice at the institution (i.e. Undergraduate Studies Academic Calendar) and our adherence to statutory requirements and to align with the Student Academic Accommodation Guidelines.

Current Calendar copy	Proposed Calendar copy
<p>No equivalent sections</p>	<p><u>15.1 Academic accommodations for students with disabilities</u></p> <p><u>The University of Waterloo is committed to upholding the rights of persons with disabilities and creating accessible and inclusive learning environments for all. In this context, the term disability covers a broad range and degree of conditions that can be permanent, temporary, sporadic, and suspected, including, but not limited to, physical disabilities, learning disabilities, mental health disabilities, disabling medical conditions, and the physical, emotional, and</u></p>

psychological effects of a trauma (e.g., sexual violence). Program administrators, instructors and supervisors work with [AccessAbility Services](#) to ensure students have equitable access to their education, and receive reasonable academic accommodations that provide the opportunity to meet the academic standards of their program.

The [Student Academic Accommodation Guidelines](#) support the staff and faculty of the University of Waterloo in understanding their roles and responsibilities in the academic accommodation process. Students are encouraged to register with [AccessAbility Services](#) as early as possible to make the nature of their disability and/or needs known. Students can complete [AccessAbility Services' online application](#). [AccessAbility Services](#) is available to assist with completing the application upon request.

15.2 Funding and support for students with disabilities

Students who are on reduced academic load as a stipulation of verified accommodation through [AccessAbility Services](#) will have equal opportunity for services (such as access to on-campus housing), awards and scholarships that are normally only available to students with full-time enrolment status.

In most instances, a reduced academic load will result in registration under the graduate [part-time definition](#), with tuition rates consistent with this level of progression.

Research students are generally supported through a blend of funding commitments including scholarships/awards and employment opportunities through Graduate Teaching Assistantships and Graduate Research Assistantship positions. Students who are on a reduced workload accommodated through [AccessAbility Services](#) will work out a funding plan with their supervisor, department/school, Faculty and GSPA, with support from [AccessAbility Services](#) advisors.

<p>1.1 Religious holidays/examination scheduling</p> <p>The University acknowledges that, due to the pluralistic nature of the University community, some students may on religious grounds require alternative times to write examinations and tests. Accordingly, a student who requires an alternative examination or test time on religious grounds should consult with the Associate Dean of the Faculty offering the course regarding alternative arrangements. Such a request should be made within one week of the announcement of the test or examination date. For students in courses taught at the Federated University or affiliated Colleges, the responsibilities of the Associate Dean in these procedures are exercised by the Dean of the Federated University or affiliated Colleges (or Head in cases where there is no Dean).</p>	<p><u>15.3 Academic accommodations for creed/religion</u></p> <p>The University acknowledges that, due to the pluralistic nature of the University community, some students may <u>seek academic accommodations on</u> religious grounds.</p> <p><u>For accommodation of course work expectations, students can complete the Religious Observance Self-Declaration Form in Quest, which will inform their instructors of the potential conflict for certain dates. As the dates of important religious observances are generally known well in advance, students must consult with their instructor(s) within two weeks of the announcement of the due date or scheduled date for which academic accommodation is being sought.</u></p> <p><u>For accommodations of scheduled milestones/non-course degree requirements, students should inform their department/school graduate officer/coordinator at least two weeks in advance.</u></p>
<p>No equivalent section</p>	<p><u>15.4 Academic accommodations for other code grounds</u></p> <p><u>Students seeking academic accommodations related to a protected ground (e.g., family status which would encompass pregnancy and breastfeeding, and gender), per Ontario Human Rights Code, should inform their instructor/department/school graduate officer/coordinator as soon as they become aware of the need.</u></p>

6) Canadian Universities Graduate Transfer Agreement (CUGTA)

Revisions are being made to reflect current practice. Including additional information to provide more guidance in line with CUGTA regulations.

Current Calendar copy	Proposed Calendar copy
<p>12.2 Canadian Universities Graduate Transfer Agreement (CUGTA)</p> <p>The Canadian Universities Graduate Transfer Agreement (CUGTA, 1998) is to provide</p>	<p>12.2 Canadian Universities Graduate Transfer Agreement (CUGTA)</p> <p><u>In instances where University of Waterloo students may benefit from access to courses</u></p>

~~students in good standing enrolled in a graduate degree or diploma program at a Canadian Association for Graduate Studies (CAGS) member university the opportunity to avail themselves of courses offered at another member institution (host) for transfer credit to the program at their institution (home).~~

For more information on this agreement and procedures, please refer to the [Graduate Studies and Postdoctoral Affairs website](#).

offered at another Canadian institution, outside of Ontario, or when students enrolled at another Canadian university may value access to courses at the University of Waterloo, these students in good academic standing may pursue those opportunities through the Canadian Universities Graduate Transfer Agreement (CUGTA).

Students enrolled in an Ontario university seeking opportunities within Ontario should follow the [Ontario Visiting Graduate Student \(OVGS\) procedures](#).

Under CUGTA, the student's current university is designated as the Home University; the university offering the course in which the student is seeking enrolment is designated as the Host University.

Access to courses through CUGTA is limited to cases where:

- Approval is granted by both the Host and Home Universities;
- The course is deemed as integral to the student's degree program; and
- The course is not available at the Home University.

Courses successfully completed under CUGTA will be considered for transfer credit in the student's program at the Home University upon submission of an official transcript that demonstrates that the student's performance in the course satisfies their Home Program's standards. The student is responsible for seeking, receiving and submitting the transcript; the submitted transcript becomes part of the student's official academic record.

For University of Waterloo students, transfer credit will be limited to two half-credit (0.50 unit weight) courses of the program's course requirements.

For more information on this agreement and procedures, please refer to the [Graduate Studies and Postdoctoral Affairs website](#).

7) Non-degree admission

Changes to the non-degree admission category are being made to allow for programs to use non-degree admission to facilitate part-time, professional, student enrolment in existing courses/programs. Any exceptions to the regulations (i.e. upper bound to transfer credit) must be by design of the program, and approved by the Associate Dean, and AVP-GSPA.

Current Calendar copy	Proposed Calendar copy
<p>3.6 Non-degree admission</p> <p>Applicants possessing an Honours Bachelor's degree or equivalent who intend to take one or more graduate courses but are not proceeding to a degree or a diploma should apply for non-degree admission. Consult with the department/school offering the intended course(s) to determine if non-degree status is possible. Non-degree admission will be limited to programs that offer part-time status, and fees will be charged at the research/coursework master's rate including any incidental fees. Any requests for full-time enrolment as a non-degree student will not normally be granted.</p> <p>Non-degree graduate students who wish to apply to a graduate degree program must follow the regular admission process and meet program requirements. Admission into a graduate degree program from a non-degree status is not guaranteed.</p> <p>Students accepted into a graduate degree program will only receive credit for courses taken as a non-degree graduate student on the recommendation of the academic unit offering that graduate degree program and with approval by the Associate Dean (Graduate Studies). As an upper bound, students may transfer no more than one-half the course credits required for the degree. Programs may choose to set a lower limit, at the time of admission, of courses allowed for transfer.</p>	<p>3.6 Non-degree admission</p> <p>Applicants <u>holding</u> an Honours Bachelor's degree or equivalent who intend to take one or more graduate courses but are not proceeding to a degree or a diploma should apply for non-degree admission. Consult with the department/school offering the intended course(s) to determine if non-degree status is possible. Non-degree admission will be limited to programs that offer part-time status; <u>normally</u> fees will be charged at the research/coursework master's rate, including any incidental fees. <u>Part-time students cannot typically enrol in more than two courses (equivalent to 1.0 units) per term, or as specified by the program.</u> Requests for full-time enrolment as a non-degree student will not normally be granted.</p> <p>Non-degree graduate students who wish to apply to a graduate degree program must follow the regular admission process and meet program requirements. Admission into a graduate degree program from a non-degree status is not guaranteed.</p> <p>Students accepted into a graduate degree program will only receive credit for courses taken as a non-degree graduate student on the recommendation of the academic unit offering that graduate degree program and with approval by the Associate Dean, Graduate Studies. As an upper bound, students may transfer no more than half of the course credits required for the degree. Programs may choose to set a lower limit, at the time of admission, of courses allowed for transfer. <u>Any exceptions to this upper bound should be reviewed and approved as part of a broader program design. Approval must be confirmed through the Associate Dean, Graduate Studies and the Associate Vice-</u></p>

8) Graduate research fields

Minor revisions are being made to reflect current practice.

Current Calendar copy	Proposed Calendar copy
<p>9.2 Graduate research fields</p> <p>Graduate programs and research areas are often defined by the administrative unit within which the graduate student or supervisor is appointed. Often fields define specific areas of research within the unit; in other cases, the research conducted is “at the edge” of the normal understanding of the administrative unit’s commonly understood focus.</p> <p>Graduate research fields are used to better define a student’s research concentration when the broader program definition is insufficient to appropriately represent (to academic and professional audiences) the student’s focus.</p> <p>Examples of existing research fields at Waterloo include several in the Master’s programs offered in Applied Mathematics, Computer Science and Civil and Environmental Engineering.</p> <p>Research fields are specified at the time of application.</p> <p>Academic units who wish to employ research fields are encouraged to include specific course requirements that support the learning outcomes associated with that field.</p> <p>An assessment of whether or not the student’s completed research warrants the field designation should be completed by the Department or Faculty at the time of degree completion.</p> <p>Graduate research fields:</p> <ul style="list-style-type: none"> are reported to Quality Council as part of the major modification report; 	<p>9.3 Graduate research fields</p> <p>Graduate research fields are used to better define a student’s <u>contributions to a specific area within a discipline</u>, when the broader program definition is insufficient to appropriately represent (to academic and professional audiences) the student’s research <u>foci</u>.</p> <p>Graduate programs and research areas are often defined by the administrative unit (<u>e.g. department or school</u>) within which the graduate student or supervisor is appointed.</p> <p>Graduate research fields:</p> <ul style="list-style-type: none"> are reported to Quality Council as part of the major modification report; may have a corresponding unique set of required and elected courses; should not require additional academic accomplishments beyond the normal degree requirements; should be a recognized area of research; are recognized on the student’s transcript but not on the diploma. <p>Research fields are <u>normally</u> specified at the time of application <u>and may be added or modified at the request of the student, with approval from the supervisor(s) and program.</u></p> <p><u>Normally, students’ research will not make sufficient contributions to multiple sub-disciplines to merit a designation for more than two fields.</u></p> <p>Academic units who wish to <u>designate</u> research fields are encouraged to include</p>

<ul style="list-style-type: none">• may be specified by the student when applying to a program or unit;• may have a corresponding unique set of required and elected courses;• should not require additional academic accomplishments beyond the normal degree requirements;• should be a recognized area of research;• are recognized on the student's transcript but not on the diploma.	<p>specific course requirements that support the learning outcomes associated with that field.</p> <p>An assessment of whether or not the student's completed research warrants the field designation should be completed by the Department or Faculty at the time of degree completion.</p>
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MEMO

TO: Ashley Day, Governance Officer, Senate Graduate and Research Council
FROM: Siva Sivoththaman, Associate Dean, Graduate Studies, Faculty of Engineering
RE: Senate Graduate & Research Council
DATE: November 11, 2024

Please place the following motions on the regular agenda at the November SGRC meeting. These changes were approved by the Engineering Faculty Council on October 15, 2024.

- 1) Department of Civil Engineering:
 - a. MEng in Civil Engineering: Updating the MEng degree requirements to include four new Graduate Specializations.
 - b. MEng in Civil Engineering - Co-operative Program: Updating the MEng degree requirements to include four new Graduate Specializations.
- 2) Department of Electrical and Computer Engineering:
 - a. MEng in Electrical and Computer Engineering: Updating the degree requirements to include a new Graduate Specialization in Quantum Engineering.
 - b. MEng in Electrical and Computer Engineering - Co-operative Program: Updating the degree requirements to include a new Graduate Specialization in Quantum Engineering.
- 3) Department of Mechanical and Mechatronics Engineering:
 - a. MEng in Mechanical and Mechatronics Engineering: Updating the MEng degree requirements to include three new Graduate Specializations. Changing the name of the current “Green Energy” Graduate Specialization to “Sustainable Energy” and updating the list of required/elective courses associated with the specialization.
 - b. MEng in Mechanical and Mechatronics Engineering - Co-operative Program: Updating the MEng degree requirements to include three new Graduate Specializations. Changing the name of the current “Green Energy” Graduate Specialization to “Sustainable Energy” and updating the list of required/elective courses associated with the specialization.

MEng in Civil Engineering

Master of Engineering (MEng) in Civil Engineering

Under Review | Spring 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Changes

- Coursework Option: Course Requirements
- Effective Term and Year
- Admin Notes
- Graduate Specializations

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Spring 2025

Existing

Effective Term and Year ⓘ

Spring 2024

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

09/19/2024

Quality Assurance Designation ⓘ

Major Modification

Major Modification Categories

Add/re-name a graduate research field, graduate specialization, honours, option, specialization, undergraduate diploma, minor

Is there an impact to existing students? ⓘ

Yes

Impact on Existing Students ⓘ

Current MEng students who satisfy the degree requirements of one the new Graduate Specializations may obtain the Graduate Specialization by completing/submitting a program change form prior to degree completion.

Is the credential name changing?

No

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

Updating the MEng degree requirements to include four new Graduate Specializations: These new Graduate Specializations will add structure to the MEng programs by allowing students to specialize in certain areas of study and receive recognition for that specialization from the Department which is valued when searching for a job in industry. These changes follow the recommendations of the external reviewers of the 2023 Civil and Environmental Engineering (CEE) Institutional Quality Assurance Process (IQAP) cyclical review cyclical review.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Civil and Environmental Engineering

Graduate Field of Study

Civil and Environmental Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Master of Engineering (MEng) in Civil Engineering

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Coursework

Program Types**Admit Term(s)**

Fall
Winter
Spring

Delivery Mode

On-campus

Delivery Mode Information**Length of Program**

- Full-time: 4 terms (16 months)
- Part-time: 8 terms (32 months)

Registration Option(s)

Full-time
Part-time

Registration Options Information**Graduate Research Fields**

Proposed

Graduate Specializations

- Architectural Engineering
- Environmental and Water Resources Engineering
- Sustainable Structural Systems
- Transportation Engineering

Existing

Graduate Specializations**Additional Program Information**

- The University of Waterloo does not provide funding for MEng in Civil Engineering students, and the candidates are expected to be self-supporting.

Admissions

Admission Requirements: Minimum Requirements ⓘ

- An Honours Bachelor's degree (or equivalent) with a 75% standing.
- Graduate Record Examination (GRE) score (only for those applicants who completed their degree outside of Canada and the United States).
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 2
- Type of references: academic or professional

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).

Coursework Option: Course Requirements

No Rules

Proposed

Coursework Option: Course Requirements

- Students must complete 8 one-term graduate level courses (0.50 unit weight) taken from the 500, 600 and 700 series courses (or courses acceptable for graduate credit).
- At least 4 of the 8 required courses must be taken within the Department of Civil and Environmental Engineering.
- An English for Multilingual Speakers (EMLS) technical/professional writing course for Engineers is required for all students who were not English Language Proficiency (ELP) exempt at the time of admission.
- A maximum of 2 500 level courses may be counted for credit.
- The candidate must obtain a pass in all courses credited to their program, with a minimum overall average of 70% (a grade of less than 65% in any course counts as a failure).
- At least half of the courses used for credit must normally be Faculty of Engineering courses.
- Students in the MEng in Civil Engineering program may choose to pursue a maximum of two of the following Graduate Specializations:
 1. Architectural Engineering
 2. Environmental and Water Resources Engineering
 3. Sustainable Structural Systems
 4. Transportation Engineering
- A Graduate Specialization is a University credential that is recognized on the student's transcript but not on the diploma and is intended to reflect that a student has successfully completed a set of courses that together provide an in-depth study in the area of the Graduate Specialization. A student will only obtain the Graduate Specialization on their transcript if they have completed the requirements associated with the MEng degree and the requirements associated with the Graduate Specialization.
- All MEng Graduate Specializations in Civil Engineering consist of a set of at least 4 graduate (0.50 weight) level courses and this set is comprised of a mix of compulsory and elective courses. Compulsory courses are those that are prescribed as part of the Graduate Specialization. Elective courses are those that are on a list of courses designated as electives for a given Graduate Specialization. The requirements for the Graduate Specializations are described below.

1. Graduate Specialization in Architectural Engineering

- To receive the Graduate Specialization in Architectural Engineering, students must successfully complete AE 601 Comprehensive Building Design Studio, at least 2 compulsory courses and 1 elective course. Alternatively, students have the option to complete 4 courses from the compulsory courses list. Note: If students have already successfully completed the compulsory courses, students must complete alternate courses that are approved by the Department Associate Chair, Graduate Studies.
 - Compulsory courses:
 - AE 601 Comprehensive Building Design Studio
 - Choose at least 2 from the following list:
 - ARCH 642 Modernism to the 21st Century
 - CIVE 507 Building Science and Technology
 - CIVE 630 Advanced Building Energy Analysis
 - Elective courses (choose at least 1 from the following list):
 - ARCH 684 Special Topics in Architecture
 - CIVE 505 Structural Dynamics
 - CIVE 512 Rehabilitation of Structures
 - CIVE 596 Construction Engineering
 - CIVE 601 Risk and Reliability
 - CIVE 602 Prestressed Concrete
 - CIVE 603 Reinforced Concrete Mechanics and Design
 - CIVE 604 Advanced Structural Steel Design
 - CIVE 622 Finite Element Analysis

- CIVE 700 Topics in Structural Engineering: Topic 15 Earthquake Engineering
- CIVE 700 Topics in Structural Engineering: Topic 25 Timber Design
- CIVE 700 Topics in Structural Engineering: Topic 27 Design of Structural Concrete Systems
- CIVE 700 Topics in Structural Engineering: Topic 33 Smart Structure Technology
- CIVE 700 Topics in Structural Engineering: Topic 34 Scientific Machine Learning for Engineers
- CIVE 700 Topics in Structural Engineering: Topic 35 Fire and Structures
- CIVE 700 Topics in Structural Engineering: Topic 36 Sustainable Buildings and Environment
- CIVE 700 Topics in Structural Engineering: Topic 39 Circular Engineering and the Built Environment
- CIVE 704 Bridge Design
- CIVE 710 Advanced Project Management
- CIVE 790R Master of Engineering Project
- ME 671 Fundamental Fire Dynamics
- ME 672 Advanced Fire Dynamics
- ME 673 Fire Modeling
- ME 656 Advanced HVAC Systems, Equipment and Energy Efficiency
- SYDE 532 Introduction to Complex Systems

2. Graduate Specialization in Environmental and Water Resources Engineering

- To receive the Graduate Specialization in Environmental and Water Resources Engineering, students must successfully complete at least 2 compulsory courses and 2 elective courses. Alternatively, students have the option to complete 4 courses from the compulsory courses list.
 - Compulsory courses (choose at least 2 from the following list):
 - ENVE 573 Contaminant Transport
 - ENVE 577 Engineering for Solid Waste Management
 - ENVE 585 Air Quality Engineering & Impacts
 - CIVE 671 Aquatic Chemistry
 - CIVE 680 Water Management
 - Elective courses (choose 2 from the following list):
 - CIVE 583/ENVE 583 Design of Urban Water Systems
 - CIVE 670 Physico-Chemical Processes of Water and Wastewater Treatment
 - CIVE 682 Free Surface Hydraulics
 - CIVE 770 Topics in Environmental Engineering: Topic 24 River Restoration
 - CIVE 770 Topics in Environmental Engineering: Topic 41 Atmospheric Emissions to Impacts
 - CIVE 770 Topics in Environmental Engineering: Topic 45 Environmental Fate of Organic Pollutants
 - CIVE 770 Topics in Environmental Engineering: Topic 53 Environmental and Water Resources Simulation Model Calibration
 - CIVE 771 Biological Wastewater Treatment: Theory and Practice
 - CIVE 781 Principles of Hydrologic Modelling
 - CIVE 790R Master of Engineering Project
 - EARTH 691 Special Studies for MSc Students: Topic 159 Geothermal Energy
 - EARTH 691 Special Studies for MSc Students: Topic 161 Energy Geomechanics

3. Graduate Specialization in Sustainable Structural Systems

- To receive the Graduate Specialization in Sustainable Structural Systems, students must successfully complete at least 2 compulsory course and 2 elective courses. Alternatively, students have the option to complete 4 courses from the compulsory courses list.
 - Compulsory courses (choose at least 2 from the following list):
 - CIVE 505 Structural Dynamics
 - CIVE 507 Building Science and Technology
 - CIVE 596 Construction Engineering
 - CIVE 601 Engineering Risk and Reliability
 - CIVE 622 Finite Element Analysis
 - Elective courses (choose 2 from the following list):

- CIVE 512 Rehabilitation of Structures
- CIVE 602 Prestressed Concrete
- CIVE 603 Reinforced Concrete Mechanics and Design
- CIVE 604 Advanced Structural Steel Design
- CIVE 700 Topics in Structural Engineering: Topic 15 Earthquake Engineering
- CIVE 700 Topics in Structural Engineering: Topic 21 Building Energy Analysis
- CIVE 700 Topics in Structural Engineering: Topic 25 Timber Design
- CIVE 700 Topics in Structural Engineering: Topic 27 Design of Structural Concrete Systems
- CIVE 700 Topics in Structural Engineering: Topic 33 Smart Structure Technology
- CIVE 700 Topics in Structural Engineering: Topic 34 Scientific Machine Learning for Engineers
- CIVE 700 Topics in Structural Engineering: Topic 35 Fire and Structures
- CIVE 700 Topics in Structural Engineering: Topic 36 Sustainable Buildings and Environment
- CIVE 700 Topics in Structural Engineering: Topic 39 Circular Engineering and the Built Environment
- CIVE 710 Advanced Project Management
- CIVE 790R Master of Engineering Project

4. Graduate Specialization in Transportation Engineering

- To receive the Graduate Specialization in Transportation Engineering, students must successfully complete at least 2 compulsory courses and 2 elective courses. Alternatively, students have the option to complete 4 courses from the compulsory courses list.
 - Compulsory courses (choose at least 2 from the following list):
 - CIVE 542 Pavement Structural Design
 - CIVE 640 Urban Transportation Planning Models: Principles & Applications
 - CIVE 641 Advances in Public Transportation Planning, Operations & Control
 - CIVE 642 Pavement Design and Management I
 - CIVE 643 Fundamentals of Traffic Flow Theory
 - Elective courses (choose 2 from the following list):
 - CIVE 644 Innovative and Sustainable Infrastructure Materials
 - CIVE 645 Modeling Transportation, Land Use and Spatial Economics
 - CIVE 646 Computer Applications in Transportation Engineering
 - CIVE 742 Pavement Design and Management II

Existing

Coursework Option: Course Requirements

- Students must complete 8 one-term graduate level courses (0.50 unit weight) taken from the 500, 600 and 700 series courses (or courses acceptable for graduate credit).
- At least 4 of the 8 required courses must be taken within the Department of Civil and Environmental Engineering.
- An English for Multilingual Speakers (EMLS) technical/professional writing course for Engineers is required for all students who were not English Language Proficiency (ELP) exempt at the time of admission.
- A maximum of 2 500 level courses may be counted for credit.
- The candidate must obtain a pass in all courses credited to their program, with a minimum overall average of 70% (a grade of less than 65% in any course counts as a failure).
- At least half of the courses used for credit must normally be Faculty of Engineering courses.

Coursework Option: Milestone Requirements

Notes

- Department of Civil and Environmental Engineering website
- Master of Engineering (MEng) in Civil Engineering future students program page

Workflow Information

Workflow Path ⓘ

Committee approvals

Faculty/AFIW Path(s) for Workflow ⓘ

Faculty of Engineering

Senate Workflow

Senate Regular

Dependencies

Dependent Courses and Programs/Plans

PREREQUISITES

▼ BE 605 - Project Management	View Courses >
▼ BE 603 - Operations and Supply Chain Management	View Courses >
▼ BE 602 - Data Analysis and Management	View Courses >
▼ BE 606 - Entrepreneurship and Innovation	View Courses >
▼ BE 601 - Introduction to Financial and Managerial Accounting	View Courses >
▼ BE 604 - Marketing Management	View Courses >
▼ BE 600 - Management and Leadership	View Courses >
▼ BE 610 - Special Topics in Business and Entrepreneurship	View Courses >

MEng in Civil Engineering-Co-op Master of Engineering (MEng) in Civil Engineering - Co- operative Program (direct entry)

Under Review | Spring 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Changes

- Coursework Option: Course Requirements
- Effective Term and Year
- Admin Notes
- Graduate Specializations

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Spring 2025

Existing

Effective Term and Year ⓘ

Fall 2024

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

09/19/2024

Quality Assurance Designation ⓘ

Major Modification

Major Modification Categories

Add/re-name a graduate research field, graduate specialization, honours, option, specialization, undergraduate diploma, minor

Is there an impact to existing students? ⓘ

Yes

Impact on Existing Students ⓘ

Current MEng students who satisfy the degree requirements of one the new Graduate Specializations may obtain the Graduate Specialization by completing/submitting a program change form prior to degree completion.

Is the credential name changing?

No

Graduate Co-operative Requirements

No

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

Updating the MEng degree requirements to include four new Graduate Specializations: These new Graduate Specializations will add structure to the MEng programs by allowing students to specialize in certain areas of study and receive recognition for that specialization from the Department which is valued when searching for a job in industry. These changes follow the recommendations of the external reviewers of the 2023 Civil and Environmental Engineering (CEE) Institutional Quality Assurance Process (IQAP) cyclical review cyclical review.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Civil and Environmental Engineering

Graduate Field of Study

Civil and Environmental Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Master of Engineering (MEng) in Civil Engineering - Co-operative Program (direct entry)

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Coursework

Program Types**Admit Term(s)**

Co-operative

Fall
Winter
Spring

Delivery Mode

On-campus

Delivery Mode Information

Length of Program

- Full-time: 4-5 terms (16-20 months)

Registration Option(s)

Full-time

Registration Options Information

Graduate Research Fields

Proposed

Graduate Specializations

- Architectural Engineering
- Environmental and Water Resources Engineering
- Sustainable Structural Systems
- Transportation Engineering

Existing

Graduate Specializations

Additional Program Information

- The University of Waterloo does not provide funding for MEng in Civil Engineering students, and the candidates are expected to be self-supporting.

Admissions

Admission Requirements: Minimum Requirements ⓘ

- An Honours Bachelor's degree (or equivalent) with a 75% standing.
- Graduate Record Examination (GRE) score (only for those applicants who completed their degree outside of Canada and the United States).
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 2
- Type of references: academic or professional

Requirements Information

Graduate Degree Requirements

- Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).
- The MEng in Civil Engineering - Co-operative Program will enable students to combine graduate studies with work experience.
- The program includes completion of 1-2 required work terms. The work term(s) typically takes place in term 3 (or terms 3 and 4). The work term(s) must meet Co-operative and Experiential Education (CEE) standard work term requirements and Departmental requirements. Students should apply to jobs related to their program of study. Note: the program must start and end on an academic term. Students in the program are encouraged to complete WIL 601 Career Foundations for Work-Integrated Learning in the academic term prior to the first work term.

Coursework Option: Course Requirements

No Rules

Proposed

Coursework Option: Course Requirements

- Students must complete 8 one-term graduate level courses (0.50 unit weight) taken from the 500, 600 and 700 series courses (or courses acceptable for graduate credit).
- At least 4 of the 8 required courses must be taken within the Department of Civil and Environmental Engineering.
- An English for Multilingual Speakers (EMLS) technical/professional writing course for Engineers is required for all students who were not English Language Proficiency (ELP) exempt at the time of admission.
- A maximum of 2 500 level courses may be counted for credit.
- The candidate must obtain a pass in all courses credited to their program, with a minimum overall average of 70% (a grade of less than 65% in any course counts as a failure).
- At least half of the courses used for credit must normally be Faculty of Engineering courses.
- Students in the MEng in Civil Engineering program may choose to pursue a maximum of two of the following Graduate Specializations:
 1. Architectural Engineering
 2. Environmental and Water Resources Engineering
 3. Sustainable Structural Systems
 4. Transportation Engineering
- A Graduate Specialization is a University credential that is recognized on the student's transcript but not on the diploma and is intended to reflect that a student has successfully completed a set of courses that together provide an in-depth study in the area of the Graduate Specialization. A student will only obtain the Graduate Specialization on their transcript if they have completed the requirements associated with the MEng degree and the requirements associated with the Graduate Specialization.
- All MEng Graduate Specializations in Civil Engineering consist of a set of at least 4 graduate (0.50 weight) level courses and this set is comprised of a mix of compulsory and elective courses. Compulsory courses are those that are prescribed as part of the Graduate Specialization. Elective courses are those that are on a list of courses designated as electives for a given Graduate Specialization. The requirements for the Graduate Specializations are described below.

1. Graduate Specialization in Architectural Engineering

- To receive the Graduate Specialization in Architectural Engineering, students must successfully complete AE 601 Comprehensive Building Design Studio, at least 2 compulsory courses and 1 elective course. Alternatively, students have the option to complete 4 courses from the compulsory courses list. Note: If students have already successfully completed the compulsory courses, students must complete alternate courses that are approved by the Department Associate Chair, Graduate Studies.
 - Compulsory courses:
 - AE 601 Comprehensive Building Design Studio
 - Choose at least 2 from the following list:
 - ARCH 642 Modernism to the 21st Century
 - CIVE 507 Building Science and Technology
 - CIVE 630 Advanced Building Energy Analysis
 - Elective courses (choose at least 1 from the following list):
 - ARCH 684 Special Topics in Architecture
 - CIVE 505 Structural Dynamics
 - CIVE 512 Rehabilitation of Structures
 - CIVE 596 Construction Engineering
 - CIVE 601 Risk and Reliability
 - CIVE 602 Prestressed Concrete
 - CIVE 603 Reinforced Concrete Mechanics and Design
 - CIVE 604 Advanced Structural Steel Design
 - CIVE 622 Finite Element Analysis

- CIVE 700 Topics in Structural Engineering: Topic 15 Earthquake Engineering
- CIVE 700 Topics in Structural Engineering: Topic 25 Timber Design
- CIVE 700 Topics in Structural Engineering: Topic 27 Design of Structural Concrete Systems
- CIVE 700 Topics in Structural Engineering: Topic 33 Smart Structure Technology
- CIVE 700 Topics in Structural Engineering: Topic 34 Scientific Machine Learning for Engineers
- CIVE 700 Topics in Structural Engineering: Topic 35 Fire and Structures
- CIVE 700 Topics in Structural Engineering: Topic 36 Sustainable Buildings and Environment
- CIVE 700 Topics in Structural Engineering: Topic 39 Circular Engineering and the Built Environment
- CIVE 704 Bridge Design
- CIVE 710 Advanced Project Management
- CIVE 790R Master of Engineering Project
- ME 671 Fundamental Fire Dynamics
- ME 672 Advanced Fire Dynamics
- ME 673 Fire Modeling
- ME 656 Advanced HVAC Systems, Equipment and Energy Efficiency
- SYDE 532 Introduction to Complex Systems

2. Graduate Specialization in Environmental and Water Resources Engineering

- To receive the Graduate Specialization in Environmental and Water Resources Engineering, students must successfully complete at least 2 compulsory courses and 2 elective courses. Alternatively, students have the option to complete 4 courses from the compulsory courses list.
 - Compulsory courses (choose at least 2 from the following list):
 - ENVE 573 Contaminant Transport
 - ENVE 577 Engineering for Solid Waste Management
 - ENVE 585 Air Quality Engineering & Impacts
 - CIVE 671 Aquatic Chemistry
 - CIVE 680 Water Management
 - Elective courses (choose 2 from the following list):
 - CIVE 583/ENVE 583 Design of Urban Water Systems
 - CIVE 670 Physico-Chemical Processes of Water and Wastewater Treatment
 - CIVE 682 Free Surface Hydraulics
 - CIVE 770 Topics in Environmental Engineering: Topic 24 River Restoration
 - CIVE 770 Topics in Environmental Engineering: Topic 41 Atmospheric Emissions to Impacts
 - CIVE 770 Topics in Environmental Engineering: Topic 45 Environmental Fate of Organic Pollutants
 - CIVE 770 Topics in Environmental Engineering: Topic 53 Environmental and Water Resources Simulation Model Calibration
 - CIVE 771 Biological Wastewater Treatment: Theory and Practice
 - CIVE 781 Principles of Hydrologic Modelling
 - CIVE 790R Master of Engineering Project
 - EARTH 691 Special Studies for MSc Students: Topic 159 Geothermal Energy
 - EARTH 691 Special Studies for MSc Students: Topic 161 Energy Geomechanics

3. Graduate Specialization in Sustainable Structural Systems

- To receive the Graduate Specialization in Sustainable Structural Systems, students must successfully complete at least 2 compulsory course and 2 elective courses. Alternatively, students have the option to complete 4 courses from the compulsory courses list.
 - Compulsory courses (choose at least 2 from the following list):
 - CIVE 505 Structural Dynamics
 - CIVE 507 Building Science and Technology
 - CIVE 596 Construction Engineering
 - CIVE 601 Engineering Risk and Reliability
 - CIVE 622 Finite Element Analysis
 - Elective courses (choose 2 from the following list):

- CIVE 512 Rehabilitation of Structures
- CIVE 602 Prestressed Concrete
- CIVE 603 Reinforced Concrete Mechanics and Design
- CIVE 604 Advanced Structural Steel Design
- CIVE 700 Topics in Structural Engineering: Topic 15 Earthquake Engineering
- CIVE 700 Topics in Structural Engineering: Topic 21 Building Energy Analysis
- CIVE 700 Topics in Structural Engineering: Topic 25 Timber Design
- CIVE 700 Topics in Structural Engineering: Topic 27 Design of Structural Concrete Systems
- CIVE 700 Topics in Structural Engineering: Topic 33 Smart Structure Technology
- CIVE 700 Topics in Structural Engineering: Topic 34 Scientific Machine Learning for Engineers
- CIVE 700 Topics in Structural Engineering: Topic 35 Fire and Structures
- CIVE 700 Topics in Structural Engineering: Topic 36 Sustainable Buildings and Environment
- CIVE 700 Topics in Structural Engineering: Topic 39 Circular Engineering and the Built Environment
- CIVE 710 Advanced Project Management
- CIVE 790R Master of Engineering Project

4. Graduate Specialization in Transportation Engineering

- To receive the Graduate Specialization in Transportation Engineering, students must successfully complete at least 2 compulsory courses and 2 elective courses. Alternatively, students have the option to complete 4 courses from the compulsory courses list.
 - Compulsory courses (choose at least 2 from the following list):
 - CIVE 542 Pavement Structural Design
 - CIVE 640 Urban Transportation Planning Models: Principles & Applications
 - CIVE 641 Advances in Public Transportation Planning, Operations & Control
 - CIVE 642 Pavement Design and Management I
 - CIVE 643 Fundamentals of Traffic Flow Theory
 - Elective courses (choose 2 from the following list):
 - CIVE 644 Innovative and Sustainable Infrastructure Materials
 - CIVE 645 Modeling Transportation, Land Use and Spatial Economics
 - CIVE 646 Computer Applications in Transportation Engineering
 - CIVE 742 Pavement Design and Management II

Existing

Coursework Option: Course Requirements

- Students must complete 8 one-term graduate level courses (0.50 unit weight) taken from the 500, 600 and 700 series courses (or courses acceptable for graduate credit).
- At least 4 of the 8 required courses must be taken within the Department of Civil and Environmental Engineering.
- An English for Multilingual Speakers (EMLS) technical/professional writing course for Engineers is required for all students who were not English Language Proficiency (ELP) exempt at the time of admission.
- A maximum of 2 500 level courses may be counted for credit.
- The candidate must obtain a pass in all courses credited to their program, with a minimum overall average of 70% (a grade of less than 65% in any course counts as a failure).
- At least half of the courses used for credit must normally be Faculty of Engineering courses.

Coursework Option: Milestone Requirements

Graduate Studies Work Report

- Students must complete one or two work-term experiences. For each work experience, a work report must be submitted to the Department for review to earn credit for the work report.
- Students are responsible for following the roles and responsibilities of Co-operative and Experiential Education (CEE).

Notes ⓘ

- Department of Civil and Environmental Engineering website

Workflow Information

Workflow Path ⓘ

Committee approvals

Faculty/AFIW Path(s) for Workflow ⓘ

Faculty of Engineering

Senate Workflow

Senate Regular

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

MEng in Electrical & Computer Engineering **Master of Engineering (MEng) in Electrical and Computer Engineering**

Under Review | Spring 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Changes

- Coursework Option: Course Requirements
- Graduate Specializations
- Effective Term and Year
- Admin Notes

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Spring 2025

Existing

Effective Term and Year ⓘ

Winter 2024

Proposal Details

Proposal Type

 ⓘ

Change

Academic Unit Approval

04/25/2024

Quality Assurance Designation

 ⓘ

Major Modification

Major Modification Categories

Add/re-name a graduate research field, graduate specialization, honours, option, specialization, undergraduate diploma, minor

Is there an impact to existing students?

 ⓘ

Yes

Impact on Existing Students ⓘ

Students currently registered in the program will be able to obtain the new Graduate Specialization designation at the time of degree completion if they fulfill the applicable degree requirements.

Is the credential name changing?

No

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

Updating the degree requirements to include a new Graduate Specialization in Quantum Engineering: The new graduate specialization will provide an opportunity for our professional master's students to specialize in the emerging area of quantum engineering. Graduate specializations also help direct our professional master's students in their course selections. The field of quantum engineering has had demand at the undergraduate level as well as in our research based programs and this specialization will now allow our professional master's students to pursue this engineering field as well.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Electrical and Computer Engineering

Graduate Field of Study

Electrical and Computer Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Master of Engineering (MEng) in Electrical and Computer Engineering

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Coursework

Program Types**Admit Term(s)**

Fall
Winter
Spring

Delivery Mode

On-campus

Delivery Mode Information**Length of Program**

- Full-time: 4 terms (16 months)
- Part-time: 8 terms (32 months)

Registration Option(s)

Full-time
Part-time

Registration Options Information**Graduate Research Fields**

Proposed

Graduate Specializations

- Artificial Intelligence and Machine Learning
- Biomedical Engineering
- Business Leadership
- Computer Networking and Security
- Nanoelectronic Circuits and Systems
- Nanoelectronic Devices and Materials
- Quantum Engineering
- Software
- Sustainable Energy

Existing

Graduate Specializations

- Artificial Intelligence and Machine Learning
- Biomedical Engineering
- Business Leadership
- Computer Networking and Security
- Nanoelectronic Circuits and Systems
- Nanoelectronic Devices and Materials
- Software
- Sustainable Energy

Additional Program Information

Admissions

Admission Requirements: Minimum Requirements ⓘ

- The Department of Electrical and Computer Engineering requires either (i) a 75% overall standing in the last two years, or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent or (ii) a 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent, as the minimum requirement for admission to a Master's program for applicants educated at a Canadian institution. A 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent is the minimum requirement for admission to a Master's program for applicants educated outside of Canada.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 2
- Type of references: at least 1 academic

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).

Coursework Option: Course Requirements

No Rules

Proposed

Coursework Option: Course Requirements

- Students must successfully complete 8 one-term courses (0.50 unit weight) acceptable for credit by the Department.
- Students may register for any ECE course at the 600 or 700 levels.
- A minimum of 5 courses must be taken from within the ECE Department. A maximum of 3 courses may be taken from outside the Department but must be from the faculties of Engineering, Mathematics and Science. Students opting for the Graduate Specialization in Business Leadership are allowed to take a maximum of 4 courses from outside ECE, but from the specified list of BE/BET courses, detailed below.
- A minimum grade of 65% in each of the 8 courses and a minimum cumulative average of 70% are required to remain in the program. Students who receive a grade of less than 65% may be permitted to take a maximum of 2 additional courses to meet the minimum averages for the degree requirements (outlined above).
- Students wishing to complete a Graduate Specialization as part of their MEng program should consult the list of required courses for each Graduate Specialization before selecting courses, as the number of minimum required courses may differ.
- Students in the MEng in Electrical and Computer Engineering program may choose to pursue one of the following Graduate Specializations:
 1. Artificial Intelligence and Machine Learning
 2. Biomedical Engineering
 3. Business Leadership
 4. Computer Networking and Security
 5. Nanoelectronic Circuits and Systems
 6. Nanoelectronic Devices and Materials
 7. Quantum Engineering
 8. Software
 9. Sustainable Energy
- A Graduate Specialization is a University credential that is recognized on the student's transcript but not on the diploma and is intended to reflect that a student has successfully completed a set of courses that together provide an in-depth study in the area of the Graduate Specialization. A student will only obtain the Graduate Specialization on their transcript if they have completed the requirements associated with the MEng degree and the requirements associated with the Graduate Specialization.
- All MEng Graduate Specializations in Electrical and Computer Engineering consist of a set of at least 4 graduate (0.50 weight) level courses and this set is comprised of a mix of compulsory and elective courses. Compulsory courses are those that are prescribed as part of the Graduate Specialization. Elective courses are those that are on a list of courses designated as electives for a given Graduate Specialization. The requirements for each of the Graduate Specializations are described below.
- Note: Not all elective courses for any given Graduate Specialization are guaranteed to be offered each year. Students are encouraged to take elective courses when they are offered and should plan accordingly.
- Students will be able to complete the Business Leadership Graduate Specialization along with 1 other ECE Graduate Specialization, noting the following:
 - Each course will only be counted towards one Graduate Specialization and the MEng degree.
 - The number of required courses for the MEng degree will increase from 8 to 9 or 10 depending on the requirements associated with the Graduate Specializations.
- Students must consult with the ECE Masters Coordinator to finalize their plan of study and to ensure that they are able to meet the degree and Graduate Specialization requirements within the program time limits.

1. Graduate Specialization in Artificial Intelligence and Machine Learning

- To receive the Graduate Specialization in Artificial Intelligence and Machine Learning, students must successfully complete 2 compulsory courses and 3 elective courses:
 - Compulsory courses:
 - ECE 657 Tools of Intelligent Systems Design

- ECE 657A Data and Knowledge Modelling and Analysis
- Elective courses (choose 3 from the following list):
 - ECE 602 Introduction to Optimization
 - ECE 603 Statistical Signal Processing
 - ECE 606 Algorithm Design and Analysis
 - ECE 607 Fundamentals of Ultrasonics
 - ECE 613 Image Processing and Visual Communication
 - ECE 659 Intelligent Sensors and Sensor Networks
 - ECE 700 Topic-7 Game Theory with Engineering Applications
 - ECE 750 Topic-32 Biology and Computation
 - ECE 750 Topic-33 Embodied Intelligence
 - ECE 750 Topic-35 Social Robotics
 - MSCI 718 Statistical Methods for Data Analytics

2. Graduate Specialization in Biomedical Engineering

- To receive the Graduate Specialization in Biomedical Engineering, students must successfully complete 3 compulsory courses and 2 elective courses:
 - Compulsory courses:
 - ECE 601 Foundations of Biology in Engineering
 - ECE 608 Quantitative Methods in Biomedical Engineering
 - ECE 609 Engineering Analysis of Living Cells
 - Elective courses (choose 2 from the following list):
 - ECE 607 Fundamentals of Ultrasonics
 - ECE 613 Image Processing and Visual Communications
 - ECE 675 Radiation and Propagation of Electromagnetic Fields
 - ECE 750 Topic-32 Biology and Computation
 - ECE 750 Topic-33 Embodied Intelligence
 - SYDE 677 Medical Imaging

3. Graduate Specialization in Business Leadership

- To receive the Graduate Specialization in Business Leadership, students must successfully complete 2 compulsory courses and 2 elective courses:
 - Compulsory courses:
 - BE 600 Management and Leadership
 - BE 601 Introduction to Financial and Managerial Accounting
 - Elective courses (choose 2 from the following list): Note: not all elective courses may be offered each year.
 - BE 602 Data Analysis and Management
 - BE 603 Operations and Supply Chain Management
 - BE 604 Marketing Management
 - BE 605 Project Management
 - BE 606 Entrepreneurship and Innovation
 - BE 610 Special Topics in Business and Entrepreneurship
 - BE 660 Negotiations
 - BE 680 Consulting
 - ECE 657A Data & Knowledge Modelling & Analysis
 - ECE 699 Master of Engineering Project
 - Note: A maximum of 4 courses from outside the Department of ECE is permitted to satisfy both the MEng in ECE and Graduate Specialization in Business Leadership requirements.

4. Graduate Specialization in Computer Networking and Security

- To receive the Graduate Specialization in Computer Networking and Security, students must successfully complete 3 compulsory courses and 2 elective courses:
 - Compulsory courses:

- ECE 610 Broadband Communication Networks
- ECE 628 Computer Network Security
- ECE 655 Protocols, Software, and Issues in Mobile Systems
- Elective courses (choose 2 from the following list):
 - ECE 606 Algorithm Design and Analysis
 - ECE 611 Digital Communications
 - ECE 612 Information Theory
 - ECE 656 Database Systems
 - ECE 657 Tools of Intelligent Systems Design
 - ECE 659 Intelligent Sensors & Wireless Sensor Network
 - ECE 715 Wireless Communication Networks
 - ECE 716 Communication Security

5. Graduate Specialization in Nanoelectronic Circuits and Systems

- To receive the Graduate Specialization in Nanoelectronic Circuits and Systems, students must successfully complete 2 compulsory project courses, and 5 elective courses:
- Note: Students are required to complete the 5 elective courses prior to enrolling in the ECE 699A project course.
- The Graduate Specialization in Nanoelectronic Circuits and Systems is primarily designed for students starting in the Fall term. Therefore, if a student starts in the Spring or Winter term the Graduate Specialization may not be guaranteed, due to the sequencing of elective courses.
 - Compulsory courses:
 - ECE 699A Master of Engineering Project 1
 - ECE 699B Master of Engineering Project 2
 - Elective courses: Choose 5 total between Set-A and Set-B. A minimum of 2 of the 5 electives must be taken from Set-A.
 - Set-A:
 - ECE 621 Computer Organization
 - ECE 627 Register-transfer-level Digital Systems
 - ECE 630 Physics & Models Semiconductor Devices
 - ECE 631 Microelectronic Processing Technology
 - ECE 636 Advanced Analog Integrated Circuits
 - ECE 637 Digital Integrated Circuits
 - ECE 642 Radio Frequency IC Design
 - ECE 671 Microwave & RF Engineering
 - Set-B:
 - ECE 606 Algorithm Design and Analysis
 - ECE 638 CMOS Sensor Integrated Circuits
 - ECE 730 Topic-9 VLSI Quality, Reliability and Yield Engineering
 - ECE 730 Topic-16 Embedded Semiconductor RAM
 - ECE 730 Topic-30 Advanced VLSI Devices
 - ECE 738 VLSI Circuits for Wireless Communication
 - ECE 740 Topic-3 CMOS Data Converters
 - ECE 770 Topic-22 Radio and Wireless Systems

6. Graduate Specialization in Nanoelectronic Devices and Materials

- To receive the Graduate Specialization in Nanoelectronic Devices and Materials, students must successfully complete 2 compulsory courses and 3 elective courses:
 - Compulsory courses:
 - ECE 630 Physics and Models of Semiconductor Devices
 - ECE 631 Microelectronic Processing Technology
 - Elective courses (choose 3 from the following list):
 - ECE 632 Photovoltaic Energy Conversion
 - ECE 633 Nanoelectronics

- ECE 634 Organic Electronics
- ECE 635 Fabrication in the Nanoscale: Technology and Applications
- ECE 672 Optoelectronic Devices
- NANO 600 Introduction to Nanotechnology

7. Graduate Specialization in Quantum Engineering

- To receive the Graduate Specialization in Quantum Engineering, students must successfully complete 2 compulsory courses and 3 elective courses:
 - Compulsory courses:
 - ECE 676 Quantum Information Processing Devices
 - ECE 677 Applied Quantum Mechanics
 - Elective courses (choose 3 from the following list):
 - ECE 630 Physics and Models of Semiconductor Devices
 - ECE 633 Nanoelectronics
 - ECE 671 Microwave and RF Engineering
 - ECE 676B Experimental Quantum Engineering
 - ECE 676C Programming of Quantum Computing Algorithms
 - ECE 676D Superconducting Quantum Circuits
 - ECE 676E Lab on Low-Temperature Quantum Engineering
 - QIC 710 Quantum Information Processing
 - QIC 880 Nanoelectronics for Quantum Information Processing

8. Graduate Specialization in Software

- To receive the Graduate Specialization in Software, students must successfully complete 3 compulsory courses and 2 elective courses:
 - Compulsory courses:
 - ECE 650 Methods and Tools for Software Engineering
 - ECE 651 Foundations of Software Engineering
 - ECE 653 Software Testing, Quality Assurance and Maintenance
 - Elective courses (choose 2 from the following list):
 - ECE 606 Algorithm Design and Analysis
 - ECE 655 Protocols, Software, Issues in Mobile Systems
 - ECE 656 Database Systems
 - ECE 657 Tools of Intelligent Systems Design
 - ECE 658 Component Based Software

9. Graduate Specialization in Sustainable Energy

- To receive the Graduate Specialization in Sustainable Energy, students must successfully complete 1 compulsory course and 4 elective courses:
 - Compulsory course:
 - ECE 660 Operation and Control of Future Integrated Energy Systems
 - Elective courses (choose 4 from the following list):
 - ECE 632 Photovoltaic Energy Conversion
 - ECE 662 Power System Analysis and Control
 - ECE 663 Energy Processing
 - ECE 665 High Voltage Engineering Applications
 - ECE 666 Power Systems Operation
 - ECE 668 Distribution System Engineering
 - ECE 669 Dielectric Materials
 - ECE 761 HVDC and FACTS
 - ECE 762 Power System Components and Modelling
 - ECE 763 Sustainable Distributed Power Generation
 - ECE 765 Power System Protection and Relaying

- ECE 768 Power System Quality

Existing

Coursework Option: Course Requirements

- Students must successfully complete 8 one-term courses (0.50 unit weight) acceptable for credit by the Department.
- Students may register for any ECE course at the 600 or 700 levels.
- A minimum of 5 courses must be taken from within the ECE Department. A maximum of 3 courses may be taken from outside the Department but must be from the faculties of Engineering, Mathematics and Science. Students opting for the Graduate Specialization in Business Leadership are allowed to take a maximum of 4 courses from outside ECE, but from the specified list of BE/BET courses, detailed below.
- A minimum grade of 65% in each of the 8 courses and a minimum cumulative average of 70% are required to remain in the program. Students who receive a grade of less than 65% may be permitted to take a maximum of 2 additional courses to meet the minimum averages for the degree requirements (outlined above).
- Students wishing to complete a Graduate Specialization as part of their MEng program should consult the list of required courses for each Graduate Specialization before selecting courses, as the number of minimum required courses may differ.
- Students in the MEng in Electrical and Computer Engineering program may choose to pursue one of the following Graduate Specializations:
 1. Artificial Intelligence and Machine Learning
 2. Biomedical Engineering
 3. Business Leadership
 4. Computer Networking and Security
 5. Nanoelectronic Circuits and Systems
 6. Nanoelectronic Devices and Materials
 7. Software
 8. Sustainable Energy
- A Graduate Specialization is a University credential that is recognized on the student's transcript but not on the diploma and is intended to reflect that a student has successfully completed a set of courses that together provide an in-depth study in the area of the Graduate Specialization. A student will only obtain the Graduate Specialization on their transcript if they have completed the requirements associated with the MEng degree and the requirements associated with the Graduate Specialization.
- All MEng Graduate Specializations in Electrical and Computer Engineering consist of a set of at least 4 graduate (0.50 weight) level courses and this set is comprised of a mix of compulsory and elective courses. Compulsory courses are those that are prescribed as part of the Graduate Specialization. Elective courses are those that are on a list of courses designated as electives for a given Graduate Specialization. The requirements for each of the Graduate Specializations are described below.
- Note: Not all elective courses for any given Graduate Specialization are guaranteed to be offered each year. Students are encouraged to take elective courses when they are offered and should plan accordingly.
- Students will be able to complete the Business Leadership Graduate Specialization along with 1 other ECE Graduate Specialization, noting the following:
 - Each course will only be counted towards one Graduate Specialization and the MEng degree.
 - The number of required courses for the MEng degree will increase from 8 to 9 or 10 depending on the requirements associated with the Graduate Specializations.
- Students must consult with the ECE Masters Coordinator to finalize their plan of study and to ensure that they are able to meet the degree and Graduate Specialization requirements within the program time limits.

1. Graduate Specialization in Artificial Intelligence and Machine Learning

- To receive the Graduate Specialization in Artificial Intelligence and Machine Learning, students must successfully complete 2 compulsory courses and 3 elective courses:
 - Compulsory courses:
 - ECE 657 Tools of Intelligent Systems Design
 - ECE 657A Data and Knowledge Modelling and Analysis
 - Elective courses (choose 3 from the following list):
 - ECE 602 Introduction to Optimization

- ECE 603 Statistical Signal Processing
- ECE 606 Algorithm Design and Analysis
- ECE 607 Fundamentals of Ultrasonics
- ECE 613 Image Processing and Visual Communication
- ECE 659 Intelligent Sensors and Sensor Networks
- ECE 700 Topic-7 Game Theory with Engineering Applications
- ECE 750 Topic-32 Biology and Computation
- ECE 750 Topic-33 Embodied Intelligence
- ECE 750 Topic-35 Social Robotics
- MSCI 718 Statistical Methods for Data Analytics

2. Graduate Specialization in Biomedical Engineering

- To receive the Graduate Specialization in Biomedical Engineering, students must successfully complete 3 compulsory courses and 2 elective courses:
 - Compulsory courses:
 - ECE 601 Foundations of Biology in Engineering
 - ECE 608 Quantitative Methods in Biomedical Engineering
 - ECE 609 Engineering Analysis of Living Cells
 - Elective courses (choose 2 from the following list):
 - ECE 607 Fundamentals of Ultrasonics
 - ECE 613 Image Processing and Visual Communications
 - ECE 675 Radiation and Propagation of Electromagnetic Fields
 - ECE 750 Topic-32 Biology and Computation
 - ECE 750 Topic-33 Embodied Intelligence
 - SYDE 677 Medical Imaging

3. Graduate Specialization in Business Leadership

- To receive the Graduate Specialization in Business Leadership, students must successfully complete 2 compulsory courses and 2 elective courses:
 - Compulsory courses:
 - BE 600 Management and Leadership
 - BE 601 Introduction to Financial and Managerial Accounting
 - Elective courses (choose 2 from the following list): Note: not all elective courses may be offered each year.
 - BE 602 Data Analysis and Management
 - BE 603 Operations and Supply Chain Management
 - BE 604 Marketing Management
 - BE 605 Project Management
 - BE 606 Entrepreneurship and Innovation
 - BE 610 Special Topics in Business and Entrepreneurship
 - BE 660 Negotiations
 - BE 680 Consulting
 - ECE 657A Data & Knowledge Modelling & Analysis
 - ECE 699 Master of Engineering Project
 - Note: A maximum of 4 courses from outside the Department of ECE is permitted to satisfy both the MEng in ECE and Graduate Specialization in Business Leadership requirements.

4. Graduate Specialization in Computer Networking and Security

- To receive the Graduate Specialization in Computer Networking and Security, students must successfully complete 3 compulsory courses and 2 elective courses:
 - Compulsory courses:
 - ECE 610 Broadband Communication Networks
 - ECE 628 Computer Network Security
 - ECE 655 Protocols, Software, and Issues in Mobile Systems

- o Elective courses (choose 2 from the following list):
 - ECE 606 Algorithm Design and Analysis
 - ECE 611 Digital Communications
 - ECE 612 Information Theory
 - ECE 656 Database Systems
 - ECE 657 Tools of Intelligent Systems Design
 - ECE 659 Intelligent Sensors & Wireless Sensor Network
 - ECE 715 Wireless Communication Networks
 - ECE 716 Communication Security

5. Graduate Specialization in Nanoelectronic Circuits and Systems

- To receive the Graduate Specialization in Nanoelectronic Circuits and Systems, students must successfully complete 2 compulsory project courses, and 5 elective courses:
- Note: Students are required to complete the 5 elective courses prior to enrolling in the ECE 699A project course.
- The Graduate Specialization in Nanoelectronic Circuits and Systems is primarily designed for students starting in the Fall term. Therefore, if a student starts in the Spring or Winter term the Graduate Specialization may not be guaranteed, due to the sequencing of elective courses.
 - o Compulsory courses:
 - ECE 699A Master of Engineering Project 1
 - ECE 699B Master of Engineering Project 2
 - o Elective courses: Choose 5 total between Set-A and Set-B. A minimum of 2 of the 5 electives must be taken from Set-A.
 - Set-A:
 - ECE 621 Computer Organization
 - ECE 627 Register-transfer-level Digital Systems
 - ECE 630 Physics & Models Semiconductor Devices
 - ECE 631 Microelectronic Processing Technology
 - ECE 636 Advanced Analog Integrated Circuits
 - ECE 637 Digital Integrated Circuits
 - ECE 642 Radio Frequency IC Design
 - ECE 671 Microwave & RF Engineering
 - Set-B:
 - ECE 606 Algorithm Design and Analysis
 - ECE 638 CMOS Sensor Integrated Circuits
 - ECE 730 Topic-9 VLSI Quality, Reliability and Yield Engineering
 - ECE 730 Topic-16 Embedded Semiconductor RAM
 - ECE 730 Topic-30 Advanced VLSI Devices
 - ECE 738 VLSI Circuits for Wireless Communication
 - ECE 740 Topic-3 CMOS Data Converters
 - ECE 770 Topic-22 Radio and Wireless Systems

6. Graduate Specialization in Nanoelectronic Devices and Materials

- To receive the Graduate Specialization in Nanoelectronic Devices and Materials, students must successfully complete 2 compulsory courses and 3 elective courses:
 - o Compulsory courses:
 - ECE 630 Physics and Models of Semiconductor Devices
 - ECE 631 Microelectronic Processing Technology
 - o Elective courses (choose 3 from the following list):
 - ECE 632 Photovoltaic Energy Conversion
 - ECE 633 Nanoelectronics
 - ECE 634 Organic Electronics
 - ECE 635 Fabrication in the Nanoscale: Technology and Applications
 - ECE 672 Optoelectronic Devices

- NANO 600 Introduction to Nanotechnology

7. Graduate Specialization in Software

- To receive the Graduate Specialization in Software, students must successfully complete 3 compulsory courses and 2 elective courses:
 - Compulsory courses:
 - ECE 650 Methods and Tools for Software Engineering
 - ECE 651 Foundations of Software Engineering
 - ECE 653 Software Testing, Quality Assurance and Maintenance
 - Elective courses (choose 2 from the following list):
 - ECE 606 Algorithm Design and Analysis
 - ECE 655 Protocols, Software, Issues in Mobile Systems
 - ECE 656 Database Systems
 - ECE 657 Tools of Intelligent Systems Design
 - ECE 658 Component Based Software

8. Graduate Specialization in Sustainable Energy

- To receive the Graduate Specialization in Sustainable Energy, students must successfully complete 1 compulsory course and 4 elective courses:
 - Compulsory course:
 - ECE 660 Operation and Control of Future Integrated Energy Systems
 - Elective courses (choose 4 from the following list):
 - ECE 632 Photovoltaic Energy Conversion
 - ECE 662 Power System Analysis and Control
 - ECE 663 Energy Processing
 - ECE 665 High Voltage Engineering Applications
 - ECE 666 Power Systems Operation
 - ECE 668 Distribution System Engineering
 - ECE 669 Dielectric Materials
 - ECE 761 HVDC and FACTS
 - ECE 762 Power System Components and Modelling
 - ECE 763 Sustainable Distributed Power Generation
 - ECE 765 Power System Protection and Relaying
 - ECE 768 Power System Quality

Coursework Option: Milestone Requirements

Notes ⓘ

- Department of Electrical and Computer Engineering website
- Master of Engineering (MEng) in Electrical and Computer Engineering future students program page

Workflow Information

Workflow Path ⓘ

Committee approvals

Faculty/AFIW Path(s) for Workflow ⓘ

Faculty of Engineering

Senate Workflow

Senate Regular

Dependencies

Dependent Courses and Programs/Plans

PREREQUISITES

▼ BE 605 - Project Management	View Courses >
▼ BE 603 - Operations and Supply Chain Management	View Courses >
▼ BE 602 - Data Analysis and Management	View Courses >
▼ BE 606 - Entrepreneurship and Innovation	View Courses >
▼ BE 601 - Introduction to Financial and Managerial Accounting	View Courses >
▼ BE 604 - Marketing Management	View Courses >
▼ BE 600 - Management and Leadership	View Courses >
▼ BE 610 - Special Topics in Business and Entrepreneurship	View Courses >

MEng in Electrical & Computer Engineering-Co-op Master of Engineering (MEng) in Electrical and Computer Engineering - Co-operative Program (direct entry)

Under Review | Spring 2025

Proposal Information

Status

Active

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

expand ▲

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

Changes

- Coursework Option: Course Requirements
- Graduate Specializations
- participants
- Effective Term and Year
- Admin Notes

Effective Date and Career

Career

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Spring 2025

Existing

Effective Term and Year ⓘ

Winter 2024

Proposal Details

Proposal Type

 ⓘ

Change

Academic Unit Approval

04/25/2024

Quality Assurance Designation

 ⓘ

Major Modification

Major Modification Categories

Add/re-name a graduate research field, graduate specialization, honours, option, specialization, undergraduate diploma, minor

Is there an impact to existing students? ⓘ

Yes

Impact on Existing Students ⓘ

Students currently registered in the program will be able to obtain the new Graduate Specialization designation at the time of degree completion if they fulfill the applicable degree requirements.

Is the credential name changing?

No

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

Updating the degree requirements to include a new Graduate Specialization in Quantum Engineering: The new graduate specialization will provide an opportunity for our professional master's students to specialize in the emerging area of quantum engineering. Graduate specializations also help direct our professional master's students in their course selections. The field of quantum engineering has had demand at the undergraduate level as well as in our research based programs and this specialization will now allow our professional master's students to pursue this engineering field as well.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Electrical and Computer Engineering

Graduate Field of Study

Electrical and Computer Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Master of Engineering (MEng) in Electrical and Computer Engineering - Co-operative Program (direct entry)

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Coursework

Program Types

Co-operative

Admit Term(s)Fall
Winter
Spring**Delivery Mode**

On-campus

Delivery Mode Information**Length of Program**

- Full-time: 5-6 terms (20-24 months)

Registration Option(s)

Full-time

Registration Options Information**Graduate Research Fields**

Proposed

Graduate Specializations

- Artificial Intelligence and Machine Learning
- Biomedical Engineering
- Business Leadership
- Computer Networking and Security
- Nanoelectronic Circuits and Systems
- Nanoelectronic Devices and Materials
- Quantum Engineering
- Software
- Sustainable Energy

Existing

Graduate Specializations

- Artificial Intelligence and Machine Learning
- Biomedical Engineering
- Business Leadership
- Computer Networking and Security
- Nanoelectronic Circuits and Systems
- Nanoelectronic Devices and Materials
- Software
- Sustainable Energy

Additional Program Information

Admissions

Admission Requirements: Minimum Requirements ⓘ

- The Department of Electrical and Computer Engineering requires either (i) a 75% overall standing in the last two years, or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent or (ii) a 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent, as the minimum requirement for admission to a Master's program for applicants educated at a Canadian institution. A 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent is the minimum requirement for admission to a Master's program for applicants educated outside of Canada.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 2
- Type of references: at least 1 academic

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).
- The MEng in Electrical and Computer Engineering - Co-operative Program will enable students to combine graduate studies with work experience. The program will foster professional development, networking and new collaborations while enhancing employment opportunities after degree completion.
- The program will include 1 or 2 work terms. The timing of work and academic terms is fairly flexible, but the program must start and end on an academic term. Students in the program are encouraged to complete WIL 601 Career Foundations for Work-Integrated Learning in the academic term prior to the first work term.

Coursework Option: Course Requirements

No Rules

Proposed

Coursework Option: Course Requirements

- Students must successfully complete 8 one-term courses (0.50 unit weight) acceptable for credit by the Department.
- Students may register for any ECE course at the 600 or 700 levels.
- A minimum of 5 courses must be taken from within the ECE Department. A maximum of 3 courses may be taken from outside the Department but must be from the faculties of Engineering, Mathematics and Science. Students opting for the Graduate Specialization in Business Leadership are allowed to take a maximum of 4 courses from outside ECE, but from the specified list of BE/BET courses, detailed below.
- A minimum grade of 65% in each of the 8 courses and a minimum cumulative average of 70% are required to remain in the program. Students who receive a grade of less than 65% may be permitted to take a maximum of 2 additional courses to meet the minimum averages for the degree requirements (outlined above).
- Students wishing to complete a Graduate Specialization as part of their MEng program should consult the list of required courses for each Graduate Specialization before selecting courses, as the number of minimum required courses may differ.
- Students in the MEng in Electrical and Computer Engineering - Co-operative Program may choose to pursue one of the following Graduate Specializations:
 1. Artificial Intelligence and Machine Learning
 2. Biomedical Engineering
 3. Business Leadership
 4. Computer Networking and Security
 5. Nanoelectronic Circuits and Systems
 6. Nanoelectronic Devices and Materials
 7. Quantum Engineering
 8. Software
 9. Sustainable Energy
- A Graduate Specialization is a University credential that is recognized on the student's transcript but not on the diploma and is intended to reflect that a student has successfully completed a set of courses that together provide an in-depth study in the area of the Graduate Specialization. A student will only obtain the Graduate Specialization on their transcript if they have completed the requirements associated with the MEng degree and the requirements associated with the Graduate Specialization.
- All MEng Graduate Specializations in Electrical and Computer Engineering consist of a set of at least 4 graduate (0.50 weight) level courses and this set is comprised of a mix of compulsory and elective courses. Compulsory courses are those that are prescribed as part of the Graduate Specialization. Elective courses are those that are on a list of courses designated as electives for a given Graduate Specialization. The requirements for each of the Graduate Specializations are described below.
- Note: Not all elective courses for any given Graduate Specialization are guaranteed to be offered each year. Students are encouraged to take elective courses when they are offered and should plan accordingly.
- Students will be able to complete the Business Leadership Graduate Specialization along with 1 other ECE Graduate Specialization, noting the following:
 - Each course will only be counted towards one Graduate Specialization and the MEng degree.
 - The number of required courses for the MEng degree will increase from 8 to 9 or 10 depending on the requirements associated with the Graduate Specializations.
- Students must consult with the ECE Masters Coordinator to finalize their plan of study and to ensure that they are able to meet the degree and Graduate Specialization requirements within the program time limits.

1. Graduate Specialization in Artificial Intelligence and Machine Learning

- To receive the Graduate Specialization in Artificial Intelligence and Machine Learning, students must successfully complete 2 compulsory courses and 3 elective courses:
 - Compulsory courses:
 - ECE 657 Tools of Intelligent Systems Design

- ECE 657A Data and Knowledge Modelling and Analysis
- Elective courses (choose 3 from the following list):
 - ECE 602 Introduction to Optimization
 - ECE 603 Statistical Signal Processing
 - ECE 606 Algorithm Design and Analysis
 - ECE 607 Fundamentals of Ultrasonics
 - ECE 613 Image Processing and Visual Communication
 - ECE 659 Intelligent Sensors and Sensor Networks
 - ECE 700 Topic-7 Game Theory with Engineering Applications
 - ECE 750 Topic-32 Biology and Computation
 - ECE 750 Topic-33 Embodied Intelligence
 - ECE 750 Topic-35 Social Robotics
 - MSCI 718 Statistical Methods for Data Analytics

2. Graduate Specialization in Biomedical Engineering

- To receive the Graduate Specialization in Biomedical Engineering, students must successfully complete 3 compulsory courses and 2 elective courses:
 - Compulsory courses:
 - ECE 601 Foundations of Biology in Engineering
 - ECE 608 Quantitative Methods in Biomedical Engineering
 - ECE 609 Engineering Analysis of Living Cells
 - Elective courses (choose 2 from the following list):
 - ECE 607 Fundamentals of Ultrasonics
 - ECE 613 Image Processing and Visual Communications
 - ECE 675 Radiation and Propagation of Electromagnetic Fields
 - ECE 750 Topic-32 Biology and Computation
 - ECE 750 Topic-33 Embodied Intelligence
 - SYDE 677 Medical Imaging

3. Graduate Specialization in Business Leadership

- To receive the Graduate Specialization in Business Leadership, students must successfully complete 2 compulsory courses and 2 elective courses:
 - Compulsory courses:
 - BE 600 Management and Leadership
 - BE 601 Introduction to Financial and Managerial Accounting
 - Elective courses (choose 2 from the following list): Note: not all elective courses may be offered each year.
 - BE 602 Data Analysis and Management
 - BE 603 Operations and Supply Chain Management
 - BE 604 Marketing Management
 - BE 605 Project Management
 - BE 606 Entrepreneurship and Innovation
 - BE 610 Special Topics in Business and Entrepreneurship
 - BE 660 Negotiations
 - BE 680 Consulting
 - ECE 657A Data & Knowledge Modelling & Analysis
 - ECE 699 Master of Engineering Project
 - Note: A maximum of 4 courses from outside the Department of ECE is permitted to satisfy both the MEng in ECE and Graduate Specialization in Business Leadership requirements.

4. Graduate Specialization in Computer Networking and Security

- To receive the Graduate Specialization in Computer Networking and Security, students must successfully complete 3 compulsory courses and 2 elective courses:
 - Compulsory courses:

- ECE 610 Broadband Communication Networks
- ECE 628 Computer Network Security
- ECE 655 Protocols, Software, and Issues in Mobile Systems
- Elective courses (choose 2 from the following list):
 - ECE 606 Algorithm Design and Analysis
 - ECE 611 Digital Communications
 - ECE 612 Information Theory
 - ECE 656 Database Systems
 - ECE 657 Tools of Intelligent Systems Design
 - ECE 659 Intelligent Sensors & Wireless Sensor Network
 - ECE 715 Wireless Communication Networks
 - ECE 716 Communication Security

5. Graduate Specialization in Nanoelectronic Circuits and Systems

- To receive the Graduate Specialization in Nanoelectronic Circuits and Systems, students must successfully complete 2 compulsory project courses, and 5 elective courses:
- Note: Students are required to complete the 5 elective courses prior to enrolling in the ECE 699A project course.
- The Graduate Specialization in Nanoelectronic Circuits and Systems is primarily designed for students starting in the Fall term. Therefore, if a student starts in the Spring or Winter term the Graduate Specialization may not be guaranteed, due to the sequencing of elective courses.
 - Compulsory courses:
 - ECE 699A Master of Engineering Project 1
 - ECE 699B Master of Engineering Project 2
 - Elective courses: Choose 5 total between Set-A and Set-B. A minimum of 2 of the 5 electives must be taken from Set-A.
 - Set-A:
 - ECE 621 Computer Organization
 - ECE 627 Register-transfer-level Digital Systems
 - ECE 630 Physics & Models Semiconductor Devices
 - ECE 631 Microelectronic Processing Technology
 - ECE 636 Advanced Analog Integrated Circuits
 - ECE 637 Digital Integrated Circuits
 - ECE 642 Radio Frequency IC Design
 - ECE 671 Microwave & RF Engineering
 - Set-B:
 - ECE 606 Algorithm Design and Analysis
 - ECE 638 CMOS Sensor Integrated Circuits
 - ECE 730 Topic-9 VLSI Quality, Reliability and Yield Engineering
 - ECE 730 Topic-16 Embedded Semiconductor RAM
 - ECE 730 Topic-30 Advanced VLSI Devices
 - ECE 738 VLSI Circuits for Wireless Communication
 - ECE 740 Topic-3 CMOS Data Converters
 - ECE 770 Topic-22 Radio and Wireless Systems

6. Graduate Specialization in Nanoelectronic Devices and Materials

- To receive the Graduate Specialization in Nanoelectronic Devices and Materials, students must successfully complete 2 compulsory courses and 3 elective courses:
 - Compulsory courses:
 - ECE 630 Physics and Models of Semiconductor Devices
 - ECE 631 Microelectronic Processing Technology
 - Elective courses (choose 3 from the following list):
 - ECE 632 Photovoltaic Energy Conversion
 - ECE 633 Nanoelectronics

- ECE 634 Organic Electronics
- ECE 635 Fabrication in the Nanoscale: Technology and Applications
- ECE 672 Optoelectronic Devices
- NANO 600 Introduction to Nanotechnology

7. Graduate Specialization in Quantum Engineering

- To receive the Graduate Specialization in Quantum Engineering, students must successfully complete 2 compulsory courses and 3 elective courses:
 - Compulsory courses:
 - ECE 676 Quantum Information Processing Devices
 - ECE 677 Applied Quantum Mechanics
 - Elective courses (choose 3 from the following list):
 - ECE 630 Physics and Models of Semiconductor Devices
 - ECE 633 Nanoelectronics
 - ECE 671 Microwave and RF Engineering
 - ECE 676B Experimental Quantum Engineering
 - ECE 676C Programming of Quantum Computing Algorithms
 - ECE 676D Superconducting Quantum Circuits
 - ECE 676E Lab on Low-Temperature Quantum Engineering
 - QIC 710 Quantum Information Processing
 - QIC 880 Nanoelectronics for Quantum Information Processing

8. Graduate Specialization in Software

- To receive the Graduate Specialization in Software, students must successfully complete 3 compulsory courses and 2 elective courses:
 - Compulsory courses:
 - ECE 650 Methods and Tools for Software Engineering
 - ECE 651 Foundations of Software Engineering
 - ECE 653 Software Testing, Quality Assurance and Maintenance
 - Elective courses (choose 2 from the following list):
 - ECE 606 Algorithm Design and Analysis
 - ECE 655 Protocols, Software, Issues in Mobile Systems
 - ECE 656 Database Systems
 - ECE 657 Tools of Intelligent Systems Design
 - ECE 658 Component Based Software

9. Graduate Specialization in Sustainable Energy

- To receive the Graduate Specialization in Sustainable Energy, students must successfully complete 1 compulsory course and 4 elective courses:
 - Compulsory course:
 - ECE 660 Operation and Control of Future Integrated Energy Systems
 - Elective courses (choose 4 from the following list):
 - ECE 632 Photovoltaic Energy Conversion
 - ECE 662 Power System Analysis and Control
 - ECE 663 Energy Processing
 - ECE 665 High Voltage Engineering Applications
 - ECE 666 Power Systems Operation
 - ECE 668 Distribution System Engineering
 - ECE 669 Dielectric Materials
 - ECE 761 HVDC and FACTS
 - ECE 762 Power System Components and Modelling
 - ECE 763 Sustainable Distributed Power Generation
 - ECE 765 Power System Protection and Relaying

- ECE 768 Power System Quality

Existing

Coursework Option: Course Requirements

- Students must successfully complete 8 one-term courses (0.50 unit weight) acceptable for credit by the Department.
- Students may register for any ECE course at the 600 or 700 levels.
- A minimum of 5 courses must be taken from within the ECE Department. A maximum of 3 courses may be taken from outside the Department but must be from the faculties of Engineering, Mathematics and Science. Students opting for the Graduate Specialization in Business Leadership are allowed to take a maximum of 4 courses from outside ECE, but from the specified list of BE/BET courses, detailed below.
- A minimum grade of 65% in each of the 8 courses and a minimum cumulative average of 70% are required to remain in the program. Students who receive a grade of less than 65% may be permitted to take a maximum of 2 additional courses to meet the minimum averages for the degree requirements (outlined above).
- Students wishing to complete a Graduate Specialization as part of their MEng program should consult the list of required courses for each Graduate Specialization before selecting courses, as the number of minimum required courses may differ.
- Students in the MEng in Electrical and Computer Engineering - Co-operative Program may choose to pursue one of the following Graduate Specializations:
 1. Artificial Intelligence and Machine Learning
 2. Biomedical Engineering
 3. Business Leadership
 4. Computer Networking and Security
 5. Nanoelectronic Circuits and Systems
 6. Nanoelectronic Devices and Materials
 7. Software
 8. Sustainable Energy
- A Graduate Specialization is a University credential that is recognized on the student's transcript but not on the diploma and is intended to reflect that a student has successfully completed a set of courses that together provide an in-depth study in the area of the Graduate Specialization. A student will only obtain the Graduate Specialization on their transcript if they have completed the requirements associated with the MEng degree and the requirements associated with the Graduate Specialization.
- All MEng Graduate Specializations in Electrical and Computer Engineering consist of a set of at least 4 graduate (0.50 weight) level courses and this set is comprised of a mix of compulsory and elective courses. Compulsory courses are those that are prescribed as part of the Graduate Specialization. Elective courses are those that are on a list of courses designated as electives for a given Graduate Specialization. The requirements for each of the Graduate Specializations are described below.
- Note: Not all elective courses for any given Graduate Specialization are guaranteed to be offered each year. Students are encouraged to take elective courses when they are offered and should plan accordingly.
- Students will be able to complete the Business Leadership Graduate Specialization along with 1 other ECE Graduate Specialization, noting the following:
 - Each course will only be counted towards one Graduate Specialization and the MEng degree.
 - The number of required courses for the MEng degree will increase from 8 to 9 or 10 depending on the requirements associated with the Graduate Specializations.
- Students must consult with the ECE Masters Coordinator to finalize their plan of study and to ensure that they are able to meet the degree and Graduate Specialization requirements within the program time limits.

1. Graduate Specialization in Artificial Intelligence and Machine Learning

- To receive the Graduate Specialization in Artificial Intelligence and Machine Learning, students must successfully complete 2 compulsory courses and 3 elective courses:
 - Compulsory courses:
 - ECE 657 Tools of Intelligent Systems Design
 - ECE 657A Data and Knowledge Modelling and Analysis
 - Elective courses (choose 3 from the following list):
 - ECE 602 Introduction to Optimization

- ECE 603 Statistical Signal Processing
- ECE 606 Algorithm Design and Analysis
- ECE 607 Fundamentals of Ultrasonics
- ECE 613 Image Processing and Visual Communication
- ECE 659 Intelligent Sensors and Sensor Networks
- ECE 700 Topic-7 Game Theory with Engineering Applications
- ECE 750 Topic-32 Biology and Computation
- ECE 750 Topic-33 Embodied Intelligence
- ECE 750 Topic-35 Social Robotics
- MSCI 718 Statistical Methods for Data Analytics

2. Graduate Specialization in Biomedical Engineering

- To receive the Graduate Specialization in Biomedical Engineering, students must successfully complete 3 compulsory courses and 2 elective courses:
 - Compulsory courses:
 - ECE 601 Foundations of Biology in Engineering
 - ECE 608 Quantitative Methods in Biomedical Engineering
 - ECE 609 Engineering Analysis of Living Cells
 - Elective courses (choose 2 from the following list):
 - ECE 607 Fundamentals of Ultrasonics
 - ECE 613 Image Processing and Visual Communications
 - ECE 675 Radiation and Propagation of Electromagnetic Fields
 - ECE 750 Topic-32 Biology and Computation
 - ECE 750 Topic-33 Embodied Intelligence
 - SYDE 677 Medical Imaging

3. Graduate Specialization in Business Leadership

- To receive the Graduate Specialization in Business Leadership, students must successfully complete 2 compulsory courses and 2 elective courses:
 - Compulsory courses:
 - BE 600 Management and Leadership
 - BE 601 Introduction to Financial and Managerial Accounting
 - Elective courses (choose 2 from the following list): Note: not all elective courses may be offered each year.
 - BE 602 Data Analysis and Management
 - BE 603 Operations and Supply Chain Management
 - BE 604 Marketing Management
 - BE 605 Project Management
 - BE 606 Entrepreneurship and Innovation
 - BE 610 Special Topics in Business and Entrepreneurship
 - BE 660 Negotiations
 - BE 680 Consulting
 - ECE 657A Data & Knowledge Modelling & Analysis
 - ECE 699 Master of Engineering Project
 - Note: A maximum of 4 courses from outside the Department of ECE is permitted to satisfy both the MEng in ECE and Graduate Specialization in Business Leadership requirements.

4. Graduate Specialization in Computer Networking and Security

- To receive the Graduate Specialization in Computer Networking and Security, students must successfully complete 3 compulsory courses and 2 elective courses:
 - Compulsory courses:
 - ECE 610 Broadband Communication Networks
 - ECE 628 Computer Network Security
 - ECE 655 Protocols, Software, and Issues in Mobile Systems

- o Elective courses (choose 2 from the following list):
 - ECE 606 Algorithm Design and Analysis
 - ECE 611 Digital Communications
 - ECE 612 Information Theory
 - ECE 656 Database Systems
 - ECE 657 Tools of Intelligent Systems Design
 - ECE 659 Intelligent Sensors & Wireless Sensor Network
 - ECE 715 Wireless Communication Networks
 - ECE 716 Communication Security

5. Graduate Specialization in Nanoelectronic Circuits and Systems

- To receive the Graduate Specialization in Nanoelectronic Circuits and Systems, students must successfully complete 2 compulsory project courses, and 5 elective courses:
- Note: Students are required to complete the 5 elective courses prior to enrolling in the ECE 699A project course.
- The Graduate Specialization in Nanoelectronic Circuits and Systems is primarily designed for students starting in the Fall term. Therefore, if a student starts in the Spring or Winter term the Graduate Specialization may not be guaranteed, due to the sequencing of elective courses.
 - o Compulsory courses:
 - ECE 699A Master of Engineering Project 1
 - ECE 699B Master of Engineering Project 2
 - o Elective courses: Choose 5 total between Set-A and Set-B. A minimum of 2 of the 5 electives must be taken from Set-A.
 - Set-A:
 - ECE 621 Computer Organization
 - ECE 627 Register-transfer-level Digital Systems
 - ECE 630 Physics & Models Semiconductor Devices
 - ECE 631 Microelectronic Processing Technology
 - ECE 636 Advanced Analog Integrated Circuits
 - ECE 637 Digital Integrated Circuits
 - ECE 642 Radio Frequency IC Design
 - ECE 671 Microwave & RF Engineering
 - Set-B:
 - ECE 606 Algorithm Design and Analysis
 - ECE 638 CMOS Sensor Integrated Circuits
 - ECE 730 Topic-9 VLSI Quality, Reliability and Yield Engineering
 - ECE 730 Topic-16 Embedded Semiconductor RAM
 - ECE 730 Topic-30 Advanced VLSI Devices
 - ECE 738 VLSI Circuits for Wireless Communication
 - ECE 740 Topic-3 CMOS Data Converters
 - ECE 770 Topic-22 Radio and Wireless Systems

6. Graduate Specialization in Nanoelectronic Devices and Materials

- To receive the Graduate Specialization in Nanoelectronic Devices and Materials, students must successfully complete 2 compulsory courses and 3 elective courses:
 - o Compulsory courses:
 - ECE 630 Physics and Models of Semiconductor Devices
 - ECE 631 Microelectronic Processing Technology
 - o Elective courses (choose 3 from the following list):
 - ECE 632 Photovoltaic Energy Conversion
 - ECE 633 Nanoelectronics
 - ECE 634 Organic Electronics
 - ECE 635 Fabrication in the Nanoscale: Technology and Applications
 - ECE 672 Optoelectronic Devices

- NANO 600 Introduction to Nanotechnology

7. Graduate Specialization in Software

- To receive the Graduate Specialization in Software, students must successfully complete 3 compulsory courses and 2 elective courses:
 - Compulsory courses:
 - ECE 650 Methods and Tools for Software Engineering
 - ECE 651 Foundations of Software Engineering
 - ECE 653 Software Testing, Quality Assurance and Maintenance
 - Elective courses (choose 2 from the following list):
 - ECE 606 Algorithm Design and Analysis
 - ECE 655 Protocols, Software, Issues in Mobile Systems
 - ECE 656 Database Systems
 - ECE 657 Tools of Intelligent Systems Design
 - ECE 658 Component Based Software

8. Graduate Specialization in Sustainable Energy

- To receive the Graduate Specialization in Sustainable Energy, students must successfully complete 1 compulsory course and 4 elective courses:
 - Compulsory course:
 - ECE 660 Operation and Control of Future Integrated Energy Systems
 - Elective courses (choose 4 from the following list):
 - ECE 632 Photovoltaic Energy Conversion
 - ECE 662 Power System Analysis and Control
 - ECE 663 Energy Processing
 - ECE 665 High Voltage Engineering Applications
 - ECE 666 Power Systems Operation
 - ECE 668 Distribution System Engineering
 - ECE 669 Dielectric Materials
 - ECE 761 HVDC and FACTS
 - ECE 762 Power System Components and Modelling
 - ECE 763 Sustainable Distributed Power Generation
 - ECE 765 Power System Protection and Relaying
 - ECE 768 Power System Quality

Coursework Option: Milestone Requirements

Graduate Studies Work Report

- Students must complete one or two work-term placements. A work report must be submitted to the Department for review and credit by the end of each work term.
- Students are responsible for following the regulations and procedures of Co-operative and Experiential Education (CEE).

Notes

- Department of Electrical and Computer Engineering website
- Master of Engineering (MEng) in Electrical and Computer Engineering - Co-operative Program future students program page

Workflow Information

Workflow Path ⓘ

Committee approvals

Faculty/AFIW Path(s) for Workflow ⓘ

Faculty of Engineering

Senate Workflow

Senate Regular

Dependencies

Dependent Courses and Programs/Plans

PREREQUISITES

✓ BE 605 - Project Management	View Courses >
✓ BE 603 - Operations and Supply Chain Management	View Courses >
✓ BE 602 - Data Analysis and Management	View Courses >
✓ BE 606 - Entrepreneurship and Innovation	View Courses >
✓ BE 601 - Introduction to Financial and Managerial Accounting	View Courses >
✓ BE 604 - Marketing Management	View Courses >
✓ BE 600 - Management and Leadership	View Courses >
✓ BE 610 - Special Topics in Business and Entrepreneurship	View Courses >

Prior to form submission, review the [content revision instructions](#) and information regarding [major/minor modifications](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Engineering

Programs: 1) Master of Engineering (MEng) in Mechanical and Mechatronics Engineering
2) Master of Engineering (MEng) in Mechanical and Mechatronics Engineering - Co-operative Program

Program contact name(s): Cecile Devaud

Form completed by: Cecile Devaud

Description of proposed changes:

Note: changes to courses and milestones also require the completion/submission of the [SGRC Graduate Studies Course/Milestone Form](#).

Updating the MEng degree requirements to include three new Graduate Specializations. Changing the name of the current "Green Energy" Graduate Specialization to "Sustainable Energy" and updating the list of required/elective courses associated with the specialization.

Is this a [major modification](#) to the program? Yes

Rationale for change(s):

The proposed changes are prompted by the 2023 Mechanical and Mechatronics Engineering (MME) Institutional Quality Assurance Process (IQAP) cyclical review that includes the external reviewers' assessment and department-wide-consultation of faculty members and graduate students through surveys and discussions. These changes follow the recommendations of the external reviewers of the 2023 MME IQAP cyclical review. Their recommendation was to "deviate from the current a la carte approach of students sorting out their academic journey, develop a framework that allows flexibility, but also points to the opportunities in an organized and strategic fashion". The new specializations will improve clarity of the graduate courses offered in the Department with associated themes. The specializations will provide a guided path for MEng students, while keeping some flexibility in the course selection. The updates to the existing Green Energy specialization are needed since the list of courses is outdated and the current title does not reflect the course offering that is focused on a broader content on sustainable energy. The MME MEng program learning outcomes have not changed.

Proposed effective date: Term: Winter Year: 2025

Current [Graduate Studies Academic Calendar \(GSAC\)](#) page (include the link to the web page where the changes are to be made):

<https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/programs/rkNj110Rjn>

<https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/programs/r1V0l1ARi2>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>Graduate specializations</p> <ul style="list-style-type: none"> • Green Energy <p>Degree requirements</p> <ul style="list-style-type: none"> • Students must complete the course requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM). <p>Course requirements</p> <ul style="list-style-type: none"> • Students must complete 8 one-term (0.50 unit weight) graduate level courses (or courses acceptable for graduate credit). • A maximum of 2 500-level courses may be counted for credit. • An English for Multilingual Speakers (EMLS) technical/professional course is normally required for all students who were not English Language Proficiency (ELP) exempt at the time of admission. This course is normally taken in the first term of the program. • The EMLS communication course can be waived at the discretion of the Department. • At least 2 out of the 8 required courses must be taken from the following list of ME graduate core courses: <ul style="list-style-type: none"> ○ ME 620 Mechanics of Continua ○ ME 621 Advanced Finite Element Method ○ ME 631 Mechanical Metallurgy ○ ME 632 Experimental Methods in Materials Engineering ○ ME 640 Autonomous Mobile Robotics ○ ME 649 Control of Machines and Processes ○ ME 651 Heat Conduction ○ ME 652 Convective Heat Transfer ○ ME 653 Radiation Heat Transfer ○ ME 662 Advanced Fluid Mechanics ○ ME 664 Turbulent Flow • MEng students completing the Graduate Diploma (GDip) program option or the Graduate Specialization are allowed to use the mandatory courses from the GDip or Graduate Specialization to count toward 2 of the 8 core courses. • MEng students must attend at least 4 MME research seminars. • Additional Faculty regulations concerning Master's degree requirements are: 	<p>Graduate specializations</p> <ul style="list-style-type: none"> • <u>Building Systems</u> • <u>Materials and Advanced Manufacturing</u> • <u>Mechatronic Systems</u> • <u>Sustainable Energy</u> <p>Degree requirements</p> <ul style="list-style-type: none"> • Students must complete the course requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM). <p>Course requirements</p> <ul style="list-style-type: none"> • Students must complete 8 one-term (0.50 unit weight) graduate level courses (or courses acceptable for graduate credit). • A maximum of 2 500-level courses may be counted for credit. • An English for Multilingual Speakers (EMLS) technical/professional course is normally required for all students who were not English Language Proficiency (ELP) exempt at the time of admission. This course is normally taken in the first term of the program. • The EMLS communication course can be waived at the discretion of the Department. • At least 2 out of the 8 required courses must be taken from the following list of ME graduate core courses: <ul style="list-style-type: none"> ○ ME 620 Mechanics of Continua ○ ME 621 Advanced Finite Element Method ○ ME 631 Mechanical Metallurgy ○ ME 632 Experimental Methods in Materials Engineering ○ ME 640 Autonomous Mobile Robotics ○ ME 649 Control of Machines and Processes ○ ME 651 Heat Conduction ○ ME 652 Convective Heat Transfer ○ ME 653 Radiation Heat Transfer ○ ME 662 Advanced Fluid Mechanics ○ ME 664 Turbulent Flow • MEng students must attend at least 4 MME research seminars. • Additional Faculty regulations concerning Master's degree requirements are: <ul style="list-style-type: none"> ○ The candidate must obtain a pass in all courses credited to their program, with a minimum overall average of 70% (a

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> ○ The candidate must obtain a pass in all courses credited to their program, with a minimum overall average of 70% (a grade of less than 65% in any course counts as a failure). ○ At least half of the courses used for credit must normally be Faculty of Engineering courses and the other half need to be Mechanical and Mechatronics Engineering courses. • Students in the MEng in Mechanical and Mechatronics Engineering program may choose to pursue the following Graduate Specialization: <ul style="list-style-type: none"> 1. Green Energy • A Graduate Specialization is a University credential that is recognized on the student's transcript but not on the diploma and is intended to reflect that a student has successfully completed a set of courses that together provide an in-depth study in the area of the Graduate Specialization. A student will only obtain the Graduate Specialization on their transcript if they have completed the requirements associated with the MEng degree and the requirements associated with the Graduate Specialization. • All MEng Graduate Specializations in Mechanical and Mechatronics Engineering consist of a set of at least 4 graduate (0.50 weight) level courses and this set is comprised of a mix of compulsory and elective courses. Compulsory courses are those that are prescribed as part of the Graduate Specialization. Elective courses are those that are on a list of courses designated as electives for a given Graduate Specialization. The requirements for the Graduate Specialization are described below. <p>1. Graduate Specialization in Green Energy</p> <ul style="list-style-type: none"> • To receive the Graduate Specialization in Green Energy, students must successfully complete 1 compulsory course and 3 elective courses: <ul style="list-style-type: none"> ○ Compulsory course: <ul style="list-style-type: none"> ▪ ME 659 Energy and Environment ○ Elective courses (choose 3 from the following list): <ul style="list-style-type: none"> ▪ ME 738 Special Topics in Materials: Hydrogen Storage Materials ▪ ME 751 Fuel Cell Technology 	<p>grade of less than 65% in any course counts as a failure).</p> <ul style="list-style-type: none"> ○ At least half of the courses used for credit must normally be Faculty of Engineering courses and the other half need to be Mechanical and Mechatronics Engineering courses. • Students in the MEng in Mechanical and Mechatronics Engineering program may choose to pursue <u>one of</u> the following Graduate Specializations: <ol style="list-style-type: none"> 1. <u>Building Systems</u> 2. <u>Materials and Advanced Manufacturing</u> 3. <u>Mechatronic Systems</u> 4. <u>Sustainable Energy</u> • A Graduate Specialization is a University credential that is recognized on the student's transcript but not on the diploma and is intended to reflect that a student has successfully completed a set of courses that together provide an in-depth study in the area of the Graduate Specialization. A student will only obtain the Graduate Specialization on their transcript if they have completed the requirements associated with the MEng degree and the requirements associated with the Graduate Specialization. • All MEng Graduate Specializations in Mechanical and Mechatronics Engineering consist of a set of at least 4 graduate (0.50 weight) level courses and this set is comprised of a mix of compulsory and elective courses. Compulsory courses are those that are prescribed as part of the Graduate Specialization. Elective courses are those that are on a list of courses designated as electives for a given Graduate Specialization. The requirements for the Graduate Specialization are described below. <p>1. <u>Graduate Specialization in Building Systems</u></p> <ul style="list-style-type: none"> • <u>To receive the Graduate Specialization in Building Systems, students must successfully complete 2 compulsory course and 2 elective courses. Note: No more than 1 of the 4 courses may be 500-level.</u> <ul style="list-style-type: none"> ○ <u>Compulsory courses (choose 2 from the following list):</u> <ul style="list-style-type: none"> ▪ <u>CIVE 507 Building Science and Technology or CIVE 707 Advanced Building Science</u> ▪ <u>ME 567 Fire Safety Engineering</u> ▪ <u>ME 654 Advanced Applied Thermal Engineering</u>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> ▪ ME 753 Solar Energy ▪ ME 760 Special Topics in Thermal Engineering: Low Energy Building Systems ▪ ME 760 Special Topics in Thermal Engineering: Building Energy Performance ▪ ME 760 Special Topics in Thermal Engineering: Air Pollution and Greenhouse Gases ▪ ME 760 Special Topics in Thermal Engineering: Wind Energy 	<ul style="list-style-type: none"> ▪ <u>ME 655 Advanced Building Energy Analysis</u> ▪ <u>ME 656 Advanced HVAC Systems, Equipment, and Energy Efficiency</u> ○ <u>Elective courses (choose 2 from the following list):</u> <ul style="list-style-type: none"> ▪ <u>CIVE 601 Engineering Risk and Reliability</u> ▪ <u>ME 562 Experimental Methods in Fluids</u> ▪ <u>ME 566 Computational Fluid Dynamics for Engineering Design</u> ▪ <u>ME 651 Heat Conduction</u> ▪ <u>ME 652 Convective Heat Transfer</u> ▪ <u>ME 653 Radiation Heat Transfer</u> ▪ <u>ME 662 Advanced Fluid Mechanics</u> ▪ <u>ME 663 Computational Fluid Dynamics</u> ▪ <u>ME 671 Fundamental Fire Dynamics</u> ▪ <u>ME 672 Advanced Fire Dynamics</u> ▪ <u>ME 673 Fire Modeling</u> <p>2. <u>Graduate Specialization in Materials and Advanced Manufacturing</u></p> <ul style="list-style-type: none"> • <u>To receive the Graduate Specialization in Materials and Advanced Manufacturing, students must successfully complete 2 compulsory courses and 2 elective courses. Note: No more than 1 of the 4 courses may be 500-level.</u> <ul style="list-style-type: none"> ○ <u>Compulsory courses (choose 2 from the following list):</u> <ul style="list-style-type: none"> ▪ <u>ME 531 Physical Metallurgy Applied to Manufacturing</u> ▪ <u>ME 559 Finite Element Methods or ME 621 Advanced Finite Element Method</u> ▪ <u>ME 620 Mechanics of Continua</u> ▪ <u>ME 631 Mechanical Metallurgy</u> ▪ <u>ME 632 Experimental Methods in Materials Engineering</u> ▪ <u>ME 739 Manufacturing Processes Topics: Topic 15 Additive Manufacturing Design</u> ○ <u>Elective courses (choose 2 from the following list):</u> <ul style="list-style-type: none"> ▪ <u>ME 526 Fatigue and Fracture Analysis</u>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
	<ul style="list-style-type: none"> ▪ <u>ME 533 Non-Metallic and Composite Materials</u> ▪ <u>ME 535 Welding Metallurgy</u> ▪ <u>ME 538 Welding Design, Fabrication and Quality Control</u> ▪ <u>ME 596 Special Topics in Mechanical Engineering: Topic 12 Manufacturing of Mechatronics Materials and Components</u> ▪ <u>ME 627 Fatigue Analysis and Design</u> ▪ <u>ME 628 Fracture Mechanics</u> ▪ <u>ME 732 Thermodynamics and Phase Transformations</u> ▪ <u>ME 734 Mechanics of Composite Materials</u> ▪ <u>ME 735 Special Topics - Welding and Joining: Topic 2 Advanced Materials Joining</u> ▪ <u>ME 739 Manufacturing Processes Topics: Topic 15 Additive Manufacturing</u> ▪ <u>NANO 600 Introduction to Nanotechnology</u> ▪ <u>NANO 603 Nanocomposites</u> ▪ <u>NANO 605 Design of MEMS and NEMS</u> ▪ <u>NANO 606 Advanced MicroElectroMechanical Systems: Physics, Design & Fabrication</u> <p><u>3. Graduate Specialization in Mechatronic Systems</u></p> <ul style="list-style-type: none"> • <u>To receive the Graduate Specialization in Mechatronic Systems, students must successfully complete 2 compulsory courses and 2 elective courses. Note: No more than 1 of the 4 courses may be 500-level.</u> <ul style="list-style-type: none"> ○ <u>Compulsory courses (choose 2 from the following list):</u> <ul style="list-style-type: none"> ▪ <u>ECE 602 Introduction to Optimization</u> ▪ <u>ECE 650 Methods and Tools for Software Engineering</u> ▪ <u>ME 547 Robotic Manipulators: Kinematics, Dynamics and Control</u> ▪ <u>ME 640 Autonomous Mobile Robotics</u> ▪ <u>ME 649 Control of Machines and Processes</u>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
	<ul style="list-style-type: none"> ▪ <u>ME 780 Special Topics in Mechatronics: Topic 1 Precision Control Systems</u> ▪ <u>ME 780 Special Topics in Mechatronics: Topic 5 Computational Intelligence</u> ○ <u>Elective courses (choose 2 from the following list):</u> <ul style="list-style-type: none"> ▪ <u>ECE 682 Multivariable Control Systems</u> ▪ <u>ECE 780 Special Topics in Control: Topic 11 Model Predictive Control</u> ▪ <u>ME 540 Fundamentals in Neural and Rehabilitation Engineering</u> ▪ <u>ME 780 Special Topics in Mechatronics: Topic 17 Vehicle System Dynamics</u> ▪ <u>ME 780 Special Topics in Mechatronics: Topic 14 Electromagnetic Actuators</u> ▪ <u>ME 780 Special Topics in Mechatronics: Topic 10 Adaptive Control</u> ▪ <u>ME 780 Special Topics in Mechatronics: Topic 37 Human Movement Neuromechanics</u> ▪ <u>ME 780 Special Topics in Mechatronics: Topic 38 Design of a Mechatronic System</u> ▪ <u>MTE 546 Multi Sensor Data Fusion</u> ▪ <u>SYDE 575 Image Processing</u> ▪ <u>SYDE 652 Dynamics of Multibody Systems</u> ▪ <u>SYDE 655 Optimal and Learning-Based Control</u> <p>4. Graduate Specialization in <u>Sustainable Energy</u></p> <ul style="list-style-type: none"> • To receive the Graduate Specialization in <u>Sustainable Energy</u>, students must successfully complete 1 compulsory course and 3 elective courses. <u>Note: at least 3 courses total must be from the compulsory course list and the elective course list A. No more than 1 of the 4 courses may be 500-level.</u> <ul style="list-style-type: none"> ○ <u>Compulsory courses (choose at least 1 from the following list):</u> <ul style="list-style-type: none"> ▪ <u>ME 654 Advanced Applied Thermal Engineering</u> ▪ <u>ME 659 Energy and Environment</u> ○ <u>Elective course list A:</u>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
	<ul style="list-style-type: none"> ▪ <u>ME 655 Advanced Building Energy Analysis</u> ▪ <u>ME 751 Fuel Cell Technology</u> ▪ <u>ME 753 Solar Energy</u> ▪ <u>ME 760 Special Topics in Thermal Engineering: Energy Storage</u> ▪ <u>ME 765 Special Topics in Fluid Mechanics: Topic 6 Wind Energy</u> ○ <u>Elective course list B:</u> <ul style="list-style-type: none"> ▪ <u>ME 562 Experimental Methods in Fluids</u> ▪ <u>ME 566 Computational Fluid Dynamics for Engineering Design</u> ▪ <u>ME 651 Heat Conduction</u> ▪ <u>ME 652 Convective Heat Transfer</u> ▪ <u>ME 653 Radiation Heat Transfer</u> ▪ <u>ME 662 Advanced Fluid Mechanics</u> ▪ <u>ME 663 Computational Fluid Dynamics</u> ▪ <u>ME 671 Fundamental Fire Dynamics</u> ▪ <u>ME 750 Advanced Engineering Thermodynamics</u>

How will students currently registered in the program be impacted by these changes?

Current MEng students pursuing the Green Energy Specialization will not be affected by these changes. Current MEng students who satisfy the degree requirements of one the new Graduate Specializations may obtain the Graduate Specialization by completing/submitting a program change form prior to degree completion.

Department/School approval date (mm/dd/yy): 04/05/24

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 05/08/24

Faculty approval date (mm/dd/yy): 10/15/24

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate approval date (mm/dd/yy) (if applicable):

FACULTY OF ENVIRONMENT - GRADUATE STUDIES COMMITTEE REPORT

TO SENATE GRADUATE & RESEARCH COUNCIL

November 2024

1. SEED
 - i. MDP - Reducing the number of required courses from 13 to 9; Removing the Graduate Studies Practicum milestone.

Prior to form submission, review the [content revision instructions](#) and information regarding [major/minor modifications](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Environment

Program: Master of Development Practice (MDP)

Program contact name(s): Cameron McCordic, Heather Hall

Form completed by: Cameron McCordic, Heather Hall

Description of proposed changes:

Note: changes to courses and milestones also require the completion/submission of the [SGRC Graduate Studies Course/Milestone Form](#).

- 1) Reducing the number of required courses from 13 to 9.
- 2) Removing the Graduate Studies Practicum milestone.

Is this a [major modification](#) to the program? Yes

Rationale for change(s):

Over the last few years, a number of programmatic challenges have emerged in the delivery of the Master of Development Practice (MDP) program. These challenges have included diminishing options for appropriate practicum placements for international students enrolled in the program and a high course load requirement placed on students enrolled in the program.

To address these challenges, the SEED Director, the Associate Director of Grad Studies (professional programs), the current MDP Academic Director, and the former interim MDP Academic Director have consulted with members of the University to identify options for revising the structure, administration, and delivery of the MDP program. The following members of the University have been informally consulted in this process:

- *The Dean of the Faculty of Environment*
- *The Associate Vice-President of Graduate Studies and Postdoctoral Affairs*
- *MDP program instructors*
- *Current and former MDP students were also consulted regarding their experiences in the MDP program as part of the MDP program review process.*

The individuals consulted voiced support for the program revisions recommended in this document. The program revisions recommended in this document were also derived from recommendations made by external reviewers during the recent program review of the MDP. Please note that none of the program learning outcomes are being revised as part of the proposed MDP program revisions.

The Graduate Studies Practicum milestone is being removed from the degree requirements as it was setup in error when the program began. The requirement has been and will continue to be satisfied by successfully completing INDEV 611/DEVP 611.

Please note that the INDEV (International Development) subject code/name is also being revised to DEVP (Development Practice).

Current [Graduate Studies Academic Calendar \(GSAC\)](#) page (include the link to the web page where the changes are to be made):

<https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/programs/Bk03jR1nn>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>Admit term(s)</p> <ul style="list-style-type: none"> • Fall <p>Delivery mode</p> <ul style="list-style-type: none"> • On-campus <p>Registration option(s)</p> <ul style="list-style-type: none"> • Full-time <p>Study option(s)</p> <ul style="list-style-type: none"> • Coursework <p>Length of program</p> <ul style="list-style-type: none"> • 4 terms (16 months) <p>Admission requirements: Minimum requirements</p> <ul style="list-style-type: none"> • A four-year Honours Bachelor's degree (or its equivalent) from a recognized university in a humanities, social science, health, engineering, environmental science, or business discipline, and have a minimum of 75% overall standing in the last two years of study. • English language proficiency (ELP) (if applicable) <p>Admission requirements: Application materials</p> <ul style="list-style-type: none"> • Résumé/Curriculum vitae • Supplementary information form • Transcript(s) <p>Admission requirements: References</p> <ul style="list-style-type: none"> • Number of references: 2 • Type of references: 1 academic and 1 professional, or 2 academic, or 2 professional. 1 of the letters must be from a referee who can attest to the leadership competencies of the applicant. <p>Degree requirements</p> <ul style="list-style-type: none"> • Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM). 	<p>Admit term(s)</p> <ul style="list-style-type: none"> • Fall <p>Delivery mode</p> <ul style="list-style-type: none"> • On-campus <p>Registration option(s)</p> <ul style="list-style-type: none"> • Full-time <p>Study option(s)</p> <ul style="list-style-type: none"> • Coursework <p>Length of program</p> <ul style="list-style-type: none"> • <u>3 terms (12 months)</u> <p>Admission requirements: Minimum requirements</p> <ul style="list-style-type: none"> • A four-year Honours Bachelor's degree (or its equivalent) from a recognized university in a humanities, social science, health, engineering, environmental science, or business discipline, and have a minimum of 75% overall standing in the last two years of study. • English language proficiency (ELP) (if applicable) <p>Admission requirements: Application materials</p> <ul style="list-style-type: none"> • Résumé/Curriculum vitae • Supplementary information form • Transcript(s) <p>Admission requirements: References</p> <ul style="list-style-type: none"> • Number of references: 2 • Type of references: 1 academic and 1 professional, or 2 academic, or 2 professional. 1 of the letters must be from a referee who can attest to the leadership competencies of the applicant. <p>Degree requirements</p> <ul style="list-style-type: none"> • Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>Coursework option: Course requirements</p> <ul style="list-style-type: none"> • Required courses: <ul style="list-style-type: none"> ○ Year 1 (Terms 1–3): core curriculum: <ul style="list-style-type: none"> ▪ INDEV 601 Foundations of Sustainable Development Practice ▪ INDEV 602 International Development: Theories and Practice ▪ INDEV 603 Global Health ▪ INDEV 604 Sustainable Cities ▪ INDEV 605 Economics for Sustainable Development ▪ INDEV 606 Energy and Sustainability ▪ INDEV 607 Methods of Sustainable Development Practice: A Systems Approach ▪ INDEV 608 Water and Security ▪ INDEV 609 Sustainability Concepts, Applications and Key Debates ▪ INDEV 611 Field Placement Project • Elective courses: <ul style="list-style-type: none"> ○ Year 2 (Term 4): students must complete 3 elective courses. ○ Normally students will complete all 3 elective courses during the Fall term (September–December). Students are encouraged to consult with the program administrator to determine an appropriate suite of courses. ○ Further details on elective courses are available from the School of Environment, Enterprise and Development (SEED) website. <p>Coursework option: Milestone requirements</p> <p>Graduate Studies Practicum</p> <ul style="list-style-type: none"> • The Practicum (INDEV 611 Field Placement) is to be completed in term 3. • Students must complete 2 one-day workshops from a choice of 3 workshops. 	<p>Coursework option: Course requirements</p> <ul style="list-style-type: none"> • Required courses: <ul style="list-style-type: none"> ○ <u>Fall:</u> <ul style="list-style-type: none"> ▪ <u>DEVP 601 Foundations of Sustainable Development Practice</u> ▪ <u>DEVP 602 International Development: Theories and Practice</u> ▪ <u>DEVP 609 Sustainability Concepts, Applications and Key Debates</u> ▪ <u>1 graduate-level elective course</u> ○ <u>Winter:</u> <ul style="list-style-type: none"> ▪ <u>DEVP 607 Methods of Sustainable Development Practice: A Systems Approach</u> ▪ <u>3 graduate-level elective courses</u> ○ <u>Spring:</u> <ul style="list-style-type: none"> ▪ <u>DEVP 611 Field Placement Project or a graduate-level projects course as approved by the MDP Academic Program Director and SEED Grad Officer</u> • Elective courses: <ul style="list-style-type: none"> ○ <u>DEVP 603 Global Health</u> ○ <u>DEVP 604 Sustainable Cities</u> ○ <u>DEVP 605 Economics for Sustainable Development</u> ○ <u>DEVP 606 Energy and Sustainability</u> ○ <u>DEVP 608 Water and Security</u> ○ <u>SUSM 678 Governing the Commons</u> ○ Students are encouraged to consult with the program administrator to determine an appropriate suite of courses. ○ Further details on elective courses are available from the School of Environment, Enterprise and Development (SEED) website.

How will students currently registered in the program be impacted by these changes?

Current students will be provided with the option to remain in the current version of the MDP program or switch to the new version in Winter 2025. A program coffee chat will be held with the students in Fall 2024 to discuss

the proposed changes and provide opportunity for students to ask questions and make an informed decision.

Department/School approval date (mm/dd/yy): 09/13/2024

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 09/12/24

Faculty approval date (mm/dd/yy): 10/24/24

Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate approval date (mm/dd/yy) (if applicable):