

Senate Graduate and Research Council

Open Session

January 27, 2025

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

Needles Hall

NH 3318 / Virtual Option

Waterloo Campus

Think Differently | Act with Purpose | Work Together

2025 01 27 Senate Graduate and Research Council Meeting Book

AGENDA

Governance Resources

[Link to Governance Resources](#)

1. Conflict of Interest

1.1 Conflict of Interest 4

10:30 a.m.

Consent Agenda

Motion: To approve or receive for information the items on the consent agenda, listed as items 2-5 below.

2. Minutes of the November 18, 2024 Meeting

2.1 2024-11-18 SGRC Minutes Decision (SGRC) 5

3. Graduate Awards [Heidi Mussar]

3.1 Graduate Financial Aid and Awards 8
Items a.- d. Decision (SGRC); e. - g. Information

4. Clinical Research Ethics Board [Julie Joza]

4.1 CREB New Member: Mark Simon Decision (SGRC) 11

5. Curricular Submissions

5.1 Faculty of Arts [Anna Esselment] Decision (SGRC) 12

5.2 Faculty of Engineering [Siva Sivothythaman] Decision (SGRC) 81

5.3 Faculty of Environment [Peter Deadman] Decision (SGRC) 339

5.4 Faculty of Health [Brian Laird] Decision (SGRC) 464

5.5 Faculty of Mathematics [Brian Ingalls] Decision (SGRC) 488

Regular Agenda

6. Business Arising from the Minutes Oral/Input

10:35 a.m.

7. Chair Remarks [Charmaine Dean] Information

10:40 a.m.

8. Waterloo Centre for Automotive Research (WatCAR) Renewal

Motion: To approve the report to renew the Waterloo Centre for Automotive Research on behalf of Senate, as presented.

8.1 WatCAR Renewal Report [Amir Khajepour] Decision (SGRC) 527

10:55 a.m.

9. Centre for Advanced Materials Joining (CAMJ) Renewal

Motion: To approve the report to renew the Centre for Advanced Materials Joining on behalf of Senate, as presented.

9.1 CAMJ Renewal Report [Adrian Gerlich] Decision (SGRC) 563

11:05 a.m.

10. Senate Course Outline Requirements Discussion

10.1 Course Outline Tool Recommendations [Christine Barbeau,
Laura Deakin, Mirko Vucicevich, and Mary Power] 606

10.2 Bugs Example 615

11. Curricular Submissions

11:20 a.m. 11.1 Faculty of Engineering [Siva Sivoththaman] Decision (SEN-R) 626
Motion: To recommend that Senate approve the proposed new academic programs of MEng in Chemical Engineering - Health Technologies; MEng in Mechanical and Mechatronics Engineering - Health Technologies; MMSc - Health Technologies as presented; and, that the effective date be either May 1, 2025 or September 1, 2025.

11:35 a.m. 11.2 Faculty of Environment [Peter Deadman] Decision (SEN-R) 718
Motion: To recommend that Senate approve the following major modifications to the Doctor of Philosophy (PhD) in Planning – Water, MA in Geography, MES in Geography, MSc in Geography, PhD in Geography, MES in Sustainability Management effective 1 May 2025, as presented.

11:45 a.m. 11.3 Faculty of Health [Brian Laird] Decision (SEN-R) 752
Motion: To recommend that Senate approve the following major modifications to the Doctor of Philosophy (PhD) in Planning – Water, MA in Geography, MES in Geography, MSc in Geography, PhD in Geography, MES in Sustainability Management effective 1 May 2025, as presented.

11:55 a.m. 11.4 Faculty of Science [Martin Ross] Decision (SEN-R) 773
Motion: To recommend that Senate approve the following major modifications to the PhD and MSc in Biology Graduate research fields, effective 1 May 2025, as presented.

12. Other Business Oral/Input

13. Adjournment Oral/Input
The next meeting will be March 17th, 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 November 18, 2024 Meeting

Present: Steven Bednarski, Sue Ann Campbell, David Clausi, Ashley Day (secretary), Robert de Loe, Peter Deadman, Charmaine Dean (co-chair), Mrityika Dreesha, Bernard Duncker, Anna Esselment, Ana Ferrer, Brian Ingalls, Julie Joza, Brian Laird, Joseph Meleshko, Ian Milligan, Carlee Ann Montgomery, Marina Mourtzakis, Nicholas Pellegrino, Martin Ross, Marianne Simm, Siva Sivoththaman, Mike Szarka, Justin Wan (co-chair)

Resources/Guests: Angela Christelis, Trevor Clews, Jennifer Coghlin, Mike Grivicic, Alison Hitchins, Carrie MacKinnon Molson

Absent: Neela Hassan, Abhishesh Homagain, Shirley Tang, Clarence Woudsma

Organization of Meeting: Charmaine Dean and Justin Wan took the chair in Woudsma's absence, 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. Item 4a was requested to be pulled into the regular agenda for discussion by Laird. Pellegrino and Ferrer. Carried

2. MINUTES OF THE OCTOBER 21, 2024 MEETING

Council approved the minutes of the meeting as distributed.

3. GRADUATE AWARDS'

Council received the following for decision:

4. Cornfield PhD Fellowship in Sustainable Energy Systems – trust
5. Wefers Bettink Family Graduate Scholarship – endowment
6. Severin Hacker PhD Fellowship in Amblyopia Research – trust
7. Statistics and Actuarial Science Graduate Entrance Award – operating
8. Civil and Environmental Engineering Graduate Award – operating
9. Tikkun Olam Award – trust
10. Innovation in Psychology Graduate Scholarship – trust
11. Major Graduate Award for Innovation in Engineering – trust
12. Major Graduate Award for Innovation in Science - trust

Council received the following for information:

13. Statistics and Actuarial Science Chair's Graduate Award – operating

14. CURRICULAR SUBMISSIONS

- 4.1 Faculty of Engineering (Siva Sivoththaman)
- 4.2 Faculty of Environment (Peter Deadman)
- 4.3 Faculty of Science (Martin Ross)

Amendment post package distribution: The effective date for the Master of Science (MSc) in Chemistry - Quantum Information Chemistry on page 202 shall be amended from Winter 2023 to Winter 2025.

- 4.4 Faculty of Math (Brian Laird)

REGULAR AGENDA

15. BUSINESS ARISING FROM THE MINUTES

There was no business arising from the minutes.

16. CO-CHAIR'S REMARKS

Senate Graduate and Research Council November 18, 2024 Minutes

Dean spoke to Institutional Partnerships forum and town halls that have recently happened. Council was reminded how important these engagement opportunities are to support development of institutional guidelines. SGRC was encouraged to provide feedback. Milligan asked for any additional feedback to be sent to the institutional email taskforce-partnerships@uwaterloo.ca by Friday November 22.

Dean introduced Justin Wan who has stepped in as co-chair in Woudsma's absence for the November SGRC meeting. Wan spoke to his role as Interim Co-AVP, Graduate Studies and Postdoctoral Affairs and research area of scientific computing.

Dean then provided the following brief updates:

- 17.** Council members were encouraged to attend the University Operating Budget Town Hall taking place in the afternoon of November 18. Feedback can also be sent to budget@uwaterloo.ca.
- 18.** There is a call for nominations for membership of the Presidential Nominating Committee. SGRC members are encouraged to participate. Additional information can be found on the Secretariat website.
- 19.** CREATE Tri-Council quota will be provided to us by the end of the year. There will be competitive review, and we have been encouraged by the agency to submit beyond the quota.

20. 2025-2026 ACADEMIC CALENDAR

Coghlin introduced the item as an annual submission to SUC and SGRC prior to approval at Senate at the November meeting. The attached guidelines were used during the creation of the calendar.

A motion was heard to recommend that Senate approve the 2025-2026 calendar dates as presented. Ross and Milligan. Carried.

21. GRADUATE STUDIES ACADEMIC CALENDAR CHANGES

Simm presented the proposed changes to the graduate calendar. There is progress being made to review sections and make updates, reflect changes and identify any gaps. There are five items in total in the package as presented.

A motion was heard to recommend that Senate approve the following Graduate Studies Academic Calendar changes, effective 1 January 2025, as presented. Simm and Esselment. Carried

22. OPEN RESEARCH CONFERENCE

Milligan presented a short overview of the recent Open Research Conference and the current challenges, and multiple understandings of what open research is across departments. Open discussion took place at the event on Balancing Open Science and Research Security, and the Need for Cultural and Structural Change. Examples shared during discussions included positive research data sharing, the need to protect research, and examples of dangerous research sharing. Outcomes from the discussions will be used to develop principles as a next step.

23. CURRICULAR SUBMISSIONS

10.1 Faculty of Engineering (Siva Sivoththaman)

A member of council requested that the consent item be pulled into the regular agenda, specifically the creation of the new MSE 619 Healthcare Analytics course in the Department of Management Science and Engineering. Laird spoke to the change being supported by the Faculty of Health but wanted to note that the school of health sciences will move from health informatics to analytics in 2025 and would like to ensure there is no overlap between Faculties. Sivoththaman and Laird to connect offline to ensure faculty teaching are communicating and to monitor any overlap.

A motion was heard to approve the new course, MSE 619, with the understanding that the Faculties will communicate any duplication of effort. Sivoththaman and Esselment. Carried

As part of the regular agenda, Sivoththaman spoke to the calendar change requests and adding a number of specializations. It was noted that there is an amendment post package distribution: The effective date for the Master of Engineering (MEng) in Mechanical and Mechatronics Engineering on page 323 shall be amended from Winter 2023 to Winter 2025.

A motion was heard to recommend that Senate approve the following major modifications, effective May 1, 2025, as presented. Sivoththaman and Ross. Carried

10.2 Faculty of Environment (Peter Deadman)

Deadman introduced the major modification to the Master of Development Practice which will reduce the number of required courses from 13 to 9; and remove the Graduate Studies Practicum milestone.

Senate Graduate and Research Council
November 18, 2024 Minutes

A motion was heard to recommend that Senate approve the following major modifications, effective 1 January 2025, as presented. Deadman and Esselment. Carried.

24. DORA WORKSHOP

Milligan presented an overview on the Declaration on Research Assessment (DORA). Milligan spoke to who has signed DORA to date (McGill, Montreal, Calgary and more to come). There are 18 general recommendations. Milligan spoke to number 4 and 5 specifically (research publications, and research outputs). The Tri-agencies recently announced the move to narrative CVs which will provide a more holistic overview of a candidate and a better understanding of how candidates fit with initiatives. So far, Milligan has received feedback from six Faculties with helpful engagement. Milligan confirmed that policy 76 and 77 could not be opened up should UW join.

The groups broke out for discussion. Questions included: *What do you think the biggest challenges are in implementing DORA at the University of Waterloo? Do you think we should sign DORA? What challenges might arise in your unit, and why? What solutions might overcome these challenges? Given these challenges, what's your overall recommendation on a pathway forward?*

Milligan will share an analysis of the group discussions at a future SGRC meeting prior to a recommendation to Senate.

25. OTHER BUSINESS

There was no further business.

26. ADJOURNMENT

With no further business, the meeting adjourned. The next meeting will be held on Monday, January 27, 2025, 10:30 a.m. to noon in NH 3318.

November 20, 2024

Ashley Day
Governance Officer
Secretariat

January 6, 2025

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 – January 2025

Items for Consent

a) Pearl Sullivan Engineering Ideas Clinic Activity Pitch Award – operating

The Pearl Sullivan Engineering Ideas Clinic Activity Pitch Awards will be awarded to the top 3 winners of an annual competition where graduate students propose new activities to be implemented within the Engineering Ideas Clinic with the goal of promoting a focus on teaching activities, and on connecting research to undergraduate teaching in the Faculty of Engineering. 1st place = \$1,000; 2nd place = \$500; 3rd place = \$250

b) Dr. Benjamin Plumb Memorial Graduate Scholarship – trust

A scholarship, valued at \$4,000, will be awarded annually to a full-time graduate student enrolled in a research-based master's or doctoral program in the Department of Civil and Environmental Engineering in the Faculty of Engineering. Selection is based on academic excellence (e.g., minimum cumulative average of 80% or equivalent) and research in field work of river mechanics and river rehabilitation. Interested students should submit an application by the end of January to the Department of Civil and Environmental Engineering. This scholarship was established in memory of alumnus, Dr. Benjamin Plumb (BASc '10 and PhD '17, civil engineering), through the support of his former employer, GeoProcess Research Associates, as well as colleagues, friends and family.

The first selection will be made in winter 2025.

Total gift = \$20,000

c) Ages Foundation Graduate Scholarship – trust

Two awards, valued at \$5,000 each, will be awarded annually to full-time graduate students who are or will be registered full time in a Master's or Doctoral program in the Faculty of Environment and who have an interest in the area of ecology. Selection will be based on academic excellence (minimum 80% cumulative average). Preference will be given to students who demonstrate leadership and community engagement. Selection will be based on the student's application for admission to the graduate program. This fund is made possible by a donation from the Ages Foundation.

The first selection will be made in fall 2025.

Total gift = \$50,000

d) Jenny Francis Graduate Award in Architecture – endowment

Awards valued at up to \$7,500 will be awarded annually to students who are or will be registered full time in the Master's program in the School of Architecture in the Faculty of Engineering. Selection is based on academic achievement combined with merit of the proposed research project as outlined in a 1-page proposal; applicants must describe the intended research project, travel requirements to complete the intended research, and a budget of expected costs. Students interested in applying must submit an application form that can be

found on the School of Architecture website, by the deadline advertised, normally each winter. This award was established in memory of Jenny Francis (MArch '02) through the generous support of her family to provide assistance for research travel.

The value of the Award will be determined by the income generated by the Fund each year. The goal is to provide one or two awards annually valued at up to \$7,500 each. 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 \$2,500.

Total endowment = \$250k

Items for Information

e) Pure Math Doctoral Thesis Completion Award – operating

Originally created in November 2023, the Department of Pure Mathematics would like to amend the terms of reference by no longer selecting recipients based upon a student's application for the Doctoral Thesis Completion Award (DTCA) managed by Graduate Studies and Postdoctoral Affairs (GSPA). Because the priorities and application requirements for the DTCA have shifted, Pure Math will create their own application procedure. As such, the criterion regarding selection will be updated to the following:

“Selection will be made by a committee chaired by the Associate Chair Graduate Studies in the Department of Pure Mathematics, based on a departmental application procedure.”

f) Jain Family Award for Entrepreneurship – trust

Originally created in 2021, this award is being separated into two separate named awards with recipients for one award being selected in the fall term and the other in the winter term. The rest of the original criteria will remain the same. The names and award descriptions are as follows:

(i) Anuj Jain Family Award for Entrepreneurship

One award, valued at \$5,000, will be provided annually to undergraduate or graduate students participating in Concept or Velocity programing at the University of Waterloo. Preference will be given to students pursuing this experience on a co-op term. Selection will be based on a merit-evaluation process including, but not limited to, the progress of the start-up's business model and viability for commercial success. Interested students or teams should submit an application by the Friday of the second week of the Winter term to Velocity. This fund is made possible by a donation from proud UW alumnus Anuj Jain (BASc '97) and the Vijay Anand Foundation to support student entrepreneurship at Waterloo and to encourage more students to follow their passion in the start-up community.

(ii) Nitin Jain Family Award for Entrepreneurship

One award, valued at \$5,000, will be provided annually to undergraduate or graduate students participating in Concept or Velocity programing at the University of Waterloo. Preference will be given to students pursuing this experience on a co-op term. Selection will be based on a merit-evaluation process including, but not limited to, the progress of the start-up's business model and viability for commercial success. Interested students or teams should submit an application by the Friday of the second week of the Fall term to Velocity. This fund is made possible by a donation from proud UW alumnus Nitin Jain (BASc '01) and the Vijay Anand Foundation to support student entrepreneurship at Waterloo and to encourage more students to follow their passion in the start-up community.

g) Mike and Ophelia Lazaridis Fellowships – endowment

Amended in 2016, as IQC has decided to increase the student's take home pay by increasing the overall fellowship amounts through a combination of funds from the endowment,

supervisor and IQC. The values for the master's and doctoral fellowships are being updated as follows:

Effective January 1, 2025, students in a Master's degree program will receive a Lazaridis Fellowship of \$20,000 plus an additional \$11,000 from a Graduate Research Studentship and/or Teaching Assistantship for a total funding package of \$31,000. Students in a Doctoral degree program will receive a total funding package of \$44,000 comprised of a Lazaridis Fellowship of \$34,400 plus an additional \$9,600 through a Graduate Research Studentship and/or Teaching Assistantship.

Memorandum

To: Members, Senate Graduate and Research Council (SGRC)

From: Julie Joza, Director, Research Ethics

Date: January 6, 2025

Subject: Membership on Waterloo's Clinical Research Ethics Board

This memo outlines membership updates that will be taking place on Waterloo's Clinical Research Ethics Board. This update is for consideration and approval by the Senate Graduate and Research Council.

Clinical Research Ethics Board (CREB)

New Member

[Mark Simon](#), JD, MA, MBA will be joining CREB as the member providing expertise in relevant law. Mark is replacing Diane McInnis whose term is ending in March. Mark has an extensive and well-rounded academic background with four university degrees including a bachelor's and master's degree in philosophy from Wilfrid Laurier University, and an MBA focusing on accounting and strategy. Mark completed his Juris Doctorate at the University of Windsor. He has worked with a national non-profit organization prior to attending law school, medium-sized law firms in both Waterloo and London, and recently opened a practice in Stratford. His undergraduate and graduate work included training in research methodologies and a major research paper. Mark brings an interest in research, an enjoyment of academic life, a commitment to volunteerism, and a desire to explain the spirit of what the law is trying to convey. His term will begin on March 1, 2025, and continue through to February 29, 2028.

Reminder: SGRC members who wish to learn more about the qualifications or academic background and interests of the individual being nominated to the REB are encouraged to contact Julie Joza, Director, Research Ethics at jajoza@uwaterloo.ca. Julie will be pleased to discuss with SGRC members in advance of the meeting the information they may need to help support their decision to recommend the nomination of the individual in becoming a member of the REB. On behalf of the SGRC, the research ethics office retains a copy of each member's CV and expression of interest in being a REB member.

ARTS GRADUATE STUDIES

December 13, 2024

TO: Members, Senate Graduate and Research Council

FROM: Maha Eid, Graduate Studies and Research Officer

RE: Graduate Affairs Group Reports

The attached Arts Graduate Affairs Group reports were approved by the Arts Faculty Council meeting on November 19, 2024, and are now being submitted for approval by the Senate Graduate and Research Council on January 27, 2025.

Maha Eid

Maha Eid

Attach.

**Arts Faculty Council Report to
Senate Graduate and Research Council**

CURRICULAR ITEMS for approval

Consent Agenda

- i. **Philosophy** – create new course PHIL 626 (Bioethics and Technology)
- ii. **Psychology** – create new course PSYCH 634 (Data Visualization, Management, and Analysis)
- iii. **Political Science** – revise the course description of PSCI 600 (Political Science Methods)
- iv. **Sociology and Legal Studies** – revise the course title of SOC 710 from Intermediate Social Statistics to Applied Statistical Methods
- v. **School of Accounting and Finance** – PhD in Accounting: updating the admission and degree requirements
- vi. **Political Science** – PhD in Political Science: updating PhD experiential seminar milestone
- vii. **School of Accounting and Finance** – MA in Accounting: updating the minimum admission requirements to include the Bachelor of Sustainability and Financial Management (SFM) as an entry program
- viii. **Sociology and Legal Studies** –
 - a. MA in Sociology: articulating the length of programs in the GSAC for thesis and MRP streams
 - b. MA in Sociology (coop): articulating the length of programs in the GSAC for thesis and MRP streams
- ix. **Theological Studies (for information)** – updating minimum admission requirements

Regular Agenda:

- i. **Psychology** – PhD in Psychology: Updating degree requirements to include the new Grad Research Field “General Psychology” and clarifying the prerequisites for the Industrial/Organizational Psychology (IO) graduate research field
- i. **English Language and Literature** –
 - a. MA in English: Experimental Digital Media program changed to Critical Media Studies
 - b. MA in English (coop): Experimental Digital Media program changed to Critical Media Studies

PHIL 626

Bioethics and Technology

Under Review | Spring 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!

Effective Term and Year ⓘ

Spring 2025

Quest Course ID

Offering Number

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

09/20/2024

Rationale for New Course ⓘ

The Faculty of Engineering is creating a new Collaborative Health Technologies program and would like students to take an Arts course. The plan is that PHIL 626 will be one of two Arts courses for that purpose, the other being an Economics course. Engineering will pay for a sessional instructor for one PHIL course during any term PHIL 626 is offered, to help compensate for the need to assign a faculty member to teach PHIL 626.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Arts

Academic Unit ⓘ

Department of Philosophy

Subject Code ⓘ

PHIL

Number ⓘ

626

Title ⓘ

Bioethics and Technology

Abbreviated Title ⓘ

Bioethics and Technology

Description ⓘ

Students will grapple with a sample of ethical issues related to advanced and emerging medical technologies and/or biotechnologies. The primary goals of doing so are: (1) To gain familiarity with key ethical concepts and values, which may include patient autonomy, beneficence, justice, care, anti-ableism, inclusion, and others; and (2) to enhance core critical thinking skills needed for ethics, which will help improve each student's self-understanding (of not only what they think is right and wrong, but, more importantly, why) and their capacity to engage with different perspectives on the "whats" and "whys" of ethics in a spirit of open-mindedness, mutual respect, and constructive cooperation. Frequent in-class discussion is typically an important element of student learning in this course.

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

- Open only to Masters students in the Collaborative Health Technologies Program.

Corequisites

No Rules

Antirequisites

No Rules

Course Notes

Fee Statement

Workflow Information

Workflow Path

Committee approvals

Faculty/AFIW Path(s) for Workflow

Faculty of Arts

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

PSYCH 634

Data Visualization, Management, and Analysis

Under Review | Spring 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

expand ▲

Effective Date & Career

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

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

09/10/2024

Rationale for New Course ⓘ

This course has been offered the last couple years as a “Special Topics” course at the graduate level and been well received. It makes a unique addition to our advanced methods/statistics offerings and will contribute to numerous graduate programs in our department.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ	Academic Unit ⓘ
Faculty of Arts	Department of Psychology
Subject Code ⓘ	Number ⓘ

PSYCH 634

Title ⓘ

Data Visualization, Management, and Analysis

Abbreviated Title ⓘ

Data Viz and Management

Description ⓘ

The purpose of this course is to equip students with the skills needed to navigate the full data process—from management to analysis to visualization—in a way that is accessible, reproducible, reusable, and readable.

Units ⓘ

0.50

Components ⓘ

LectureLaboratory

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

- Not completed nor concurrently enrolled in: PSYCH493

Course Notes

Fee Statement

Workflow Information

Workflow Path

Committee approvals

Faculty/AFIW Path(s) for Workflow

Faculty of Arts

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

PSCI 600

Political Science Methods

Under Review | Spring 2025

Proposal Information

Status		Workflow Status	
Active		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 - Description	

Effective Date & Career

Career ⓘ	Important!	Quest Course ID
Graduate		11481
	Proposed	
	Effective Term and Year ⓘ	Offering Number
	Spring 2025	1
	Existing	
	Effective Term and Year ⓘ	
	Fall 2023	

Proposal Details

Proposal Type ⓘ	Academic Unit Approval
Change	09/20/2024

Rationale for Change ⓘ

Revising the course description as the course is not team-taught.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Arts

Academic Unit ⓘ

Department of Political Science

Subject Code ⓘ

PSCI

Number ⓘ

600

Title ⓘ

Political Science Methods

Abbreviated Title ⓘ

Political Science Methods

Proposed

Description ⓘ

This course examines different approaches to the study of political science, with units focusing on quantitative methods, qualitative methods, and an exploration of the epistemology of social science.

Existing

Description ⓘ

This team-taught course examines different approaches to the study of political science, with units focusing on quantitative methods, qualitative methods, and an exploration of the epistemology of social science.

Units ⓘ

0.50

Components ⓘ

Seminar

Primary Component

Seminar

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 Arts

Dependencies

Dependent Courses and Programs/Plans There are no dependencies

SOC 710

Applied Statistical Methods

Under Review | Spring 2025

Proposal Information

Status	Workflow Status	
	In Progress	
Active	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 - Title - Abbreviated Title - Calendar Activation Date	

Effective Date & Career

Career ⓘ	Important!	Quest Course ID
		3044
Graduate	Proposed	Offering Number
	Effective Term and Year ⓘ	
Spring 2025		1
	Existing	
	Effective Term and Year ⓘ	
Fall 2023		

Proposal Details

Proposal Type ⓘ	Academic Unit Approval
Change	04/25/2024

Rationale for Change

The updated title better reflects the content of the course.

Consultations

Supporting Documentation

Course Information

Faculty

Faculty of Arts

Academic Unit

Department of Sociology and Legal Studies

Subject Code

SOC

Number

710

Proposed

Title

Applied Statistical Methods

Existing

Title

Intermediate Social Statistics

Proposed

Abbreviated Title

Applied Statistical Methods

Existing

Abbreviated Title

Intermediate Social Statistics

Description

Applied multiple regression/correlation, with emphasis on data processing/computing, model construction and interpretation and underlying statistical assumptions.

Units

0.50

Components

Seminar

Primary Component

Seminar

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 Arts

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

PhD in Accounting

Doctor of Philosophy (PhD) in Accounting

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 - Admission Requirements: Minimum Requirements - Graduate Degree Requirements - Graduate Course Requirements - Milestone Requirements - Effective Term and Year Show All ▼

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 09/20/2024
Quality Assurance Designation ⓘ Minor Modification	

Is there an impact to existing students? ⓘ

Yes

Impact on Existing Students ⓘ

Current students will not be required to follow the proposed calendar content. Current students will be made aware of the changes that will come into effect in Spring 2025 for students starting the program in Fall 2025.

Is the credential name changing?

No

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

Description of proposed changes: Updating the admission and degree requirements. Below is a summary of the proposed revisions:

1. Admission Requirements: The revisions recognize the most common business-related backgrounds (accounting, finance), and the non-business-related backgrounds most students in the program select as their core discipline (economics, psychology).
2. Supervisors: Students will identify a supervisor by the end of their first spring term of study rather than one month after the comprehensive exam. So, students will, on average, identify a supervisor one year earlier.
3. Faculty Advisors: Students will have a faculty advisor for one year rather than for two years because students will now identify a supervisor by the end of their first spring term of study. Faculty advisors will also be given more "official" responsibilities. They will (normally) be the faculty supervisor for the PhD Research Paper ("Summer Paper"), and they will (normally) be the faculty supervisor for at least two research internships (students must complete six internships).
4. Identifying Advisory Committee Members: Students will identify the members of their advisory committee within one month after successfully completing the comprehensive exam. Currently, there is inconsistency in the timing of the student's identification of the members of the advisory committee. Some students identify the advisory committee around the same time they identify the supervisor, other students do not identify the advisory committee until very close to the proposal or even at the proposal. This inconsistency is potentially driven by differences in how the advisory committee is discussed in the Graduate Studies Academic Calendar (GSAC) vs. the PhD Proposal Policy (an internal policy approved by the PhD Policy Committee to outline the procedures for a PhD proposal for PhD students in accounting and faculty from the School of Accounting and Finance).
5. Composition of the Advisory Committee: The GSAC will no longer require students to have a member of the advisory committee who is from the University of Waterloo but outside the School of Accounting and Finance. The GSAC will also recommend a typical advisory committee composition.
6. Thesis Examining Committee: The expected composition of the examining committee has been added to the GSAC.
7. Coursework Requirements: Students will no longer be required to take core disciplines courses from two different academic disciplines. They will still have to take at least two core discipline courses, but they can be from the same academic discipline.
8. Minor Revisions: Minor editorial revisions have been made to the GSAC.

Rationale for changes:

1. Admission requirements: The revisions keep the "backgrounds" focused on the most common business-related backgrounds for students interested in a PhD in Accounting (accounting, finance). Also, the revisions focus on the non-business-related backgrounds that most students in the program select as their core discipline (economics, psychology). The GSAC will still encourage students from various business-related and non-business-related backgrounds to apply.
2. Supervisors: An identified weakness of the program is that students feel like they have little direction in the first two years of the program. Also, waiting until the end of year two to identify a supervisor is potentially slowing down student progress. Many students are not able to meet the expectation that they propose their thesis research within one year of successfully completing the comprehensive exam. Identifying a supervisor earlier gives more time for the student and supervisor to develop a productive working relationship and to discuss and develop the student's thesis research.
3. Faculty advisors: Students should be assigned a faculty advisor who could potentially serve as the supervisor (assuming a productive working relationship can be established). Currently, the faculty advisor's role is not well articulated in the Calendar or program policies. The faculty advisor will be asked to assume many of the same responsibilities as a supervisor as outlined in the Guide for Graduate Research and Supervision. Essentially, the faculty advisor will serve as a temporary supervisor until the student is prepared to formally choose a supervisor by the end of their first spring term of study. It will be important to provide the student an opportunity to develop a productive

working relationship with the faculty advisor. To achieve this, normally, the faculty advisor will supervise the student’s summer paper and their first two research internships in the first fall and winter terms.

- 4. Identifying Advisory Committee Members: It is important that the advisory committee is identified well before the proposal so that the student can establish a productive working relationship with the committee and receive helpful advice prior to the proposal. Also, recent revisions to the description of advisory committees approved by Senate Graduate & Research Council (SGRC) state that advisory committees for PhD students “shall be established not later than the month following the student’s successful completion of the Comprehensive or Qualifying Exam”.
- 5. Composition of the Advisory Committee: The composition of the advisory committee did not consistently follow the GSAC when it said: “One member of the Advisory Committee will be from outside the School of Accounting and Finance but within the University.” All students have an internal-external member on the examining committee but not all students have an internal-external member on the advisory committee. This inconsistency could potentially be driven by confusion related to the distinction between the composition of the advisory committee and the examining committee. Specifically, it is possible that the GSAC was interpreted as referring to the internal-external member of the examining committee. Although the proposed changes no longer require that one member of the advisory committee be from outside the School of Accounting and Finance, students could still choose to have a member from outside the School of Accounting and Finance on their advisory committee.
- 6. Thesis Examining Committee: To provide clarity that the thesis examining committee will (normally) comprise the advisory committee, plus an internal-external and an external examiner.
- 7. Coursework Requirements: Students need to focus on developing expertise in their specialty area. Students interested in economics-based research (psychology-based research) should not be required to take a core discipline outside of economics (psychology) if two good economics (psychology) courses are available. Students will be able to achieve breadth through the required accounting seminars (ACC 781, 782, 783).
- 8. Minor Revisions: To provide greater clarity and align with current practice.

Consultations (Departmental) ⓘ

Supporting Documentation

General Program/Plan Information

Faculty ⓘ

Faculty of Arts

Academic Unit ⓘ

School of Accounting and Finance

Graduate Field of Study

Accounting and Finance

Faculty ⓘ

Faculty of Arts

Program/Plan Name ⓘ

Doctor of Philosophy (PhD) in Accounting

Graduate Credential Type

PhD

Accelerated Program

Not applicable

Program Types

Internship

Admit Term(s)

Fall

Delivery Mode

On-campus

Delivery Mode Information

Length of Program

- Normally, there will be no more than four terms of course work in order to ensure timely completion of the program and to provide time for research. Course work may, however, include prerequisites to the required courses, particularly if the student has been admitted with an Honours Bachelor's degree. No student who requires more than two terms of prerequisite course work will be admitted to the program. It is expected that, after completion of any prerequisite course work, the student will complete the course requirements and write the comprehensive examination within two years, and complete the thesis within four years of admission.
- The University Senate has set the following time limits for a PhD program:
 - from an Honours Bachelor's degree: 18 terms (6 years)
 - from a Master's degree: 12 terms (4 years)

Registration Option(s)

Full-time

Registration Options Information**Graduate Research Fields**

- Empirical/Archival Research in Accounting
- Judgement and Decision-Making

Graduate Specializations**Additional Program Information**

Admissions

Proposed**Admission Requirements: Minimum Requirements** ⓘ

- Successful completion of a Master's degree or Honour's Bachelor's degree with at least an 80% average.
- Students from various backgrounds, including economics, psychology and other academic disciplines are encouraged to apply. Admissions will not be confined to those with a background in accounting, finance, or other business-related disciplines.
- English language proficiency (ELP) (if applicable)

Existing**Admission Requirements: Minimum Requirements** ⓘ

- Successful completion of a Master's degree or Honour's Bachelor's degree with at least an 80% average.
- Students from various backgrounds, including economics, mathematics, statistics, behavioural science, and related disciplines are encouraged to apply. Admissions will not be confined to those with a background in accounting, commerce, or business administration.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Graduate Management Admission Test (GMAT) or Graduate Record Examination (GRE)
- Résumé
- Supplementary information form
- Transcript(s)

Admission Requirements: References

- Number of references: 3
- Type of references: academic

Requirements Information

Proposed

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).
- Note: At the completion of the program, students are expected to be capable of conducting research in a selected specialty area within the School of Accounting and Finance. This will require specialization in the following ways:
 - Selection of an appropriate core discipline from economics, psychology, or another academic discipline other than accounting to provide the foundation for the chosen subject area and methods specialty.
 - Selection of one subject area chosen from: accounting information systems, auditing, financial accounting, management accounting, or taxation.
 - Selection of one methods specialty from archival, analytical, experimental, or field.
- While specialization is essential for students to be able to conduct research, breadth is also important for an accounting academic career. Students are expected to be familiar with the various research questions and methods used outside of their selected specialty area.

Existing

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).
- Note: At the completion of the program, students are expected to be capable of conducting research in a selected specialty area within the School of Accounting and Finance. This will require specialization in the following ways:
 - Selection of an appropriate core discipline from economics, behavioural science, or related core disciplines, to provide the foundation for the chosen area and methods specialty.
 - Selection of one subject area chosen from: accounting information systems, auditing, financial accounting, management accounting, or taxation.
 - Selection of one methods specialty from archival, analytical, experimental, or field.
- While specialization is essential for a student to be able to conduct research, breadth is also important for an accounting academic career. The student is expected to be familiar with important research questions and methods in all subject areas.

Graduate Course Requirements

No Rules

Proposed

Graduate Course Requirements

- Students will select appropriate coursework for their chosen core discipline, subject area and methods specialty. Course selections shall be approved each term, in advance, by the Graduate Officer. The specific requirements are as follows:
- Students must complete 12 graduate level courses (0.50 unit weight) as follows:
 - Core discipline: at least 2 graduate-level courses from economics, psychology, or another academic discipline other than accounting to provide the appropriate foundation for the chosen subject area and methods specialty.
 - Subject area:
 - ACC 781 Introduction to Accounting Research: will be offered to all PhD students in their first year and will introduce them to important research questions and methods in accounting. This course will stress issues of research design.
 - ACC 782 Experimental & Field Research in Accounting, and ACC 783 Archival & Analytic Research in Accounting will be offered in alternating Winter terms to first- and second-year students. These courses will introduce research methods used in accounting research.
 - At least 2 other accounting PhD seminar courses.
 - Methods specialty: at least 2 graduate-level courses chosen from statistics, econometrics, psychometrics, research design or other related areas of study.
- In addition to formal coursework, students are expected to attend the School's research workshops since an early orientation to research is critical for success in the program.
- The PhD Policy Committee may modify or extend course requirements where it deems the student's background and research interests warrants it. At the discretion of the Committee, additional courses beyond the minimum PhD requirements may be required of individual students. The Committee may also substitute 2 senior undergraduate courses if appropriate graduate-level courses are unavailable.
- The PhD Policy Committee will assign each student a faculty advisor who will assist the Graduate Officer in approving appropriate course work and ensure an early orientation to research. The faculty advisor and Graduate Officer will jointly approve the student's choice of specialization, which must be identified by the end of the first spring term of study. At this time, the PhD Policy Committee will review the student's program and appoint a new faculty advisor, if necessary.

Existing

Graduate Course Requirements

- Students will select appropriate coursework for their chosen subject area and methods specialty. Course selections shall be approved each term, in advance, by the Graduate Officer. The specific requirements are as follows:
- Students must complete 12 graduate level courses (0.50 unit weight) as follows:
 - ACC 781 Introduction to Accounting Research: will be offered to all PhD students in their first year and will introduce them to important research questions and methods in accounting. This course will stress issues of research design.
 - ACC 782 Experimental & Field Research in Accounting, and ACC 783 Archival & Analytic Research in Accounting will be offered in alternating Winter terms to first- and second-year students. These courses will introduce research methods used in accounting research.
 - At least 2 other accounting PhD seminar courses (0.50 unit weight), chosen from two different subject areas.
 - Core discipline: graduate-level courses from at least 2 of the following: economics, finance, psychology, sociology or other core disciplines to provide the appropriate foundation for the chosen subject area and methods specialty.
 - Statistics and Quantitative Methods: graduate-level courses chosen from the following: statistics, econometrics, psychometrics, research design or similar areas.

- In addition to formal coursework, students are expected to attend the School's research workshops since an early orientation to research is critical for success in the program.
- The Graduate Studies Committee of the School of Accounting and Finance must approve each student's course work. It may modify or extend course requirements where it deems the student's background and research interests warrants it. At the discretion of the Committee, additional courses beyond the minimum PhD requirements may be required of individual students. The Committee may also substitute 2 senior undergraduate courses if appropriate graduate-level courses are unavailable.
- When entering the program, each student will be assigned a faculty advisor who will assist the Committee in approving appropriate course work and ensure an early orientation to research. The faculty advisor and Graduate Officer will jointly approve the student's choice of specialization, which must be identified by the end of the first spring term of study. At this time, the Graduate Studies Committee will review the student's program and appoint a new faculty advisor, if necessary. Formal reviews of the student's progress will be conducted by the Graduate Studies Committee. Students whose progress does not meet the program's standards will be required to withdraw.

Proposed

Milestone Requirements

PhD Research Paper

- Students are required to complete a PhD Research Paper in the first spring term. Normally, the student's faculty advisor will serve as the faculty supervisor (or co-supervisor) for the research paper. The Graduate Officer will consult with the student to identify a potential faculty supervisor (or co-supervisors) as necessary.

PhD Internship

- Each PhD student must complete a minimum of 6 terms of research internship with faculty members from the School of Accounting and Finance. Normally, at least two of the internships will be supervised by the student's faculty advisor.

PhD Comprehensive Examination

- Students are required to meet the University-level PhD Comprehensive Examination minimum requirements, with certain noted exceptions that are specific to the Faculty of Arts Comprehensive Examination minimum requirements:
 - Comprehensive examination purpose: Consistent with University-level minimum requirements.
 - Timing: Consistent with University-level minimum requirements.
 - Committee: Consistent with University-level minimum requirements with the exception that in the Faculty of Arts, the Graduate Chair can approve the committee for comprehensive examinations.
 - Who Chairs an examination: Consistent with University-level minimum requirements.
 - Format / Content: Consistent with University-level 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 Accounting program are also required to meet the following requirements:
 - Upon satisfactory completion of course work (no failures, 78% average) students will write a comprehensive examination measuring knowledge in the chosen core discipline, subject area and methods specialty. The written examination component of the comprehensive examination will have two requirements:
 - Specialist - to measure whether the student has the necessary foundation, methodological knowledge and skills to conduct research in the chosen methods specialty.
 - Breadth - to measure understanding of the various research questions and methods used in accounting research. A specialist level of knowledge will not be expected in research issues outside the student's selected core discipline, subject area and methods specialty.

PhD Thesis

- At the end of the first spring term of study, the Graduate Officer will consult with the student to identify a potential supervisor (or co-supervisors). The supervisor (or one of the co-supervisors) must be a tenure stream faculty member from the School of Accounting and Finance with Sole-Supervisory Privilege Status (SSPS2).
- Within one month of successful completion of the comprehensive examination, the student and the supervisor (or co-supervisors) will jointly decide the composition of the student's advisory committee. Normally, the members of the advisory committee will be the supervisor (or co-supervisors) and two other faculty members from the School of Accounting and Finance. The student will communicate to the Graduate Officer the composition of their advisory committee.
- The student will submit a proposal for the PhD thesis containing a detailed statement and justification of a research problem and method and a review of relevant literature. An acceptable proposal will demonstrate that the candidate has developed a research plan that should lead to an acceptable thesis and that the candidate has a clear understanding of the problem addressed, the relevant literature, and the research method. Normally the proposal should be a description of planned work rather than a work in progress. The proposal will be presented at a research seminar in the School of Accounting and Finance.
- The completed thesis will be defended in an oral examination conducted in accordance with the general requirements of the University.
- Normally, the examining committee will consist of the supervisor, two other faculty members from the School of Accounting and Finance, an internal-external member, and an external examiner.

Other requirements

- Formal evaluations of student progress will be conducted by the Graduate Officer in consultation with the student's faculty advisor or supervisor. Students whose progress does not meet the program's standards will be required to withdraw.
- Language requirements: no language requirements, other than English, are specified.

Existing

Milestone Requirements

PhD Research Paper

- Students are required to complete a PhD Research Paper in the first spring term.

PhD Internship

- Each PhD student must complete a minimum of 6 terms of research internship with one or more faculty member in the School of Accounting and Finance.

PhD Comprehensive Examination

- Students are required to meet the University-level PhD Comprehensive Examination minimum requirements, with certain noted exceptions that are specific to the Faculty of Arts Comprehensive Examination minimum requirements:
 - Comprehensive examination purpose: Consistent with University-level minimum requirements.
 - Timing: Consistent with University-level minimum requirements.
 - Committee: Consistent with University-level minimum requirements with the exception that in the Faculty of Arts, the Graduate Chair can approve the committee for comprehensive examinations.
 - Who Chairs an examination: Consistent with University-level minimum requirements.
 - Format / Content: Consistent with University-level 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 Accounting program are also required to meet the following requirements:
 - Upon satisfactory completion of course work (no failures, 78% average) students will write a comprehensive examination measuring knowledge in the chosen core discipline, functional area and methods specialty. The written examination component of the comprehensive examination will have two requirements:

- Specialist - to measure whether the student has the necessary foundation, methodological knowledge and skills to conduct research in the chosen methods specialty.
- Breadth - to measure understanding of the various research questions and methods used in accounting research. A specialist level of knowledge will not be expected in research issues outside the student's selected core discipline, functional area and methods specialty.

PhD Thesis

- Within one month of successful completion of the comprehensive examination, the PhD Program Director will consult with the candidate to identify a potential thesis supervisor and other members of an Advisory Committee. This is only an initial Advisory Committee; its membership may change over time as the thesis research evolves. The supervisor must have Sole-Supervisory Privilege Status (SSPS2) as described in the Organization of Graduate Studies section of this Calendar. The supervisor must be from the School of Accounting and Finance, although if there are two co-supervisors, only one need be from the School of Accounting and Finance. One member of the Advisory Committee will be from outside the School of Accounting and Finance but within the University. Further regulations concerning the Advisory Committee are found in the Academic Regulations section of this Calendar.
- The student will submit a proposal for the PhD thesis containing a detailed statement and justification of a research problem and method and a review of relevant literature. An acceptable proposal will demonstrate that the candidate has developed a research plan that should lead to an acceptable thesis and that the candidate has a clear understanding of the problem addressed, the relevant literature, and the research method. Normally the proposal should be a description of planned work rather than a work in progress. The proposal will be presented at a research seminar in the School of Accounting and Finance.
- The completed thesis will be defended in an oral examination conducted in accordance with the general requirements of the University.

Other requirements

- Language requirements: no language requirements, other than English, are specified.

Notes ⓘ

- School of Accounting and Finance website
- Doctor of Philosophy (PhD) in Accounting future students program page

Workflow Information

Workflow Path ⓘ

Committee approvals

Faculty/AFIW Path(s) for Workflow ⓘ

Faculty of Arts

Senate Workflow

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Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

PhD in Political Science

Doctor of Philosophy (PhD) in Political Science

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
- Milestone Requirements

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

09/20/2024

Quality Assurance Designation ⓘ

Minor Modification

Is there an impact to existing students? ⓘ

Yes

Impact on Existing Students ⓘ

There is only one student in the experiential stream at the moment and they have permission to take WIL 601.

Is the credential name changing?

No

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

Updating the PhD Experiential Seminar milestone which is required for students in the Experiential stream of the program: Consistent with other milestones in the PhD in Political Science program, this change will draw on relevant opportunities and expertise made available at the University of Waterloo.

Consultations (Departmental) ⓘ

Supporting Documentation

General Program/Plan Information

Faculty ⓘ

Faculty of Arts

Academic Unit ⓘ

Department of Political Science

Graduate Field of Study

Political Science

Faculty ⓘ

Faculty of Arts

Program/Plan Name ⓘ

Doctor of Philosophy (PhD) in Political Science

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**

- Canadian Politics
- International Relations
- Political Economy

Graduate Specializations**Additional Program Information**

Admissions

Admission Requirements: Minimum Requirements ⓘ

- Students must hold a Master's degree with a minimum 80% average or equivalent in political science, or a related discipline.
- Experienced professionals in the private or public sectors will be considered for admission, but additional course work may be required.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé
- Supplementary information form
- Transcript(s)
- Writing sample

Admission Requirements: References

- Number of references: 3
- Type of references: normally from academic sources

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: In addition to the Regular stream of the program, students have the option of taking the Teaching stream (featuring additional professional development modules, including a mentored teaching experience) and the Experiential stream (which may include entry into the Co-op program - described separately - or another placement and other experiential training, including additional professional development modules).

Graduate Course Requirements

No Rules

Graduate Course Requirements**Regular stream / Teaching stream / Experiential stream**

- Students must complete 6 (0.50 unit weight) graduate-level courses:
 - PSCI 600 Political Science Methods
 - 2 core courses in one of the program's three graduate research fields
 - 2 courses in the student's second area (which may be another of the three graduate research fields or a custom concentration)
 - 1 elective (may be taken outside the Department of Political Science at the approval of the Associate Chair, Graduate Studies)
- If selecting the Canadian Politics research field, students must complete the following core courses:
 - PSCI 661 Canadian Political Institutions
 - PSCI 662 Canadian Political Process
- If selecting the International Relations research field, students must complete the following core courses:
 - PSCI 610 International Relations Theory
 - PSCI 611 Current Issues in International Relations
- If selecting the Political Economy research field, students must complete the following core courses:
 - PSCI 690 Theories of Political Economy
 - PSCI 691 Developments in Political Economy or PSCI 688 Governance of Global Economy
- Students entering the PhD program from the University of Waterloo's Master of Arts (MA) in Political Science program may have already completed some of the required core courses for their chosen research fields. To meet formal course requirements for the PhD degree, these students must complete 6 new (0.50 unit weight) graduate-level courses that satisfy their comprehensive examination preparation.
- Reading courses may supplement regular offerings in the program, although it is understood that they will be approved at the discretion of the Department. Students will normally be permitted to take 1 reading course as part of their degree.
- Students are required to maintain an overall average of 80% in their graduate-level coursework.

Proposed

Milestone Requirements**Regular stream:****PhD Professional Development Seminar**

- Students must complete the following mandatory professional development workshops (typically in Year 2 and 3 of the program). The six mandatory workshops are offered by the Department:
 - Research design and methods
 - Conducting literature review
 - Planning and best practices in fieldwork
 - Conferencing best practices (completed after proposal defence)
 - Careers in political science and translating skills for a non-academic job market
 - Communicating research to a broader audience
- Students must also complete 3 additional professional development workshops to satisfy the requirements of the PhD Professional Development Seminar. Workshops must be approved by the Associate Chair, Graduate Studies, but may include the following:
 - Practice job talk / job interview
 - Workshops or courses providing additional training in social science methods
 - CTE workshop aimed at graduate students

- MITACS Edge workshop/course
- Writing Centre workshop
- Career Centre workshop
- Counselling Services workshop on mindfulness, cognitive therapy, or practical skills to reduce anxiety
- Completion of any course or workshop relevant to professional development offered by a campus partner

PhD Comprehensive Examination

- Students are required to meet the University-level PhD Comprehensive Examination minimum requirements, with certain noted exceptions that are specific to the Faculty of Arts Comprehensive Examination minimum requirements:
 - Comprehensive examination purpose: Consistent with University-level minimum requirements.
 - Timing: Consistent with University-level minimum requirements.
 - Committee: Consistent with University-level minimum requirements with the exception that in the Faculty of Arts, the Graduate Chair can approve the committee for comprehensive examinations.
 - Who Chairs an examination: Consistent with University-level minimum requirements.
 - Format / Content: Consistent with University-level 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 Political Science program are also required to meet the following requirements:
 - At the end of their coursework, typically in September of Year 2, students are required to sit two exams.
 - The first exam will be from one of the three graduate research fields of the program the student has selected to study in. It will be comprised of a written exam, followed by an oral exam.
 - The second exam may follow the same format as the first if the student's second field is also one of the three graduate research fields of the program. Alternatively, the student may elect to submit a review essay broadly addressing the major theoretical debates, methodological hurdles, or substantive problems posed by existing scholarship in the field.
 - If the second area of study is a custom concentration, the comprehensive exam will consist of a review essay broadly addressing the major theoretical debates, methodological hurdles, or substantive problems posed by existing scholarship in the field.

PhD Thesis Proposal

- Students will write a thesis proposal situating their research question(s) in the extant literature, outlining their approach, theory, scope, and research methodology, and explaining the original nature of their contribution, along with a timeline and proposed chapter outline. The proposal will be subject to an oral defence, normally by the end of the sixth term, before a committee including the student's supervisor and two other faculty members.

PhD Thesis

- Students will have choice in the format of their thesis. Students may choose a traditional dissertation (ranging from 200 to 350 pages in length), or a 'publication model' consisting of at least three sole-authored published (or in press) works, at least one of which is in a traditional, peer-reviewed outlet (other publications might include research reports for think tanks, etc.), and including an original introduction, conclusion and any necessary bridging chapters to reflect a coherent project. In rare cases, and with the approval of the student's supervisor and the Department's Graduate Committee, students may opt for a non-traditional thesis that meets the standards of an original doctoral-level contribution to knowledge, but in a different form (for example, a documentary). The Department is especially cognizant of the potential for alternative approaches to knowledge-generation and dissemination, such as Indigenous approaches to knowledge, as something to be accommodated on a case-by-case basis.
- Normally, students should complete and defend the dissertation within four years of starting the program. Regardless of format, the thesis will be subject to an oral defence before a committee, including the supervisor, two other Political Science faculty members, an internal-external examiner from another department/program at the University of Waterloo, and an external examiner.

Teaching stream:

PhD Professional Development Seminar

- Students must complete the following mandatory professional development workshops (typically in Year 2 and 3 of the program). The six mandatory workshops are offered by the Department:
 - Research design and methods
 - Conducting literature review
 - Planning and best practices in fieldwork
 - Conferencing best practices (completed after proposal defence)
 - Careers in political science and translating skills for a non-academic job market
 - Communicating research to a broader audience

PhD Teaching Seminar

- Students who participate in the teaching stream of the program will be required to complete the PhD Teaching Seminar. The following mandatory professional development workshops must be completed:
 - Centre for Teaching Excellence Fundamentals of University Teaching program (student may begin this program as early as Year 1)
 - 2 Guest Lectures in Political Science (students will receive automatic credit if they have the opportunity to teach their own course as a sessional instructor)
 - Develop a syllabus for a real or prospective Political Science course

PhD Comprehensive Examination

- Students are required to meet the University-level PhD Comprehensive Examination minimum requirements, with certain noted exceptions that are specific to the Faculty of Arts Comprehensive Examination minimum requirements:
 - Comprehensive examination purpose: Consistent with University-level minimum requirements.
 - Timing: Consistent with University-level minimum requirements.
 - Committee: Consistent with University-level minimum requirements with the exception that in the Faculty of Arts, the Graduate Chair can approve the committee for comprehensive examinations.
 - Who Chairs an examination: Consistent with University-level minimum requirements.
 - Format / Content: Consistent with University-level 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 Political Science program are also required to meet the following requirements:
 - At the end of their coursework, typically in September of Year 2, students are required to sit two exams.
 - The first exam will be from one of the three graduate research fields of the program the student has selected to study in. It will be comprised of a written exam, followed by an oral exam.
 - The second exam may follow the same format as the first if the student's second field is also one of the three graduate research fields of the program. Alternatively, the student may elect to submit a review essay broadly addressing the major theoretical debates, methodological hurdles, or substantive problems posed by existing scholarship in the field.
 - If the second area of study is a custom concentration, the comprehensive exam will consist of a review essay broadly addressing the major theoretical debates, methodological hurdles, or substantive problems posed by existing scholarship in the field.

PhD Thesis Proposal

- Students will write a thesis proposal situating their research question(s) in the extant literature, outlining their approach, theory, scope, and research methodology, and explaining the original nature of their contribution, along with a timeline and proposed chapter outline. The proposal will be subject to an oral defence, normally by the end of the sixth term, before a committee including the student's supervisor and two other faculty members.

PhD Thesis

- Students will have choice in the format of their thesis. Students may choose a traditional dissertation (ranging from 200 to 350 pages in length), or a 'publication model' consisting of at least three sole-authored published (or in press) works, at least one of which is in a traditional, peer-reviewed outlet (other publications might include research reports for think tanks, etc.), and including an original introduction, conclusion and any necessary bridging chapters to reflect a coherent project. In rare cases, and with the approval of the student's supervisor and the Department's Graduate Committee, students may opt for a non-traditional thesis that meets the standards of an original doctoral-level contribution to knowledge, but in a different form (for example, a documentary). The Department is especially cognizant of the potential for alternative approaches to knowledge-generation and dissemination, such as Indigenous approaches to knowledge, as something to be accommodated on a case-by-case basis.
- Normally, students should complete and defend the dissertation within four years of starting the program. Regardless of format, the thesis will be subject to an oral defence before a committee, including the supervisor, two other Political Science faculty members, an internal-external examiner from another department/program at the University of Waterloo, and an external examiner.

Experiential stream:

PhD Professional Development Seminar

- Students must complete the following mandatory professional development workshops (typically in Year 2 and 3 of the program). The six mandatory workshops are offered by the Department:
 - Research design and methods
 - Conducting literature review
 - Planning and best practices in fieldwork
 - Conferencing best practices (completed after proposal defence)
 - Careers in political science and translating skills for a non-academic job market
 - Communicating research to a broader audience

PhD Experiential Seminar

- Students who participate in the experiential stream of the program will be required to complete the PhD Experiential Seminar. The following course and mandatory professional development workshops must be completed:
 - WIL 601 Career Foundations for Work-Integrated Learning (must be completed prior to internship placement) (Centre for Work Integrated Learning)
 - Writing resumes (must be completed prior to internship placement) (Centre for Career Development)
 - Parallel career planning (Centre for Career Development)
 - MITACS or other campus partner module(s) (as approved by the Associate Chair, Graduate Studies)

PhD Comprehensive Examination

- Students are required to meet the University-level PhD Comprehensive Examination minimum requirements, with certain noted exceptions that are specific to the Faculty of Arts Comprehensive Examination minimum requirements:
 - Comprehensive examination purpose: Consistent with University-level minimum requirements.
 - Timing: Consistent with University-level minimum requirements.
 - Committee: Consistent with University-level minimum requirements with the exception that in the Faculty of Arts, the Graduate Chair can approve the committee for comprehensive examinations.
 - Who Chairs an examination: Consistent with University-level minimum requirements.
 - Format / Content: Consistent with University-level 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 Political Science program are also required to meet the following requirements:
 - At the end of their coursework, typically in September of Year 2, students are required to sit two exams.

- o The first exam will be from one of the three graduate research fields of the program the student has selected to study in. It will be comprised of a written exam, followed by an oral exam.
- o The second exam may follow the same format as the first if the student's second field is also one of the three graduate research fields of the program. Alternatively, the student may elect to submit a review essay broadly addressing the major theoretical debates, methodological hurdles, or substantive problems posed by existing scholarship in the field.
- o If the second area of study is a custom concentration, the comprehensive exam will consist of a review essay broadly addressing the major theoretical debates, methodological hurdles, or substantive problems posed by existing scholarship in the field.

PhD Internship

- Students in the experiential stream have the option of undertaking an internship through Mitacs or finding an alternative placement (at the approval of the student's supervisor and the Associate Chair, Graduate Studies). Students will be eligible to go on placements for periods ranging from four months to one year.

PhD Internship Report

- Required for students who are participating in the experiential stream. Students must complete and submit a PhD Internship Report within one month of the completion of their placement.

PhD Thesis Proposal

- Students will write a thesis proposal situating their research question(s) in the extant literature, outlining their approach, theory, scope, and research methodology, and explaining the original nature of their contribution, along with a timeline and proposed chapter outline. The proposal will be subject to an oral defence, normally by the end of the sixth term, before a committee including the student's supervisor and two other faculty members.

PhD Thesis

- Students will have choice in the format of their thesis. Students may choose a traditional dissertation (ranging from 200 to 350 pages in length), or a 'publication model' consisting of at least three sole-authored published (or in press) works, at least one of which is in a traditional, peer-reviewed outlet (other publications might include research reports for think tanks, etc.), and including an original introduction, conclusion and any necessary bridging chapters to reflect a coherent project. In rare cases, and with the approval of the student's supervisor and the Department's Graduate Committee, students may opt for a non-traditional thesis that meets the standards of an original doctoral-level contribution to knowledge, but in a different form (for example, a documentary). The Department is especially cognizant of the potential for alternative approaches to knowledge-generation and dissemination, such as Indigenous approaches to knowledge, as something to be accommodated on a case-by-case basis.
- Normally, students should complete and defend the dissertation within four years of starting the program. Regardless of format, the thesis will be subject to an oral defence before a committee, including the supervisor, two other Political Science faculty members, an internal-external examiner from another department/program at the University of Waterloo, and an external examiner.

Existing

Milestone Requirements

Regular stream:

PhD Professional Development Seminar

- Students must complete the following mandatory professional development workshops (typically in Year 2 and 3 of the program). The six mandatory workshops are offered by the Department:
 - o Research design and methods
 - o Conducting literature review

- o Planning and best practices in fieldwork
 - o Conferencing best practices (completed after proposal defence)
 - o Careers in political science and translating skills for a non-academic job market
 - o Communicating research to a broader audience
- Students must also complete 3 additional professional development workshops to satisfy the requirements of the PhD Professional Development Seminar. Workshops must be approved by the Associate Chair, Graduate Studies, but may include the following:
 - o Practice job talk / job interview
 - o Workshops or courses providing additional training in social science methods
 - o CTE workshop aimed at graduate students
 - o MITACS Edge workshop/course
 - o Writing Centre workshop
 - o Career Centre workshop
 - o Counselling Services workshop on mindfulness, cognitive therapy, or practical skills to reduce anxiety
 - o Completion of any course or workshop relevant to professional development offered by a campus partner

PhD Comprehensive Examination

- Students are required to meet the University-level PhD Comprehensive Examination minimum requirements, with certain noted exceptions that are specific to the Faculty of Arts Comprehensive Examination minimum requirements:
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 - o Timing: Consistent with University-level minimum requirements.
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 - o Who Chairs an examination: Consistent with University-level minimum requirements.
 - o Format / Content: Consistent with University-level minimum requirements.
 - o 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 Political Science program are also required to meet the following requirements:
 - o At the end of their coursework, typically in September of Year 2, students are required to sit two exams.
 - o The first exam will be from one of the three graduate research fields of the program the student has selected to study in. It will be comprised of a written exam, followed by an oral exam.
 - o The second exam may follow the same format as the first if the student's second field is also one of the three graduate research fields of the program. Alternatively, the student may elect to submit a review essay broadly addressing the major theoretical debates, methodological hurdles, or substantive problems posed by existing scholarship in the field.
 - o If the second area of study is a custom concentration, the comprehensive exam will consist of a review essay broadly addressing the major theoretical debates, methodological hurdles, or substantive problems posed by existing scholarship in the field.

PhD Thesis Proposal

- Students will write a thesis proposal situating their research question(s) in the extant literature, outlining their approach, theory, scope, and research methodology, and explaining the original nature of their contribution, along with a timeline and proposed chapter outline. The proposal will be subject to an oral defence, normally by the end of the sixth term, before a committee including the student's supervisor and two other faculty members.

PhD Thesis

- Students will have choice in the format of their thesis. Students may choose a traditional dissertation (ranging from 200 to 350 pages in length), or a 'publication model' consisting of at least three sole-authored published (or in press) works, at least one of which is in a traditional, peer-reviewed outlet (other publications might include research reports for think tanks, etc.), and including an original introduction, conclusion and any necessary bridging chapters to reflect

a coherent project. In rare cases, and with the approval of the student's supervisor and the Department's Graduate Committee, students may opt for a non-traditional thesis that meets the standards of an original doctoral-level contribution to knowledge, but in a different form (for example, a documentary). The Department is especially cognizant of the potential for alternative approaches to knowledge-generation and dissemination, such as Indigenous approaches to knowledge, as something to be accommodated on a case-by-case basis.

- Normally, students should complete and defend the dissertation within four years of starting the program. Regardless of format, the thesis will be subject to an oral defence before a committee, including the supervisor, two other Political Science faculty members, an internal-external examiner from another department/program at the University of Waterloo, and an external examiner.

Teaching stream:

PhD Professional Development Seminar

- Students must complete the following mandatory professional development workshops (typically in Year 2 and 3 of the program). The six mandatory workshops are offered by the Department:
 - Research design and methods
 - Conducting literature review
 - Planning and best practices in fieldwork
 - Conferencing best practices (completed after proposal defence)
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 - Communicating research to a broader audience

PhD Teaching Seminar

- Students who participate in the teaching stream of the program will be required to complete the PhD Teaching Seminar. The following mandatory professional development workshops must be completed:
 - Centre for Teaching Excellence Fundamentals of University Teaching program (student may begin this program as early as Year 1)
 - 2 Guest Lectures in Political Science (students will receive automatic credit if they have the opportunity to teach their own course as a sessional instructor)
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PhD Comprehensive Examination

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 - At the end of their coursework, typically in September of Year 2, students are required to sit two exams.
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- If the second area of study is a custom concentration, the comprehensive exam will consist of a review essay broadly addressing the major theoretical debates, methodological hurdles, or substantive problems posed by existing scholarship in the field.

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PhD Professional Development Seminar

- Students must complete the following mandatory professional development workshops (typically in Year 2 and 3 of the program). The six mandatory workshops are offered by the Department:
 - Research design and methods
 - Conducting literature review
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 - Conferencing best practices (completed after proposal defence)
 - Careers in political science and translating skills for a non-academic job market
 - Communicating research to a broader audience

PhD Experiential Seminar

- Students who participate in the experiential stream of the program will be required to complete the PhD Experiential Seminar. The following mandatory professional development workshops must be completed:
 - Reflective practices in experiential learning (must be completed prior to internship placement) (offered by the Department)
 - Writing resumes (must be completed prior to internship placement) (Centre for Career Development)
 - Parallel career planning (Centre for Career Development)
 - MITACS or other campus partner module(s) (as approved by the Associate Chair, Graduate Studies)

PhD Comprehensive Examination

- Students are required to meet the University-level PhD Comprehensive Examination minimum requirements, with certain noted exceptions that are specific to the Faculty of Arts Comprehensive Examination minimum requirements:
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 - The second exam may follow the same format as the first if the student's second field is also one of the three graduate research fields of the program. Alternatively, the student may elect to submit a review essay broadly addressing the major theoretical debates, methodological hurdles, or substantive problems posed by existing scholarship in the field.
 - If the second area of study is a custom concentration, the comprehensive exam will consist of a review essay broadly addressing the major theoretical debates, methodological hurdles, or substantive problems posed by existing scholarship in the field.

PhD Internship

- Students in the experiential stream have the option of undertaking an internship through Mitacs or finding an alternative placement (at the approval of the student's supervisor and the Associate Chair, Graduate Studies). Students will be eligible to go on placements for periods ranging from four months to one year.

PhD Internship Report

- Required for students who are participating in the experiential stream. Students must complete and submit a PhD Internship Report within one month of the completion of their placement.

PhD Thesis Proposal

- Students will write a thesis proposal situating their research question(s) in the extant literature, outlining their approach, theory, scope, and research methodology, and explaining the original nature of their contribution, along with a timeline and proposed chapter outline. The proposal will be subject to an oral defence, normally by the end of the sixth term, before a committee including the student's supervisor and two other faculty members.

PhD Thesis

- Students will have choice in the format of their thesis. Students may choose a traditional dissertation (ranging from 200 to 350 pages in length), or a 'publication model' consisting of at least three sole-authored published (or in press) works, at least one of which is in a traditional, peer-reviewed outlet (other publications might include research reports for think tanks, etc.), and including an original introduction, conclusion and any necessary bridging chapters to reflect a coherent project. In rare cases, and with the approval of the student's supervisor and the Department's Graduate Committee, students may opt for a non-traditional thesis that meets the standards of an original doctoral-level contribution to knowledge, but in a different form (for example, a documentary). The Department is especially cognizant of the potential for alternative approaches to knowledge-generation and dissemination, such as Indigenous approaches to knowledge, as something to be accommodated on a case-by-case basis.
- Normally, students should complete and defend the dissertation within four years of starting the program. Regardless of format, the thesis will be subject to an oral defence before a committee, including the supervisor, two other Political

Science faculty members, an internal-external examiner from another department/program at the University of Waterloo, and an external examiner.

Notes ⓘ

- Department of Political Science website
- Doctor of Philosophy (PhD) in Political Science future students program page

Workflow Information

Workflow Path ⓘ	Faculty/AFIW Path(s) for Workflow ⓘ	Senate Workflow
Committee approvals	Faculty of Arts	--

Dependencies

Dependent Courses and Programs/Plans
There are no dependencies

Master of Accounting (MAcc)

Master of Accounting (MAcc)

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

- Admission Requirements: Minimum Requirements
- 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

09/20/2024

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) ⓘ

Updating the minimum admission requirements to include the Bachelor of Sustainability and Financial Management (SFM) as an entry program. SFM was approved as an academic plan in 2021 where students completing the Corporate Sustainability Specialization would be eligible to apply for MAcc, so this change represents the final step to allow students to pursue this pathway: The School is revising the MAcc admission requirements for 2026 and beyond to reflect the SFM as an entry program. The list of courses required for admission is also being updated to recognize SFM and its associated course options tied to existing required courses for admission to the MAcc program.

Consultations (Departmental) ⓘ

Supporting Documentation

General Program/Plan Information

Faculty ⓘ

Faculty of Arts

Academic Unit ⓘ

School of Accounting and Finance

Graduate Field of Study

Accounting and Finance

Faculty ⓘ

Faculty of Arts

Program/Plan Name ⓘ

Master of Accounting (MAcc)

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Master's Research Paper / Coursework

Program Types

Admit Term(s)

Winter

Delivery Mode

On-campus

Delivery Mode Information**Length of Program**

- 2 terms (8 months)

Registration Option(s)

Full-time

Part-time

Registration Options Information

Note: direct entry into the MAcc program is only available through the full-time option. Students must obtain approval from the Program Director to transfer to the part-time option, which will be assessed on a case-by-case basis.

Graduate Research Fields

- Information Technology
- Performance Measurement
- Taxation

Graduate Specializations**Additional Program Information**

- This program is accredited by Chartered Professional Accountants (CPA) Canada, so students who successfully complete the program, including all CPA requirements, are exempt from all 6 modules of the CPA Professional Education Program and may proceed directly to the Common Final Examination (CFE).

Admissions

Proposed

Admission Requirements: Minimum Requirements ⓘ

- To be considered for admission to the MAcc program, students must meet these minimum requirements:
 - Successful completion of any of the following University of Waterloo four-year Honours undergraduate degrees, with at least a 75% average across all courses taken in the last two years of the program:
 - Bachelor of Accounting and Financial Management, with completion of the Professional Accountant Specialization
 - Bachelor of Math/Chartered Professional Accountancy Studies
 - Bachelor of Science/Chartered Professional Accountancy Studies, or
 - Bachelor of Sustainability and Financial Management, with completion of the Corporate Sustainability Specialization
 - Completion of the following set of courses, with a grade of at least 60% in each course and with at least a 70% average across all courses, calculated using the maximum grade in a course in the case of repeated courses:
 - AFM 273 Financial Instruments and Capital Markets or AFM 272 Global Capital Markets
 - AFM 274 Introduction to Corporate Finance or AFM 275 Corporate Finance
 - AFM 291 Intermediate Financial Accounting I
 - AFM 311 Professional Ethics or SFM 309 Sustainability and Business Ethics
 - AFM 321 Personal Financial Planning
 - AFM 341 Accounting Information Systems
 - AFM 362 Taxation 1 - Corporate Taxation
 - AFM 373 Cases and Applications in Corporate Finance or AFM 476 Corporate Financial Decision Making
 - AFM 382 Cost Management Systems
 - AFM 391 Intermediate Financial Accounting II
 - AFM 433 Business Strategy or ENBUS 302 Strategies for Environment and Business
 - AFM 451 Audit Strategy
 - AFM 462 Advanced Taxation
 - AFM 482 Performance Measurement and Organization Control
 - AFM 491 Advanced Financial Accounting
- Note: Simply meeting these minimum requirements does not guarantee admission to the MAcc program.
- English language proficiency (ELP) (if applicable)

Existing

Admission Requirements: Minimum Requirements ⓘ

- To be considered for admission to the MAcc program, students must meet these minimum requirements:
 - Successful completion of any of the following University of Waterloo four-year Honours undergraduate degrees, with at least a 75% average across all courses taken in the last two years of the program:
 - Bachelor of Accounting and Financial Management, with completion of the Professional Accountant Specialization
 - Bachelor of Math/Chartered Professional Accountancy Studies, or
 - Bachelor of Science/Chartered Professional Accountancy Studies
 - Completion of the following set of courses, with a grade of at least 60% in each course and with at least a 70% average across all courses, calculated using the maximum grade in a course in the case of repeated courses:
 - AFM 273 Financial Instruments and Capital Markets or AFM 272 Global Capital Markets
 - AFM 274 Introduction to Corporate Finance or AFM 372 Corporate Finance
 - AFM 291 Intermediate Financial Accounting I
 - AFM 311 Professional Ethics
 - AFM 321 Personal Financial Planning
 - AFM 341 Accounting Information Systems
 - AFM 362 Taxation 1 - Corporate Taxation
 - AFM 373 Cases and Applications in Corporate Finance or AFM 476 Corporate Financial Decision Making

- AFM 382 Cost Management Systems
- AFM 391 Intermediate Financial Accounting II
- AFM 433 Business Strategy
- AFM 451 Audit Strategy
- AFM 462 Advanced Taxation
- AFM 482 Performance Measurement and Organization Control
- AFM 491 Advanced Financial Accounting
- Note: Simply meeting these minimum requirements does not guarantee admission to the MAcc program.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Transcript(s)

Admission Requirements: References

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements associated with their chosen study option in addition to the Graduate Academic Integrity Module (Graduate AIM).

Coursework Option: Course Requirements

No Rules

Coursework Option: Course Requirements

- Students must complete 8 approved graduate courses (0.50 unit weight) over two terms.
- The availability of particular courses depends on sufficient student demand.
- Students must achieve an average of at least 60% in each ACC course and an average of at least 75% across all courses presented in fulfillment of the degree requirements. Students with a first-term average below 75% may be required to withdraw from the program.

Coursework Option: Milestone Requirements

Master's Research Paper Option: Course Requirements

No Rules

Master's Research Paper Option: Course Requirements

- Students must complete 7 approved graduate courses (0.50 unit weight) over two terms.
- The availability of particular courses depends on sufficient student demand.
- Students must achieve an average of at least 60% in each ACC course and an average of at least 75% across all courses presented in fulfillment of the degree requirements. Students with a first-term average below 75% may be required to withdraw from the program.

Master's Research Paper Option: Milestone Requirements

Master's Research Paper

Notes ⓘ

- School of Accounting and Finance website

Workflow Information

Workflow Path ⓘ

Committee approvals

Faculty/AFIW Path(s) for Workflow ⓘ

Faculty of Arts

Senate Workflow

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Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

MA in Sociology

Master of Arts (MA) in Sociology

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
- Calendar Activation Date
- Length of Program

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

04/25/2024

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) ⓘ

Articulating the length of programs in the GSAC: 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. The program lengths are also consistent with other programs in the Faculty of Arts.

Consultations (Departmental) ⓘ

Supporting Documentation

General Program/Plan Information

Faculty ⓘ

Faculty of Arts

Academic Unit ⓘ

Department of Sociology and Legal Studies

Graduate Field of Study

Sociology and Legal Studies

Faculty ⓘ

Faculty of Arts

Program/Plan Name ⓘ

Master of Arts (MA) in Sociology

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Thesis / Master's Research Paper

Program Types

Admit Term(s)

Fall
Winter
Spring

Delivery Mode

On-campus

Delivery Mode Information

Proposed

Length of Program

- Thesis option: 4 terms (16 months)
- Master's Research Paper option: 3 terms (12 months)

Existing

Length of Program

Registration Option(s)

Full-time

Part-time

Registration Options Information

Graduate Research Fields

- Crime, Law, and Security
- Knowledge, Education, and Digital Culture
- Migration, Borders, and Transnationalism
- Social Inequality and Public Policy

Graduate Specializations

Additional Program Information

Admissions

Admission Requirements: Minimum Requirements ⓘ

- Normally an Honours Bachelor's degree or its equivalent in Sociology with at least a 78% overall standing.
- A statement of academic interest (approximately a page, outlining areas of interest and reasons for choosing to study at the University of Waterloo).
- Results from the General Section of the Graduate Record Examination (GRE) (optional).
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Curriculum vitae
- Supplementary information form
- Transcript(s)
 - From all other post-secondary institutions.
- Writing sample

Admission Requirements: References

- Number of references: 3
- Type of references: academic

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements associated with their chosen study option in addition to the Graduate Academic Integrity Module (Graduate AIM).
- Note: Students are admitted to a Master's study option (Thesis or Master's Research Paper). Thereafter, the approval of the Associate Chair, Graduate Affairs, is necessary in order to change an option. In the case of the Thesis or Master's Research Paper options, the Departmental Advisor will also assist the student in the identification of a potential supervisor. Students should keep in mind that it is strongly advised that they complete three courses in their first term.
- Note: Coursework beyond these minima may be required at the discretion of the Associate Chair, Graduate Affairs. If additional coursework is required, the student will be notified in writing at the time of entry into the program. Additional coursework may be required by those who in the estimation of the Associate Chair, Graduate Affairs, do not possess the equivalent of an Honours Bachelor's degree in sociology from the University of Waterloo.

Thesis Option: Course Requirements

No Rules

Thesis Option: Course Requirements

- Students must complete the following courses:
 - Theory: 1 of SOC 700 Sociological Theory or SOC 708 Contemporary Sociological Theory
 - Methods: SOC 712 Elements of Social Research
 - Statistics: SOC 710 Intermediate Social Statistics
 - At least 1 other graduate course with a minimum 0.50 unit weight. These courses must also require a substantial piece of research (project or essay).
 - Students may take a maximum of 1 reading course from University of Waterloo Sociology and Legal Studies Faculty or adjuncts.
- In order to complete a course satisfactorily, students must complete all course requirements as specified by the instructor and receive a minimum grade of 75%.

Thesis Option: Milestone Requirements

Master's Thesis

- Students must write and orally defend a thesis proposal and a thesis.
- A thesis proposal, approved by a supervisor and two readers, must be completed by the end of the second term (typically the end of April). The thesis should be completed and defended by the end of the sixth term.
- A Master's thesis is considered to involve an amount of work equivalent to 4 one-term courses (2.00 units, approximately 100 to 150 pages in length).

Master's Research Paper Option: Course Requirements

No Rules

Master's Research Paper Option: Course Requirements

- Students must complete the following courses:
 - Theory: 1 of SOC 700 Sociological Theory or SOC 708 Contemporary Sociological Theory
 - Methods: SOC 712 Elements of Social Research
 - Statistics: SOC 710 Intermediate Social Statistics
 - At least 3 other graduate courses with a minimum 0.50 unit weight each. These courses must also require a substantial piece of research (project or essay).
 - Students may take a maximum of 1 reading course from University of Waterloo Sociology and Legal Studies Faculty or adjuncts.
- In order to complete a course satisfactorily, students must complete all course requirements as specified by the instructor and receive a minimum grade of 75%.

Master's Research Paper Option: Milestone Requirements

Master's Research Paper

- Students must prepare a research paper proposal and write and orally defend a research paper.
- A research paper proposal must be completed and approved by a supervisor and one reader/examiner by the middle of the third term (typically the end of June). The research paper must be defended by the end of the fourth term (typically, the end of December).
- A research paper is considered to involve an amount of work equivalent to 2 one-term courses (1.00 unit, approximately 50 to 70 pages in length). As a guideline, the focus of a Master's Research Paper (MRP) can be on the research question, theory and methodology, and possibly some exploratory research on the state of the research but it is up to the supervisor, reader/examiner and student to set the direction for the MRP.

Notes ⓘ

- Department of Sociology and Legal Studies website
- Master of Arts (MA) in Sociology future students program page

Workflow Information

Workflow Path ⓘ	Faculty/AFIW Path(s) for Workflow ⓘ	Senate Workflow
Committee approvals	Faculty of Arts	No Senate

Dependencies

Dependent Courses and Programs/Plans

PREREQUISITES

▼ SOC 712 - Elements of Social Research

[View Courses ➤](#)

MA in Sociology-Co-op Master of Arts (MA) in Sociology - 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

- Effective Term and Year
- Calendar Activation Date
- Length of Program

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

04/25/2024

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) ⓘ

Articulating the length of programs in the GSAC: 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. The program lengths are also consistent with other programs in the Faculty of Arts.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Arts

Academic Unit ⓘ

Department of Sociology and Legal Studies

Graduate Field of Study

Sociology and Legal Studies

Faculty ⓘ

Faculty of Arts

Program/Plan Name ⓘ

Master of Arts (MA) in Sociology - Co-operative Program (direct entry)

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Thesis / Master's Research Paper

Program Types

Co-operative

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

On-campus

Delivery Mode Information

Proposed

Length of Program

- Thesis option: 5 terms (20 months)
- Master's Research Paper option: 4 terms (16 months)

Existing

Length of Program

Registration Option(s)

Full-time

Part-time

Registration Options Information

Graduate Research Fields

- Crime, Law, and Security
- Knowledge, Education, and Digital Culture
- Migration, Borders, and Transnationalism
- Social Inequality and Public Policy

Graduate Specializations

Additional Program Information

Admissions

Admission Requirements: Minimum Requirements ⓘ

- Normally an Honours Bachelor's degree or its equivalent in Sociology with at least a 78% overall standing.
- A statement of academic interest (approximately a page, outlining areas of interest and reasons for choosing to study at the University of Waterloo).
- Results from the General Section of the Graduate Record Examination (GRE) (optional).
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Curriculum vitae
- Supplementary information form
- Transcript(s)
 - From all other post-secondary institutions.
- Writing sample

Admission Requirements: References

- Number of references: 3
- Type of references: academic

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements associated with their chosen study option in addition to the Graduate Academic Integrity Module (Graduate AIM).
- Note: Students are admitted to a Master's study option (Thesis or Master's Research Paper). Thereafter, the approval of the Associate Chair, Graduate Affairs, is necessary in order to change an option. In the case of the Thesis or Master's Research Paper options, the Departmental Advisor will also assist the student in the identification of a potential supervisor. Students should keep in mind that it is strongly advised that they complete three courses in their first term.
- Note: Coursework beyond these minima may be required at the discretion of the Associate Chair, Graduate Affairs. If additional coursework is required, the student will be notified in writing at the time of entry into the program. Additional coursework may be required by those who in the estimation of the Associate Chair, Graduate Affairs, do not possess the equivalent of an Honours Bachelor's degree in sociology from the University of Waterloo.

Thesis Option: Course Requirements

No Rules

Thesis Option: Course Requirements

- Students must complete the following courses:
 - Theory: 1 of SOC 700 Sociological Theory or SOC 708 Contemporary Sociological Theory
 - Methods: SOC 712 Elements of Social Research
 - Statistics: SOC 710 Intermediate Social Statistics
 - At least 1 other graduate course with a minimum 0.50 unit weight. These courses must also require a substantial piece of research (project or essay).
 - Students may take a maximum of 1 reading course from University of Waterloo Sociology and Legal Studies Faculty or adjuncts.
- In order to complete a course satisfactorily, students must complete all course requirements as specified by the instructor and receive a minimum grade of 75%.

Thesis Option: Milestone Requirements

Graduate Studies Work Report

- Students are required to submit a work report upon completion of the work terms.

Master's Thesis

- Students must write and orally defend a thesis proposal and a thesis.
- A thesis proposal, approved by a supervisor and two readers, must be completed by the end of the second term (typically the end of April). The thesis should be completed and defended by the end of the sixth term.
- A Master's thesis is considered to involve an amount of work equivalent to 4 one-term courses (2.00 units, approximately 100 to 150 pages in length).

Master's Research Paper Option: Course Requirements

No Rules

Master's Research Paper Option: Course Requirements

- Students must complete the following courses:
 - Theory: 1 of SOC 700 Sociological Theory or SOC 708 Contemporary Sociological Theory
 - Methods: SOC 712 Elements of Social Research
 - Statistics: SOC 710 Intermediate Social Statistics
 - At least 3 other graduate courses with a minimum 0.50 unit weight each. These courses must also require a substantial piece of research (project or essay).
 - Students may take a maximum of 1 reading course from University of Waterloo Sociology and Legal Studies Faculty or adjuncts.
- In order to complete a course satisfactorily, students must complete all course requirements as specified by the instructor and receive a minimum grade of 75%.

Master's Research Paper Option: Milestone Requirements

Graduate Studies Work Report

- Students are required to submit a work report upon completion of the work terms

Master's Research Paper

- Students must prepare a research paper proposal and write and orally defend a research paper.
- A research paper proposal must be completed and approved by a supervisor and one reader/examiner by the middle of the third term (typically the end of June). The research paper must be defended by the end of the fourth term (typically, the end of December).
- A research paper is considered to involve an amount of work equivalent to 2 one-term courses (1.00 unit, approximately 50 to 70 pages in length). As a guideline, the focus of a Master's Research Paper (MRP) can be on the research question, theory and methodology, and possibly some exploratory research on the state of the research but it is up to the supervisor, reader/examiner and student to set the direction for the MRP.

Notes ⓘ

- Department of Sociology and Legal Studies website
- Master of Arts (MA) in Sociology - Co-operative Program future students program page

Workflow Information

Workflow Path ⓘ

Committee approvals

Faculty/AFIW Path(s) for Workflow ⓘ

Faculty of Arts

Senate Workflow

No Senate

Dependencies

Dependent Courses and Programs/Plans

PREREQUISITES

▼ SOC 712 - Elements of Social Research

View Courses ➤

Master of Theological Studies (MTS)

Master of Theological Studies (MTS)

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
- Calendar Activation Date
- Admission Requirements: Minimum Requirements

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

06/07/2024

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) ⓘ

Updating the minimum admission requirements: These admission requirements reflect the current practice of how we determine non-standard admissions. Including a more detailed description of alternative admission requirements in the Calendar helps potential students determine their eligibility. It also fosters a more consistent review of applicants by GSPA and the TS Administrative Group.

Consultations (Departmental) ⓘ

Supporting Documentation

General Program/Plan Information

Faculty ⓘ

Conrad Grebel University College

Academic Unit ⓘ

Conrad Grebel University College

Graduate Field of Study

Theological Studies

Faculty ⓘ

Faculty of Arts with Conrad Grebel University College

Program/Plan Name ⓘ

Master of Theological Studies (MTS)

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Thesis / Coursework

Program Types

Admit Term(s)

Fall
Winter

Delivery Mode

Delivery Mode Information

On-campus

Conrad Grebel University College campus

Length of Program

- Full-time students should plan to complete the program within two years. All students should plan to complete the program within 15 "active" terms (terms in which they are registered for at least one course) over a period of no longer than eight calendar years.

Registration Option(s)

Full-time
Part-time

Registration Options Information

Graduate Research Fields

- Christian Theology

Graduate Specializations

Additional Program Information

Admissions

Proposed

Admission Requirements: Minimum Requirements

- For applicants whose previous degree was completed in Canada, a 75% overall standing in the last two years, or equivalent, in a four-year Honours Bachelor's degree or equivalent is the minimum requirement for admission to the 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 equivalent is the minimum requirement for admission.
- Alternative admission requirements: MTS may grant alternative admission to a limited number of students who do not meet the regular academic admission requirements of a four-year Bachelor's degree or equivalent. The admissions committee will be guided by the following alternative admission standards:
 - Applicants with a three-year Bachelor's degree in theology or religious studies with a 75% average (or its equivalent) may be eligible for non-standard entry directly into the MTS program.
 - MTS may grant admission to mature students who do not meet the regular academic admission requirements but who show aptitude for graduate study, and have significant field experience in a church or faith-based social service agency. The admissions committee will be guided by the following non-standard admission standards:
 - Evidence of successful participation in post-secondary education as documented by transcripts and other records.
 - The applicant may be asked to submit copies of reports, documents, manuscripts, or creative media from their field experience.
- Probationary admission may be granted for a specified time to confirm an applicant's ability to succeed in the program. Probationary students must attain an overall average of 75% in their courses to remain in the program.
- Applicants who do not meet standard admission requirements may be asked to complete a specified qualifying program of undergraduate courses. This will help prepare them for their proposed program of studies. They will have to achieve an average of 75% in their qualifying program, after which they can apply to enter the MTS program.
- English language proficiency (ELP) (if applicable)

Existing

Admission Requirements: Minimum Requirements

- The minimum academic requirement for admission to the program is a four-year bachelor degree with an overall 75% average, or its equivalent. Applicants who do not meet these requirements but who demonstrate aptitude for such graduate studies may be admitted after meeting the requirements of probationary or transitional admission or completing a qualifying program as deemed appropriate by the Admission Committee.
- Applicants to the Thesis option will be expected to have successfully completed considerable previous undergraduate or graduate study in religion and theology, in areas related to their proposed thesis research. Applicants to the Thesis option whose previous academic study has been in other disciplines may be admitted to the Thesis option as transitional students. Additional requirements will be specified at the time of admission.
- The Graduate Admissions Committee will consider applications after all the required documents are uploaded. Application material submitted in support of the application will not be returned.
- An interview may be required.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Résumé
- Supplementary information form
- Transcript(s)
 - From each institution through which the student has completed coursework.

Admission Requirements: References

- Number of references: 3

- Type of references: 2 of these should be from people competent to assess the candidate's academic capacities and potential.

Requirements Information

Graduate Degree Requirements ⓘ

- Students must complete the course and milestone requirements associated with their chosen study option in addition to the Graduate Academic Integrity Module (Graduate AIM).
- Note: Once admitted to the program, students will consult with their faculty advisors to select an option and design a plan of study appropriate to their academic and professional backgrounds, interests, and goals.
- The Coursework option and Coursework - Applied Studies option require the completion of 16 graduate level courses (0.50 unit weight). The Thesis option requires the completion of 8 graduate level courses (0.50 unit weight) and the successful completion of a thesis.

Thesis Option: Course Requirements

No Rules

Thesis Option: Course Requirements

- Students must complete 8 graduate-level one-term courses (0.50 unit weight) including 4 core courses.
- Students must maintain a 75% average.
- Core courses (must be taken at Conrad Grebel University College (CGUC)):
 - TS 600 Thinking Theologically
 - TS 610 Studying the Old Testament
 - TS 611 Studying the New Testament
 - TS 640 The Mennonite Tradition in Historical Context
- Courses taken in other departments: at least 50% of the courses required for the degree must be taken in the Theological Studies program. Transfer credits will be specified at the time of admission. After admission, courses may be taken in other departments or institutions, with the approval of the student's faculty advisor.
- Course schedule: courses are normally offered in weekly three-hour daytime or evening time slots, with occasional classes offered on a three or four weekend-per-term schedule. In the spring term there will be intensive courses offered over one or two weeks, with substantial preparatory work required before the first class and major research assignments due after the conclusion of the class schedule.
- The four core courses will be scheduled annually during the fall and winter terms. Another four to six graduate courses will be offered each fall and winter term, with an additional two to three offered in the spring. Thus in an annual cycle there will normally be 16 or more courses available.
- Full-time status is three courses in each fall or winter term and two courses in the spring term.
- Students can complement their studies at CGUC with courses taken at other graduate schools.

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

- Students must write and orally defend a thesis. A thesis is approximately 120 pages in length and is considered to be the equivalent of 50% of the student's program. It consists of the following stages:
 1. Preliminary Stage: consulting with the Program Director and faculty advisor to identify a research area and select a thesis supervisor. This stage should be completed by early in the second term of full time studies.
 2. Thesis Proposal: writing a proposal under the guidance of the thesis supervisor, for approval by the Graduate Studies Committee. Two readers will be chosen once the proposal has been accepted. This stage should be completed by the end of the second term of full time studies.
 3. Thesis Research: thesis research begins during the formulation of the thesis proposal. Some of the research can often be integrated into coursework. A significant period of focused research will also be required. Students whose research requires specific language skills (e.g. Hebrew, Greek) will be required to demonstrate competency in that language.
 4. Thesis Writing: writing the thesis under the direction of the thesis supervisor normally occurs when coursework is complete.
 5. Thesis Defence: when the thesis supervisor confirms that the thesis is ready for defence, it will be sent to the two readers for their assessment. If they agree that it is ready for defence a date for the defence will be confirmed. The defence will be chaired by the Program Director and involve the student, thesis supervisor and the two readers. It will be open to other faculty and students.
 6. Thesis Completion: after the thesis has been successfully defended it will be revised or corrected, approved by the thesis supervisor, and then filed with the College and University in the form and according to procedures in force at that time. Students will be responsible for the costs of this stage.

Coursework Option: Course Requirements

No Rules

Coursework Option: Course Requirements**Coursework option:**

- Students must complete 16 graduate-level one-term courses (0.50 unit weight) including 4 core courses.
- Students must maintain a 75% average.
- Core courses (must be taken at CGUC):
 - TS 600 Thinking Theologically
 - TS 610 Studying the Old Testament
 - TS 611 Studying the New Testament
 - TS 640 The Mennonite Tradition in Historical Context
- Courses taken in other departments: at least 50% of the courses required for the degree must be taken in the Theological Studies program. Transfer credits will be specified at the time of admission. After admission, courses may be taken in other departments or institutions, with the approval of the student's faculty advisor.
- Course schedule: courses are normally offered in weekly three-hour daytime or evening time slots, with occasional classes offered on a three or four weekend-per-term schedule. In the spring term there will be intensive courses offered over one or two weeks, with substantial preparatory work required before the first class and major research assignments due after the conclusion of the class schedule.
- The four core courses will be scheduled annually during the fall and winter terms. Another four to six graduate courses will be offered each fall and winter term, with an additional two to three offered in the spring. Thus in an annual cycle there will normally be 16 or more courses available.
- Full-time status is three courses in each fall or winter term and two courses in the spring term.
- Students can complement their studies at CGUC with courses taken at other graduate schools.

Coursework - Applied Studies option:

- Students must complete 16 graduate-level one-term courses (0.50 unit weight) including 4 core courses and the 4 Applied Studies required courses.
- Students must maintain a 75% average.
- Core courses (must be taken at CGUC):
 - TS 600 Thinking Theologically
 - TS 610 Studying the Old Testament
 - TS 611 Studying the New Testament
 - TS 640 The Mennonite Tradition in Historical Context
- Applied Studies required courses (must be taken at CGUC):
 - TS 677 Church and Ministry
 - TS 678 Supervised Experience in Ministry I
 - TS 679 Supervised Experience in Ministry II
 - TS 783 Theology and Practice of Leadership
- Courses taken in other departments: at least 50% of the courses required for the degree must be taken in the Theological Studies program. Transfer credits will be specified at the time of admission. After admission, courses may be taken in other departments or institutions, with the approval of the student's faculty advisor.
- Course schedule: courses are normally offered in weekly three-hour daytime or evening time slots, with occasional classes offered on a three or four weekend-per-term schedule. In the spring term there will be intensive courses offered over one or two weeks, with substantial preparatory work required before the first class and major research assignments due after the conclusion of the class schedule.
- The four core courses and the internships will be scheduled annually during the fall and winter terms. Another four to six graduate courses will be offered each fall and winter term, with an additional two to three offered in the spring. Thus in an annual cycle there will normally be 16 or more courses available.
- Full-time status is three courses in each fall or winter term and two courses in the spring term.
- Students can complement their studies at CGUC with courses taken at other graduate schools.

Coursework Option: Milestone Requirements

Master's Seminar Presentation

- Students in the Coursework option and Coursework - Applied Studies option will choose one of the papers written for a course taken during the second year of full-time studies, or within the last four terms of part-time studies. In consultation with the professor for whom the original paper was written, the student will make any revisions required to qualify the paper as a research paper. Length will normally be 25-30 pages (7,500 words). The paper will be presented and defended in the research seminar. After the presentation in the research seminar the student will make revisions to the paper under the supervision of the professor. The research paper will then be filed with the Department.
- The research seminar is a colloquium chaired by the Program Director in which research papers are presented to Theological Studies faculty and graduate students. In addition to presenting their own research paper they will be expected to read and present an oral evaluation of one of the other research papers presented in the seminar.

Notes ⓘ

- Theological Studies website
- Master of Theological Studies (MTS) future students program page

Workflow Information

Workflow Path ⓘ

Committee approvals

Faculty/AFIW Path(s) for Workflow ⓘ

Faculty of Arts

Senate Workflow

No Senate

Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

SGRC - Consent Agenda - Faculty of Engineering - January 27, 2025

Meeting Information

Agenda Page Title ⓘ
SGRC - Consent Agenda - Faculty of Engineering - January 27, 2025

Career Level	Faculty/Unit	
Graduate	Engineering	
Date	Time	Location
01/27/2025		

Summary
Course Changes:
School of Architecture
Chemical Engineering
Civil and Environmental Engineering
Mechanical and Mechatronics Engineering

Programs & Plan Changes:
Chemical Engineering (PhD, MEng)
Civil and Environmental Engineering (Nuclear MEng)

Other Business

Attachment(s)

Course Proposals

Course Proposal Details

Courses: Retire

Code	Title	Type	Workflow Step	↺
ARCH 611	Drawing, Representation and Practice	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review	
ARCH 612	Originality and Invention in Architecture	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review	
ARCH 613	Light, Colour and Darkness	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review	

Code	Title	Type	Workflow Step
ARCH 622	Urban Revitalization & Design	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
ARCH 623	Ecosystem Design for Urban Landscapes	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
ARCH 624	The Social Ecology of the Urban Periphery	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
ARCH 641	The Inner Studio	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
ARCH 643	The Study and Design of Cultural Sites	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
ARCH 644	Architecture, Memory and Commemoration	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
ARCH 645	Architecture and the State	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
ARCH 646	Architecture and Film	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
ARCH 672	Energy Effective Design	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
ARCH 675	Sheltering Systems	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
ARCH 676	Lightweight Structures	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
ARCH 677	Survey of Digital Design Technologies for Architecture	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
ARCH 678	Digital Lighting Design for Architecture	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
ARCH 686	Competitions in Architecture	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
ME 670	Atmospheric Dynamics	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
UN 700	Industrial Research Project in Nuclear Engineering	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
UN 702	Power Plant Thermodynamics	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
UN 799	Special Topics in Nuclear Engineering	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review

Code	Title	Type	Workflow Step	
UN 801	Nuclear Plant Systems and Operations Test	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review	
Courses: New				
Code	Title	Type	Workflow Step	
ARCH 710	Special Topics in Visual and Digital Media	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review	
ARCH 720	Special Topics in Urbanism and Landscape	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review	
ARCH 740	Special Topics in Architectural History and Theory	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review	
ARCH 770	Special Topics in Building Technology and Environment	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review	
ARCH 780	Special Topics in Race, Equity, and Environmental Justice	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review	
CHE 698	Directed MEng Research Project	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review	
ME 634	Practical Experimental Statistics and Data Visualization	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review	
ME 641	System Identification & Adaptive Control	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review	
ME 642	Precision Control Systems	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review	
ME 643	Introduction to Vehicle Dynamics and Control, Hybrid and Electric Vehicles, and Automated Driving	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review	
ME 646	Design for Additive Manufacturing	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review	
ME 647	Additive Manufacturing	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review	

Code	Title	Type	Workflow Step
ME 744	Computational Intelligence	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
UN 601	Control, Instrumentation and Electrical Systems	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
UN 602	Nuclear Fuel Waste Management	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
UN 603	Project Management for Nuclear Engineers	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
UN 803	Nuclear Reactor Safety Design	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
UN 804	Nuclear Reactor Heat Transport System Design	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
UN 805	Introduction to Operational Health Physics	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
UN 806	Nuclear Fuel Engineering	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
UN 807	Power Plant Thermodynamics	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
UN 808	Reactor Chemistry and Corrosion	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review
UN 901	Nuclear Materials	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review

Courses: Changes

Code	Title	Type	Workflow Step	
ME 659	Energy and Environment	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review	
MSE 623	Introduction to Machine Learning	Course	SGRC, Senate Graduate and Research Council (SGRC) Under Review	

Programs & Plans Proposals

Programs & Plans Proposal Details

Programs & Plans: Retire

No proposals have been added.

Programs & Plans: Major Modifications

No proposals have been added.

Programs & Plans: Minor Modifications

Code	Title	Type	Workflow Step	
MEng in Chemical Engineering	Master of Engineering (MEng) in Chemical Engineering	Program	SGRC, Senate Graduate and Research Council (SGRC) Under Review	
MEng in Chemical Engineering-Co-op	Master of Engineering (MEng) in Chemical Engineering - Co-operative Program (direct entry)	Program	SGRC, Senate Graduate and Research Council (SGRC) Under Review	
PhD in Chemical Engineering	Doctor of Philosophy (PhD) in Chemical Engineering	Program	SGRC, Senate Graduate and Research Council (SGRC) Under Review	
PhD in Chemical Engineering-Nanotechnology	Doctor of Philosophy (PhD) in Chemical Engineering - Nanotechnology	Program	SGRC, Senate Graduate and Research Council (SGRC) Under Review	
PhD in Chemical Engineering-Water	Doctor of Philosophy (PhD) in Chemical Engineering - Water	Program	SGRC, Senate Graduate and Research Council (SGRC) Under Review	
MEng in Civil Engineering-Nuclear Engineering	Master of Engineering (MEng) in Civil Engineering - Nuclear Engineering	Program	SGRC, Senate Graduate and Research Council (SGRC) Under Review	

Regulations Proposals

Regulations Proposal Details

Regulations: Retire

No proposals have been added.

Regulations: New

No proposals have been added.

Regulations: Changes

No proposals have been added.

ARCH 611

Drawing, Representation and Practice

Under Review | Spring 2025

Proposal Information

Status

Changes

~~Active~~**Retired**

Warning: All versions that start after the retired version will be deleted.

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

Effective Date & Career

Career ⓘ

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Spring 2025

Existing

Effective Term and Year ⓘ

Fall 2023

Quest Course ID

10627

Offering Number

1

Proposal Details

Proposal Type ⓘ

Retire

Academic Unit Approval

05/14/2024

Retired Impact ⓘ

No

Rationale for Change ⓘ

All the courses which Architecture is requesting to inactivate were either never taught or are no longer taught. Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. Many of the courses

Architecture would like to inactivate were created when the M.Arch was created twenty five years ago and have never been offered because they require overly specialized disciplinary knowledge which the current faculty may not have or may not be interested in teaching.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

611

Title ⓘ

Drawing, Representation and Practice

Abbreviated Title ⓘ

Drawing, Represent & Practice

Description ⓘ

In architecture, there is a crucial tension between the act of drawing – the representation of three dimensioned forms in two dimensions – and the fabrication of those forms in a concrete context. Using case studies of artisanal production and industrial design and manufacture, and addressing the possibilities and limitations of the computer as a design and production tool in architecture, this seminar draws out a discourse on the cultural momentum of composition and representation, and the fabrication of architectural forms in both virtual and material realities, establishing provisional guidelines for their interplay. Consent of instructor required for those outside of the M.Arch program

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 ⓘ

- Enrolled in Master of Architecture (MArch), Master of Architecture (MArch)-Co-op, or Master of Architecture (MArch)-Water

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

ARCH 612

Originality and Invention in Architecture

Under Review | Spring 2025

Proposal Information

Status	Workflow Status
Changes	In Progress
~~Active~~ Retired	SGRC, Senate Graduate and Research Council (SGRC) expand ▲
Warning: All versions that start after the retired version will be deleted.	Waiting for Approval Approval Delegate(s)
	Mike Grivicic
	Tim Weber-Kraljevski
	Diana Goncalves
	Melanie Figueiredo
	Ashley Day
	Changes
	• Effective Term and Year

Effective Date & Career

Career ⓘ	Important!	Quest Course ID
Graduate		10628
	Proposed Effective Term and Year ⓘ Spring 2025	Offering Number 1
	Existing Effective Term and Year ⓘ Fall 2023	

Proposal Details

Proposal Type ⓘ	Academic Unit Approval
Retire	05/14/2024
Retired Impact ⓘ	
No	
Rationale for Change ⓘ	
All the courses which Architecture is requesting to inactivate were either never taught or are no longer taught. Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. Many of the courses	

Architecture would like to inactivate were created when the M.Arch was created twenty five years ago and have never been offered because they require overly specialized disciplinary knowledge which the current faculty may not have or may not be interested in teaching.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

612

Title ⓘ

Originality and Invention in Architecture

Abbreviated Title ⓘ

Originality,Invention Architec

Description ⓘ

Professional knowledge in architecture involves not only the application of science or theory to instrumental problems, but also the innovation that calls for cognitive risk-taking, reflection-in-action, and learning-by-doing. This practice is legitimized by a discourse that evolved in the nineteenth century, and that defines a good project as an original project. Critically engaging this discourse of originality, this course addresses the processes and strategies that foster invention in architecture in a reflective practicum that emphasizes the value of synthetic thinking across disciplines. Consent of instructor required for those outside of the M.Arch program.

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 ⓘ

- Enrolled in Master of Architecture (MArch), Master of Architecture (MArch)-Co-op, or Master of Architecture (MArch)-Water

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

ARCH 613

Light, Colour and Darkness

Under Review | Spring 2025

Proposal Information

Status	Workflow Status
Changes	In Progress
~~Active~~ Retired	SGRC, Senate Graduate and Research Council (SGRC) expand ▲
Warning: All versions that start after the retired version will be deleted.	Waiting for Approval Approval Delegate(s)
	Mike Grivicic
	Tim Weber-Kraljevski
	Diana Goncalves
	Melanie Figueiredo
	Ashley Day
	Changes
	• Effective Term and Year

Effective Date & Career

Career ⓘ	Important!	Quest Course ID
Graduate		10629
	Proposed Effective Term and Year ⓘ Spring 2025	Offering Number 1
	Existing Effective Term and Year ⓘ Fall 2023	

Proposal Details

Proposal Type ⓘ	Academic Unit Approval
Retire	05/14/2024
Retired Impact ⓘ	
No	
Rationale for Change ⓘ	
All the courses which Architecture is requesting to inactivate were either never taught or are no longer taught. Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. Many of the courses	

Architecture would like to inactivate were created when the M.Arch was created twenty five years ago and have never been offered because they require overly specialized disciplinary knowledge which the current faculty may not have or may not be interested in teaching.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

613

Title ⓘ

Light, Colour and Darkness

Abbreviated Title ⓘ

Light, Colour & Darkness

Description ⓘ

Light, colour and darkness define an essential condition in the experience and the understanding of the environments that we imagine, create, and inhabit. This seminar addresses the empirical nature and the cultural, philosophical and spiritual meanings of light, colour and darkness and explores with the aid of, among other tools, digital simulation, the generation, presence, significance, experience and representation of light, colour and darkness in architecture. Consent of instructor required for those outside of the M.Arch program.

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 ⓘ

- Enrolled in Master of Architecture (MArch), Master of Architecture (MArch)-Co-op, or Master of Architecture (MArch)-Water

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

ARCH 622

Urban Revitalization & Design

Under Review | Spring 2025

Proposal Information

Status	Workflow Status
Changes	In Progress
~~Active~~ Retired	SGRC, Senate Graduate and Research Council (SGRC) expand ▲
Warning: All versions that start after the retired version will be deleted.	Waiting for Approval Approval Delegate(s)
	Mike Grivicic
	Tim Weber-Kraljevski
	Diana Goncalves
	Melanie Figueiredo
	Ashley Day
	Changes
	• Effective Term and Year

Effective Date & Career

Career ⓘ	Important!	Quest Course ID
Graduate		13896
	Proposed	
	Effective Term and Year ⓘ	Offering Number
	Spring 2025	1
	Existing	
	Effective Term and Year ⓘ	
	Fall 2023	

Proposal Details

Proposal Type ⓘ	Academic Unit Approval
Retire	05/14/2024
Retired Impact ⓘ	
No	
Rationale for Change ⓘ	
All the courses which Architecture is requesting to inactivate were either never taught or are no longer taught. Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. Many of the courses	

Architecture would like to inactivate were created when the M.Arch was created twenty five years ago and have never been offered because they require overly specialized disciplinary knowledge which the current faculty may not have or may not be interested in teaching.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

622

Title ⓘ

Urban Revitalization & Design

Abbreviated Title ⓘ

Urban Revitalization & Design

Description ⓘ

This course will discuss issues/challenges faced by cities (from downtown revitalization to suburbanization). Research has shown that their physical environments will fare better if such cities are designed, planned, and modeled in collaboration with professionals (i.e. architects and urban designers) and the community. Students will investigate how design projects improve the quality of life of mid-size cities (i.e. creative city concept). Together, we will focus on identifying opportunities for innovative collaborations and tangible improvements to the design of urban environments. The school is especially interested in strengthening collaboration among universities, community residents, planning and design practitioners, and policymakers to seize their own destiny to design, model, and plan. Accordingly, we will investigate thematic (e.g. urban revitalization, design/aesthetics, environmental/greening, gentrification, housing, and multiculturalism) and policy-oriented areas (e.g. urban design guidelines, new urbanism, intensification, and land-use development patterns) that relate to the mid-size city. This is a seminar-based course and student participation is key to its success.

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 ⓘ

Instructor consent required

Consent to Drop ⓘ

No consent required

Prerequisites ⓘ

- Enrolled in Master of Architecture (MArch), Master of Architecture (MArch)-Co-op, or Master of Architecture (MArch)-Water

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

ARCH 623

Ecosystem Design for Urban Landscapes

Under Review | Spring 2025

Proposal Information

Status	Workflow Status
Changes	In Progress
~~Active~~ Retired	SGRC, Senate Graduate and Research Council (SGRC) expand ▲
Warning: All versions that start after the retired version will be deleted.	Waiting for Approval Approval Delegate(s)
	Mike Grivicic
	Tim Weber-Kraljevski
	Diana Goncalves
	Melanie Figueiredo
	Ashley Day
	Changes
	• Effective Term and Year

Effective Date & Career

Career ⓘ	Important!	Quest Course ID
Graduate		10643
	Proposed Effective Term and Year ⓘ Spring 2025	Offering Number 1
	Existing Effective Term and Year ⓘ Fall 2023	

Proposal Details

Proposal Type ⓘ	Academic Unit Approval
Retire	05/14/2024
Retired Impact ⓘ	
No	
Rationale for Change ⓘ	
All the courses which Architecture is requesting to inactivate were either never taught or are no longer taught. Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. Many of the courses	

Architecture would like to inactivate were created when the M.Arch was created twenty five years ago and have never been offered because they require overly specialized disciplinary knowledge which the current faculty may not have or may not be interested in teaching.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

623

Title ⓘ

Ecosystem Design for Urban Landscapes

Abbreviated Title ⓘ

Ecosys Design-Urban Landscpes

Description ⓘ

Landscape design is being reshaped by ecosystems thinking. This course introduces the concepts of ecosystems design for urban and peripheral landscapes. Beginning with case studies on the spatial forms taken by the historic co-evolution of nature and cultural forms in urban land systems, the course introduces ecosystems-based classifications combining abiotic, biotic, and cultural analyses; urban land mosaics based on urban landscape ecologies; and green infrastructures. It concludes with contemporary case studies demonstrating the scope of ecosystems-based urban design and planning, guidelines for ecosystems design, and evolutionary design approaches.

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

ARCH 624

The Social Ecology of the Urban Periphery

Under Review | Spring 2025

Proposal Information

Status

Changes

~~Active~~**Retired**

Warning: All versions that start after the retired version will be deleted.

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

Effective Date & Career

Career ⓘ

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Spring 2025

Existing

Effective Term and Year ⓘ

Fall 2023

Quest Course ID

10644

Offering Number

1

Proposal Details

Proposal Type ⓘ

Retire

Academic Unit Approval

05/14/2024

Retired Impact ⓘ

No

Rationale for Change ⓘ

All the courses which Architecture is requesting to inactivate were either never taught or are no longer taught. Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. Many of the courses

Architecture would like to inactivate were created when the M.Arch was created twenty five years ago and have never been offered because they require overly specialized disciplinary knowledge which the current faculty may not have or may not be interested in teaching.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

624

Title ⓘ

The Social Ecology of the Urban Periphery

Abbreviated Title ⓘ

Social Ecology Urban Periphery

Description ⓘ

With the rise of the metropolis, the development of new transport and leisure infrastructures, the rapid adoption of new technologies of communication (radio, television, internet), and the pervasive influence of marketed "lifestyles," public spaces have lost much of their customary function as a common ground, while the periphery is invested as a new semi-public commons. This course explores the dynamic relation between the old politics of the architectural centre and the new social ecologies of the sub-urban and natural peripheries, to identify fresh design opportunities within the development economy of the sub-urban, semi-rural, and "cottage-country" edge. Consent of instructor required for those who do not have the required course.

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 ⓘ

- Must have completed the following: ARCH327

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

ARCH 641

The Inner Studio

Under Review | Spring 2025

Proposal Information

Status		Workflow Status	
Changes		In Progress	
~~Active~~ Retired		SGRC, Senate Graduate and Research Council (SGRC)	expand ▲
Warning: All versions that start after the retired version will be deleted.		Waiting for Approval Approval Delegate(s)	
		Mike Grivicic	
		Tim Weber-Kraljevski	
		Diana Goncalves	
		Melanie Figueiredo	
		Ashley Day	
		Changes	
		• Effective Term and Year	

Effective Date & Career

Career ⓘ	Important!	Quest Course ID
Graduate		13899
	Proposed	
	Effective Term and Year ⓘ	Offering Number
	Spring 2025	1
	Existing	
	Effective Term and Year ⓘ	
	Fall 2023	

Proposal Details

Proposal Type ⓘ	Academic Unit Approval
Retire	05/14/2024
Retired Impact ⓘ	
No	
Rationale for Change ⓘ	
All the courses which Architecture is requesting to inactivate were either never taught or are no longer taught. Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. Many of the courses	

Architecture would like to inactivate were created when the M.Arch was created twenty five years ago and have never been offered because they require overly specialized disciplinary knowledge which the current faculty may not have or may not be interested in teaching.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

641

Title ⓘ

The Inner Studio

Abbreviated Title ⓘ

The Inner Studio

Description ⓘ

The built world and the inner world are linked, and have the potential to touch us through the act of design. The inspiration and meaning for the creative designs we need are available from the psyche but we have not been given the tools to access these resources and bring them into the built world. The purpose of this elective is to connect architects with new pathways and creative tools for bringing their imagination into the world. This course presents a psychological view of the built world in order to help architects understand the wisdom of their dreams, shadows and body during the process of design. Its in-depth approach allows the architect to experience the act of design as inseparable from enriching the self.

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 ⓘ

Instructor consent required

Consent to Drop ⓘ

No consent required

Prerequisites ⓘ

- Enrolled in Master of Architecture (MArch), Master of Architecture (MArch)-Co-op, or Master of Architecture (MArch)-Water

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

ARCH 643

The Study and Design of Cultural Sites

Under Review | Spring 2025

Proposal Information

Status	Workflow Status
Changes	In Progress
~~Active~~ Retired	SGRC, Senate Graduate and Research Council (SGRC) expand ▲
Warning: All versions that start after the retired version will be deleted.	Waiting for Approval Approval Delegate(s)
	Mike Grivicic
	Tim Weber-Kraljevski
	Diana Goncalves
	Melanie Figueiredo
	Ashley Day
	Changes
	Effective Term and Year

Effective Date & Career

Career ⓘ	Important!	Quest Course ID
Graduate		10637
	Proposed	
	Effective Term and Year ⓘ	Offering Number
	Spring 2025	1
	Existing	
	Effective Term and Year ⓘ	
	Fall 2023	

Proposal Details

Proposal Type ⓘ	Academic Unit Approval
Retire	05/14/2024
Retired Impact ⓘ	
No	
Rationale for Change ⓘ	
All the courses which Architecture is requesting to inactivate were either never taught or are no longer taught. Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. Many of the courses	

Architecture would like to inactivate were created when the M.Arch was created twenty five years ago and have never been offered because they require overly specialized disciplinary knowledge which the current faculty may not have or may not be interested in teaching.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

643

Title ⓘ

The Study and Design of Cultural Sites

Abbreviated Title ⓘ

Study Design of Cultural Sites

Description ⓘ

Heritage districts, parks, memorials, and reserves have become an important focus of architectural activity, calling on knowledge of cultural conditions, environmental impact and values, economic uses, managerial practices, and legal limitations. This course will introduce ways to identify and define potential cultural sites, and study their history and place in the collective memory, their economy, and the role of architectural intervention in them. Consent of instructor required for those outside of the M.Arch program.

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 ⓘ

- Enrolled in Master of Architecture (MArch), Master of Architecture (MArch)-Co-op, or Master of Architecture (MArch)-Water

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

ARCH 643

The Study and Design of Cultural Sites

Under Review | Spring 2025

Proposal Information

Status

Changes

~~Active~~**Retired**

Warning: All versions that start after the retired version will be deleted.

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

Effective Date & Career

Career ⓘ

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Spring 2025

Existing

Effective Term and Year ⓘ

Fall 2023

Quest Course ID

10637

Offering Number

1

Proposal Details

Proposal Type ⓘ

Retire

Academic Unit Approval

05/14/2024

Retired Impact ⓘ

No

Rationale for Change ⓘ

All the courses which Architecture is requesting to inactivate were either never taught or are no longer taught. Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. Many of the courses

Architecture would like to inactivate were created when the M.Arch was created twenty five years ago and have never been offered because they require overly specialized disciplinary knowledge which the current faculty may not have or may not be interested in teaching.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

643

Title ⓘ

The Study and Design of Cultural Sites

Abbreviated Title ⓘ

Study Design of Cultural Sites

Description ⓘ

Heritage districts, parks, memorials, and reserves have become an important focus of architectural activity, calling on knowledge of cultural conditions, environmental impact and values, economic uses, managerial practices, and legal limitations. This course will introduce ways to identify and define potential cultural sites, and study their history and place in the collective memory, their economy, and the role of architectural intervention in them. Consent of instructor required for those outside of the M.Arch program.

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 ⓘ

- Enrolled in Master of Architecture (MArch), Master of Architecture (MArch)-Co-op, or Master of Architecture (MArch)-Water

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

ARCH 644

Architecture, Memory and Commemoration

Under Review | Spring 2025

Proposal Information

Status

Changes

~~Active~~**Retired**

Warning: All versions that start after the retired version will be deleted.

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

Effective Date & Career

Career ⓘ

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Spring 2025

Existing

Effective Term and Year ⓘ

Fall 2023

Quest Course ID

10638

Offering Number

1

Proposal Details

Proposal Type ⓘ

Retire

Academic Unit Approval

05/14/2024

Retired Impact ⓘ

No

Rationale for Change ⓘ

All the courses which Architecture is requesting to inactivate were either never taught or are no longer taught. Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. Many of the courses

Architecture would like to inactivate were created when the M.Arch was created twenty five years ago and have never been offered because they require overly specialized disciplinary knowledge which the current faculty may not have or may not be interested in teaching.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

644

Title ⓘ

Architecture, Memory and Commemoration

Abbreviated Title ⓘ

Arch,Memory & Commemoration

Description ⓘ

From its very beginnings, building has consecrated sites of history by transforming, through a process of reification, the fleeting memories of individuals into a communally shared and politically significant history. This course examines the different ways buildings and architecturally articulated precincts have operated as instruments of memory in the traditional tribal society, the ancient city-states, the multi-ethnic empire, Christendom, the modern nation state, and the post-industrial, post-modern, and multi-cultural commonwealths of today. Consent of instructor required for those who do not have the required prerequisite.

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 ⓘ

- Must have completed at least 1 of the following: ARCH246, ARCH247

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

ARCH 645

Architecture and the State

Under Review | Spring 2025

Proposal Information

Status	Workflow Status
Changes	In Progress
~~Active~~ Retired	SGRC, Senate Graduate and Research Council (SGRC) expand ▲
Warning: All versions that start after the retired version will be deleted.	Waiting for Approval Approval Delegate(s)
	Mike Grivicic
	Tim Weber-Kraljevski
	Diana Goncalves
	Melanie Figueiredo
	Ashley Day
	Changes
	• Effective Term and Year

Effective Date & Career

Career ⓘ	Important!	Quest Course ID
Graduate		10639
	Proposed	
	Effective Term and Year ⓘ	Offering Number
	Spring 2025	1
	Existing	
	Effective Term and Year ⓘ	
	Fall 2023	

Proposal Details

Proposal Type ⓘ	Academic Unit Approval
Retire	05/14/2024
Retired Impact ⓘ	
No	
Rationale for Change ⓘ	
All the courses which Architecture is requesting to inactivate were either never taught or are no longer taught. Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. Many of the courses	

Architecture would like to inactivate were created when the M.Arch was created twenty five years ago and have never been offered because they require overly specialized disciplinary knowledge which the current faculty may not have or may not be interested in teaching.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

645

Title ⓘ

Architecture and the State

Abbreviated Title ⓘ

Architecture and the State

Description ⓘ

Through the creation of buildings, infrastructure programs, funding agencies, policy initiatives, procurement practices and regulatory agencies central governments have used architecture to shape and unify the nation and define the national territory. This course investigates the relationship between politics and architecture, with particular attention on the rise and decline of Canadian federal architecture and Canadian federal architectural policy, using case studies to explore the way various Canadian governments sought to establish and re-represent a common Canadian identity. Consent of instructor required for those who do not have the required prerequisite.

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 ⓘ

- Must have completed at least 1 of the following: ARCH246, ARCH247

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

ARCH 646

Architecture and Film

Under Review | Spring 2025

Proposal Information

Status	Workflow Status
Changes	In Progress
~~Active~~ Retired	SGRC, Senate Graduate and Research Council (SGRC) expand ▲
Warning: All versions that start after the retired version will be deleted.	Waiting for Approval Approval Delegate(s)
	Mike Grivicic
	Tim Weber-Kraljevski
	Diana Goncalves
	Melanie Figueiredo
	Ashley Day
	Changes
	• Effective Term and Year

Effective Date & Career

Career ⓘ	Important!	Quest Course ID
Graduate		12034
	Proposed	
	Effective Term and Year ⓘ	Offering Number
	Spring 2025	1
	Existing	
	Effective Term and Year ⓘ	
	Fall 2023	

Proposal Details

Proposal Type ⓘ	Academic Unit Approval
Retire	05/14/2024
Retired Impact ⓘ	
No	
Rationale for Change ⓘ	
All the courses which Architecture is requesting to inactivate were either never taught or are no longer taught. Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. Many of the courses	

Architecture would like to inactivate were created when the M.Arch was created twenty five years ago and have never been offered because they require overly specialized disciplinary knowledge which the current faculty may not have or may not be interested in teaching.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

646

Title ⓘ

Architecture and Film

Abbreviated Title ⓘ

Architecture and Film

Description ⓘ

This course explores the relationship between Architecture and the development of early, modern and science fiction films via the examination of the source and methods of portrayal of architectural expression in film. Films will be viewed to examine precedents for imagery, set design, location selection, as well as the integrated vision of the urban and dystopic environmental future. Futuristic film architecture will provide an opportunity to study a vision of the future of urban built form and provide a forum for critical discussion. Assignments will require that the students become familiar with different methods of media: video filming, sound and visual editing, web page production.

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

ARCH 672

Energy Effective Design

Under Review | Spring 2025

Proposal Information

Status		Workflow Status	
Changes		In Progress	
~~Active~~ Retired		SGRC, Senate Graduate and Research Council (SGRC)	expand ▲
Warning: All versions that start after the retired version will be deleted.		Waiting for Approval Approval Delegate(s)	
		Mike Grivicic	
		Tim Weber-Kraljevski	
		Diana Goncalves	
		Melanie Figueiredo	
		Ashley Day	
		Changes	
		• Effective Term and Year	

Effective Date & Career

Career ⓘ	Important!	Quest Course ID
Graduate		10640
	Proposed	
	Effective Term and Year ⓘ	Offering Number
	Spring 2025	1
	Existing	
	Effective Term and Year ⓘ	
	Fall 2023	

Proposal Details

Proposal Type ⓘ	Academic Unit Approval
Retire	05/14/2024
Retired Impact ⓘ	
No	
Rationale for Change ⓘ	
All the courses which Architecture is requesting to inactivate were either never taught or are no longer taught. Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. Many of the courses	

Architecture would like to inactivate were created when the M.Arch was created twenty five years ago and have never been offered because they require overly specialized disciplinary knowledge which the current faculty may not have or may not be interested in teaching.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

672

Title ⓘ

Energy Effective Design

Abbreviated Title ⓘ

Energy Effective Design

Description ⓘ

Vernacular building techniques once manifested the principles of passive solar heating, passive cooling and daylighting by solar orientation. Searching for ways to design energy efficient, comfortable and functional buildings, this workshop revisits the principles of passive heating, cooling and solar lighting, and explores the operation and use of energy simulation computer programs and post occupancy analysis within the context of sustainable design. The methods will be tested in two design projects: a freestanding suburban house and an urban row house. Consent of instructor required for those outside of the M.Arch program.

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 ⓘ

- Enrolled in Master of Architecture (MArch), Master of Architecture (MArch)-Co-op, or Master of Architecture (MArch)-Water

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

ARCH 675

Sheltering Systems

Under Review | Spring 2025

Proposal Information

Status		Workflow Status	
Changes		In Progress	
~~Active~~ Retired		SGRC, Senate Graduate and Research Council (SGRC)	expand ▲
Warning: All versions that start after the retired version will be deleted.		Waiting for Approval Approval Delegate(s)	
		Mike Grivicic	
		Tim Weber-Kraljevski	
		Diana Goncalves	
		Melanie Figueiredo	
		Ashley Day	
		Changes	
		• Effective Term and Year	

Effective Date & Career

Career ⓘ	Important!	Quest Course ID
Graduate		10647
	Proposed	
	Effective Term and Year ⓘ	Offering Number
	Spring 2025	1
	Existing	
	Effective Term and Year ⓘ	
	Fall 2023	

Proposal Details

Proposal Type ⓘ	Academic Unit Approval
Retire	05/14/2024
Retired Impact ⓘ	
No	
Rationale for Change ⓘ	
All the courses which Architecture is requesting to inactivate were either never taught or are no longer taught. Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. Many of the courses	

Architecture would like to inactivate were created when the M.Arch was created twenty five years ago and have never been offered because they require overly specialized disciplinary knowledge which the current faculty may not have or may not be interested in teaching.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

675

Title ⓘ

Sheltering Systems

Abbreviated Title ⓘ

Sheltering Systems

Description ⓘ

This studio/workshop explores the architectural, technological, social and economic aspects of building system design - building systems are considered in the broadest terms. ARCH 675 expects participants to be aware of and pay particular attention to the matrix of cultural, sociological and geographic extremes. Participants are expected to be capable of considerable independent study supported by frequently scheduled meetings with the course instructor. This course incorporates design-build experience, wherein the construction of proposed systems is explored through the development of prototypes. Consent of instructor required for those outside of the M.Arch program.

Units ⓘ

0.50

Components ⓘ

LaboratoryLecture

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 ⓘ

- Enrolled in Master of Architecture (MArch), Master of Architecture (MArch)-Co-op, or Master of Architecture (MArch)-Water

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

ARCH 676

Lightweight Structures

Under Review | Spring 2025

Proposal Information

Status		Workflow Status	
Changes		In Progress	
~~Active~~ Retired		SGRC, Senate Graduate and Research Council (SGRC)	expand ▲
Warning: All versions that start after the retired version will be deleted.		Waiting for Approval Approval Delegate(s)	
		Mike Grivicic	
		Tim Weber-Kraljevski	
		Diana Goncalves	
		Melanie Figueiredo	
		Ashley Day	
		Changes	
		• Effective Term and Year	

Effective Date & Career

Career ⓘ	Important!	Quest Course ID
Graduate		10648
	Proposed	
	Effective Term and Year ⓘ	Offering Number
	Spring 2025	1
	Existing	
	Effective Term and Year ⓘ	
	Fall 2023	

Proposal Details

Proposal Type ⓘ	Academic Unit Approval
Retire	05/14/2024
Retired Impact ⓘ	
No	
Rationale for Change ⓘ	
All the courses which Architecture is requesting to inactivate were either never taught or are no longer taught. Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. Many of the courses	

Architecture would like to inactivate were created when the M.Arch was created twenty five years ago and have never been offered because they require overly specialized disciplinary knowledge which the current faculty may not have or may not be interested in teaching.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

676

Title ⓘ

Lightweight Structures

Abbreviated Title ⓘ

Lightweight Structures

Description ⓘ

Innovative structures - frames, fabrics and shells - give architects design options that have not previously existed, especially with long spans and large, single building volumes. The course deals with the applications, analysis, economics, design and fabrication of modern lightweight structures. Consent of instructor required for those outside of the M.Arch program. University of Waterloo BES pre-professional Architecture Degree

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 ⓘ

- Enrolled in Master of Architecture (MArch), Master of Architecture (MArch)-Co-op, or Master of Architecture (MArch)-Water

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

ARCH 677

Survey of Digital Design Technologies for Architecture

Under Review | Spring 2025

Proposal Information

Status

Changes

~~Active~~**Retired**

Warning: All versions that start after the retired version will be deleted.

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

Effective Date & Career

Career ⓘ

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Spring 2025

Existing

Effective Term and Year ⓘ

Fall 2023

Quest Course ID

11628

Offering Number

1

Proposal Details

Proposal Type ⓘ

Retire

Academic Unit Approval

05/14/2024

Retired Impact ⓘ

No

Rationale for Change ⓘ

All the courses which Architecture is requesting to inactivate were either never taught or are no longer taught. Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. Many of the courses

Architecture would like to inactivate were created when the M.Arch was created twenty five years ago and have never been offered because they require overly specialized disciplinary knowledge which the current faculty may not have or may not be interested in teaching.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

677

Title ⓘ

Survey of Digital Design Technologies for Architecture

Abbreviated Title ⓘ

Digital Design Technologies

Description ⓘ

This course provides an overview of the software and hardware technologies to support the design of an architecture that is more holistically conceived on cultural, social, health, technical and formal grounds that would otherwise be possible. What is taught facilitates an integrated design process where all disciplines collaborate through all phases of a project to achieve a sustainable design. There will be an exploration of software applications including the generation of landscapes and vegetation, energy analysis, acoustics, lighting, structure, people movement, air flow analysis, microclimate analysis and various types of three-dimensional modelling software, particularly, packages that facilitate interfacing with rapid prototyping and allow complex form generation. Rapid prototyping techniques will include laser cutting, three-dimensional printing and CNC 3-axis machining. The course format is a seminar in which each student will explore some of these technologies in depth by means of a small design example and presentations to the class while obtaining an overview from the course lectures and presentations by other students on other applications.

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 ⓘ

Department consent required

Consent to Drop ⓘ

No consent required

Prerequisites ⓘ

- Complete all of the following
 - Must have completed the following: ARCH113
 - Enrolled in Master of Architecture (MArch), Master of Architecture (MArch)-Co-op, or Master of Architecture (MArch)-Water

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

ARCH 678

Digital Lighting Design for Architecture

Under Review | Spring 2025

Proposal Information

Status	Workflow Status
Changes	In Progress
~~Active~~ Retired	SGRC, Senate Graduate and Research Council (SGRC) expand ▲
Warning: All versions that start after the retired version will be deleted.	Waiting for Approval Approval Delegate(s)
	Mike Grivicic
	Tim Weber-Kraljevski
	Diana Goncalves
	Melanie Figueiredo
	Ashley Day
	Changes
	Effective Term and Year

Effective Date & Career

Career ⓘ	Important!	Quest Course ID
Graduate		11629
	Proposed	
	Effective Term and Year ⓘ	Offering Number
	Spring 2025	1
	Existing	
	Effective Term and Year ⓘ	
	Fall 2023	

Proposal Details

Proposal Type ⓘ	Academic Unit Approval
Retire	05/14/2024
Retired Impact ⓘ	
No	
Rationale for Change ⓘ	
All the courses which Architecture is requesting to inactivate were either never taught or are no longer taught. Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. Many of the courses	

Architecture would like to inactivate were created when the M.Arch was created twenty five years ago and have never been offered because they require overly specialized disciplinary knowledge which the current faculty may not have or may not be interested in teaching.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

678

Title ⓘ

Digital Lighting Design for Architecture

Abbreviated Title ⓘ

Digital Lighting Design

Description ⓘ

The intention of the course is to learn to achieve design intent in terms of artificial and natural lighting by digital means. There are three components to the course. One is lighting concepts in terms of colour and materiality, light propagation, sky conditions, sun movement and quantitative lighting analysis including glare. Another component is the use of physically accurate lighting simulation and rendering software. A third is lighting design and critical evaluation through exercises and a small design project.

Units ⓘ

0.50

Components ⓘ

Laboratory Lecture Tutorial

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 ⓘ

- Must have completed the following: ARCH113

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

ARCH 686

Competitions in Architecture

Under Review | Spring 2025

Proposal Information

Status		Workflow Status	
Changes		In Progress	
~~Active~~ Retired		SGRC, Senate Graduate and Research Council (SGRC)	expand ▲
Warning: All versions that start after the retired version will be deleted.		Waiting for Approval Approval Delegate(s)	
		Mike Grivicic	
		Tim Weber-Kraljevski	
		Diana Goncalves	
		Melanie Figueiredo	
		Ashley Day	
		Changes	
		• Effective Term and Year	

Effective Date & Career

Career ⓘ	Important!	Quest Course ID
Graduate		13900
	Proposed	
	Effective Term and Year ⓘ	Offering Number
	Spring 2025	1
	Existing	
	Effective Term and Year ⓘ	
	Fall 2023	

Proposal Details

Proposal Type ⓘ	Academic Unit Approval
Retire	05/14/2024
Retired Impact ⓘ	
No	
Rationale for Change ⓘ	
All the courses which Architecture is requesting to inactivate were either never taught or are no longer taught. Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. Many of the courses	

Architecture would like to inactivate were created when the M.Arch was created twenty five years ago and have never been offered because they require overly specialized disciplinary knowledge which the current faculty may not have or may not be interested in teaching.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

686

Title ⓘ

Competitions in Architecture

Abbreviated Title ⓘ

Competitions in Architecture

Description ⓘ

This course provides an opportunity for the student to independently engage in the respected tradition of the Architectural Competition. The competition entry and accompanying research paper must focus on the use of architectural precedents as the basis for the creation of typologically based propositions. Submission to the external competition is mandatory, the timing and detailed requirements of which will determine the personalized academic requirements for this course.

Units ⓘ

0.50

Components ⓘ

Reading

Primary Component

Reading

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 ⓘ

- Enrolled in Master of Architecture (MArch), Master of Architecture (MArch)-Co-op, or Master of Architecture (MArch)-Water

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 670

Atmospheric Dynamics

Under Review | Spring 2025

Proposal Information

Status	Workflow Status
Changes	In Progress
~~Active~~ Retired	SGRC, Senate Graduate and Research Council (SGRC) expand ▲
Warning: All versions that start after the retired version will be deleted.	Waiting for Approval Approval Delegate(s)
	Mike Grivicic
	Tim Weber-Kraljevski
	Diana Goncalves
	Melanie Figueiredo
	Ashley Day
	Changes
	• Effective Term and Year

Effective Date & Career

Career ⓘ	Important!	Quest Course ID
Graduate		1870
	Proposed	
	Effective Term and Year ⓘ	Offering Number
	Spring 2025	1
	Existing	
	Effective Term and Year ⓘ	
	Fall 2023	

Proposal Details

Proposal Type ⓘ	Academic Unit Approval
Retire	09/25/2024
Retired Impact ⓘ	
No	
Rationale for Change ⓘ	
No longer offered. No plans to offer in future and has not been offered in more than 15 years.	
Consultations ⓘ	
Supporting Documentation	

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Mechanical and Mechatronics Engineering

Subject Code ⓘ

ME

Number ⓘ

670

Title ⓘ

Atmospheric Dynamics

Abbreviated Title ⓘ

Atmospheric Dynamics

Description ⓘ

Hydrodynamic equations of motion on a rotating axis. Geostrophic balance in the atmosphere and oceans, vertical variation of wind and pressure fields in the atmosphere, mechanisms of pressure change, vorticity equation.

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

UN 700

Industrial Research Project in Nuclear Engineering

Under Review | Spring 2025

Proposal Information

Status	Workflow Status
Changes	In Progress
~~Active~~ Retired	SGRC, Senate Graduate and Research Council (SGRC) expand ▲
Warning: All versions that start after the retired version will be deleted.	Waiting for Approval Approval Delegate(s)
	Mike Grivicic
	Tim Weber-Kraljevski
	Diana Goncalves
	Melanie Figueiredo
	Ashley Day
	Changes
	• Effective Term and Year

Effective Date & Career

Career ⓘ	Important!	Quest Course ID
Graduate		12162
	Proposed	
	Effective Term and Year ⓘ	Offering Number
	Spring 2025	1
	Existing	
	Effective Term and Year ⓘ	
	Fall 2023	

Proposal Details

Proposal Type ⓘ	Academic Unit Approval
Retire	11/28/2024
Retired Impact ⓘ	
No	
Rationale for Change ⓘ	
Host institution is no longer offering these courses and we need to ensure that the information in the Calendar is reflective of this change.	
Consultations ⓘ	

Supporting Documentation

Course Information

Faculty		Academic Unit	
Faculty of Engineering		Department of Civil and Environmental Engineering	
Subject Code	Number		
UN	700		
Title			
Industrial Research Project in Nuclear Engineering			
Abbreviated Title			
Nuclear Engineering Project			
Description			
An industry-oriented research project in the field of Engineering Risk and Reliability Analysis. The project will be completed in an industrial laboratory under the supervision of a suitably qualified staff scientist and a university co-supervisor. The topic for the project will be arranged in consultation with the candidate and through negotiation with the candidate's employer. A substantial report on the project and a verbal presentation at the University are required. The industrial research project is equivalent to two half-term courses.			
Units			
1.00			
Components		Primary Component	
Reading		Reading	

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

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

UN 702

Power Plant Thermodynamics

Under Review | Spring 2025

Proposal Information

Status	Workflow Status
Changes	In Progress
~~Active~~ Retired	SGRC, Senate Graduate and Research Council (SGRC) expand ▲
Warning: All versions that start after the retired version will be deleted.	Waiting for Approval Approval Delegate(s)
	Mike Grivicic
	Tim Weber-Kraljevski
	Diana Goncalves
	Melanie Figueiredo
	Ashley Day
	Changes
	• Effective Term and Year

Effective Date & Career

Career ⓘ	Important!	Quest Course ID
Graduate		12253
	Proposed	
	Effective Term and Year ⓘ	Offering Number
	Spring 2025	1
	Existing	
	Effective Term and Year ⓘ	
	Fall 2023	

Proposal Details

Proposal Type ⓘ	Academic Unit Approval
Retire	11/28/2024
Retired Impact ⓘ	
No	
Rationale for Change ⓘ	
Host institution is no longer offering these courses and we need to ensure that the information in the Calendar is reflective of this change.	
Consultations ⓘ	

Supporting Documentation

Course Information

Faculty ?

Faculty of Engineering

Academic Unit ?

Department of Civil and Environmental Engineering

Subject Code ?

UN

Number ?

702

Title ?

Power Plant Thermodynamics

Abbreviated Title ?

Power Plant Thermodynamics

Description ?

Theoretical and practical analysis of the following with particular reference to CANDU plants. Thermodynamic Cycles: Nuclear versus conventional steam cycles, regenerative feedwater heating, moisture separation and reheating, turbine expansion lines, heat balance diagrams, available energy, cycle efficiency and energy analysis. Nuclear Heat Removal: Heat conduction and convection in fuel rods and heat exchanger tubes, heat transfer in boilers and condensers, boiler influence on heat transport system, boiler swelling and shrinking, boiler level control and condenser performance. Steam Turbine Operation: Turbine configuration, impulse and reaction blading, blade velocity diagrams, turbine seals and sealing systems, moisture in turbines, part load operation, back pressure effects, thermal effects and turbine governing.

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

Department 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

UN 799

Special Topics in Nuclear Engineering

Under Review | Spring 2025

Proposal Information

Status

Changes

~~Active~~**Retired**

Warning: All versions that start after the retired version will be deleted.

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

Effective Date & Career

Career ⓘ

Graduate

Important!

Proposed
Effective Term and Year ⓘ
Spring 2025

Existing
Effective Term and Year ⓘ
Fall 2023

Quest Course ID

12254

Offering Number

1

Proposal Details

Proposal Type ⓘ

Retire

Academic Unit Approval

11/28/2024

Retired Impact ⓘ

No

Rationale for Change ⓘ

Host institution is no longer offering these courses and we need to ensure that the information in the Calendar is reflective of this change.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ? Faculty of Engineering		Academic Unit ? Department of Civil and Environmental Engineering	
Subject Code ? UN	Number ? 799		
Title ? Special Topics in Nuclear Engineering			
Abbreviated Title ? Topics in Nuclear Engineering			
Description ? The course will cover special topics related to the field of Nuclear Engineering.			
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

Department 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

UN 801

Nuclear Plant Systems and Operations Test

Under Review | Spring 2025

Proposal Information

Status

Changes

~~Active~~**Retired**

Warning: All versions that start after the retired version will be deleted.

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

Effective Date & Career

Career ⓘ

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Spring 2025

Existing

Effective Term and Year ⓘ

Fall 2023

Quest Course ID

12296

Offering Number

1

Proposal Details

Proposal Type ⓘ

Retire

Academic Unit Approval

11/28/2024

Retired Impact ⓘ

No

Rationale for Change ⓘ

Host institution is no longer offering these courses and we need to ensure that the information in the Calendar is reflective of this change.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Civil and Environmental Engineering

Subject Code ⓘ

UN

Number ⓘ

801

Title ⓘ

Nuclear Plant Systems and Operations Test

Abbreviated Title ⓘ

Nuclear Plant Syst&Operations

Description ⓘ

System and overall unit operations relevant to nuclear power plants with emphasis on CANDU; includes all major reactor and process systems with nuclear plant simulator; self-study using interactive CD ROM. Two to three class one day meetings will be scheduled.

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

ARCH 710

Special Topics in Visual and Digital Media

Under Review | Spring 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 ⓘ

Spring 2025

Offering Number

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

05/14/2024

Rationale for New Course ⓘ

Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. The ARCH 710 elective (with sub-sections as needed) will cover electives focused on Visual and Digital Media. Students can take two (2) ARCH 710 courses, as long as they are enrolling in a different special topic.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

710

Title ⓘ

Special Topics in Visual and Digital Media

Abbreviated Title ⓘ

Topics: Visual & Digital Media

Description ⓘ

A range of special topics within visual and digital media that include course offerings in parametric design and scripting, advanced visualization, interaction design, and digital fabrication.

Units ⓘ

0.50

Components ⓘ

Seminar

Primary Component

Seminar

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? ⓘ	Total Completions Allowed	Allow Multiple Enrol in a Term
Yes	02	Yes

Enrolment Rules

Consent to Add ⓘ	Consent to Drop ⓘ
No consent required	No consent required

Prerequisites ⓘ
Enrolled in Master of Architecture (MArch), Master of Architecture (MArch)-Co-op, or Master of Architecture (MArch)-Water

Corequisites ⓘ
No Rules

Antirequisites ⓘ
No Rules

Course Notes

Fee Statement ⓘ

Workflow Information

Workflow Path ⓘ	Faculty/AFIW Path(s) for Workflow ⓘ
Committee approvals	Faculty of Engineering

Dependencies

Dependent Courses and Programs/Plans
There are no dependencies

ARCH 720

Special Topics in Urbanism and Landscape

Under Review | Spring 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

expand ▲

Effective Date & Career

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

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

05/14/2024

Rationale for New Course ⓘ

Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. The ARCH 720 elective (with sub-sections as needed) will cover electives focused on questions of Urbanism and Landscape. Students can take two (2) ARCH 720 courses, as long as they are enrolling in a different special topic.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ	Academic Unit ⓘ
Faculty of Engineering	School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

720

Title ⓘ

Special Topics in Urbanism and Landscape

Abbreviated Title ⓘ

Topics: Urbanism & Landscape

Description ⓘ

A range of special topics courses within urbanism and landscape.

Units ⓘ

0.50

Components ⓘ

Seminar

Primary Component

Seminar

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?

Yes

Total Completions Allowed

02

Allow Multiple Enrol in a Term

Yes

Enrolment Rules

Consent to Add

No consent required

Consent to Drop

No consent required

Prerequisites

- Enrolled in Master of Architecture (MArch), Master of Architecture (MArch)-Co-op, or Master of Architecture (MArch)-Water

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

ARCH 740

Special Topics in Architectural History and Theory

Under Review | Spring 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 ⓘ

Spring 2025

Offering Number

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

05/14/2024

Rationale for New Course ⓘ

Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. The ARCH 740 elective (with sub-sections as needed) will cover electives focused on Architectural History and Theory. Students can take two (2) ARCH 740 courses, as long as they are enrolling in a different special topic.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

740

Title ⓘ

Special Topics in Architectural History and Theory

Abbreviated Title ⓘ

Topics: Archit Hist & Theory

Description ⓘ

A range of special topics courses within cultural and architectural history, theory and criticism.

Units ⓘ

0.50

Components ⓘ

Seminar

Primary Component

Seminar

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?

Yes

Total Completions Allowed

02

Allow Multiple Enrol in a Term

Yes

Enrolment Rules

Consent to Add

No consent required

Consent to Drop

No consent required

Prerequisites

- Enrolled in Master of Architecture (MArch), Master of Architecture (MArch)-Co-op, or Master of Architecture (MArch)-Water

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

ARCH 770

Special Topics in Building Technology and Environment

Under Review | Spring 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 ⓘ

Spring 2025

Offering Number

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

05/14/2024

Rationale for New Course ⓘ

Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. The ARCH 770 elective (with sub-sections as needed) will cover electives focused on Building Technology and Environment. Students can take two (2) ARCH 770 courses, as long as they are enrolling in a different special topic.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

770

Title ⓘ

Special Topics in Building Technology and Environment

Abbreviated Title ⓘ

Topics: Building Tech & Env

Description ⓘ

A range of special topics courses within building technologies, structures, materials and methods and environmental systems including coursework in alternative energy systems, ecological design and design build.

Units ⓘ

0.50

Components ⓘ

Seminar

Primary Component

Seminar

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? ⓘ	Total Completions Allowed	Allow Multiple Enrol in a Term
Yes	02	Yes

Enrolment Rules

Consent to Add ⓘ	Consent to Drop ⓘ
No consent required	No consent required

Prerequisites ⓘ
Enrolled in Master of Architecture (MArch), Master of Architecture (MArch)-Co-op, or Master of Architecture (MArch)-Water

Corequisites ⓘ
No Rules

Antirequisites ⓘ
No Rules

Course Notes

Fee Statement ⓘ

Workflow Information

Workflow Path ⓘ	Faculty/AFIW Path(s) for Workflow ⓘ
Committee approvals	Faculty of Engineering

Dependencies

Dependent Courses and Programs/Plans
There are no dependencies

ARCH 780

Special Topics in Race, Equity, and Environmental Justice

Under Review | Spring 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

expand

▲

Effective Date & Career

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

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

05/14/2024

Rationale for New Course ⓘ

Instead of specific elective course names and numbers, Architecture has decided to have general 710, 720, 740, 770 and 780 numbers tied to general research themes, with sections created for the electives offered in a given term. The ARCH 780 elective (with sub-sections as needed) will cover electives focused on Race, Equity and Environmental Justice. Students can take two (2) ARCH 780 courses, if enrolling in a different special topic.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ	Academic Unit ⓘ
Faculty of Engineering	School of Architecture

Subject Code ⓘ

ARCH

Number ⓘ

780

Title ⓘ

Special Topics in Race, Equity, and Environmental Justice

Abbreviated Title ⓘ

Topics: Race, Equity & Envir

Description ⓘ

The equity and environmental justice electives include courses that are at the intersection of representation, culture, technology, environment, landscape, and urbanism to consider questions of race, space, and environmental justice, addressing a range of topics that can include universal design principles, design norms and standards, exclusionary and inclusive practices in architecture, questions of solidarity, climate crisis, sustainability, as well as social and spatial justice.

Units ⓘ

0.50

Components ⓘ

Seminar

Primary Component

Seminar

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? ⓘ	Total Completions Allowed	Allow Multiple Enrol in a Term
Yes	02	Yes

Enrolment Rules

Consent to Add ⓘ	Consent to Drop ⓘ
No consent required	No consent required

Prerequisites ⓘ
Enrolled in Master of Architecture (MArch), Master of Architecture (MArch)-Co-op, or Master of Architecture (MArch)-Water

Corequisites ⓘ
No Rules

Antirequisites ⓘ
No Rules

Course Notes

Fee Statement ⓘ

Workflow Information

Workflow Path ⓘ	Faculty/AFIW Path(s) for Workflow ⓘ
Committee approvals	Faculty of Engineering

Dependencies

Dependent Courses and Programs/Plans
There are no dependencies

CHE 698

Directed MEng Research Project

Under Review | Spring 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!

Effective Term and Year ⓘ

Spring 2025

Quest Course ID

Offering Number

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

09/16/2024

Rationale for New Course ⓘ

This provides MEng students with an avenue for some experiential learning to complement the classroom instruction they receive.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Chemical Engineering

Subject Code ⓘ

CHE

Number ⓘ

698

Title ?

Directed MEng Research Project

Abbreviated Title ?

Directed MEng Research Project

Description ?

This course is a research project, designed exclusively for MEng in Chemical Engineering students who have completed at least 3 graduate courses and are in good academic standing. Students will carry out a research project over one academic term, under the direct supervision of a Chemical Engineering faculty member. A written project report has to be submitted at the end of the term, and the report will be evaluated and graded by the project supervisor. This course is not transferable to Chemical Engineering MAsC or PhD programs.

Units ?

0.50

Components ?

ProjectReading

Primary Component

Project

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

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 634

Practical Experimental Statistics and Data Visualization

Under Review | Spring 2025

Proposal Information

Workflow Status
In Progress
SGRC, Senate Graduate and Research Council (SGRC)
Waiting for Approval | Approval Delegate(s)
Mike Grivicic
Tim Weber-Kraljevski
Diana Goncalves
Melanie Figueiredo
Ashley Day

expand ▲

Effective Date & Career

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

Proposal Details

Proposal Type ⓘ
New

Academic Unit Approval
09/25/2024

Rationale for New Course ⓘ
This graduate course is currently listed as a special topics graduate course in materials (ME 738 – Topic 29). Enrolment has been good and increasing over the last three offerings in 2021-2023, with 10-14 graduate students per offering. It has been offered in Fall term every year. It is time to change this to a regular course number rather than a special topic. A unique course number will help the visibility for students wishing to enrol. Further, the course content has evolved over time and the title has evolved to reflect these changes.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ Faculty of Engineering	Academic Unit ⓘ Department of Mechanical and Mechatronics Engineering

Subject Code ⓘ

ME

Number ⓘ

634

Title ⓘ

Practical Experimental Statistics and Data Visualization

Abbreviated Title ⓘ

Practical Exp Stat Data Vis

Description ⓘ

Experimental variability is examined using a back-to-basics approach showing the fundamental meaning of statistical concepts like mean, standard deviation, and significance. With this foundation, there will be a deeper dive into different techniques to understand data through significance testing, experimental design, typical data distributions, processing non-normal data, and experimental design and analysis. The course will end with a discussion of data visualization, discussing how to maximize the effectiveness of data communication by discussing the theories underpinning effective data communication, matching plotting techniques to presented data and best plotting practices to highlight conclusions. The course concepts will be underpinned by project work to apply the class concept to real-life datasets and figures.

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

- Complete all of the following
 - Not completed nor concurrently enrolled in:
 - CM762 - Data Visualization (0.50)
 - STAT830 - Experimental Design (0.50)
 - STAT842 - Data Visualization (0.50)
 - Not completed nor concurrently enrolled in: CHE425, ME738 (Topic 29: Statistical Analysis and Data Visualization), STAT430

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 641

System Identification & Adaptive Control

Under Review | Spring 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 ⓘ

Spring 2025

Offering Number

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

09/25/2024

Rationale for New Course ⓘ

This graduate course is currently listed as a special topics graduate course in mechatronics (ME 780 – Topic 10). Enrolment has been good over 14 years, with on average approximately 15 graduate students per offering over 9 offerings. It is expected to be offered in Fall term every year or every other year. It is time to change this to a regular course number rather than a special topic. A unique course number will help the visibility for students wishing to enrol. Further, the course content has evolved over time and the title has evolved to reflect these changes.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Academic Unit ⓘ

Faculty of Engineering

Department of Mechanical and Mechatronics Engineering

Subject Code ⓘ

ME

Number ⓘ

641

Title ⓘ

System Identification & Adaptive Control

Abbreviated Title ⓘ

Syst Id & Adapt Control

Description ⓘ

This course is on the fundamentals of system identification and (parameter identification based) adaptive control of dynamic systems whose parameters are unknown or changing with time in an unknown manner. Focus is on continuous-time dynamic engineering systems. The covered topics include system parameterization and parametric modeling, gradient and least-squares based parameter identification algorithms, parameter projection and other robustification techniques, state estimation and observer design, adaptive state estimators, kalman filtering, adaptive pole placement control, adaptive linear quadratic control, model reference adaptive control, sliding mode control and other nonlinear techniques. There is a significant project component on applications of parameter identification and adaptive control.

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

- Not completed nor concurrently enrolled in: ME780 (Topic 10: Adaptive Control)

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 642

Precision Control Systems

Under Review | Spring 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

expand ▲

Effective Date & Career

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

Proposal Details

Proposal Type ⓘ	Academic Unit Approval
New	09/25/2024

Rationale for New Course ⓘ

This graduate course is currently listed as a special topics graduate course in mechatronics (ME 780 – Topic 1). This course has been offered three times between 2018 and 2023 with 6 - 15 graduate students per offering. It is expected to be offered in Fall term every other year. It is time to change this to a regular course number rather than a special topic. A unique course number will help the visibility for students wishing to enrol.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ	Academic Unit ⓘ
Faculty of Engineering	Department of Mechanical and Mechatronics Engineering

Subject Code ⓘ

ME

Number ⓘ

642

Title ⓘ

Precision Control Systems

Abbreviated Title ⓘ

Precision Control Systems

Description ⓘ

This course aims to provide a basic understanding of the mechatronic design, analysis, modeling, trajectory planning, parameter identification, and controller design techniques applicable to precision mechatronic systems, such as machine tools and electronic/optical manufacturing equipment. The theoretical content is complemented by application-oriented projects. Students are also expected to give a presentation, at the end of the term, about their independent study of a special topic related to dynamics, modeling, controls, or mechatronic design. For research students, this presentation can be related to their thesis work.

Units ⓘ

0.50

Components ⓘ

LectureLaboratory

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

- Not completed nor concurrently enrolled in: ME780 (Topic 1: Precision Control Systems)

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 643

Introduction to Vehicle Dynamics and Control, Hybrid and Electric Vehicles, and Automated Driving

Under Review | Spring 2025

Proposal Information

Workflow Status
In Progress
SGRC, Senate Graduate and Research Council (SGRC)
Waiting for Approval | Approval Delegate(s)
Mike Grivicic
Tim Weber-Kraljevski
Diana Goncalves
Melanie Figueiredo
Ashley Day

expand ▲

Effective Date & Career

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

Proposal Details

Proposal Type ⓘ
New

Academic Unit Approval
09/25/2024

Rationale for New Course ⓘ
This graduate course is currently listed as a special topics graduate course in mechatronics (ME 780 – Topic 17). The enrolment has been good and steady since its first offering in 2011 with 10-15 graduate students per offering. It has been offered typically once a year and is expected to be offered in Spring term. It is time to change this to a regular course number rather than a special topic. A unique course number will help the visibility for students wishing to enrol. Further, the course content has evolved over time and the title has evolved to reflect these changes.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ Faculty of Engineering	Academic Unit ⓘ Department of Mechanical and Mechatronics Engineering

Subject Code ⓘ

ME

Number ⓘ

643

Title ⓘ

Introduction to Vehicle Dynamics and Control, Hybrid and Electric Vehicles, and Automated Driving

Abbreviated Title ⓘ

Intro Vehicle Dyn & Control

Description ⓘ

In this course, we explore vehicle systems, vehicle modeling and dynamics, and hybrid and electric vehicles, focusing on their powertrain topology, electric motors, energy storage systems, and power management systems. We also cover active suspension control, vehicle stability control, and autonomous driving, emphasizing hardware and software configurations, as well as path planning and tracking techniques. The course provides an introduction to these topics, helping students understand vehicle systems and the latest developments in the automotive industry.

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

- Not completed nor concurrently enrolled in: ME780 (Topic 17: Vehicle System Dynamics)

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 646

Design for Additive Manufacturing

Under Review | Spring 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!

Effective Term and Year ⓘ

Spring 2025

Quest Course ID

Offering Number

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

09/25/2024

Rationale for New Course ⓘ

This graduate course is currently listed as a special topics graduate course in Manufacturing Processes (ME 739 – Topic 15). Enrolment has been good and steady since 2018, with 10-20 graduate students per offering. It has been offered each Fall term. It is time to change this to a regular course number rather than a special topic. A unique course number will help the visibility for students wishing to enrol. Further, the course content has evolved over time and the title has evolved to reflect these changes.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Mechanical and Mechatronics Engineering

Subject Code ⓘ

ME

Number ⓘ

646

Title ⓘ

Design for Additive Manufacturing

Abbreviated Title ⓘ

Design for Ad Manufacturing

Description ⓘ

Additive manufacturing (AM) processes are capable of creating parts with a high design complexity and functionality. Design for Additive Manufacturing (DfAM) discusses how to conceptualize and create a part design suited for manufacturability via various AM processes, while leveraging design freedoms to enhance performance. After taking this course, students will have gained experience with key DfAM concepts, such as functional complexity, hierarchical design, architected materials via latticing, topology optimization, and assembly consolidation. Through project coursework, students will explore various design tools, the basics of AM processes, and how DfAM concepts relate to AM production.

Units ⓘ

0.50

Components ⓘ

LectureLaboratory

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

- Not completed nor concurrently enrolled in: ME739 (Topic 15: Additive Manufacturing Design)

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 647

Additive Manufacturing

Under Review | Spring 2025

Proposal Information

Workflow Status
In Progress
SGRC, Senate Graduate and Research Council (SGRC)
Waiting for Approval | Approval Delegate(s)
Mike Grivicic
Tim Weber-Kraljevski
Diana Goncalves
Melanie Figueiredo
Ashley Day

expand ▲

Effective Date & Career

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

Proposal Details

Proposal Type ⓘ
New

Academic Unit Approval
09/25/2024

Rationale for New Course ⓘ
This graduate course is currently listed as a special topics graduate course in in Manufacturing Processes (ME 739 - Topic 17). Enrolment has been good since 2016, with 21-34 graduate students per offering. It has been offered each Winter term except in 2024. It is time to change this to a regular course number rather than a special topic. A unique course number will help the visibility for students wishing to enrol.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ Faculty of Engineering	Academic Unit ⓘ Department of Mechanical and Mechatronics Engineering

Subject Code ⓘ

ME

Number ⓘ

647

Title ⓘ

Additive Manufacturing

Abbreviated Title ⓘ

Additive Manufacturing

Description ⓘ

Explore additive manufacturing from fundamentals and its standard classification to laser material processing in multi-scale. Gain insights into modeling, real-time monitoring, and quality assurance for metal additive manufacturing processes. Dive into case studies on applications of additive manufacturing in biomedical and industrial fields. Emerging applications, trends and opportunities in this dynamic technology landscape.

Units ⓘ

0.50

Components ⓘ

LectureLaboratory

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

- Not completed nor concurrently enrolled in: ME739 (Topic 17: Additive Manufacturing)

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 744

Computational Intelligence

Under Review | Spring 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

expand ▲

Effective Date & Career

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

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

09/25/2024

Rationale for New Course ⓘ

This graduate course is currently listed as a special topics graduate course in mechatronics (ME 780 – Topic 5). Enrolment has been good since its first offering in 2009, with 20-30 graduate students per offering. It is offered in Fall term every other year. It is time to change this to a regular course number rather than a special topic. A unique course number will help the visibility for students wishing to enrol.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ	Academic Unit ⓘ
Faculty of Engineering	Department of Mechanical and Mechatronics Engineering

Subject Code ⓘ

ME

Number ⓘ

744

Title ⓘ

Computational Intelligence

Abbreviated Title ⓘ

Computational Intelligence

Description ⓘ

The course offers a comprehensive study of different machine learning techniques used for a variety of engineering applications. The theoretical aspect of the course introduces the students to topics such as supervised (shallow and deep) learning, unsupervised learning and reinforcement learning. In this course, implementation of these machine learning tools in image processing, robotics motion planning and control applications will be discussed. Implementation of machine learning algorithms using resources available in machine learning libraries like TensorFlow and PyTorch will also be introduced through several assignments that students will tackle during the term.

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

- Not completed nor concurrently enrolled in: ME780 (Topic 5: Computational Intelligence)

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

UN 601

Control, Instrumentation and Electrical Systems

Under Review | Spring 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

expand ▲

Effective Date & Career

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

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

11/28/2024

Rationale for New Course ⓘ

Course has been updated at host institution and we need to ensure that the information in the Calendar is reflective of this change.

Consultations ⓘ

Supporting Documentation

Course Information

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

UN

601

Title ?

Control, Instrumentation and Electrical Systems

Abbreviated Title ?

Ctrl, Instr & Elect Systems

Description ?

This course covers the basic control, instrumentation and electrical systems commonly found in CANDU based nuclear power plants. The course starts with an overall view of the dynamics associated with different parts of the plant, i.e. reactor, heat transport systems, moderator, steam generator, turbine, and electrical generator. Based on such knowledge, the control and regulation functions in the above systems are then defined. Different instrumentation and measurement techniques are examined, along with control strategies. The time and frequency domain performance characterizations of control loops are introduced with consideration of actuator and sensor limitations. Different controller design and tuning methods and instrumentation calibration procedures are discussed. Two modes of operation of CANDU plants will be analyzed, i.e. normal mode and alternate mode. Advanced control technologies, such as distributed control systems, Field bus communication protocols are introduced in view of their potential applications in the existing and newly constructed CANDU power plants. The electric systems in the CANDU plant will be examined. The modeling of the dynamics and control devices for the generator will be covered in details. The dynamic interaction between the CANDU power plants and the rest of the electric power grid with other generating facilities and various types of load will be studied.

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

Department 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

UN 602

Nuclear Fuel Waste Management

Under Review | Spring 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

expand

▲

Effective Date & Career

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

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

11/28/2024

Rationale for New Course ⓘ

Course has been updated at host institution and we need to ensure that the information in the Calendar is reflective of this change.

Consultations ⓘ

Supporting Documentation

Course Information

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

UN

602

Title ?

Nuclear Fuel Waste Management

Abbreviated Title ?

Nuclear Fuel Waste Mgmt

Description ?

This course will examine the sources and management approaches to storage and disposal of various nuclear wastes with focus on spent fuel waste generated primarily from nuclear reactors, in particular CANDU reactor. Key components of waste management approaches include waste characterization, classification, processing, packaging, transportation, storage and final disposal of the waste in a suitable repository. The first part of the course will examine detailed approaches including regulatory framework to manage low-level and intermediate-level radioactive wastes and wastes from Naturally Occurring Radioactive Materials. In the second half of the course, detailed considerations will be given to high-level radioactive spent nuclear fuel wastes. Presently, nuclear fuel waste management involves storage in water pools or dry storage containers at reactor sites. If the spent fuel is defined as waste, then permanent disposal at an appropriate deep geological site would be considered. The possible permanent disposal scenarios developed internationally will be discussed, with a primary emphasis on those potentially applicable in Canada. For this last topic, the design and fabrication of waste containers and the processes that could potentially lead to their failure, the properties of engineered barriers within the geological site, the essential geological features of the chosen site, and the computational modeling approaches used in site performance assessment calculations will be described. International experiences on regulatory and Community issues, resolutions, and examples of operating and planned nuclear waste storage and disposal facilities will be detailed. The course will also present through examples tools to arrive at preferred management options for selected non-fuel waste effluents.

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

Department 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

UN 603

Project Management for Nuclear Engineers

Under Review | Spring 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

expand ▲

Effective Date & Career

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

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

11/28/2024

Rationale for New Course ⓘ

Course has been updated at host institution and we need to ensure that the information in the Calendar is reflective of this change.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ	Academic Unit ⓘ
Faculty of Engineering	Department of Civil and Environmental Engineering
Subject Code ⓘ	Number ⓘ
UN	603

Title ?

Project Management for Nuclear Engineers

Abbreviated Title ?

Proj Mgmt - Nuclear Engineers

Description ?

Project Management is emerging as perhaps the key core competency in engineering in the 21st century industrial workplace. This course in Project Management will prepare nuclear engineers in the application of this discipline in their work. It is an intensive investigation into the major principles of Project Management slanted towards, but not exclusively about, the management of nuclear engineering projects. The course uses the Project Management Institute's PMBOK (Project Management Body of Knowledge) as a skeleton and expands that coverage with relevant examples from nuclear, software and general engineering. Special emphasis will be placed on Risk Management, particularly in the area of safety-critical projects. The graduate will be well-positioned both to apply the knowledge in their area of engineering and to sit the PMI's PMP examination. The course will be taught by a professional engineer holding the PMP certification, using many case studies from industry and engineering.

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

Department 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

UN 803

Nuclear Reactor Safety Design

Under Review | Spring 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

expand

Effective Date & Career

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

Proposal Details

Proposal Type

New

Academic Unit Approval

11/28/2024

Rationale for New Course

Course has been updated at host institution and we need to ensure that the information in the Calendar is reflective of this change.

Consultations

Supporting Documentation

Course Information

Faculty	Academic Unit
Faculty of Engineering	Department of Civil and Environmental Engineering
Subject Code	Number
UN	803

Title ?

Nuclear Reactor Safety Design

Abbreviated Title ?

Nuclear Reactor Safety Design

Description ?

This course covers safety design and analysis of nuclear reactors based on deterministic and probabilistic assessments. Topics include: nuclear safety principles, concepts of risk; probability tools and techniques; safety criteria; design basis accidents and other accidents; risk assessment; deterministic safety analysis; probabilistic safety assessments; regulatory requirements, safety system design; severe accidents; operational safety of reactors; and general policy and principles. Examples will be drawn from CANDU-6 and multi-unit CANDU designs, with limited discussion of Light Water Reactors (e.g., BWRX-300).

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

Department 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

UN 804

Nuclear Reactor Heat Transport System Design

Under Review | Spring 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

expand ▲

Effective Date & Career

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

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

11/28/2024

Rationale for New Course ⓘ

Course has been updated at host institution and we need to ensure that the information in the Calendar is reflective of this change.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ	Academic Unit ⓘ
Faculty of Engineering	Department of Civil and Environmental Engineering
Subject Code ⓘ	Number ⓘ
UN	804

Title ?

Nuclear Reactor Heat Transport System Design

Abbreviated Title ?

Nuclear Heat Trans Syst Design

Description ?

This course covers the topic of thermalhydraulics design and operation of nuclear power reactors. It includes an overview of nuclear reactor systems, thermalhydraulic design requirements, limits, and margins, and thermalhydraulic phenomena related to reactor safety. The course covers the conservation equations and equation of state and applies them to describe single and two-phase flow and heat transfer in the reactor core and other reactor systems. The course describes and explains the energy conversion processes in the reactor core and other elements of the reactor heat transport systems. Also, the course provides information about the pressure drop and other thermalhydraulics parameters and phenomena in the reactor heat transport system. The course discusses the design, role, and functionality of various thermalhydraulics systems and components.

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

Department 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

UN 805

Introduction to Operational Health Physics

Under Review | Spring 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

expand ▲

Effective Date & Career

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

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

11/28/2024

Rationale for New Course ⓘ

Course has been updated at host institution and we need to ensure that the information in the Calendar is reflective of this change.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ	Academic Unit ⓘ
Faculty of Engineering	Department of Civil and Environmental Engineering
Subject Code ⓘ	Number ⓘ
UN	805

Title ?

Introduction to Operational Health Physics

Abbreviated Title ?

Intro Operational Hlth Physics

Description ?

An introduction to a number of topics that will be encountered in the practice of health physics. The following topics will be discussed: Dose limitation; dosimetric quantities for individuals and populations; ionizing radiation risks and hazards; ICRP-60; internal doses and the compartment model; derived air concentrations and annual limit on intake; metabolic models for respiratory system and GI tract, radiation safety at nuclear reactors, particle accelerators, irradiators, X-Ray installations and laboratories; pathway analysis; derived release limits; environmental monitoring, sample collection and preparation, and sources of radiation; atmospheric transport; cost-benefit analysis; derivation of limits for surface contamination.

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

Department 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

UN 806

Nuclear Fuel Engineering

Under Review | Spring 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

expand ▲

Effective Date & Career

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

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

11/28/2024

Rationale for New Course ⓘ

Course has been updated at host institution and we need to ensure that the information in the Calendar is reflective of this change.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ	Academic Unit ⓘ
Faculty of Engineering	Department of Civil and Environmental Engineering
Subject Code ⓘ	Number ⓘ
UN	806

Title ?

Nuclear Fuel Engineering

Abbreviated Title ?

Nuclear Fuel Engineering

Description ?

This course covers power reactor fuel design, performance, and safety aspects, and complements other Engineering Physics / UNENE courses on reactor core design, thermohydraulics and reactor safety design. It includes fissile and fertile fuels; burnup effects; fuel production (as well as uranium enrichment and reprocessing of spent fuel), quality assurance and CANDU fuel technical specifications; thermal conductivity; fuel chemistry; fuel restructuring and grain growth; fission product behaviour; fuel defect detection and location; fuel performance in operation; and fuel / fuel channel behaviour in design basis and severe accidents.

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

Department 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

UN 807

Power Plant Thermodynamics

Under Review | Spring 2025

Proposal Information

Workflow Status
In Progress
SGRC, Senate Graduate and Research Council (SGRC)
Waiting for Approval | Approval Delegate(s)
Mike Grivicic
Tim Weber-Kraljevski
Diana Goncalves
Melanie Figueiredo
Ashley Day

expand ▲

Effective Date & Career

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

Proposal Details

Proposal Type ⓘ
New

Academic Unit Approval
11/28/2024

Rationale for New Course ⓘ
Course has been updated at host institution and we need to ensure that the information in the Calendar is reflective of this change.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ Faculty of Engineering	Academic Unit ⓘ Department of Civil and Environmental Engineering
Subject Code ⓘ UN	Number ⓘ 807

Title ?

Power Plant Thermodynamics

Abbreviated Title ?

Power Plant Thermodynamics

Description ?

Theoretical and practical analysis of the following with particular reference to CANDU plants. Thermodynamic Cycles: Nuclear versus conventional steam cycles, regenerative feedwater heating, moisture separation and reheating, turbine expansion lines, heat balance diagrams, available energy, cycle efficiency and energy analysis. Nuclear Heat Removal: Heat conduction and convection in fuel rods and heat exchanger tubes, heat transfer in boilers and condensers, boiler influence on heat transport system, boiler swelling and shrinking, boiler level control, condenser performance. Steam Turbine Operation: Turbine configuration, impulse and reaction blading, blade velocity diagrams, turbine seals and sealing systems, moisture in turbines, part load operation, back pressure effects, thermal effects and turbine governing.

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

Department 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

UN 808

Reactor Chemistry and Corrosion

Under Review | Spring 2025

Proposal Information

Workflow Status
In Progress
SGRC, Senate Graduate and Research Council (SGRC)
Waiting for Approval | Approval Delegate(s)
Mike Grivicic
Tim Weber-Kraljevski
Diana Goncalves
Melanie Figueiredo
Ashley Day

expand ▲

Effective Date & Career

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

Proposal Details

Proposal Type ⓘ
New

Academic Unit Approval
11/28/2024

Rationale for New Course ⓘ
Course has been updated at host institution and we need to ensure that the information in the Calendar is reflective of this change.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ Faculty of Engineering	Academic Unit ⓘ Department of Civil and Environmental Engineering
Subject Code ⓘ UN	Number ⓘ 808

Title ?

Reactor Chemistry and Corrosion

Abbreviated Title ?

Reactor Chemistry & Corrosion

Description ?

Corrosion and its costs, corrosion measurement, general materials and environment affects. Types of corrosion: uniform, galvanic, crevice, pitting, intergranular, selective leaching, erosion-corrosion, stress-corrosion, hydrogen effects. Corrosion testing: materials selection. Electrochemical principles: thermodynamics, electrode kinetics, mixed potentials, practical applications. High temperature corrosion. Nuclear plant corrosion, fossil plant corrosion, other industrial environments.

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

Department 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

UN 901

Nuclear Materials

Under Review | Spring 2025

Proposal Information

Workflow Status

In Progress

SGRC, Senate Graduate and Research Council (SGRC)

Waiting for Approval | Approval Delegate(s)

Mike Grivicic

Tim Weber-Kraljevski

Diana Goncalves

Melanie Figueiredo

Ashley Day

expand

Effective Date & Career

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

Proposal Details

Proposal Type ⓘ

New

Academic Unit Approval

11/28/2024

Rationale for New Course ⓘ

Course has been updated at host institution and we need to ensure that the information in the Calendar is reflective of this change.

Consultations ⓘ

Supporting Documentation

Course Information

Faculty ⓘ Faculty of Engineering	Academic Unit ⓘ Department of Civil and Environmental Engineering
Subject Code ⓘ UN	Number ⓘ 901

Title ?

Nuclear Materials

Abbreviated Title ?

Nuclear Materials

Description ?

A nuclear reactor presents a unique environment in which materials must perform. In addition to the high temperatures and stresses to which materials are subjected in conventional applications, nuclear materials are subjected to various kinds of radiation which affect their performance, and often this dictates a requirement for a unique property (for example, a low cross section for thermal neutron absorption) that is not relevant in conventional applications. The effects of the radiation may be direct (e.g., the displacement of atoms from their normal positions by fast neutrons or fission fragments), or indirect (e.g., a more aggressive chemical environment caused by radiolytic decomposition). This course describes materials typically used in nuclear environments, the unique conditions to which they are subjected, the basic physical phenomena that affect their performance and the resulting design criteria for reactor components made from these materials.

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

Department 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 659

Energy and Environment

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
- Description
- Requisite Summary
- Prerequisites

Effective Date & Career

Career ⓘ

Graduate

Important!

Proposed
Effective Term and Year ⓘ
Spring 2025

Existing
Effective Term and Year ⓘ
Fall 2023

Quest Course ID

15078

Offering Number

1

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

09/25/2024

Rationale for Change ⓘ

This course has been offered on a regular basis each Spring and Fall term since 2018. Some updates are needed for the requisites. Experience revealed there is no need for this pre-requisite (ME 250). Further, the course content has evolved over time and the course description reflects these changes.

Consultations ⓘ**Supporting Documentation**

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Mechanical and Mechatronics Engineering

Subject Code ⓘ

ME

Number ⓘ

659

Title ⓘ

Energy and Environment

Abbreviated Title ⓘ

Energy and Environment

Proposed

Description ⓘ

Review Canada's and the world's energy situation from energy reserve availability to consumption trends, to environmental impact. The technological capabilities and challenges associated with, and physics and engineering principles behind, a range of energy conversion systems for a range of energy resources and energy storage mediums including fossil fuels, nuclear, solar, wind, hydro, geothermal, bio-fuels, hydrogen (fuel cells), wave, and tidal. The thermodynamics of energy conversion systems is considered from the perspectives of optimization, improving energy conversion efficiency, and energy system decision making. May be held with ME 459 Energy Conversion but with enhancements for the ME 659 students.

Existing

Description ⓘ

Review Canada's and the world's energy situation from energy reserve availability, to consumption trends, to environmental impact. Energy resources covered include fossil fuels, nuclear, solar, wind, geothermal, and others. The technological capabilities and challenges associated with, and physics and engineering principles behind, a range of energy conversion systems are covered. The energy conversion systems covered are fossil fuel systems, nuclear fission power plants, photovoltaic and thermal solar collector systems, wind energy systems, and a range of other systems as appropriate from wave and tidal energy to fuel cells. The thermodynamics of energy conversion systems is considered from the perspectives of optimization and improving energy conversion efficiency. May be held with ME 459 (Energy Conversion) but with enhancements for the ME 659 students. Also offered Online.

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 ⓘ

- Complete all of the following
 - ~~Must have completed the following: ME250~~

Corequisites ⓘ

No Rules

Antirequisites ⓘ

- Not completed nor concurrently enrolled in: ME459

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 623

Introduction to Machine Learning

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

- Title
- Abbreviated Title
- Description
- Components
- Requisite Summary

Show All ▼

Effective Date & Career

Career ⓘ

Graduate

Important!

Proposed

Effective Term and Year ⓘ

Spring 2025

Existing

Effective Term and Year ⓘ

Fall 2024

Quest Course ID

15643

Offering Number

1

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

11/06/2024

Rationale for Change ⓘ

Updating the MSE 623 course title and description to reflect how the course has evolved in response to recent trends in AI/ML and to align it with the undergraduate course, MSE 446.

Consultations ⓘ**Supporting Documentation**

Course Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Management Science and Engineering

Subject Code ⓘ

MSE

Number ⓘ

623

Proposed

Title ⓘ

Introduction to Machine Learning

Existing

Title ⓘ

Big Data Analytics

Proposed

Abbreviated Title ⓘ

Intro to Machine Learning

Existing

Abbreviated Title ⓘ

Big Data Analytics

Proposed

Description ⓘ

This course provides an introduction to the field of machine learning, with an emphasis on tools and algorithms that learn patterns from data. Topics covered may include data preparation, descriptive learning such as clustering, and predictive learning using classical methods such as regression and data-intensive methods such as deep learning. Students will read and present papers and complete a research project.

Existing

Description ⓘ

This course focuses on methods and algorithms for turning very large collections of data into actionable insight. Topics may include data profiling, transformation and cleaning, data mining, data warehousing and cloud computing. Applications will be drawn from various areas such as smart grid analytics and ubiquitous computing. Students will read and present papers and

complete a research project. Priority may be given to Management Sciences students. Previous studies in programming, algorithms, statistics and database management are necessary background topics for those taking this course.

Units ⓘ

0.50

Proposed

Components ⓘ

LectureReading

Primary Component

Lecture

Existing

Components ⓘ

LectureOnline

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

- Complete all of the following
 - Not completed nor concurrently enrolled in:
 - **CS680 - Introduction to Machine Learning (0.50)**
 - **ECE657A - Data & Knowledge Modelling & Analysis (0.50)**
 - Not completed nor concurrently enrolled in: **MSE446**, **MSCI723**

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

ANTIREQUISITES

▼ ECE 657A - Data & Knowledge Modelling & Analysis

[View Courses](#) ➤

GRADUATE DIPLOMA: COURSE REQUIREMENTS

▼ GDip in Data Analytics (type 2) - Graduate Diploma (GDip) in Data Analytics

[View Programs](#) ➤

MEng in Chemical Engineering

Master of Engineering (MEng) in Chemical 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

- Admit Term(s)
- 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 ⓘ
Fall 2024

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

10/21/2024

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) ⓘ

Changing the official admit terms to Fall, Winter, and Spring instead of just Fall: We are trying to remove as many barriers as possible for our MEng applicants.

Consultations (Departmental) ⓘ

Supporting Documentation

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Chemical Engineering

Graduate Field of Study

Chemical Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Master of Engineering (MEng) in Chemical Engineering

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Coursework

Program Types

Proposed
Admit Term(s)

Fall
Winter
Spring

Existing

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****Graduate Specializations**

- Biological Engineering
- Entrepreneurship
- Polymer Science and Engineering
- Process Systems Engineering

Additional Program Information

- Important notice for MEng applicants: applicants to the MEng program are expected to be entirely self funded. No financial assistance will be provided from the Department of Chemical Engineering or the University of Waterloo.

Admissions

Admission Requirements: Minimum Requirements ?

- A 75% overall standing in the last two years, or equivalent, in a four-year Honours Bachelor's degree or equivalent.
- 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).

Coursework Option: Course Requirements

No Rules

Coursework Option: Course Requirements

- Students must complete CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 credit weight) and 8 graduate courses (0.50 unit weight per course) as follows:
 - Either CHE 601 Theory and Application of Transport Phenomena or CHE 602 Chemical Reactor Analysis
 - 7 graduate level electives of which 4 must be CHE courses
- No more than 2 may be 500 level courses.
- No more than 1 may be a reading course.
- Graduate courses offered by the Faculty of Engineering are numbered as 600 or 700 series courses and are assigned a unit weight of 0.50, which means that they are one-term courses as defined in the Graduate Studies Academic Calendar.
- Only courses taken within five years prior to the completion of the MEng degree may be counted for credit towards a degree, unless a request for revalidation is granted.
- Students must achieve a:
 - Minimum cumulative average of 70%.
 - Minimum grade of 65% in each individual course.
 - Note: Probationary students may have specific grade requirements, which will be specified in their admission letter.
- Each student is responsible for monitoring their own academic records and must immediately notify the Graduate Coordinator of any inadequate grade or average.
- Students in the MEng in Chemical Engineering program may choose to pursue one of the following Graduate Specializations:
 1. Biological Engineering
 2. Entrepreneurship
 3. Polymer Science and Engineering
 4. Process Systems 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 Chemical Engineering consist of a set of 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: Students are limited to one Graduate Specialization designation for their MEng in Chemical Engineering degree.

1. Graduate Specialization in Biological Engineering

- To receive the Graduate Specialization in Biological Engineering, students must successfully complete 3 compulsory courses and 1 elective course:
 - Compulsory courses:
 - CHE 562 Advanced Bioprocess Engineering
 - CHE 660 Principles of Biochemical Engineering
 - CHE 663 Bioseparations
 - Elective courses (choose 1 from the following list):
 - CHE 561 Biomaterials & Biomedical Design
 - CHE 564 Food Process Engineering

2. Graduate Specialization in Entrepreneurship

- Students must obtain approval from the Chemical Engineering Graduate Officer in order to pursue the Graduate Specialization in Entrepreneurship. Interested students will be required to submit a short proposal following matriculation describing their entrepreneurship idea and suitability to pursue it.
- To receive the Graduate Specialization in Entrepreneurship, students must successfully complete the following 4 compulsory courses:
 - Compulsory courses:
 - BE 600 Management and Leadership
 - BE 605 Project Management
 - BE 606 Entrepreneurship and Innovation
 - CHE 651 Technology Entrepreneurship Project

3. Graduate Specialization in Polymer Science and Engineering

- To receive the Graduate Specialization in Polymer Science and Engineering, students must successfully complete 2 compulsory courses and 2 elective courses:
 - Compulsory courses:
 - CHE 541 Introduction to Polymer Science and Properties
 - CHE 621 Model Building and Response Surface Methodology
 - Elective courses (choose 2 from the following list):
 - CHE 543 Polymer Production: Polymer Reaction Engineering
 - CHE 640 Polymer Property Characterization
 - CHE 641 Fundamentals of Polymer Processing Operations

4. Graduate Specialization in Process Systems Engineering

- To receive the Graduate Specialization in Process Systems Engineering, students must successfully complete 2 compulsory courses and 2 elective courses:
 - Compulsory courses:
 - CHE 620 Applied Engineering Mathematics
 - CHE 621 Model Building and Response Surface Methodology
 - Elective courses (choose 2 from the following list):
 - CHE 520 Process Flowsheet Analysis
 - CHE 521 Process Optimization
 - CHE 522 Advanced Process Dynamics and Control

Coursework Option: Milestone Requirements

Seminar Attendance

- Over the course of their degree program, all students must attend 12 seminars from departments and research institutions where Chemical Engineering faculty members have a membership. The Chemical Engineering seminars are documented in the Events section of the Chemical Engineering Department website.
- Note: At Chemical Engineering seminars, attendance is documented. At other approved seminars, students must complete an attendance form and get it signed by the seminar organizer. Full instructions are available on the Department website.

Notes ⓘ

- Department of Chemical Engineering website
- Master of Engineering (MEng) in Chemical Engineering future students program page

Workflow Information

Workflow Path ⓘ

Faculty/AFIW Path(s) for Workflow ⓘ

Senate Workflow

Committee approvals

Faculty of Engineering

--

Dependencies

Dependent Courses and Programs/Plans

PREREQUISITES

✓ CHE 661 - Advances in Biochemical Engineering	View Courses ➤
✓ CHE 730 - Special Topics in Chemical Kinetics,Catalysis and Advanced Reactor Engineering	View Courses ➤
✓ CHE 720 - Special Topics in Analysis of Chemical Processes	View Courses ➤
✓ CHE 710 - Special Topics in Transport Phenomena	View Courses ➤
✓ CHE 750 - Special Topics in Electrochemical Engineering, Interfacial Engineering & Materials Science	View Courses ➤
✓ CHE 760 - Special Topics in Biochemical Engineering	View Courses ➤
✓ CHE 740 - Special Topics in Polymer Science and Engineering	View Courses ➤
✓ CHE 770 - Special Topics in Environmental Engineering and Pollution Control	View Courses ➤
✓ CHE 612 - Interfacial Phenomena	View Courses ➤
✓ 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 ➤
✓ CHE 620 - Applied Engineering Mathematics	View Courses ➤
✓ CHE 600 - Engineering and Research Methods, Ethics, Practice, and Law	View Courses ➤

MEng in Chemical Engineering-Co-op Master of Engineering (MEng) in Chemical 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 - Admit Term(s) - 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 ⓘ Fall 2024

Proposal Details

Proposal Type ⓘ Change	Academic Unit Approval 10/21/2024
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) ⓘ

Changing the official admit terms to Fall, Winter, and Spring instead of just Fall: We are trying to remove as many barriers as possible for our MEng applicants.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Chemical Engineering

Graduate Field of Study

Chemical Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Master of Engineering (MEng) in Chemical Engineering - Co-operative Program (direct entry)

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Coursework

Program Types

Co-operative

Proposed

Admit Term(s)

Fall

Winter

Spring

Existing

Admit Term(s)

Fall

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**

- Biological Engineering
- Entrepreneurship
- Polymer Science and Engineering
- Process Systems Engineering

Additional Program Information

- Important notice for MEng applicants: applicants to the MEng program are expected to be entirely self funded. No financial assistance will be provided from the Department of Chemical Engineering or the University of Waterloo.

Admissions

Admission Requirements: Minimum Requirements ⓘ

- A 75% overall standing in the last two years, or equivalent, in a four-year Honours Bachelor's degree or equivalent.
- 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 Chemical 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 4 (or terms 4 and 5). The work term(s) must meet Co-operative and Experiential Education (CEE) standard work term requirements and Departmental requirements. Student's 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

Coursework Option: Course Requirements

- Students must complete CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 credit weight), CHE 650 Engineering Work-term Experience Report (0.25 credit weight, must be completed in term 5 or 6) and 8 graduate courses (0.50 unit weight per course) as follows:
 - Either CHE 601 Theory and Application of Transport Phenomena or CHE 602 Chemical Reactor Analysis
 - 7 graduate level electives of which 4 must be CHE courses
- No more than 2 may be 500 level courses.
- No more than 1 may be a reading course.
- Graduate courses offered by the Faculty of Engineering are numbered as 600 or 700 series courses and are assigned a unit weight of 0.50, which means that they are one-term courses as defined in the Graduate Studies Academic Calendar.
- Only courses taken within five years prior to the completion of the MEng degree may be counted for credit towards a degree, unless a request for revalidation is granted.
- Students must achieve a:
 - Minimum cumulative average of 70%.
 - Minimum grade of 65% in each individual course.
 - Note: Probationary students may have specific grade requirements, which will be specified in their admission letter.
- Each student is responsible for monitoring their own academic records and must immediately notify the Graduate Coordinator of any inadequate grade or average.
- Students in the MEng in Chemical Engineering program may choose to pursue one of the following Graduate Specializations:
 1. Biological Engineering
 2. Entrepreneurship
 3. Polymer Science and Engineering
 4. Process Systems 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 Chemical Engineering consist of a set of 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: Students are limited to one Graduate Specialization designation for their MEng in Chemical Engineering degree.

1. Graduate Specialization in Biological Engineering

- To receive the Graduate Specialization in Biological Engineering, students must successfully complete 3 compulsory courses and 1 elective course:
 - Compulsory courses:
 - CHE 562 Advanced Bioprocess Engineering
 - CHE 660 Principles of Biochemical Engineering
 - CHE 663 Bioseparations
 - Elective courses (choose 1 from the following list):
 - CHE 561 Biomaterials & Biomedical Design
 - CHE 564 Food Process Engineering

2. Graduate Specialization in Entrepreneurship

- Students must obtain approval from the Chemical Engineering Graduate Officer in order to pursue the Graduate Specialization in Entrepreneurship. Interested students will be required to submit a short proposal following matriculation describing their entrepreneurship idea and suitability to pursue it.
- To receive the Graduate Specialization in Entrepreneurship, students must successfully complete the following 4 compulsory courses:
 - Compulsory courses:
 - BE 600 Management and Leadership
 - BE 605 Project Management
 - BE 606 Entrepreneurship and Innovation
 - CHE 651 Technology Entrepreneurship Project

3. Graduate Specialization in Polymer Science and Engineering

- To receive the Graduate Specialization in Polymer Science and Engineering, students must successfully complete 2 compulsory courses and 2 elective courses:
 - Compulsory courses:
 - CHE 541 Introduction to Polymer Science and Properties
 - CHE 621 Model Building and Response Surface Methodology
 - Elective courses (choose 2 from the following list):
 - CHE 543 Polymer Production: Polymer Reaction Engineering
 - CHE 640 Polymer Property Characterization
 - CHE 641 Fundamentals of Polymer Processing Operations

4. Graduate Specialization in Process Systems Engineering

- To receive the Graduate Specialization in Process Systems Engineering, students must successfully complete 2 compulsory courses and 2 elective courses:
 - Compulsory courses:
 - CHE 620 Applied Engineering Mathematics
 - CHE 621 Model Building and Response Surface Methodology
 - Elective courses (choose 2 from the following list):
 - CHE 520 Process Flowsheet Analysis
 - CHE 521 Process Optimization
 - CHE 522 Advanced Process Dynamics and Control

Coursework Option: Milestone Requirements

Seminar Attendance

- Over the course of their degree program, all students must attend 12 seminars from departments and research institutions where Chemical Engineering faculty members have a membership. The Chemical Engineering seminars are documented in the Events section of the Chemical Engineering Department website.
- Note: At Chemical Engineering seminars, attendance is documented. At other approved seminars, students must complete an attendance form and get it signed by the seminar organizer. Full instructions are available on the Department website.

Graduate Studies Work Report

- Students must complete one or two work-term experience(s). 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 roles and responsibilities of Co-operative and Experiential Education (CEE).

Notes ?

- Department of Chemical Engineering website
- Master of Engineering (MEng) in Chemical 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

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Dependencies

Dependent Courses and Programs/Plans**PREREQUISITES**

✓ CHE 661 - Advances in Biochemical Engineering	View Courses >
✓ CHE 730 - Special Topics in Chemical Kinetics,Catalysis and Advanced Reactor Engineering	View Courses >
✓ CHE 720 - Special Topics in Analysis of Chemical Processes	View Courses >
✓ CHE 710 - Special Topics in Transport Phenomena	View Courses >
✓ CHE 750 - Special Topics in Electrochemical Engineering, Interfacial Engineering & Materials Science	View Courses >
✓ CHE 760 - Special Topics in Biochemical Engineering	View Courses >
✓ CHE 740 - Special Topics in Polymer Science and Engineering	View Courses >
✓ CHE 770 - Special Topics in Environmental Engineering and Pollution Control	View Courses >
✓ CHE 612 - Interfacial Phenomena	View Courses >
✓ 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 >
✓ CHE 620 - Applied Engineering Mathematics	View Courses >
✓ CHE 600 - Engineering and Research Methods, Ethics, Practice, and Law	View Courses >
✓ CHE 650 - Engineering Work-term Experience Report	View Courses >

PhD in Chemical Engineering

Doctor of Philosophy (PhD) in Chemical Engineering

Under Review | Fall 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 ⓘ
Fall 2025

Existing
Effective Term and Year ⓘ
Fall 2024

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

10/21/2024

Quality Assurance Designation ⓘ

Minor Modification

Is there an impact to existing students? ⓘ

Yes

Impact on Existing Students ⓘ

They will be allowed to abide by the new degree requirements to avail themselves of the new options if they wish.

Is the credential name changing?

No

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

The current degree requirements state that PhD students must take both CHE 601 and CHE 602 (or equivalents) in either the PhD or MASc degrees. We are removing this requirement. This change makes it easier to accept students who have a Master's degree from a discipline outside of chemical engineering. For these students we will require all graduate courses be taken within Chemical Engineering to provide breadth of background training.

Given the increasingly broad scope of research within the Department of Chemical Engineering, our research faculty are seeking more flexibility in hiring and training members of their research teams. The requirement to take both CHE 601 and CHE 602 is limiting this goal by imposing a set of "core" courses that are too narrow in scope.

Consultations (Departmental) ⓘ

Supporting Documentation

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Chemical Engineering

Graduate Field of Study

Chemical Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Doctor of Philosophy (PhD) in Chemical 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 the 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, 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.
- 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 student 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 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.

Registration Option(s)

Full-time

Part-time

Registration Options Information**Graduate Research Fields**

- Biotechnology and Biomedical Engineering
- Electrochemical Engineering
- Nanotechnology for Advanced Materials
- Process Systems Engineering
- Soft Matter and Polymer Engineering
- Sustainable Reaction Engineering

Graduate Specializations**Additional Program Information**

Admissions

Admission Requirements: Minimum Requirements ?

- At the time of admission, each student must have an approved PhD supervisor who has agreed in writing to supervise their academic program or co-supervisors, at least one of whom is an approved PhD supervisor. The Faculty of Engineering maintains a list of individually approved research supervisors, known as Approved Doctoral Dissertation Supervisors (ADDS). Additions to and deletions from this list are made by the Engineering Graduate Studies Sub-Committee upon the recommendation of the Chemical Engineering Department's Associate Chair for Graduate Studies.
- Applicants must demonstrate excellence of background preparation and academic achievement in prior degrees and, usually, possess a relevant, thesis-based Master's degree. In the Faculty of Engineering, a minimum 80% standing in an applicant's appropriate Master's program is the usual requirement. A Master's degree obtained without a full research thesis is normally an inadequate qualification for admission to the PhD program.
- Within the three required references for admission to Graduate Studies, the opinions on academic preparation and research ability must refer to the applicant's demonstrated ability to formulate research problems and execute the research required to solve problems, as indicated by a Master's of Applied Science (MASC) research thesis or published scientific/technical paper. The references should also refer to the applicant having adequate English language skills to pursue a doctoral program, with all of its requirements, at the University of Waterloo.
- The Engineering Graduate Studies Sub-Committee requires objective evidence of English language skills. Technical publications that have been written principally by an applicant and published in refereed English language journals, a thesis written in English, or a personal interview with the Chemical Engineering Department's Associate Chair for Graduate Studies are also considered as evidence.
- 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 initiated at the Department level.
- The supervisor shall prepare for the Chemical Engineering Department's Graduate Review Committee a memorandum that summarizes the applicant's qualifications for transfer. At least one additional written recommendation from another Chemical Engineering Department faculty member will facilitate a decision on the transfer request.
- Admission to the PhD program from a BASc program: In exceptional cases, applicants who have spent at least three years pursuing an appropriate Honours Bachelor's degree may be considered for admission to a PhD program, upon request from the Chemical Engineering Department.
- 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

- Students with a Master's degree in a discipline closely related to Chemical Engineering as deemed by the Associate Chair Graduate Studies, must complete 1.75 units meeting the following criteria:
 - CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 unit weight)
 - 3 graduate level elective courses at the 600 level or higher (0.5 unit weight). Of these 2 must be CHE courses. Note that 1 500 level course may be substituted here if recommended by the student's supervisor, and approved by the Associate Chair, Graduate Studies and the Associate Dean, Graduate Studies.
 - No more than 1 may be taught by supervisor(s).
 - No more than 1 may be a reading course.
- Students entering directly from their undergraduate degree must complete 3.75 units meeting the following criteria:
 - CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 unit weight)
 - 7 graduate level elective courses (0.5 unit weight). Of these 6 must be 600 level or higher and 1 can be 500 level or higher. At least 4 of these must be CHE courses. Note that 1 additional 500 level course may be substituted here if recommended by the student's supervisor, and approved by the Associate Chair, Graduate Studies and the Associate Dean, Graduate Studies.
 - No more than 2 may be taught by supervisor(s).
 - No more than 1 may be a reading course.
- Students with a Master's degree in a discipline outside of Chemical Engineering, as deemed by the Associate Chair of Graduate Studies, must complete 2.25 units meeting the following criteria:
 - CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 unit weight)
 - 4 graduate level elective courses at the 600 level or higher (0.5 unit weight). All of these must be CHE courses. Note that 1 500 level course may be substituted here if recommended by the student's supervisor, and approved by the Associate Chair, Graduate Studies and the Associate Dean, Graduate Studies.
 - No more than 1 may be taught by supervisor(s).
 - No more than 1 may be a reading course.
- The Chemical Engineering Department may require students to take more than the number of courses specified above. In every case, a graduate course program is established by the supervisor(s) in consultation with the student and, if deemed necessary, with the Associate Chair Graduate Studies of the Department. Students may also be required to take additional courses as a result of a comprehensive examination.
- Graduate courses offered by the Faculty of Engineering are numbered as 600 or 700 series courses and are assigned a unit weight of 0.50, which means that they are one-term courses as defined in the Graduate Studies Academic Calendar.
- Only courses taken within five years prior to the completion of the PhD degree may be counted for credit towards a degree, unless a request for revalidation is granted.
- Students must achieve a:
 - Minimum cumulative average of 70%.
 - Minimum grade of 65% in each individual course.
- Each student is responsible for monitoring their own academic records and must immediately notify their Graduate Coordinator of any inadequate grade or average.

Existing

Graduate Course Requirements

- Students with a MSc degree must complete CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 credit weight) and 3 graduate courses (0.50 unit weight per course) as follows:
 - 3 graduate level elective courses (a minimum of 2 CHE)
 - If CHE 601 Theory and Application of Transport Phenomena and CHE 602 Chemical Reactor Analysis or course equivalents were not taken during MSc studies, electives are reduced and these courses are substituted

- 3 must be 600 or 700 level graduate courses. Note: 1 500 level course may be permitted if recommended by the student's supervisor and the Associate Chair, Graduate Studies prior to enrolling in the course. The course must be approved by the student's supervisor, the Associate Chair, Graduate Studies and the Associate Dean, Graduate Studies.
- No more than 1 may be taught by supervisor(s).
- No more than 1 may be a reading course.
- Students without a MASc degree must complete CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 credit weight) and 7 graduate courses (0.50 unit weight per course) as follows:
 - CHE 601 Theory and Application of Transport Phenomena
 - CHE 602 Chemical Reactor Analysis
 - 5 graduate level elective courses of which 2 must be CHE courses
- 5 must be 600 or 700 level graduate courses.
- No more than 2 may be 500 level courses.
- No more than 2 may be taught by supervisor(s).
- No more than 1 may be a reading course.
- The Chemical Engineering Department may require students 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, if deemed necessary, with the Associate Chair Graduate Studies of the Department. Students may also be required to take additional courses as a result of a comprehensive examination.
- Graduate courses offered by the Faculty of Engineering are numbered as 600 or 700 series courses and are assigned a unit weight of 0.50, which means that they are one-term courses as defined in the Graduate Studies Academic Calendar.
- Only courses taken within five years prior to the completion of the PhD degree may be counted for credit towards a degree, unless a request for revalidation is granted.
- Students must achieve a:
 - Minimum cumulative average of 70%.
 - Minimum grade of 65% in each individual course.
- Each student is responsible for monitoring their own academic records and must immediately notify their Graduate Coordinator of any inadequate grade or average.

Milestone Requirements

Seminar Attendance

- Over the course of their degree program, all PhD students should attend 24 seminars from departments and research institutions where Chemical Engineering faculty members have a membership. The Chemical Engineering seminars are documented in the Events section of the Chemical Engineering Department.
- Note: At Chemical Engineering seminars, attendance is documented. At other approved seminars, students must complete an attendance form and get it signed by the seminar organizer. Full instructions are available on the Department website.

PhD Advisory Committee Meeting and Report

- Students are required to engage in a 30-60 minute, in-person or remote, PhD Advisory Committee meeting, composed of a 15-minute presentation by the student to report research progress along with a written summary of courses and milestones completed.
- The PhD Advisory Committee provides the student with a PhD Advisory Committee Report describing progress on coursework and milestones completed and an assessment by each committee member of the student's progress (excellent, satisfactory, unsatisfactory) in the following areas:
 - Understanding of material
 - Ability to handle discussion
 - Preparation, presentation, and organization
 - Research progress
 - Coursework progress

- Overall
- Students with a MASc degree must complete a PhD Advisory Committee meeting during the 3rd term after completing their PhD comprehensive examination, with no extensions.
- Students without a MASc degree must complete a PhD Advisory Committee Meeting during (i) the 4th term from the start of their program and (ii) the 3rd term after completing their PhD comprehensive examination, with no extensions.
- All PhD students will be required to complete a 2nd PhD Advisory Committee Meeting the 3rd term after completion of a previous PhD Advisory Committee Meeting in which their overall progress was assessed as “unsatisfactory” unless they have scheduled a PhD comprehensive examination or defense during that 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: Consistent with University-level minimum requirements.
 - 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 Thesis

- Students are expected to maintain continuous registration until the thesis is submitted to Graduate Studies and Postdoctoral Affairs. Under exceptional circumstances, students may request Departmental approval for inactive terms.
- The role of a supervisor is to help a student establish a research problem with an appropriate scope, suggest alternative general approaches to the solution of a problem, and provide general advice on the structure and content of a thesis. The professional engineering code of ethics must be strictly observed in the supervisor-student relationship.

Notes ⓘ

- Department of Chemical Engineering website
- Doctor of Philosophy (PhD) in Chemical Engineering future students program page

Workflow Information

Workflow Path ⓘ

Committee approvals

Faculty/AFIW Path(s) for Workflow ⓘ

Faculty of Engineering

Senate Workflow

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Dependencies

Dependent Courses and Programs/Plans

PREREQUISITES

✓ CHE 661 - Advances in Biochemical Engineering	View Courses ➤
✓ CHE 730 - Special Topics in Chemical Kinetics,Catalysis and Advanced Reactor Engineering	View Courses ➤
✓ CHE 720 - Special Topics in Analysis of Chemical Processes	View Courses ➤
✓ CHE 710 - Special Topics in Transport Phenomena	View Courses ➤
✓ CHE 750 - Special Topics in Electrochemical Engineering, Interfacial Engineering & Materials Science	View Courses ➤
✓ CHE 760 - Special Topics in Biochemical Engineering	View Courses ➤
✓ CHE 740 - Special Topics in Polymer Science and Engineering	View Courses ➤
✓ CHE 770 - Special Topics in Environmental Engineering and Pollution Control	View Courses ➤
✓ CHE 612 - Interfacial Phenomena	View Courses ➤
✓ CHE 620 - Applied Engineering Mathematics	View Courses ➤
✓ CHE 600 - Engineering and Research Methods, Ethics, Practice, and Law	View Courses ➤

PhD in Chemical Engineering-Nanotechnology

Doctor of Philosophy (PhD) in Chemical Engineering - Nanotechnology

Under Review | Fall 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 ⓘ Fall 2025 Existing Effective Term and Year ⓘ Fall 2024

Proposal Details

Proposal Type ⓘ Change	Academic Unit Approval 10/21/2024
Quality Assurance Designation ⓘ Minor Modification	

Is there an impact to existing students? ⓘ

Yes

Impact on Existing Students ⓘ

They will be allowed to abide by the new degree requirements to avail themselves of the new options if they wish.

Is the credential name changing?

No

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

The current degree requirements state that PhD students must take both CHE 601 and CHE 602 (or equivalents) in either the PhD or MASc degrees. We are removing this requirement. This change makes it easier to accept students who have a Master's degree from a discipline outside of chemical engineering. For these students we will require all graduate courses be taken within Chemical Engineering to provide breadth of background training.

Given the increasingly broad scope of research within the Department of Chemical Engineering, our research faculty are seeking more flexibility in hiring and training members of their research teams. The requirement to take both CHE 601 and CHE 602 is limiting this goal by imposing a set of "core" courses that are too narrow in scope.

Consultations (Departmental) ⓘ**Supporting Documentation**

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Chemical Engineering

Graduate Field of Study

Chemical Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Doctor of Philosophy (PhD) in Chemical 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 the 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, 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

Admission Requirements: Minimum Requirements ?

- At the time of admission, each student must have an approved PhD supervisor, who has agreed in writing to supervise their academic program, or co-supervisors, at least one of whom is an approved PhD supervisor. The Faculty of Engineering maintains a list of individually approved research supervisors called Approved Doctoral Dissertation Supervisors (ADDS) and additions to and deletions from this list are made by the Engineering Graduate Studies Sub-Committee upon the recommendation of the Chemical Engineering Department's Associate Chair for Graduate Studies.
- Applicants must demonstrate excellence of background preparation and academic achievement in prior degrees and, usually, possess a relevant, thesis-based Master's degree. In the Faculty of Engineering, a minimum 80% standing in an applicant's appropriate Master's program is the usual requirement. A Master's degree obtained without a full research thesis is normally an inadequate qualification for admission to the PhD program.
- Within the three required references for admission to Graduate Studies, the opinions on academic preparation and research ability must refer to the applicant's demonstrated ability to formulate research problems and execute the research required to solve problems, as indicated by a Master's of Applied Science (MASC) research thesis or published scientific/technical papers. The references should also refer to the applicant having adequate English language skills to pursue a doctoral program, with all of its requirements, at the University of Waterloo.
- Engineering Graduate Studies Sub-Committee requires objective evidence of English language skills. Technical publications that have been written principally by a student and published in refereed English language journals, and/or a thesis written in English, or a personal interview with the Chemical Engineering Department's Associate Chair for Graduate Studies are also considered as evidence.
- 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 initiated at the Department level. The supervisor shall prepare for the Department Graduate Review Committee a memorandum that summarizes the student's qualifications for transfer. At least one additional written recommendation from a Faculty member of the same Department will facilitate a decision on the transfer request.
- Admission to the PhD program from a BASc program: In exceptional cases, applicants who have spent at least three years pursuing an appropriate bachelor's degree may be considered for admission to a PhD program upon request from the Chemical Engineering Department.
- 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. Note: The Department reserves the right to request an additional 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).

Graduate Course Requirements

No Rules

Proposed

Graduate Course Requirements

- Students with a Master's degree in a discipline closely related to Chemical Engineering as deemed by the Associate Chair Graduate Studies, must complete 1.75 units meeting the following criteria:
 - CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 unit weight)
 - NANO 600 Introduction to Nanotechnology (0.5 unit weight)
 - 1 nanotechnology graduate level elective course (0.5 unit weight)
 - 1 graduate level CHE elective course at the 600 level or higher (0.5 unit weight). Note that 1 500 level course may be substituted here if recommended by the student's supervisor, and approved by the Associate Chair, Graduate Studies and the Associate Dean, Graduate Studies.
 - No more than 1 may be taught by supervisor(s).
 - No more than 1 may be a reading course.
- Students entering directly from their undergraduate degree, must complete 3.75 units meeting the following criteria:
 - CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 unit weight)
 - NANO 600 Introduction to Nanotechnology (0.5 unit weight)
 - 1 nanotechnology graduate level elective course at the 600 level or higher (0.5 unit weight)
 - 5 graduate-level elective courses (0.5 unit weight). Of these, 4 must be 600 level or higher and 1 can be 500 level or higher. At least 4 of these must be CHE courses. 1 additional 500 level course may be substituted if recommended by the student's supervisor, and approved by the Associate Chair, Graduate Studies and the Associate Dean, Graduate Studies.
 - No more than 2 may be taught by supervisor(s).
 - No more than 1 may be a reading course.
- Students with a Master's degree in a discipline outside of Chemical Engineering, as deemed by the Associate Chair of Graduate Studies, must complete 2.25 units meeting the following criteria:
 - CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 unit weight)
 - NANO 600 Introduction to Nanotechnology (0.5 unit weight)
 - 1 nanotechnology graduate level elective course (0.5 unit weight)
 - 2 graduate-level elective courses at the 600 level or higher (0.5 unit weight). All of these must be CHE courses. Note that 1 500 level course may be substituted if recommended by the student's supervisor, and approved by the Associate Chair, Graduate Studies and the Associate Dean, Graduate Studies.
 - No more than 1 may be taught by supervisor(s).
 - No more than 1 may be a reading course.
- Note: Students who have a Bachelor of Applied Science (BASc) in Nanotechnology Engineering or MASc in Nanotechnology from the University of Waterloo are not allowed to take NANO 600. Instead, they may choose 1 additional course at the 600 level or higher from the list of nanotechnology elective courses.
- Nanotechnology elective 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
- The Chemical Engineering Department may require students to take more than the number of courses specified above. In every case, a graduate course program is established by the supervisor(s) in consultation with the student and, if deemed necessary, with the Associate Chair Graduate Studies of the Department. Students may also be required to take additional courses as a result of a comprehensive examination.
- Graduate courses offered by the Faculty of Engineering are numbered as 600 or 700 series courses and are assigned a unit weight of 0.50, which means that they are one-term courses as defined in the Graduate Studies Academic

Calendar.

- Only courses taken within five years prior to the completion of the PhD degree may be counted for credit towards a degree, unless a request for revalidation is granted.
- Students must achieve a:
 - Minimum cumulative average of 70%.
 - Minimum grade of 65% in each individual course.
- Each student is responsible for monitoring their own academic records and must immediately notify the Graduate Studies Manager of any inadequate grade or average.

Existing

Graduate Course Requirements

- Students with a MASc degree must complete CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 credit weight) and 3 graduate courses (0.50 unit weight per course) as follows:
 - NANO 600 Introduction to Nanotechnology
 - 1 nanotechnology core course
 - 1 graduate level CHE elective course
 - If CHE 601 Theory and Application of Transport Phenomena and CHE 602 Chemical Reactor Analysis or course equivalents were not taken during MASc studies, the CHE elective is replaced by CHE 601 and CHE 602
- Note: 1 500 level course may be permitted if recommended by the student's supervisor and the Associate Chair, Graduate Studies prior to enrolling in the course. The course must be approved by the student's supervisor, the Associate Chair, Graduate Studies and the Associate Dean, Graduate Studies.
- No more than 1 may be taught by supervisor(s).
- No more than 1 may be a reading course.
- Note: Students who have a Bachelor of Applied Science (BASc) in Nanotechnology Engineering or MASc in Nanotechnology from the University of Waterloo are not allowed to take NANO 600. Instead, they may choose any 1 course from the list of nanotechnology core courses.
- Students without a MASc degree must complete CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 credit weight) and 7 graduate courses (0.50 unit weight per course) as follows:
 - CHE 601 Theory and Application of Transport Phenomena
 - CHE 602 Chemical Reactor Analysis
 - NANO 600 Introduction to Nanotechnology
 - 1 nanotechnology core course
 - 3 graduate-level elective courses, of which 2 must be CHE courses
- Note: 2 500 level courses may be permitted if recommended by the student's supervisor and the Associate Chair, Graduate Studies prior to enrolling in the courses. The courses must be approved by the student's supervisor, the Associate Chair, Graduate Studies and the Associate Dean, Graduate Studies.
- No more than 2 may be taught by supervisor(s).
- No more than 1 may be a reading course.
- Note: Students who have a BASc in Nanotechnology Engineering from the University of Waterloo are not allowed to take NANO 600. Instead, they may choose any 1 course from the list of nanotechnology core 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
- The Chemical Engineering Department may require students 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, if deemed necessary, with the Associate Chair Graduate Studies of the Department. Students may also be required to take additional courses as a result of a comprehensive examination.
- Graduate courses offered by the Faculty of Engineering are numbered as 600 or 700 series courses and are assigned a unit weight of 0.50, which means that they are one-term courses as defined in the Graduate Studies Academic

Calendar.

- Only courses taken within five years prior to the completion of the PhD degree may be counted for credit towards a degree, unless a request for revalidation is granted.
- Students must achieve a:
 - Minimum cumulative average of 70%.
 - Minimum grade of 65% in each individual course.
- Each student is responsible for monitoring their own academic records and must immediately notify the Graduate Studies Manager of any inadequate grade or average.

Milestone Requirements

Seminar Attendance

- Over the course of their degree program, all students must attend 24 seminars:
 - 8 seminars from the Waterloo Institute for Nanotechnology (WIN)
 - 16 seminars from departments and research institutions where Chemical Engineering faculty members have a membership. The Chemical Engineering seminars are documented in the Events section of the Chemical Engineering Department website.
- Note: At Chemical Engineering seminars, attendance is documented. At other approved seminars, students complete an attendance form and get it signed by the seminar organizer. Full instructions are available on the Department website.

PhD Advisory Committee Meeting and Report

- Students are required to engage in a 30-60 minute, in-person or remote, PhD Advisory Committee meeting, composed of a 15-minute presentation by the student to report research progress along with a written summary of courses and milestones completed.
- The PhD Advisory Committee provides the student with a PhD Advisory Committee Report describing progress on coursework and milestones completed and an assessment by each committee member of the student's progress (excellent, satisfactory, unsatisfactory) in the following areas:
 - Understanding of material
 - Ability to handle discussion
 - Preparation, presentation, and organization
 - Research progress
 - Coursework progress
 - Overall
- Students with a MASc degree must complete a PhD Advisory Committee meeting during the 3rd term after completing their PhD comprehensive examination, with no extensions.
- Students without a MASc degree must complete a PhD Advisory Committee Meeting during (i) the 4th term from the start of their program and (ii) the 3rd term after completing their PhD comprehensive examination, with no extensions.
- All PhD students will be required to complete a 2nd PhD Advisory Committee Meeting the 3rd term after completion of a previous PhD Advisory Committee Meeting in which their overall progress was assessed as "unsatisfactory" unless they have scheduled a PhD comprehensive examination or defense during that 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: Consistent with University-level minimum requirements.
- 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 Thesis

- Students are expected to maintain continuous registration until their thesis is submitted to Graduate Studies and Postdoctoral Affairs. Under exceptional circumstances, students may request Departmental approval for inactive terms.
- The role of a supervisor is to help a student establish a research problem with an appropriate scope, suggest alternative general approaches to the solution of a problem, and provide general advice on the structure and content of a thesis. The professional engineering code of ethics must be strictly observed in the supervisor-student relationship.

Notes ⓘ

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

Workflow Information

Workflow Path ⓘ

Committee approvals

Faculty/AFIW Path(s) for Workflow ⓘ

Faculty of Engineering

Senate Workflow

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Dependencies

Dependent Courses and Programs/Plans

PREREQUISITES

✓ CHE 661 - Advances in Biochemical Engineering	View Courses >
✓ CHE 730 - Special Topics in Chemical Kinetics,Catalysis and Advanced Reactor Engineering	View Courses >
✓ CHE 720 - Special Topics in Analysis of Chemical Processes	View Courses >
✓ CHE 710 - Special Topics in Transport Phenomena	View Courses >
✓ CHE 750 - Special Topics in Electrochemical Engineering, Interfacial Engineering & Materials Science	View Courses >
✓ CHE 760 - Special Topics in Biochemical Engineering	View Courses >
✓ CHE 740 - Special Topics in Polymer Science and Engineering	View Courses >
✓ CHE 770 - Special Topics in Environmental Engineering and Pollution Control	View Courses >
✓ CHE 612 - Interfacial Phenomena	View Courses >
✓ CHE 620 - Applied Engineering Mathematics	View Courses >
✓ CHE 600 - Engineering and Research Methods, Ethics, Practice, and Law	View Courses >

PhD in Chemical Engineering-Water

Doctor of Philosophy (PhD) in Chemical Engineering - Water

Under Review | Fall 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

Effective Date and Career

Career

Graduate

Important!

Proposed
Effective Term and Year ⓘ
Fall 2025

Existing
Effective Term and Year ⓘ
Fall 2023

Proposal Details

Proposal Type ⓘ

Change

Academic Unit Approval

10/21/2024

Quality Assurance Designation ⓘ

Minor Modification

Is there an impact to existing students? ⓘ

Yes

Impact on Existing Students ⓘ

They will be allowed to abide by the new degree requirements to avail themselves of the new options if they wish.

Is the credential name changing?

No

Graduate Co-operative Requirements

Not Applicable

Internship Requirements

Not Applicable

Rationale and Background for Change(s) ⓘ

The current degree requirements state that PhD students must take both CHE 601 and CHE 602 (or equivalents) in either the PhD or MASc degrees. We are removing this requirement. This change makes it easier to accept students who have a Master's degree from a discipline outside of chemical engineering. For these students we will require all graduate courses be taken within Chemical Engineering to provide breadth of background training.

Given the increasingly broad scope of research within the Department of Chemical Engineering, our research faculty are seeking more flexibility in hiring and training members of their research teams. The requirement to take both CHE 601 and CHE 602 is limiting this goal by imposing a set of "core" courses that are too narrow in scope.

Consultations (Departmental) ⓘ

Supporting Documentation

General Program/Plan Information

Faculty ⓘ

Faculty of Engineering

Academic Unit ⓘ

Department of Chemical Engineering

Graduate Field of Study

Chemical Engineering

Faculty ⓘ

Faculty of Engineering

Program/Plan Name ⓘ

Doctor of Philosophy (PhD) in Chemical Engineering - Water

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 the 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, 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.
- 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 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.

Registration Option(s)

Full-time

Part-time

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

Admissions

Admission Requirements: Minimum Requirements ?

- At the time of admission, each student must have an approved PhD supervisor who has agreed in writing to supervise their academic program or co-supervisors, at least one of whom is an approved PhD supervisor. The Faculty of Engineering maintains a list of individually approved research supervisors, called Approved Doctoral Dissertation Supervisors (ADDS). Additions to and deletions from this list are made by the Engineering Graduate Studies Sub-Committee upon the recommendation of the Chemical Engineering Department's Associate Chair for Graduate Studies.
- Applicants must demonstrate excellence of background preparation and academic achievement in prior degrees and, usually, possess a relevant, thesis-based Master's degree. In the Faculty of Engineering, a minimum 80% standing in an applicant's appropriate Master's program is the usual requirement. A Master's degree obtained without a full research thesis is normally an inadequate qualification for admission to the PhD program.
- Within the three required references for admission to Graduate Studies, the opinions on academic preparation and research ability must refer to the applicant's demonstrated ability to formulate research problems and execute the research required to solve problems, as indicated by a Master's of Applied Science (MASC) research thesis or published scientific/technical papers. The references should also refer to the applicant having adequate English language skills to pursue a doctoral program, with all of its requirements, at the University of Waterloo.
- The Engineering Graduate Studies Sub-Committee requires objective evidence of English language skills. Technical publications that have been written principally by an applicant and published in refereed English language journals, and/or a thesis written in English, or a personal interview with the Chemical Engineering Department's Associate Chair for Graduate Studies are also considered as evidence.
- 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 initiated at the Department level. The supervisor shall prepare for the Department Graduate Review Committee a memorandum that summarizes the candidate's qualifications for transfer. At least one additional written recommendation from another Chemical Engineering Department faculty member will facilitate a decision on the transfer request.
- Admission to the PhD program from a BASc program: In exceptional cases, applicants who have spent at least three years pursuing an appropriate bachelor's degree may be considered for admission to a PhD program upon request from the Chemical Engineering Department.
- 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

- Students with a Master's degree in a discipline closely related to Chemical Engineering as deemed by the Associate Chair Graduate Studies, must complete 1.75 units meeting the following criteria:
 - CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 unit weight)
 - WATER 601 Integrated Water Management (0.5 unit weight)
 - WATER 602 Integrated Water Management Project (0.5 unit weight)
 - 1 graduate level CHE elective course at the 600 level or higher (0.5 unit weight). Note that 1 500 level course may be substituted here if recommended by the student's supervisor, and approved by the Associate Chair, Graduate Studies and the Associate Dean, Graduate Studies.
 - No more than 1 may be taught by supervisor(s).
 - No more than 1 may be a reading course.
- Students entering directly from their undergraduate degree must complete 3.75 units meeting following criteria:
 - CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 unit weight)
 - WATER 601 Integrated Water Management (0.5 unit weight)
 - WATER 602 Integrated Water Management Project (0.5 unit weight)
 - 5 graduate level elective courses (0.5 unit weight). Of these, 4 must be 600 level or higher and 1 can be 500 level or higher. At least 4 of these must be CHE courses. Note that 1 additional 500 level course may be substituted here if recommended by the student's supervisor, and approved by the Associate Chair, Graduate Studies and the Associate Dean, Graduate Studies.
 - No more than 2 may be taught by supervisor(s).
 - No more than 1 may be a reading course.
- Students with a Master's degree in a discipline outside of Chemical Engineering, as deemed by the Associate Chair of Graduate Studies, must complete 2.25 units meeting the following criteria:
 - CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 unit weight)
 - WATER 601 Integrated Water Management (0.5 unit weight)
 - WATER 602 Integrated Water Management Project (0.5 unit weight)
 - 2 graduate level elective courses at the 600 level or higher (0.5 unit weight). All of these must be CHE courses. Note that 1 500 level course may be substituted here if recommended by the student's supervisor, and approved by the Associate Chair, Graduate Studies and the Associate Dean, Graduate Studies.
 - No more than 1 may be taught by supervisor(s).
 - No more than 1 may be a reading course.
- This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602).
- Students who have already completed WATER 601 and WATER 602 as part of their Masters Water degree, must complete the following course requirement:
 - 1 graduate level water course from outside the student's home Faculty agreed to by the student's Supervisor and the Collaborative Water Program Director.
- The Chemical Engineering Department may require students to take more than the number of courses specified above. In every case, a graduate course program is established by the supervisor(s) in consultation with the student and, if deemed necessary, with the Associate Chair Graduate Studies of the Department. Students may also be required to take additional courses as a result of a comprehensive examination.
- Graduate courses offered by the Faculty of Engineering are numbered as 600 or 700 series courses and are assigned a unit weight of 0.50, which means that they are one-term courses as defined in the Graduate Studies Academic Calendar.

- Only courses taken within five years prior to the completion of the PhD degree may be counted for credit towards a degree, unless a request for revalidation is granted.
- Students must achieve a:
 - Minimum cumulative average of 70%.
 - Minimum grade of 65% in each individual course.
- Each student is responsible for monitoring their own academic records and must immediately notify their Graduate Coordinator of any inadequate grade or average.
- The Chemical Engineering Department will determine whether or not collaborative program courses can be used as electives. It is therefore possible that students will need to take additional courses in order to meet the specific requirements of this program.

Existing

Graduate Course Requirements

- Students with a MASc degree must complete CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 credit weight) and 3 graduate courses (0.50 unit weight per course) as follows:
 - WATER 601 Integrated Water Management
 - WATER 602 Integrated Water Management Project
 - 1 graduate level CHE elective course
 - If CHE 601 Theory and Application of Transport Phenomena and CHE 602 Chemical Reactor Analysis or course equivalents were not taken during MASc studies, the CHE elective is replaced by CHE 601 and CHE 602
- Note: 1 500 level course may be permitted if recommended by the student's supervisor and the Associate Chair, Graduate Studies prior to enrolling in the course. The course must be approved by the student's supervisor, the Associate Chair, Graduate Studies and the Associate Dean, Graduate Studies.
- No more than 1 may be taught by supervisor(s).
- No more than 1 may be a reading course.
- Students without a MASc degree must complete CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 credit weight) and 7 graduate courses (0.50 unit weight per course) as follows:
 - CHE 601 Theory and Application of Transport Phenomena
 - CHE 602 Chemical Reactor Analysis
 - WATER 601 Integrated Water Management
 - WATER 602 Integrated Water Management Project
 - 3 graduate level elective courses of which 2 must be CHE courses
- No more than 2 may be 500 level courses.
- No more than 2 may be taught by supervisor(s).
- No more than 1 may be a reading course.
- This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602).
- Students who have already completed WATER 601 and WATER 602 as part of their Masters Water degree, must complete the following course requirement:
 - 1 graduate level water course from outside the student's home Faculty agreed to by the student's Supervisor and the Collaborative Water Program Director.
- The Chemical Engineering Department may require students 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, if deemed necessary, with the Associate Chair Graduate Studies of the Department. Students may also be required to take additional courses as a result of a comprehensive examination.
- Graduate courses offered by the Faculty of Engineering are numbered as 600 or 700 series courses and are assigned a unit weight of 0.50, which means that they are one-term courses as defined in the Graduate Studies Academic Calendar.

- Only courses taken within five years prior to the completion of the PhD degree may be counted for credit towards a degree, unless a request for revalidation is granted.
- Students must achieve a:
 - Minimum cumulative average of 70%.
 - Minimum grade of 65% in each individual course.
- Each student is responsible for monitoring their own academic records and must immediately notify their Graduate Coordinator of any inadequate grade or average.
- The Chemical Engineering Department will determine whether or not collaborative program courses can be used as electives. It is therefore possible that students will need to take additional courses in order to meet the specific requirements of this program.

Milestone Requirements

Seminar Attendance

- Over the course of their degree program, all students must attend 24 seminars from departments and research institutions where Chemical Engineering faculty members have a membership. The Chemical Engineering seminars are documented in the Events section of the Chemical Engineering Department website.
- Note: At Chemical Engineering seminars, attendance is documented. At other approved seminars, students complete an attendance form and get it signed by the seminar organizer. Full instructions are available on the Department website.

Collaborative Research Seminar I

- Students are required to present a seminar on their thesis or major paper research proposal and, if appropriate, early stage results to current and past Water students and Water Institute faculty members. Seminars will normally occur following the completion of WATER 601 and WATER 602. Seminars will provide the opportunity for students to discuss how learnings from Water courses were applied in, or influenced, research proposals or research work in the student's home department. Seminars will normally be poster presentations at Water Institute organized events. The seminar is not an oral examination of the thesis or paper; rather, its purpose is to develop the student's ability to communicate their research in an organized and informative manner.

Collaborative Research Seminar II

- Students who have completed the Collaborative Research Seminar 1 as part of their Masters Water degree, must complete the Collaborative Research Seminar 2.
- Students are required to present a seminar on their PhD thesis proposal to current and past water students and Water Institute faculty members. Seminars will normally occur following the completion of required courses and the comprehensive exam. Seminars should present how learnings from the Collaborative Water Program were applied in, or influenced, thesis proposals. Seminars will normally be poster presentations or talks at Water Institute organized events. The seminar is not an oral examination of the thesis proposal; rather, its purpose is to develop the student's ability to communicate their research in an organized and informative manner.

Collaborative Academic Contribution

- Students who have completed the Collaborative Water Program Research Seminar 1 as part of their Masters Water degree, must complete the Collaborative Academic Contribution milestone.
- Students are required to make an academic contribution to the Collaborative Water Program. The proposed contribution will be documented by the student and approved by the student's Supervisor and the Collaborative Water Program Director. Potential contributions may include, but not be limited to:
 - Development of new or improved curricula or course content;
 - Delivery of a lecture(s);
 - Preparation of a publication;
 - Preparation of a case study;

- Mentorship of a group of students.

PhD Advisory Committee Meeting and Report

- Students are required to engage in a 30-60 minute, in-person or remote, PhD Advisory Committee meeting, composed of a 15-minute presentation by the student to report research progress along with a written summary of courses and milestones completed.
- The PhD Advisory Committee provides the student with a PhD Advisory Committee Report describing progress on coursework and milestones completed and an assessment by each committee member of the student's progress (excellent, satisfactory, unsatisfactory) in the following areas:
 - Understanding of material
 - Ability to handle discussion
 - Preparation, presentation, and organization
 - Research progress
 - Coursework progress
 - Overall
- Students with a MASc degree must complete a PhD Advisory Committee meeting during the 3rd term after completing their PhD comprehensive examination, with no extensions.
- Students without a MASc degree must complete a PhD Advisory Committee Meeting during (i) the 4th term from the start of their program and (ii) the 3rd term after completing their PhD comprehensive examination, with no extensions.
- All PhD students will be required to complete a 2nd PhD Advisory Committee Meeting the 3rd term after completion of a previous PhD Advisory Committee Meeting in which their overall progress was assessed as "unsatisfactory" unless they have scheduled a PhD comprehensive examination or defense during that 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: Consistent with University-level minimum requirements.
 - 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 Thesis

- Students are expected to maintain continuous registration until the thesis is submitted to Graduate Studies and Postdoctoral Affairs. Under exceptional circumstances, students may request Departmental approval for inactive terms.
- The role of a supervisor is to help a student establish a research problem with an appropriate scope, suggest alternative general approaches to the solution of a problem, and provide general advice on the structure and content of a thesis. The professional engineering code of ethics must be strictly observed in the supervisor-student relationship.

Notes ⓘ

- Department of Chemical Engineering website
- Doctor of Philosophy (PhD) in Chemical Engineering - Water future students program page

Workflow Information

Workflow Path ⓘ

Committee approvals

Faculty/AFIW Path(s) for Workflow ⓘ

Faculty of Engineering

Senate Workflow

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Dependencies

Dependent Courses and Programs/Plans

PREREQUISITES

✓ CHE 661 - Advances in Biochemical Engineering	View Courses >
✓ CHE 730 - Special Topics in Chemical Kinetics,Catalysis and Advanced Reactor Engineering	View Courses >
✓ CHE 720 - Special Topics in Analysis of Chemical Processes	View Courses >
✓ CHE 710 - Special Topics in Transport Phenomena	View Courses >
✓ CHE 750 - Special Topics in Electrochemical Engineering, Interfacial Engineering & Materials Science	View Courses >
✓ CHE 760 - Special Topics in Biochemical Engineering	View Courses >
✓ CHE 740 - Special Topics in Polymer Science and Engineering	View Courses >
✓ CHE 770 - Special Topics in Environmental Engineering and Pollution Control	View Courses >
✓ CHE 612 - Interfacial Phenomena	View Courses >
✓ WATER 601 - Integrated Water Management	View Courses >
✓ CHE 620 - Applied Engineering Mathematics	View Courses >
✓ CHE 600 - Engineering and Research Methods, Ethics, Practice, and Law	View Courses >

MEng in Civil Engineering-Nuclear Engineering

Master of Engineering (MEng) in Civil Engineering - Nuclear 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
- Coursework Option: Course Requirements

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

11/28/2024

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) ⓘ

Updating the degree requirements to include the list of required/elective courses: The list of required/elective courses is being added to the GSAC to be consistent with the University Network of Excellence in Nuclear Engineering (UNENE) and the institutions participating in the UNENE program. The addition of the courses will also provide more clarity for students that are enrolled in the program and the staff/faculty that support the program.

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 - Nuclear Engineering

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Coursework

Program Types

Joint

Admit Term(s)

Fall

Delivery Mode**Delivery Mode Information**

On-campus

Length of Program

- 8 terms (32 months)

Registration Option(s)

Part-time

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

- The University Network of Excellence in Nuclear Engineering (UNENE), created through the partnership of leading Ontario universities, namely, McMaster University, University of Waterloo, Western University, Queen's University, and University of Ontario Institute of Technology (UOIT), a unique, innovative learning experience through a Master's Degree Program in Nuclear Engineering Design with emphasis on nuclear power reactor technology. UNENE is an alliance of universities, nuclear power utilities, research and regulatory agencies for the support and development of nuclear education, research and development capability in Canadian universities. For more information refer to the UNENE website.

Admissions

Admission Requirements: Minimum Requirements ⓘ

- An Honours Bachelor's degree (or equivalent) with a 75% standing.
- Applicants must be currently working in the Nuclear industry.
- 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 the following 10 one-term UNENE courses or 8 one-term UNENE courses and an industrial project:
 - Required core courses:
 - UN 502 Nuclear Power Plant Systems and Operations
 - UN 802 Reactor Physics
 - UN 803 Nuclear Reactor Safety Design
 - UN 804 Nuclear Reactor Heat Transport System Design
 - Choose 6 courses from the following list:
 - UN 501 Nuclear Fuel Management
 - UN 601 Control, Instrumentation and Electrical Systems
 - UN 602 Nuclear Fuel Waste Management
 - UN 603 Project Management for Nuclear Engineers
 - UN 701 Engineering Risk and Reliability Analysis
 - UN 805 Introduction to Operational Health Physics
 - UN 806 Nuclear Fuel Engineering
 - UN 807 Power Plant Thermodynamics
 - UN 808 Reactor Chemistry and Corrosion
 - UN 901 Nuclear Materials

Existing

Coursework Option: Course Requirements

- Students must complete 10 one-term UNENE courses or 8 one-term UNENE courses and an industrial project.

Coursework Option: Milestone Requirements**Notes** ⓘ

- Department of Civil and Environmental Engineering website
- Master of Engineering (MEng) in Civil Engineering - Nuclear Engineering future students program page

Workflow Information

Workflow Path ⓘ

Committee approvals

Faculty/AFIW Path(s) for Workflow ⓘ

Faculty of Engineering

Senate Workflow

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Dependencies

Dependent Courses and Programs/Plans

There are no dependencies

FACULTY OF ENVIRONMENT - GRADUATE STUDIES COMMITTEE

REPORT TO SENATE GRADUATE & RESEARCH COUNCIL

January 2025 (Minor Modifications)

1. Program/Course Changes

- a. ERS 669 - Cross-listing ERS 669 with GEOG 617; Minor revision to course description about what students need to take the course.
- b. GEOG 617 - Creating GEOG 617 to cross list with ERS 669. Updating the Course description for the existing ERS 669 course.
- c. GEOG Redesign (MA, MES, MSc, PhD) - Dissolution of the Joint Geography Program previously offered with Wilfrid Laurier University has resulted in some changes to course offerings.
 - i. Removing course held at Laurier
 - GEOG 606
 - GEOG 618
 - GEOG 649
 - GEOG 655
 - ii. Removing “inactive” course
 - GEOG 601
 - GEOG 605
 - GEOG 616
 - GEOG 624
 - GEOG 637
 - GEOG 639
 - GEOG 644
 - GEOG 661A
 - GEOG 661B
 - GEOG 664
 - GEOG 672
 - iii. Course revisions
 - GEOG 620 - Updating the Course description.
 - GEOG 640 - Updating the Course title and Course description.
 - GEOG 700A - GEOG 700 (0.50) will now be held over two terms, so is being replaced with GEOG 700A (0.25) and GEOG 700B (0.25).
 - GEOG 700B - GEOG 700 (0.50) will now be held over two terms, so is being replaced with GEOG 700A (0.25) and GEOG 700B (0.25).

- GEOG 800A - GEOG 800 (0.50) will now be held over two terms, so is being replaced with GEOG 800A (0.25) and GEOG 800B (0.25).
 - GEOG 800B - GEOG 800 (0.50) will now be held over two terms, so is being replaced with GEOG 800A (0.25) and GEOG 800B (0.25).
- iv. Inactivating GEOG cross lists for GEMCC courses for WLU students
- GEOG 641
 - GEOG 676
 - GEOG 679
 - GEOG 652
 - GEOG 674
 - GEOG 677
 - GEOG 653
 - GEOG 678
- v. Removing GEOG Codes from GEMCC Courses
- GEMCC 601
 - GEMCC 602
 - GEMCC 603
 - GEMCC 610
 - GEMCC 620
 - GEMCC 622
 - GEMCC 630
 - GEMCC 640
 - MCC program revision – Removing GEOG course codes
- vi. Program Updates – removing joint program wording, changing course requirements and changing electives wording
- MA in GEOG (Aeronautics)
 - MA in GEOG (Water)
 - MES in GEOG (Aeronautics)
 - MES in GEOG (Water)
 - MSc in GEOG (Aeronautics)
 - MSc in GEOG (Water)
 - PhD in GEOG (Aeronautics)
 - PhD in GEOG (Water)

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: Environment

Effective date: Term: Spring 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*):

Cross-listing ERS 669 with GEOG 617; Minor revision to course description about what students need to take the course.

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

Course subject code: ERS

Course number: 669

Course ID: 001213

Course title (max. 100 characters including spaces): Applied Statistics in Ecology and Environment

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Instructor

Course description:

Current Description: This course covers study design, and data management, visualization, and statistical analysis. The primary focus will be the development and understanding of generalized linear models as they are foundational to most analyses in Environment and Ecology. Students will learn to fit models to data and assess

model fit. Students will also be introduced to the use of the statistical software R and provided the opportunity to use that software to manage and analyze their own data. Special topics will be developed based on the needs and interests of the students and may include hierarchical modelling, multivariate statistics, survey analysis, non-linear modelling, or other topics. Students are expected to bring their own computer and data. For cases in which data have not been collected, students will work with the professor to source similar data or generate simulated data to support their progress through the course.

Revised Description: This course covers study design, and data management, visualization, and statistical analysis. The primary focus will be the development and understanding of generalized linear models as they are foundational to most analyses in Environment and Ecology. Students will learn to fit models to data and assess model fit. Students will also be introduced to the use of the statistical software R and provided the opportunity to use that software to manage and analyze their own data. Special topics will be developed based on the needs and interests of the students and may include hierarchical modelling, multivariate statistics, survey analysis, non-linear modelling, or other topics. Students are expected to bring their own computer. Students may be provided the opportunity to work with their thesis data if those data have been collected and are congruent with course learning outcomes and objectives.

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

Primary meet type: Lecture

Delivery mode: On-campus

Requisites: N/A

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: GEOG 617 (new course creation for the cross-list also submitted)

Sections combined/held with:

Rationale for request:

Working across the Faculty of Environment, we are offering several methods courses synergistically to avoid duplication across graduate programs in the Faculty. This course represents an applied statistics course of interest to GEOG students that is offered in as an ERS course and will become a part of the core course list for new Geography graduate programs.

We are also making a minor modification to the course description about students needing to have collected data already. The course now allows for students own collected data to be used if available but is not required for the course.

Form completed by: Andrea Collins

Department/School approval date (mm/dd/yy): 09/23/2024

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

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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*):

Creating GEOG 617 to cross list with ERS 669. Updating the Course description for the existing ERS 669 course.

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

Course subject code: GEOG

Course number: 617

Course ID: 001213

Course title (max. 100 characters including spaces): Applied Statistics in Ecology and Environment

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Instructor

Course description: This course covers study design, and data management, visualization, and statistical analysis. The primary focus will be the development and understanding of generalized linear models as they are foundational to most analyses in Environment and Ecology. Students will learn to fit models to data and assess

model fit. Students will also be introduced to the use of the statistical software R and provided the opportunity to use that software to manage and analyze their own data. Special topics will be developed based on the needs and interests of the students and may include hierarchical modelling, multivariate statistics, survey analysis, non-linear modelling, or other topics. Students are expected to bring their own computer. Students may be provided the opportunity to work with their thesis data if those data have been collected and are congruent with course learning outcomes and objectives.

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

Primary meet type: Lecture

Delivery mode: On-campus

Requisites: N/A

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: ERS 669 (course revision for the cross-list also submitted)

Sections combined/held with:

Rationale for request:

Working across the Faculty of Environment, we are offering several methods courses synergistically to avoid duplication across graduate programs in the Faculty. This course represents an applied statistics course of interest to GEOG students that is offered in as an ERS course and will become a part of the core course list for new Geography graduate programs.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 606

Course ID: 001348

Course title (max. 100 characters including spaces): Scientific Data Wrangling

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: As the Waterloo-Laurier Joint Graduate Program in Geography is dissolving, we are updating curriculum to reflect the modified program. This course was the UWaterloo placeholder for a course held at Laurier, so will no longer be needed. Any students taking this course will do so directly at Laurier via the Ontario Visiting Graduate Student (OVGS) program.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 618

Course ID: 001362

Course title (max. 100 characters including spaces): Spatial Analysis

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

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: As the Waterloo-Laurier Joint Graduate Program in Geography is dissolving, we are updating curriculum to reflect the modified program. This course was the UWaterloo placeholder for a course held at Laurier, so will no longer be needed. Any students taking this course will do so directly at Laurier via the Ontario Visiting Graduate Student (OVGS) program.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 649

Course ID: 012795

Course title (max. 100 characters including spaces): Hydrology of Cold Regions

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: As the Waterloo-Laurier Joint Graduate Program in Geography is dissolving, we are updating curriculum to reflect the modified program. This course was the UWaterloo placeholder for a course held at Laurier, so will no longer be needed. Any students taking this course will do so directly at Laurier via the Ontario Visiting Graduate Student (OVGS) program.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 655

Course ID: 015503

Course title (max. 100 characters including spaces): Snow Hydrology

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: As the Waterloo-Laurier Joint Graduate Program in Geography is dissolving, we are updating curriculum to reflect the modified program. This course was the UWaterloo placeholder for a course held at Laurier, so will no longer be needed. Any students taking this course will do so directly at Laurier via the Ontario Visiting Graduate Student (OVGS) program.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 601

Course ID: 009416

Course title (max. 100 characters including spaces): Environmental Change and Remote Sensing

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 been offered since before 2011 and there are no plans to offer it in the future. We are inactivating the course to clean up the Calendar and better reflect actual course offerings.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 605

Course ID: 011818

Course title (max. 100 characters including spaces): Spatial Information Technology, Globalization and International Development

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 been offered since before 2011 and there are no plans to offer it in the future. We are inactivating the course to clean up the calendar and better reflect actual course offerings.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/2024

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/2024

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 616

Course ID: 001360

Course title (max. 100 characters including spaces): Multivariate Statistics

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 been offered since before 2011 and there are no plans to offer it in the future. We are inactivating the course to clean up the Calendar and better reflect actual course offerings.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 624

Course ID: 001368

Course title (max. 100 characters including spaces): Human Activity and Travel Behaviour

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 been offered since 2012 and there are no plans to offer it in the future. We are inactivating the course to clean up the Calendar and better reflect actual course offerings.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 637

Course ID: 013243

Course title (max. 100 characters including spaces): Cultural Geography

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 been offered since before 2011 and there are no plans to offer it in the future. We are inactivating the course to clean up the Calendar and better reflect actual course offerings.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 639

Course ID: 013394

Course title (max. 100 characters including spaces): Food Systems and Sustainability

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 been offered since before 2011 and there are no plans to offer it in the future. We are inactivating the course to clean up the Calendar and better reflect actual course offerings.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 644

Course ID: 001378

Course title (max. 100 characters including spaces): Applied Geomorphology

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 been offered since before 2011 and there are no plans to offer it in the future. We are inactivating the course to clean up the Calendar and better reflect actual course offerings.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 661A

Course ID: 002264

Course title (max. 100 characters including spaces): Applied Studies in Hydrology and the Environment 1

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 been offered since before 2011 and there are no plans to offer it in the future. We are inactivating the course to clean up the Calendar and better reflect actual course offerings.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 661B

Course ID: 001389

Course title (max. 100 characters including spaces): Applied Studies in Hydrology and the Environment 2

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 been offered since before 2011 and there are no plans to offer it in the future. We are inactivating the course to clean up the Calendar and better reflect actual course offerings.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 664

Course ID: 001392

Course title (max. 100 characters including spaces): Political Ecology: Nature, Society and Sustainability

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 been offered since 2012 and there are no plans to offer it in the future. We are inactivating the course to clean up the Calendar and better reflect actual course offerings.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 672

Course ID: 001401

Course title (max. 100 characters including spaces): Human Ecology of Stressed Environments

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 been offered since before 2011 and there are no plans to offer it in the future. We are inactivating the course to clean up the Calendar and better reflect actual course offerings.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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.

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

Course subject code: GEOG

Course number: 620

Course ID: 001364

Course title (max. 100 characters including spaces): Foundations in Human Geography

Course short title (max. 30 characters including spaces): Foundations in Human Geography

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

Current description: This seminar class will provide a foundational analysis of the interdisciplinary scope of Human Geography by evaluating key concepts and theoretical approaches that have defined the evolution

of the sub-discipline in the contemporary period. Students will assess how their research interests will contribute to ongoing conceptual developments in Human Geography.

Revised description: This seminar class provides a foundational analysis of the transdisciplinary scope of Human Geography by critically evaluating key concepts and theoretical approaches that have defined the evolution of the sub-discipline in the contemporary period. Through a range of learning strategies including peer learning, academic critique, and debate, students will assess how their own research interests and activities contribute to ongoing conceptual developments in Human Geography.

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

Primary meet type: Seminar

Delivery mode: On-campus

Requisites: N/A

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 Waterloo-Laurier Joint Program in Geography is dissolving, resulting in updates to course offerings to support the new standalone graduate program at Waterloo. The updated course description better reflects the content in the redesigned course.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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 title and Course description.

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

Course subject code: GEOG

Course number: 640

Course ID: 001375

Course title (max. 100 characters including spaces):

Current title: Foundations in Environmental Science

Revised title: Contextualizing Research in Earth System Science

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

Current description: This seminar course examines basic concepts related to temporal and spatial scales together with variability as they directly affect data collection and analysis. Leading-edge research related to Environmental Science will be critically discussed. *eligible for MES

Revised description: This course involves graduate students in a participatory, seminar-style environment that critically examines current research in earth system science emphasizing the interdisciplinary nature of the science. Using a combination of individual reading, academic critique, peer learning and group discussion, students will develop knowledge related to the contextualization of their own research and how this contributes to ongoing developments in earth system science.

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

Primary meet type: Seminar

Delivery mode: On-campus

Requisites: N/A

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 Waterloo-Laurier Joint Program in Geography is dissolving, resulting in updates to course offerings to support the new standalone graduate program at Waterloo. The updated title and course description better reflect the content in the redesigned course.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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 number, Course title, and Course description. Changing the credit weight from 0.50 to 0.25.

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

Course subject code: GEOG

Course number:

Current course number: 700

Revised course number: 700A

Course ID: 016203

Course title (max. 100 characters including spaces):

Current course title: Professional Skills Development for Master's Students

Revised course title: Geographic Scholarship and Practice 1 – Master's

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

Current course short title: Master's Skills Development

Revised course short title: Geog Schol & Prac 1 – Master's

Grading basis: Credit/No Credit

Course credit weight: 0.25 (revised from 0.50)

Course consent required: Not required

Course description:

Current course description: This course is for Master's students and focuses on cohort building and the development of key transferable career-focused skills. Content may include: student and advisor/committee relationships and mutual expectations; concerns such as gender neutrality, Indigenous perspectives, or public accountability; how to communicate your research to diverse audiences and stakeholders. In addition, skills development will prioritize constructing compelling research proposals, funding applications, and presentations. Graded on a credit/no credit basis.

Revised course description: This course is for all new Master's students. The course provides an opportunity for cohort building while addressing the formal requirements and practical considerations for navigating the graduate program, as well as how to be successful in both the profession and in research. Topics include developing professional skills and networks, and understanding the broader purpose and scope of geographic research in society, including questions of equity, social justice, and reconciliation. This course includes student-developed topics and student-led opportunities. The course is assessed on a credit/non-credit basis.

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

Primary meet type: Seminar

Delivery mode: On-campus

Requisites: N/A

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: GEOG 800A

Rationale for request:

The Waterloo-Laurier Joint Program in Geography is dissolving, resulting in updates to course offerings to support the new standalone graduate program at Waterloo. To better align content delivery with timing of student progress in the program, the professional skills course GEOG 700 (0.50) will now be held over two terms, so is being replaced with GEOG 700A (0.25) (this course revision) and GEOG 700B (0.25) (course activation). The updated title better reflects the content in the redesigned course.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/27

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/24/27

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 700B

Course ID:

Course title (max. 100 characters including spaces): Geographic Scholarship and Practice 2 – Master's

Course short title (max. 30 characters including spaces): Geog Schol & Prac 2 – Master's

Grading basis: Credit/No Credit

Course credit weight: 0.25

Course consent required: Not required

Course description: This course is for all new Master's students. The course provides an opportunity for cohort building while addressing the formal requirements and practical considerations for navigating the graduate program, as well as how to be successful in both the profession and in research. Topics include developing professional skills and networks, and understanding the broader purpose and scope of geographic research in

society, including questions of equity, social justice, and reconciliation. This course includes student-developed topics and student-led opportunities. The course is assessed on a credit/non-credit basis.

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

Primary meet type: Seminar

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: GEOG 800B

Rationale for request:

The Waterloo-Laurier Joint Program in Geography is dissolving, resulting in updates to course offerings to support the new standalone graduate program at Waterloo. To better align content delivery with timing of student progress in the program, the professional skills course GEOG 700 (0.50) will now be held over two terms, so is being replaced with GEOG 700A (0.25) and GEOG 700B (0.25). The updated title better reflects the content in the redesigned course.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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 number, Course title, and Course description. Changing the credit weight from 0.50 to 0.25.

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

Course subject code: GEOG

Course number:

Current course number: 800

Revised course number: 800A

Course ID: 016201

Course title (max. 100 characters including spaces):

Current title: Professional Skills Development for Doctoral Students

Revised title: Geographic Scholarship and Practice 1 – Doctoral

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

Current short title: Doctoral Skills Development

Revised short title: Geog Schol & Prac 1 – Doctoral

Grading basis: Credit/No Credit

Course credit weight: 0.25 (revised from 0.50)

Course consent required: Not required

Course description:

Current: This course is for doctoral students. PhD students in the graduate program will engage in cohort-building exercises and develop key transferable career-focused skills deemed necessary for success as a professional researcher. This includes effective proposal and grant writing, presentation and instructional skills, professional development in terms of public engagement with diverse stakeholders and community partners (government, indigenous, community, academic). Graded on a credit/no credit basis.

Revised: This course is for all new Doctoral students. The course provides an opportunity for cohort building while addressing the formal requirements and practical considerations for navigating the graduate program, as well as how to be successful in both the profession and in research. Topics include developing professional skills and networks, and understanding the broader purpose and scope of geographic research in society, including questions of equity, social justice, and reconciliation. This course includes student-developed topics and student-led opportunities. The course is assessed on a credit/non-credit basis.

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

Primary meet type: Seminar

Delivery mode: On-campus

Requisites: N/A

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: GEOG 700A

Rationale for request:

The Waterloo-Laurier Joint Program in Geography is dissolving, resulting in updates to course offerings to support the new standalone graduate program at Waterloo. To better align content delivery with timing of student progress in the program, the professional skills course GEOG 800 (0.50) will now be held over two terms, so is being replaced with GEOG 800A (0.25) (this course revision) and GEOG 800B (0.25) (course activation). The updated title better reflects the content in the redesigned course.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 800B

Course ID: TBD

Course title (max. 100 characters including spaces): Geographic Scholarship and Practice 2 – Doctoral

Course short title (max. 30 characters including spaces): Geog Schol & Prac 2 – Doctoral

Grading basis: Credit/No Credit

Course credit weight: 0.25

Course consent required: Not required

Course description: This course is for all new Doctoral students. The course provides an opportunity for cohort building while addressing the formal requirements and practical considerations for navigating the graduate program, as well as how to be successful in both the profession and in research. Topics include developing professional skills and networks, and understanding the broader purpose and scope of geographic research in society, including questions of equity, social justice, and reconciliation. This course includes student-developed

topics and student-led opportunities. The course is assessed on a credit/non-credit basis.

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

Primary meet type: Seminar

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: GEOG 700B

Rationale for request:

The Waterloo-Laurier Joint Program in Geography is dissolving, resulting in updates to course offerings to support the new standalone graduate program at Waterloo. To better align content delivery with timing of student progress in the program, the professional skills course GEOG 800 (0.50) will now be held over two terms, so is being replaced with GEOG 800A (0.25) and GEOG 800B (0.25). The updated title better reflects the content in the redesigned course.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 641

Course ID: 010625

Course title (max. 100 characters including spaces): Climate Change: Physical Science Basis

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: The course examines the interactive physical, biological and geochemical processes responsible for and resulting from climate change, including anthropogenic influences on these processes.

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

Primary meet type: Seminar

Delivery mode: On-campus

Requisites: N/A

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 is actually a GEMCC program course. The cross-listed course number was created so that WLU students could enroll in the course via the Joint Program. Due to the dissolution of the Joint Program, the cross-listing is no longer necessary. Research GEM graduate students will still be able to take the course as an elective using the GEMCC code, if desired.

Form completed by: Alan Anthony

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 676

Course ID: 009423

Course title (max. 100 characters including spaces): Climate Change Vulnerability and Adaptation

Course short title (max. 30 characters including spaces): Climate Change Vuln. & Adapt

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

This course examines the impacts of changing climate on natural and human systems and focuses on the capacity of societies to adjust to, plan for and cope with changing climate and environmental conditions.

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

Primary meet type: Seminar

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:

This is actually a GEMCC program course. The cross-listed course number was created so that WLU students could enroll in the course via the Joint Program. Due to the dissolution of the Joint Program, the cross-listing is no longer necessary. Research GEM graduate students will still be able to take the course as an elective using the GEMCC code, if desired.

Form completed by: Alan Anthony

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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 the cross-listing with GEOG 679 and removing *eligible for MES from the course description. Note: all other course elements are being retained.*

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

Course subject code: GEOG

Course number: 679

Course ID: 014507

Course title (max. 100 characters including spaces): Climate Change Mitigation

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

This course examines the anthropogenic sources of greenhouse gas emissions and the range of strategies to reduce these emissions and to enhance carbon sequestration. The policy frameworks governing climate change mitigation are critically appraised from geopolitical, economic and ethics perspectives. This course also considers

the potential role of climate remediation strategies.

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

Primary meet type: Seminar

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:

This is actually a GEMCC program course. The cross-listed course number was created so that WLU students could enroll in the course via the Joint Program. Due to the dissolution of the Joint Program, the cross-listing is no longer necessary. Research GEM graduate students will still be able to take the course as an elective using the GEMCC code, if desired.

Form completed by: Alan Anthony

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 652

Course ID: 014506

Course title (max. 100 characters including spaces): Climate Prediction, Modeling and Scenarios

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

Computer models of the physical climate system are essential tools for investigating future climate change. This course will introduce students to the basic formulation of these models, and their strengths and limitations. Inter-linkages between climate modeling and mitigation and adaptation policy agendas is reviewed and critiqued. The

types of climate modeling experiments performed with such models and scenarios will be reviewed. The latest projections of future climate on a variety of temporal and spatial scales will be presented and evaluated.

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

Primary meet type: Seminar

Delivery mode: On-campus

Requisites: GEOG 408

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 is actually a GEMCC program course. The cross-listed course number was created so that WLU students could enroll in the course via the Joint Program. Due to the dissolution of the Joint Program, the cross-listing is no longer necessary. Research GEM graduate students will still be able to take the course as an elective using the GEMCC code, if desired.

Form completed by: Alan Anthony

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 674

Course ID: 014508

Course title (max. 100 characters including spaces): Climate Data and Analytics

Course short title (max. 30 characters including spaces): Climate Data and Analytics

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

This course examines the scientific and practical challenges of finding and utilizing climate data to derive useful information in order to inform research and decision making processes. Through lectures, readings, videos and assignments, this course will introduce different types of climate data (historical, contemporary measurements and modelled) and discuss how they can be realistically analyzed to derive useful information (both within a

research and policy context). From a general discussion on what climate data is and its value, this course will then focus on finding/collected climate data and critically evaluating how it can and should be used. Further, this course will introduce students to the development of data management plans, climate data curation, and effective ways of visualizing and contextualizing climate data to a variety of target audiences. Building upon this foundational knowledge, strategies and methodologies for analyzing climate data to derive useful information related climate risk in a variety of sectors will be explored. This includes areas such as community planning, human health, engineering/infrastructure among others. Students must have access to spreadsheet software for assignments.

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

Primary meet type: Seminar

Delivery mode: Only offered online

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 is actually a GEMCC program course. The cross-listed course number was created so that WLU students could enroll in the course via the Joint Program. Due to the dissolution of the Joint Program, the cross-listing is no longer necessary. Research GEM graduate students will still be able to take the course as an elective using the GEMCC code, if desired.

Form completed by: Alan Anthony

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 677

Course ID: 014509

Course title (max. 100 characters including spaces): Climate Change, Natural Hazards and Disaster Risk Reduction

Course short title (max. 30 characters including spaces): Climate Change, Natural Hazard

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

This course explores the complex links between climate change and natural hazards, and related disasters, including disaster risk reduction as an adaptation strategy. Emphasis is placed on examining these concepts in a developing country context.

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

Primary meet type: Seminar

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:

This is actually a GEMCC program course. The cross-listed course number was created so that WLU students could enroll in the course via the Joint Program. Due to the dissolution of the Joint Program, the cross-listing is no longer necessary. Research GEM graduate students will still be able to take the course as an elective using the GEMCC code, if desired.

Form completed by: Alan Anthony

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 653

Course ID: 014510

Course title (max. 100 characters including spaces): Land Use and the Carbon Cycle

Course short title (max. 30 characters including spaces): Land Use and the Carbon Cycle

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

This course examines contemporary theories, approaches, and technologies used to study coupled natural-human systems at the intersection of land-use and land-cover change, land management, and the carbon cycle. Topics covered include measurement and modelling techniques to improve carbon accounting, the effects

of land use and land management on carbon storage and flux, and international and national policy frameworks influencing carbon sequestration and climate change mitigation.

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

Primary meet type: Seminar

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:

This is actually a GEMCC program course. The cross-listed course number was created so that WLU students could enroll in the course via the Joint Program. Due to the dissolution of the Joint Program, the cross-listing is no longer necessary. Research GEM graduate students will still be able to take the course as an elective using the GEMCC code, if desired.

Form completed by: Alan Anthony

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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: Environment

Effective date: Term: Spring 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: GEOG

Course number: 678

Course ID: 014511

Course title (max. 100 characters including spaces): Climate Change Governance: From Global Treaties to Local Innovation

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

This course explores the theories behind, and practical approaches to, the multi-level governance of climate change. The United Nations Framework Convention on Climate Change, the Kyoto Protocol, national climate action plans and local innovation are viewed through the lenses of legitimacy, effectiveness, and participation.

Finally, we consider the challenge of transformative change, and the possibility of finding synergies among climate change responses and other pressing social and environmental priorities.

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

Primary meet type: Seminar

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:

This is actually a GEMCC program course. The cross-listed course number was created so that WLU students could enroll in the course via the Joint Program. Due to the dissolution of the Joint Program, the cross-listing is no longer necessary. Research GEM graduate students will still be able to take the course as an elective using the GEMCC code, if desired.

Form completed by: Alan Anthony

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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



Senate Graduate & Research Council

Graduate Studies Course/Milestone Form

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: Environment

Effective date: Term: Spring 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 the cross-listing with GEOG 641 and removing *eligible for MES from the course description. Note: all other course elements are being retained.*

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

Course subject code: GEMCC

Course number: 601

Course ID: 010625

Course title (max. 100 characters including spaces): Climate Change: Physical Science Basis

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: The course examines the interactive physical, biological and geochemical processes responsible for and resulting from climate change, including anthropogenic influences on these processes.

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

Primary meet type: Seminar

Delivery mode: On-campus

Requisites: N/A

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:

To remove the cross-listing with GEOG 641 – GEOG 641 is being inactivated – the cross-listing was largely in place to improve access to the courses for Laurier students in the joint program when the joint program was being offered. GEM graduate students will be able to take these courses under the GEMCC course code and removing the cross-list will help avoid confusion on course offerings and availability for GEM students.

To remove **eligible for MES* from the course description – a suggested course list will be provided to the students.

Approval from GEM received.

Form completed by: Teresa Wilson

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ **date** (mm/dd/yy): 08/06/24

Faculty approval date (mm/dd/yy): 11/14/24

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



Senate Graduate & Research Council

Graduate Studies Course/Milestone Form

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: Environment

Effective date: Term: Spring 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 the cross-listing with GEOG 676 and removing *eligible for MES from the course description. Note: all other course elements are being retained.*

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

Course subject code: GEMCC

Course number: 602

Course ID: 009423

Course title (max. 100 characters including spaces): Climate Change Vulnerability and Adaptation

Course short title (max. 30 characters including spaces): Climate Change Vuln. & Adapt

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

This course examines the impacts of changing climate on natural and human systems and focuses on the capacity of societies to adjust to, plan for and cope with changing climate and environmental conditions.

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

Primary meet type: Seminar

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:

To remove the cross-listing with GEOG 676 – GEOG 676 is being inactivated – the cross-listing was largely in place to improve access to the courses for Laurier students in the joint program when the joint program was being offered. GEM graduate students will be able to take these courses under the GEMCC course code and removing the cross-list will help avoid confusion on course offerings and availability for GEM students.

To remove **eligible for MES* from the course description – a suggested course list will be provided to the students.

Approval from GEM received.

Form completed by: Teresa Wilson

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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



Senate Graduate & Research Council

Graduate Studies Course/Milestone Form

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: Environment

Effective date: Term: Spring 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 the cross-listing with GEOG 679 and removing *eligible for MES from the course description. Note: all other course elements are being retained.*

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

Course subject code: GEMCC

Course number: 603

Course ID: 014507

Course title (max. 100 characters including spaces): Climate Change Mitigation

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

This course examines the anthropogenic sources of greenhouse gas emissions and the range of strategies to reduce these emissions and to enhance carbon sequestration. The policy frameworks governing climate change mitigation are critically appraised from geopolitical, economic and ethics perspectives. This course also considers the potential role of climate remediation strategies.

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

Primary meet type: Seminar

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:

To remove the cross-listing with GEOG 679 – GEOG 679 is being inactivated – the cross-listing was largely in place to improve access to the courses for Laurier students in the joint program when the joint program was being offered. GEM graduate students will be able to take these courses under the GEMCC course code and removing the cross-list will help avoid confusion on course offerings and availability for GEM students.

To remove **eligible for MES* from the course description – a suggested course list will be provided to the students.

Approval from GEM received.

Form completed by: Teresa Wilson

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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



Senate Graduate & Research Council

Graduate Studies Course/Milestone Form

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: Environment

Effective date: Term: Spring 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 the cross-listing with GEOG 652 and removing *eligible for MES from the course description. Note: all other course elements are being retained.*

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

Course subject code: GEMCC

Course number: 610

Course ID: 014506

Course title (max. 100 characters including spaces): Climate Prediction, Modeling and Scenarios

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

Computer models of the physical climate system are essential tools for investigating future climate change. This course will introduce students to the basic formulation of these models, and their strengths and limitations. Inter-linkages between climate modeling and mitigation and adaptation policy agendas is reviewed and critiqued. The types of climate modeling experiments performed with such models and scenarios will be reviewed. The latest projections of future climate on a variety of temporal and spatial scales will be presented and evaluated.

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

Primary meet type: Seminar

Delivery mode: On-campus

Requisites: GEOG 408

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:

To remove the cross-listing with GEOG 652 – GEOG 652 is being inactivated – the cross-listing was largely in place to improve access to the courses for Laurier students in the joint program when the joint program was being offered. GEM graduate students will be able to take these

courses under the GEMCC course code and removing the cross-list will help avoid confusion on course offerings and availability for GEM students.

To remove **eligible for MES* from the course description – a suggested course list will be provided to the students.

Approval from GEM received.

Form completed by: Teresa Wilson

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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



Senate Graduate & Research Council

Graduate Studies Course/Milestone Form

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: Environment

Effective date: Term: Spring 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 the cross-listing with GEOG 674 and removing *eligible for MES from the course description. Note: all other course elements are being retained.*

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

Course subject code: GEMCC

Course number: 620

Course ID: 014508

Course title (max. 100 characters including spaces): Climate Data and Analytics

Course short title (max. 30 characters including spaces): Climate Data and Analytics

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

This course examines the scientific and practical challenges of finding and utilizing climate data to derive useful information in order to inform research and decision-making processes. Through lectures, readings, videos and assignments, this course will introduce different types of climate data (historical, contemporary measurements and modelled) and discuss how they can be realistically analyzed to derive useful information (both within a research and policy context). From a general discussion on what climate data is and its value, this course will then focus on finding/collected climate data and critically evaluating how it can and should be used. Further, this course will introduce students to the development of data management plans, climate data curation, and effective ways of visualizing and contextualizing climate data to a variety of target audiences. Building upon this foundational knowledge, strategies and methodologies for analyzing climate data to derive useful information related climate risk in a variety of sectors will be explored. This includes areas such as community planning, human health, engineering/infrastructure among others. Students must have access to spreadsheet software for assignments.

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

Primary meet type: Seminar

Delivery mode: Only offered online

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:

To remove the cross-listing with GEOG 674 – GEOG 674 is being inactivated – the cross-listing was largely in place to improve access to the courses for Laurier students in the joint program when the joint program was being offered. GEM graduate students will be able to take these courses under the GEMCC course code and removing the cross-list will help avoid confusion on course offerings and availability for GEM students.

To remove **eligible for MES* from the course description – a suggested course list will be provided to the students.

Approval from GEM received.

Form completed by: Teresa Wilson

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ **date** (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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



Senate Graduate & Research Council

Graduate Studies Course/Milestone Form

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: Environment

Effective date: Term: Spring 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 the cross-listing with GEOG 677 and removing *eligible for MES from the course description. Note: all other course elements are being retained.*

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

Course subject code: GEMCC

Course number: 622

Course ID: 014509

Course title (max. 100 characters including spaces): Climate Change, Natural Hazards and Disaster Risk Reduction

Course short title (max. 30 characters including spaces): Climate Change, Natural Hazard

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

This course explores the complex links between climate change and natural hazards, and related disasters, including disaster risk reduction as an adaptation strategy. Emphasis is placed on examining these concepts in a developing country context.

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

Primary meet type: Seminar

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:

To remove the cross-listing with GEOG 677 – GEOG 677 is being inactivated – the cross-listing was largely in place to improve access to the courses for Laurier students in the joint program when the joint program was being offered. GEM graduate students will be able to take these courses under the GEMCC course code and removing the cross-list will help avoid confusion on course offerings and availability for GEM students.

To remove **eligible for MES* from the course description – a suggested course list will be provided to the students.

Approval from GEM received.

Form completed by: Teresa Wilson

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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



Senate Graduate & Research Council

Graduate Studies Course/Milestone Form

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: Environment

Effective date: Term: Spring 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 the cross-listing with GEOG 653 and removing *eligible for MES from the course description. Note: all other course elements are being retained.*

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

Course subject code: GEMCC

Course number: 630

Course ID: 014510

Course title (max. 100 characters including spaces): Land Use and the Carbon Cycle

Course short title (max. 30 characters including spaces): Land Use and the Carbon Cycle

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

This course examines contemporary theories, approaches, and technologies used to study coupled natural-human systems at the intersection of land-use and land-cover change, land management, and the carbon cycle. Topics covered include measurement and modelling techniques to improve carbon accounting, the effects of land use and land management on carbon storage and flux, and international and national policy frameworks influencing carbon sequestration and climate change mitigation.

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

Primary meet type: Seminar

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:

To remove the cross-listing with GEOG 653 – GEOG 653 is being inactivated – the cross-listing was largely in place to improve access to the courses for Laurier students in the joint program when the joint program was being offered. GEM graduate students will be able to take these courses under the GEMCC course code and removing the cross-list will help avoid confusion on course offerings and availability for GEM students.

To remove **eligible for MES* from the course description – a suggested course list will be provided to the students.

Approval from GEM received.

Form completed by: Teresa Wilson

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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



Senate Graduate & Research Council
Graduate Studies Course/Milestone Form

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: Environment

Effective date: Term: Spring 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 the cross-listing with GEOG 678 and removing *eligible for MES from the course description. Note: all other course elements are being retained.*

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

Course subject code: GEMCC

Course number: 640

Course ID: 014511

Course title (max. 100 characters including spaces): Climate Change Governance: From Global Treaties to Local Innovation

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

This course explores the theories behind, and practical approaches to, the multi-level governance of climate change. The United Nations Framework Convention on Climate Change, the Kyoto Protocol, national climate action plans and local innovation are viewed through the lenses of legitimacy, effectiveness, and participation. Finally, we consider the challenge of transformative change, and the possibility of finding synergies among climate change responses and other pressing social and environmental priorities.

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

Primary meet type: Seminar

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:

To remove the cross-listing with GEOG 678 – GEOG 678 is being inactivated – the cross-listing was largely in place to improve access to the courses for Laurier students in the joint program

when the joint program was being offered. GEM graduate students will be able to take these courses under the GEMCC course code and removing the cross-list will help avoid confusion on course offerings and availability for GEM students.

To remove **eligible for MES* from the course description – a suggested course list will be provided to the students.

Approval from GEM received.

Form completed by: Teresa Wilson

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ **date** (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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



Graduate Studies Program Revision Template

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

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](#).

Updating the climate change course listing and removing the cross-listing with GEOG courses.

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

Rationale for change(s):

To remove the cross-listing with GEOG courses – GEOG courses are being inactivated.

The cross-listing was largely in place to improve access to the courses for Laurier students in the joint geography program when the joint geography program was being offered.

GEM graduate students will be able to take these courses under the GEMCC course code and removing the cross-list will help avoid confusion on course offerings and availability for GEM students.

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):

[Master of Climate Change \(MCC\) \(uwaterloo.ca\)](#)

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Degree requirements - Students must complete the course and milestone requirements associated with their chosen study option in addition to the Graduate Academic Integrity Module (Graduate AIM). Master's Research Paper option: Course requirements - Students must successfully complete the following graduate level courses (0.50-unit weight per course): 3 required courses: - GEMCC 601 Climate Change: Physical Science Basis - GEMCC 602 Climate Change Vulnerability and Adaptation - GEMCC 603 Climate Change Mitigation 2 climate change electives: - Students are able to tailor their program of study based on their individual interests by completing 2 climate change designated electives which can be chosen from, but are not limited to, the following list. The availability of climate change designated electives varies year-to-year, including newly approved courses. ~~GEMCC 610~~/GEOG 652 Climate Prediction, Modeling and Scenarios - GEMCC 614 Climate Services ~~GEMCC 620~~/GEOG 674 Climate Data and Analytics ~~GEMCC 622~~/GEOG 677 Climate Change, Natural Hazards and	Degree requirements - Students must complete the course and milestone requirements associated with their chosen study option in addition to the Graduate Academic Integrity Module (Graduate AIM). Master's Research Paper option: Course requirements - Students must successfully complete the following graduate level courses (0.50-unit weight per course): 3 required courses: - GEMCC 601 Climate Change: Physical Science Basis - GEMCC 602 Climate Change Vulnerability and Adaptation - GEMCC 603 Climate Change Mitigation 2 climate change electives: - Students are able to tailor their program of study based on their individual interests by completing 2 climate change designated electives which can be chosen from, but are not limited to, the following list. The availability of climate change designated electives varies year-to-year, including newly approved courses. - GEMCC 610 Climate Prediction, Modeling and Scenarios - GEMCC 614 Climate Services - GEMCC 620 Climate Data and Analytics - GEMCC 622 Climate Change, Natural Hazards and Disaster Risk Reduction

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Disaster Risk Reduction ▪ GEMCC 630/~~GEOG 653~~ Land Use and the Carbon Cycle ▪ GEMCC 640/~~GEOG 678~~ Climate Change Governance: From Global Treaties to Local Innovation ▪ GEMCC 644 Climate Resilient Canadians and Health Systems ▪ GEMCC 650/ENBUS 652 Business and Climate Change ▪ GEMCC 652/PLAN 627 Climate Change and Community Planning ▪ GEMCC 653/FCIT 606 Sustainability Transitions in Cities ▪ GEMCC 660 Carbon Accounting and Management ▪ GEMCC 690 Climate Change Projects • 2 open electives chosen from the climate change designated electives list, partnering programs within the Faculty of Environment (that are willing to allow the student to enroll in a course), and graduate programs offered by other Faculties (that are willing to allow the student to enroll in a course). • Failure to maintain a course average of at least 75% will result in an automatic review of the student's status in the program. The review committee will consist of the Program Director and the Graduate Officer. The review committee may require that the student withdraw from the program.	▪ GEMCC 630 Land Use and the Carbon Cycle ▪ GEMCC 640 Climate Change Governance: From Global Treaties to Local Innovation ▪ GEMCC 644 Climate Resilient Canadians and Health Systems ▪ GEMCC 650/ENBUS 652 Business and Climate Change ▪ GEMCC 652/PLAN 627 Climate Change and Community Planning ▪ GEMCC 653/FCIT 606 Sustainability Transitions in Cities ▪ GEMCC 660 Carbon Accounting and Management ▪ GEMCC 690 Climate Change Projects • 2 open electives chosen from the climate change designated electives list, partnering programs within the Faculty of Environment (that are willing to allow the student to enroll in a course), and graduate programs offered by other Faculties (that are willing to allow the student to enroll in a course). • Failure to maintain a course average of at least 75% will result in an automatic review of the student's status in the program. The review committee will consist of the Program Director and the Graduate Officer. The review committee may require that the student withdraw from the program. Master's Research Paper option: Milestone requirements Master's Research Paper

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Master's Research Paper option: Milestone requirements Master's Research Paper - The Master's Research Paper will normally be completed in the Spring (third) term. Each student undertaking the research paper option will identify a topic and a suitable advisor in the first two terms in the program. The student will develop a research proposal for approval by their advisor. The research paper should be approximately 12,000 words/50 pages in length. The research paper is evaluated by the advisor and one reader designated by the Program Director. Coursework option: Course requirements - Students must successfully complete the following graduate level courses (0.50 unit weight per course): 3 required courses: - GEMCC 601 Climate Change: Physical Science Basis - GEMCC 602 Climate Change Vulnerability and Adaptation - GEMCC 603 Climate Change Mitigation 2 climate change electives: - Students are able to tailor their program of study based on their individual interests by completing 2 climate change designated electives which can be chosen from, but are not limited to, the following list. The availability of climate change designated electives varies year-to-year, including newly approved courses. - GEMCC 610/~~GEOG~~ 652 Climate Prediction, Modeling and Scenarios - GEMCC 614 Climate Services	- The Master's Research Paper will normally be completed in the Spring (third) term. Each student undertaking the research paper option will identify a topic and a suitable advisor in the first two terms in the program. The student will develop a research proposal for approval by their advisor. The research paper should be approximately 12,000 words/50 pages in length. The research paper is evaluated by the advisor and one reader designated by the Program Director. Coursework option: Course requirements - Students must successfully complete the following graduate level courses (0.50-unit weight per course): 3 required courses: - GEMCC 601 Climate Change: Physical Science Basis - GEMCC 602 Climate Change Vulnerability and Adaptation - GEMCC 603 Climate Change Mitigation 2 climate change electives: - Students are able to tailor their program of study based on their individual interests by completing 2 climate change designated electives which can be chosen from, but are not limited to, the following list. The availability of climate change designated electives varies year-to-year, including newly approved courses. - GEMCC 610/~~GEOG~~ 652 Climate Prediction, Modeling and Scenarios - GEMCC 614 Climate Services - GEMCC 620/~~GEOG~~ 674 Climate Data and Analytics

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
▪ GEMCC 620/~~GEOG~~ 674 Climate Data and Analytics ▪ GEMCC 622/~~GEOG~~ 677 Climate Change, Natural Hazards and Disaster Risk Reduction ▪ GEMCC 630/~~GEOG~~ 653 Land Use and the Carbon Cycle ▪ GEMCC 640/~~GEOG~~ 678 Climate Change Governance: From Global Treaties to Local Innovation ▪ GEMCC 644 Climate Resilient Canadians and Health Systems ▪ GEMCC 650/ENBUS 652 Business and Climate Change ▪ GEMCC 652/PLAN 627 Climate Change and Community Planning ▪ GEMCC 653/FCIT 606 Sustainability Transitions in Cities ▪ GEMCC 660 Carbon Accounting and Management ▪ GEMCC 690 Climate Change Projects • 2 open electives chosen from the climate change designated electives list, partnering programs within the Faculty of Environment (that are willing to allow the student to enroll in a course), and graduate programs offered by other Faculties (that are willing to allow the student to enroll in a course). • Failure to maintain a course average of 75% or better results in an automatic review of the student's status in the program. The review committee will consist of the Program	▪ GEMCC 622/~~GEOG~~ 677 Climate Change, Natural Hazards and Disaster Risk Reduction ▪ GEMCC 630/~~GEOG~~ 653 Land Use and the Carbon Cycle ▪ GEMCC 640/~~GEOG~~ 678 Climate Change Governance: From Global Treaties to Local Innovation ▪ GEMCC 644 Climate Resilient Canadians and Health Systems ▪ GEMCC 650/ENBUS 652 Business and Climate Change ▪ GEMCC 652/PLAN 627 Climate Change and Community Planning ▪ GEMCC 653/FCIT 606 Sustainability Transitions in Cities ▪ GEMCC 660 Carbon Accounting and Management ▪ GEMCC 690 Climate Change Projects • 2 open electives chosen from the climate change designated electives list, partnering programs within the Faculty of Environment (that are willing to allow the student to enroll in a course), and graduate programs offered by other Faculties (that are willing to allow the student to enroll in a course). • Failure to maintain a course average of 75% or better results in an automatic review of the student's status in the program. The review committee will consist of the Program Director and the Graduate Officer. The review committee may require

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Director and the Graduate Officer. The review committee may require that the student withdraw from the program. Coursework option: Milestone requirements 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 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	that the student withdraw from the program. Coursework option: Milestone requirements 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 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

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
accomplishments) and reflects on linkage to the program curriculum and professional development goals.	linkage to the program curriculum and professional development goals.

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

Any student who is currently enrolled in the program who has taken one of the cross-listed courses will still be eligible to use the course towards their climate change elective.

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ **date** (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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 Arts (MA) in Geography - Aeronautics

Program contact name(s): Maria Strack

Form completed by: Maria Strack

Description of proposed changes:

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

Required courses are being updated to align with the MA in Geography program that has been updated due to dissolution of the Joint Program with Wilfrid Laurier University.

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

Rationale for change(s):

Dissolution of the Joint Geography Program previously offered with Wilfrid Laurier University has resulted in some changes to course offerings. The MA in Geography – Aeronautics course requirements are being updated to reflect these shifts in course offerings.

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#/programs/S1Naly00i3>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Degree requirements - Students must complete the course and milestone requirements associated with their chosen study option in addition to the Graduate Academic Integrity Module (Graduate AIM). Thesis option: Course requirements - Complete all of the following - Complete all the following:	Degree requirements - Students must complete the course and milestone requirements associated with their chosen study option in addition to the Graduate Academic Integrity Module (Graduate AIM). Thesis option: Course requirements - Complete all of the following - Complete all the following:

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
▪ AVIA601 – Interdisciplinary Aeronautics (0.50) ▪ AVIA602 – Interdisciplinary Aeronautics Project (0.50) ▪ ~~GEOG700 - Professional Skills Development for Master's Students (0.50)~~ Any other GEOG graduate level course (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take ~~a non-GEOG elective course~~ with approval of the Graduate Officer. Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. The coursework part of the program is designed to develop advanced understanding of issues relating to environmental studies, and also to provide students with training in additional methods/skills for their thesis research and its defence. 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). Master's Research Paper option: Course requirements • Complete all of the following - o Complete all the following: ▪ AVIA601 – Interdisciplinary Aeronautics (0.50) ▪ AVIA602 – Interdisciplinary Aeronautics Project (0.50)	▪ AVIA601 – Interdisciplinary Aeronautics (0.50) ▪ AVIA602 – Interdisciplinary Aeronautics Project (0.50) ▪ <u>GEOG700A - Geographic Scholarship and Practice 1 - Masters (0.25)</u> ▪ <u>GEOG700B - Geographic Scholarship and Practice 2 - Masters (0.25)</u> - o Any other GEOG <u>or GEMCC</u> graduate level courses (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take <u>an elective course outside of GEOG or GEMCC</u> with approval of the Graduate Officer. Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. The coursework part of the program is designed to develop advanced understanding of issues relating to environmental studies, and also to provide students with training in additional methods/skills for their thesis research and its defence. 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). Master's Research Paper option: Course requirements • Complete all of the following - o Complete all the following:

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
▪ GEOG700 - Professional Skills Development for Master's Students (0.50) - o Complete 1 of the following: ▪ ~~GEOG600 – Foundations in Spatial Data Handling (0.50)~~ ▪ GEOG620 - Foundations in Human Geography (0.50) ▪ GEOG640 - Foundations in Environmental Science (0.50) ▪ ~~GEOG660 – Foundations in Resource and Environmental Management (0.50)~~ - o Any 2 other GEOG graduate level courses (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take ~~non-GEOG elective courses~~ with approval of the Graduate Officer. Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. 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).	▪ AVIA601 – Interdisciplinary Aeronautics (0.50) ▪ AVIA602 – Interdisciplinary Aeronautics Project (0.50) ▪ GEOG700A - Geographic Scholarship and Practice 1 - Masters (0.25) ▪ <u>GEOG700B - Geographic Scholarship and Practice 2 - Masters (0.25)</u> - o Complete 1 of the following: ▪ <u>GEOG604 – Spatial Statistics (0.50)</u> ▪ <u>GEOG617 - Applied Statistics in Ecology and Environment (0.50)</u> ▪ GEOG620 - Foundations in Human Geography (0.50) ▪ <u>GEOG625 – Qualitative Methods in Geography (0.50)</u> ▪ GEOG640 – <u>Contextualizing Research in Earth System Science (0.50)</u> - o Any 2 other GEOG or GEMCC graduate level courses (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take <u>elective courses outside of GEOG or GEMCC</u> with approval of the Graduate Officer. Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. 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).

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

Currently registered students can complete their degrees using the calendar requirements active at the time of their entry into the program. Most will have completed their course requirements prior to the active date for these changes. These calendar changes update the list of required courses, but retain the same number of required credits. Further, students currently registered in the program will already meet these revised course requirements in most cases.

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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 Arts (MA) in Geography - Water

Program contact name(s): Maria Strack

Form completed by: Maria Strack

Description of proposed changes:

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

Required courses are being updated to align with the MA in Geography program that has been updated due to dissolution of the Joint Program with Wilfrid Laurier University.

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

Rationale for change(s):

Dissolution of the Joint Geography Program previously offered with Wilfrid Laurier University has resulted in some changes to course offerings. The MA in Geography – Water course requirements are being updated to reflect these shifts in course offerings.

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#/programs/HkbalyC0i3>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Degree requirements - Students must complete the course and milestone requirements associated with their chosen study option in addition to the Graduate Academic Integrity Module (Graduate AIM). Thesis option: Course requirements - Complete all of the following - Complete all the following:	Degree requirements - Students must complete the course and milestone requirements associated with their chosen study option in addition to the Graduate Academic Integrity Module (Graduate AIM). Thesis option: Course requirements - Complete all of the following - Complete all the following:

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
▪ GEOG700 - Professional Skills Development for Master's Students (0.50) ▪ WATER601 – Integrated Water Management (0.50) ▪ WATER602 – Integrated Water Management Project (0.50) o Any other GEOG graduate level course (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take ~~a non-GEOG elective course~~ with approval of the Graduate Officer. This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602). Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. The coursework part of the program is designed to develop advanced understanding of issues relating to environmental studies, and also to provide students with training in additional methods/skills for their thesis research and its defence. • Master's Research Paper option: Course requirements • Complete all of the following - o Complete all the following: ▪ ~~GEOG700 – Professional Skills Development for Master's Students (0.50)~~ ▪ WATER601 – Integrated Water Management (0.50)	▪ <u>GEOG700A - Geographic Scholarship and Practice 1 - Masters (0.25)</u> ▪ <u>GEOG700B - Geographic Scholarship and Practice 2 - Masters (0.25)</u> ▪ WATER601 – Integrated Water Management (0.50) ▪ WATER602 – Integrated Water Management Project (0.50) o Any other GEOG <u>or GEMCC</u> graduate level courses (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take <u>an elective course outside of GEOG or GEMCC</u> with approval of the Graduate Officer. This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602). Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. The coursework part of the program is designed to develop advanced understanding of issues relating to environmental studies, and also to provide students with training in additional methods/skills for their thesis research and its defence. • Master's Research Paper option: Course requirements • Complete all of the following - o Complete all the following:

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
▪ WATER602 – Integrated Water Management Project (0.50) - o Complete 1 of the following: ▪ ~~GEOG600 – Foundations in Spatial Data Handling (0.50)~~ ▪ GEOG620 - Foundations in Human Geography (0.50) ▪ GEOG640 - Foundations in Environmental Science (0.50) ▪ ~~GEOG660 – Foundations in Resource and Environmental Management (0.50)~~ Any 2 other GEOG graduate level courses (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take ~~non-GEOG elective courses~~ with approval of the Graduate Officer. This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602). Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. •	▪ <u>GEOG700A - Geographic Scholarship and Practice 1 - Masters (0.25)</u> ▪ <u>GEOG700B - Geographic Scholarship and Practice 2 - Masters (0.25)</u> ▪ WATER601 – Integrated Water Management (0.50) ▪ WATER602 – Integrated Water Management Project (0.50) - o Complete 1 of the following: ▪ <u>GEOG 604 – Spatial Statistics (0.50)</u> ▪ <u>GEOG617 - Applied Statistics in Ecology and Environment (0.50)</u> ▪ GEOG620 - Foundations in Human Geography (0.50) ▪ <u>GEOG625 – Qualitative Methods in Geography (0.50)</u> ▪ GEOG640 - <u>Contextualizing Research in Earth System Science (0.50)</u> - o Any 2 other <u>GEOG or GEMCC</u> graduate level courses (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take <u>elective courses outside of GEOG or GEMCC</u> with approval of the Graduate Officer. This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602). Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. •

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

Currently registered students can complete their degrees using the calendar requirements active at the time of their entry into the program. Most will have completed their course requirements prior to the active date for these changes. These calendar changes update the list of required courses, but retain the same number of required credits. Further, students currently registered in the program will already meet these revised course requirements in most cases.

Department/School approval date (mm/dd/yy): 09/20/24
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Senate approval date (mm/dd/yy) (if applicable):

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Faculty: Environment

Program: Master of Environmental Studies (MES) in Geography - Aeronautics

Program contact name(s): Maria Strack

Form completed by: Maria Strack

Description of proposed changes:

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

Required courses are being updated to align with the MES in Geography program that has been updated due to dissolution of the Joint Program with Wilfrid Laurier University.

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

Rationale for change(s):

Dissolution of the Joint Geography Program previous offered with Wilfrid Laurier University has resulted in some changes to course offerings. The MES in Geography – Aeronautics course requirements are being updated to reflect these shifts in course offerings.

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#/programs/HJplyACs2>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
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Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
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Master's Research Paper option: Course requirements • Complete all of the following - o Complete all the following:	Master's Research Paper option: Course requirements • Complete all of the following

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
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How will students currently registered in the program be impacted by these changes?

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Faculty approval date (mm/dd/yy): 11/14/24

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 Environmental Studies (MES) in Geography - Water

Program contact name(s): Maria Strack

Form completed by: Maria Strack

Description of proposed changes:

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

Required courses are being updated to align with the MES in Geography program that has been updated due to dissolution of the Joint Program with Wilfrid Laurier University.

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

Rationale for change(s):

Dissolution of the Joint Geography Program previous offered with Wilfrid Laurier University has resulted in some changes to course offerings. The MES in Geography – Water course requirements are being updated to reflect these shifts in course offerings.

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#/programs/Hk6eyCCj3>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Degree requirements - Students must complete the course and milestone requirements associated with their chosen study option in addition to the Graduate Academic Integrity Module (Graduate AIM). Thesis option: Course requirements - Complete all of the following - Complete all the following:	Degree requirements - Students must complete the course and milestone requirements associated with their chosen study option in addition to the Graduate Academic Integrity Module (Graduate AIM). Thesis option: Course requirements - Complete all of the following - Complete all the following:

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
▪ GEOG700 – ~~Professional Skills Development for Master's Students (0.50)~~ ▪ WATER601 – Integrated Water Management (0.50) ▪ WATER602 – Integrated Water Management Project (0.50) o Any other GEOG graduate level course (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take ~~a non-GEOG elective course~~ with approval of the Graduate Officer. This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602). Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. The coursework part of the program is designed to develop advanced understanding of issues relating to environmental studies, and also to provide students with training in additional methods/skills for their thesis research and its defence. Master's Research Paper option: Course requirements • Complete all of the following - o Complete all the following: ▪ GEOG700 – ~~Professional Skills Development for Master's Students (0.50)~~ ▪ WATER601 – Integrated Water Management (0.50)	▪ GEOG700A - <u>Geographic Scholarship and Practice 1 - Masters (0.25)</u> ▪ <u>GEOG700B - Geographic Scholarship and Practice 2 - Masters (0.25)</u> ▪ WATER601 – Integrated Water Management (0.50) ▪ WATER602 – Integrated Water Management Project (0.50) o Any other GEOG <u>or GEMCC</u> graduate level courses (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take <u>an elective course outside of GEOG or GEMCC</u> with approval of the Graduate Officer. This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602). Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. The coursework part of the program is designed to develop advanced understanding of issues relating to environmental studies, and also to provide students with training in additional methods/skills for their thesis research and its defence. Master's Research Paper option: Course requirements • Complete all of the following - o Complete all the following:

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
▪ WATER602 – Integrated Water Management Project (0.50) - o Complete 1 of the following: ▪ ~~GEOG600 – Foundations in Spatial Data Handling (0.50)~~ ▪ GEOG620 - Foundations in Human Geography (0.50) ▪ GEOG640 - Foundations in Environmental Science (0.50) ▪ ~~GEOG660 – Foundations in Resource and Environmental Management (0.50)~~ Any 2 other GEOG graduate level courses (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take ~~non-GEOG elective courses~~ with approval of the Graduate Officer. This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602). Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program.	▪ <u>GEOG700A - Geographic Scholarship and Practice 1 - Masters (0.25)</u> ▪ <u>GEOG700B - Geographic Scholarship and Practice 2 - Masters (0.25)</u> ▪ WATER601 – Integrated Water Management (0.50) ▪ WATER602 – Integrated Water Management Project (0.50) - o Complete 1 of the following: ▪ <u>GEOG604 – Spatial Statistics (0.50)</u> ▪ <u>GEOG617 - Applied Statistics in Ecology and Environment (0.50)</u> ▪ GEOG620 - Foundations in Human Geography (0.50) ▪ <u>GEOG625 – Qualitative Methods in Geography (0.50)</u> ▪ GEOG640 – <u>Contextualizing Research in Earth System Science (0.50)</u> - o Any 2 other <u>GEOG or GEMCC</u> graduate level courses (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take <u>elective courses outside of GEOG or GEMCC</u> with approval of the Graduate Officer. This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602). Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program.

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

Currently registered students can complete their degrees using the calendar requirements active at the time of their entry into the program. Most will have completed their course requirements prior to the active date for these changes. These calendar changes update the list of required courses, but retain the same number of required credits. Further, students currently registered in the program will already meet these revised course requirements in most cases.

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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 Science (MSc) in Geography - Aeronautics

Program contact name(s): Maria Strack

Form completed by: Maria Strack

Description of proposed changes:

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

Required courses are being updated to align with the MSc in Geography program that has been updated due to dissolution of the Joint Program with Wilfrid Laurier University.

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

Rationale for change(s):

Dissolution of the Joint Geography Program previous offered with Wilfrid Laurier University has resulted in some changes to course offerings. The MSc in Geography – Aeronautics course requirements are being updated to reflect these shifts in course offerings.

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#/programs/BkQagy0Rs2>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
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 - Complete all of the following - Complete all the following:	Degree requirements - Students must complete the course and milestone requirements as listed below in addition to the Graduate Academic Integrity Module (Graduate AIM). Thesis option: Course requirements - Complete all of the following - Complete all the following:

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
▪ AVIA601 – Interdisciplinary Aeronautics (0.50) ▪ AVIA602 – Interdisciplinary Aeronautics Project (0.50) ▪ ~~GEOG700 - Professional Skills Development for Master's Students (0.50)~~ Any other GEOG graduate level course (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take ~~a non-GEOG elective course~~ with approval of the Graduate Officer. Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. The coursework part of the program is designed to develop advanced understanding of issues relating to environmental science and geomatics, and also to provide students with training in additional methods/skills for their thesis research and its defence. 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).	▪ AVIA601 – Interdisciplinary Aeronautics (0.50) ▪ AVIA602 – Interdisciplinary Aeronautics Project (0.50) ▪ <u>GEOG700A - Geographic Scholarship and Practice 1 - Masters (0.25)</u> ▪ <u>GEOG700B - Geographic Scholarship and Practice 2 - Masters (0.25)</u> - o Any other GEOG <u>or GEMCC</u> graduate level courses (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take <u>an elective course outside of GEOG or GEMCC</u> with approval of the Graduate Officer. Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. The coursework part of the program is designed to develop advanced understanding of issues relating to environmental science and geomatics, and also to provide students with training in additional methods/skills for their thesis research and its defence. 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).

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

Currently registered students can complete their degrees using the calendar requirements active at the time of their entry into the program. Most will have completed their course requirements prior to the active date for these changes. These calendar changes update the list of required courses, but retain the same number of required credits. Further, students currently registered in the program will already meet these revised course requirements in most cases.

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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 Science (MSc) in Geography - Water

Program contact name(s): Maria Strack

Form completed by: Maria Strack

Description of proposed changes:

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

Required courses are being updated to align with the MSc in Geography program that has been updated due to dissolution of the Joint Program with Wilfrid Laurier University.

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

Rationale for change(s):

Dissolution of the Joint Geography Program previous offered with Wilfrid Laurier University has resulted in some changes to course offerings. The MSc in Geography – Water program requirements are being updated to reflect these shifts in course offerings.

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#/programs/BJ6I10Ash>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
• 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 • Complete all of the following	• Degree requirements • Students must complete the course and milestone requirements as listed below in addition to the Graduate Academic Integrity Module (Graduate AIM). Thesis option: Course requirements • Complete all of the following

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
- o Complete all the following: ▪ ~~GEOG700 – Professional Skills Development for Master's Students (0.50)~~ ▪ WATER601 – Integrated Water Management (0.50) ▪ WATER602 – Integrated Water Management Project (0.50) - o Any other GEOG graduate level course (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take ~~a non-GEOG elective course~~ with approval of the Graduate Officer. This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602). Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. The coursework part of the program is designed to develop advanced understanding of issues relating to environmental science and geomatics, and also to provide students with training in additional methods/skills for their thesis research and its defence. •	- o Complete all the following: ▪ <u>GEOG700A - Geographic Scholarship and Practice 1 - Masters (0.25)</u> ▪ <u>GEOG700B - Geographic Scholarship and Practice 2 - Masters (0.25)</u> ▪ WATER601 – Integrated Water Management (0.50) ▪ WATER602 – Integrated Water Management Project (0.50) - o Any other GEOG <u>or GEMCC</u> graduate level courses (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take <u>an elective course outside of GEOG or GEMCC</u> with approval of the Graduate Officer. This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602). Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. The coursework part of the program is designed to develop advanced understanding of issues relating to environmental science and geomatics, and also to provide students with training in additional methods/skills for their thesis research and its defence. •

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

Currently registered students can complete their degrees using the calendar requirements active at the time of their entry into the program. Most will have completed their course requirements prior to the active date for

these changes. These calendar changes update the list of required courses, but retain the same number of required courses. Further, students currently registered in the program will already meet these revised course requirements in most cases.

Department/School approval date (mm/dd/yy): 09/20/24
Reviewed by GSPA (for GSPA use only) ☒ **date** (mm/dd/yy): 09/27/24
Faculty approval date (mm/dd/yy): 11/14/24
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: Doctor of Philosophy (PhD) in Geography - Aeronautics

Program contact name(s): Maria Strack

Form completed by: Maria Strack

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 program page in the GSAC to remove references to Wilfrid Laurier University (WLU) since the Waterloo/WLU joint program arrangement is being dissolved. Required courses are being updated to align with the PhD in Geography program that has been updated due to dissolution of the Joint Program with Wilfrid Laurier University.

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

Rationale for change(s):

Dissolution of the Joint Geography Program previously offered with Wilfrid Laurier University has resulted in some changes to course offerings. The PhD in Geography – Aeronautics program requirements are being updated to reflect these shifts in course offerings.

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#/programs/Skz6x1RAj2>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Admission requirements: Minimum requirements - A Master's degree in geography or equivalent, with at least an 80% average in all graduate work. - Exceptional students may be allowed to enter the PhD program directly from the Master's program. Such students must have completed all Master of Arts (MA)/Master of Environmental Studies (MES)/Master of Science (MSc) requirements except the thesis,	Admission requirements: Minimum requirements - A Master's degree in geography or equivalent, with at least an 80% average in all graduate work. - Exceptional students may be allowed to enter the PhD program directly from the Master's program. Such students must have completed all Master of Arts (MA)/Master of Environmental Studies (MES)/Master of Science (MSc) requirements except the thesis,

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
have demonstrated a superior academic record and satisfied other conditions (details of which can be obtained from the <u>Director of the Program</u>). - English language proficiency (ELP) (if applicable) Degree requirements - Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM). Course requirements - Students must successfully complete the following graduate level courses (~~0.50 unit weight per course~~): ~~GEOG 800 Professional Skills Development for Doctoral Students~~ - Aeronautics core courses: - AVIA 601 Interdisciplinary Aeronautics - AVIA 802 Interdisciplinary Aeronautics Project – PhD Level - Students who have already completed AVIA 601 and AVIA 602 as part of their Masters Aeronautics degree, must complete the following course requirements: ~~GEOG 800 Professional Skills Development for Doctoral Students~~ - AVIA 802 Interdisciplinary Aeronautics Project - PhD Level or 1 elective graduate course (0.50 unit) that is applicable to aeronautics (approved by their supervisor with support from the Director of the Collaborative Aeronautics Program) - Additional coursework may be assigned subject to the needs of individual students. - Failure to obtain a final grade of at least 77% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. - 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	have demonstrated a superior academic record and satisfied other conditions (details of which can be obtained from the <u>Graduate Officer</u>). - English language proficiency (ELP) (if applicable) Degree requirements - Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM). Course requirements - Students must successfully complete the following graduate level courses: - GEOG800A – <u>Geographic Scholarship and Practice 1 - Doctoral (0.25)</u> - GEOG800B – <u>Geographic Scholarship and Practice 2 - Doctoral (0.25)</u> - Aeronautics core courses: - AVIA 601 Interdisciplinary Aeronautics (<u>0.50</u>) - AVIA 802 Interdisciplinary Aeronautics Project – PhD Level (<u>0.50</u>) - Students who have already completed AVIA 601 and AVIA 602 as part of their Masters Aeronautics degree, must complete the following course requirements: - GEOG800A – <u>Geographic Scholarship and Practice 1 - Doctoral (0.25)</u> - GEOG800B – <u>Geographic Scholarship and Practice 2 - Doctoral (0.25)</u> - AVIA 802 Interdisciplinary Aeronautics Project - PhD Level or 1 elective graduate course (0.50 unit) that is applicable to aeronautics (approved by their supervisor with support from the Director of the Collaborative Aeronautics Program) - Additional coursework may be assigned subject to the needs of individual students. - Failure to obtain a final grade of at least 77% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. - This degree is offered through the Collaborative Aeronautics Program. This program, jointly offered by a range of departments/schools across several academic

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
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). Milestone requirements PhD Comprehensive Examination - Students are required to meet the University-level PhD Comprehensive Examination minimum requirements. - In addition to the University-level PhD Comprehensive Examination minimum requirements, students in the PhD in Geography - Water program are also required to meet the following requirements: - The Comprehensive Examination includes both a written and an oral component. Normally the Examination involves the student writing answers to a question or questions over a period of three weeks. The answer(s) will not exceed 10,000 words, excluding the bibliography, abstract, figures and tables. In the oral component of the Examination, which normally lasts no longer than three hours, the student defends the written document. The topics to be covered and the format of the Examination are determined by the student's Comprehensive Examination Committee, in consultation with the student. ~~With the approval of the Supervisor and Graduate Officer, alternative formats for the Comprehensive Examination process may be permitted, provided they meet the objectives of the Comprehensive Examination.~~ - The Comprehensive Examining Committee will consist of the student's Advisor and three additional Examiners, ~~one of whom must have a primary appointment outside the Department of Geography and Environmental Management (normally, this person will be internal to the University of Waterloo). The committee must contain at least one member with a primary appointment inside the Department of Geography and Environmental Management.~~	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). Milestone requirements PhD Comprehensive Examination - Students are required to meet the University-level PhD Comprehensive Examination minimum requirements. - In addition to the University-level PhD Comprehensive Examination minimum requirements, students in the PhD in Geography - Water program are also required to meet the following requirements: - The Comprehensive Examination includes both a written and an oral component. Normally the Examination involves the student writing answers to a question or questions over a period of three weeks. The answer(s) will not exceed 10,000 words, excluding the bibliography, abstract, figures and tables. In the oral component of the Examination, which normally lasts no longer than three hours, the student defends the written document. The topics to be covered and the format of the Examination are determined by the student's Comprehensive Examination Committee, in consultation with the student. - The Comprehensive Examining Committee will consist of the student's <u>Supervisor plus three additional Examiners, all of whom must hold a PhD (or equivalent) degree. The supervisor, along with one of the committee members, must hold a faculty appointment inside the Department of Geography and Environmental Management and at least one of the two GEM members must hold a tenured or tenure-track position. Of the remaining two members, one must have a faculty appointment at the University of Waterloo but outside the Department of Geography and Environmental</u>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
	<u>Management</u> (normally, this person will be internal to the University of Waterloo).

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

Currently registered students can complete their degrees using the calendar requirements active at the time of their entry into the program. Most will have completed their course requirements prior to the active date for these changes. These calendar changes update the list of required courses, but retain the same number of required courses. Further, students currently registered in the program will already meet these revised course requirements in most cases.

Department/School approval date (mm/dd/yy): 09/20/24
Reviewed by GSPA (for GSPA use only) ☒ **date** (mm/dd/yy): 10/15/24
Faculty approval date (mm/dd/yy): 11/14/24
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: Doctor of Philosophy (PhD) in Geography - Water

Program contact name(s): Maria Strack

Form completed by: Maria Strack

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 program page in the GSAC to remove references to Wilfrid Laurier University (WLU) since the Waterloo/WLU joint program arrangement is being dissolved. Required courses are being updated to align with the PhD in Geography program that has been updated due to dissolution of the Joint Program with Wilfrid Laurier University.

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

Rationale for change(s):

Dissolution of the Joint Geography Program previously offered with Wilfrid Laurier University has resulted in some changes to course offerings. The PhD in Geography – Water program requirements are being updated to reflect these shifts in course offerings.

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#/programs/BJpek00on>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Admission requirements: Minimum requirements - A Master's degree in geography or equivalent, with at least an 80% average in all graduate work. - Exceptional students may be allowed to enter the PhD program directly from the Master's program. Such students must have completed all Master of Arts (MA)/Master of Environmental Studies (MES)/Master of Science (MSc) requirements except the thesis,	Admission requirements: Minimum requirements - A Master's degree in geography or equivalent, with at least an 80% average in all graduate work. - Exceptional students may be allowed to enter the PhD program directly from the Master's program. Such students must have completed all Master of Arts (MA)/Master of Environmental Studies (MES)/Master of Science (MSc) requirements except the thesis,

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
have demonstrated a superior academic record and satisfied other conditions (details of which can be obtained from the ~~Director of the Program~~). - English language proficiency (ELP) (if applicable) Degree requirements - Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM). Course requirements - Students must successfully complete the following graduate level courses (0.50 unit weight per course): ~~GEOG 800 Professional Skills Development for Doctoral Students~~ - Water core courses: - WATER 601 Integrated Water Management - WATER 602 Integrated Water Management Project - This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602). - Students who have already completed WATER 601 and WATER 602 as part of their Masters Water degree, must complete the following course requirement: 1 graduate level water course from outside the student's home Faculty agreed to by the student's Supervisor and the Collaborative Water Program Director. - Additional coursework may be assigned subject to the needs of individual students. - Failure to obtain a final grade of at least 77% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program.	have demonstrated a superior academic record and satisfied other conditions (details of which can be obtained from the <u>Graduate Officer</u>). - English language proficiency (ELP) (if applicable) Degree requirements - Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM). Course requirements - Students must successfully complete the following graduate level courses (0.50 unit weight per course): - GEOG800A – <u>Geographic Scholarship and Practice 1 - Doctoral (0.25)</u> - GEOG800B – <u>Geographic Scholarship and Practice 2 - Doctoral (0.25)</u> - Water core courses: - WATER 601 Integrated Water Management - WATER 602 Integrated Water Management Project - This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments in core interdisciplinary courses (WATER 601 and WATER 602). - Students who have already completed WATER 601 and WATER 602 as part of their Masters Water degree, must complete the following course requirement: 1 graduate level water course from outside the student's home Faculty agreed to by the student's Supervisor and the Collaborative Water Program Director. - Additional coursework may be assigned subject to the needs of individual students. - Failure to obtain a final grade of at least 77% in each course will result in an automatic review of the student's status in the program, which

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
PhD Comprehensive Examination - Students are required to meet the University-level PhD Comprehensive Examination minimum requirements. - In addition to the University-level PhD Comprehensive Examination minimum requirements, students in the PhD in Geography - Water program are also required to meet the following requirements: ~~The Comprehensive Examination includes both a written and an oral component. Normally the Examination involves the student writing answers to a question or questions over a period of three weeks. The answer(s) will not exceed 10,000 words, excluding the bibliography, abstract, figures and tables. In the oral component of the Examination, which normally lasts no longer than three hours, the student defends the written document. The topics to be covered and the format of the Examination are determined by the student's Comprehensive Examination Committee, in consultation with the student. With the approval of the Waterloo-Laurier Graduate Program in Geography Committee, alternative formats for the Comprehensive Examination process may be permitted, provided they meet the objectives of the Comprehensive Examination.~~ - The Comprehensive Examining Committee will consist of the student's ~~Advisor and~~ three additional Examiners, ~~one of whom will be from outside the Waterloo-Laurier Graduate Program in Geography~~ (normally, this person will be internal to the University of Waterloo). ~~The committee must contain at least two members of the Waterloo-Laurier Graduate Program in Geography. At least one member of the committee must be from the Geography Department at the University of Waterloo or Wilfred Laurier University.~~	may require that the student withdraw from the program. PhD Comprehensive Examination - Students are required to meet the University-level PhD Comprehensive Examination minimum requirements. - In addition to the University-level PhD Comprehensive Examination minimum requirements, students in the PhD in Geography - Water program are also required to meet the following requirements: - The Comprehensive Examination includes both a written and an oral component. Normally the Examination involves the student writing answers to a question or questions over a period of three weeks. The answer(s) will not exceed 10,000 words, excluding the bibliography, abstract, figures and tables. In the oral component of the Examination, which normally lasts no longer than three hours, the student defends the written document. The topics to be covered and the format of the Examination are determined by the student's Comprehensive Examination Committee, in consultation with the student. - The Comprehensive Examining Committee will consist of the student's <u>Supervisor plus three additional Examiners, all of whom must hold a PhD (or equivalent) degree. The supervisor, along with one of the committee members, must hold a faculty appointment inside the Department of Geography and Environmental Management and at least one of the two GEM members must hold a tenured or tenure-track position. Of the remaining two members, one must have a faculty appointment at the University of Waterloo but outside the Department of Geography and Environmental Management</u> (normally, this person will be internal to the University of Waterloo).

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

Currently registered students can complete their degrees using the calendar requirements active at the time of their entry into the program. Most will have completed their course requirements prior to the active date for these changes. These calendar changes update the list of required courses, but retain the same number of required courses. Further, students currently registered in the program will already meet these revised course requirements in most cases.

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/15/24

Faculty approval date (mm/dd/yy): 11/14/24

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

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

Consent/Minor Modifications

Motion/Package	total # program/course change forms	Unit
Adding HLTH 643 to “Global Health”	3	SPHS
MA Coursework Calendar Changes	1	RLS
HLTH 617 revising course description	1	SPHS
HLTH 649 splitting to HLTH 649A; and 649B new course	1	SPHS

SPHS- Adding HLTH 643 to “Global Health” (3)

Background and Rationale:

The Global Health field is of interest to students, but we have difficulties in supporting them to meet current field requirements due to courses being discontinued (as the result of retirements and teaching needs elsewhere in the department). HLTH 643 would make the field in Global Health more accessible and avoid the administrative burden of creating tailor-made field requirements for students.

Details:

Numerous copy changes in calendar which will make it easier for students to fulfill program requirements for the Global Health field.

RLS- MA Coursework Calendar Changes

Background and Rationale:

- 1) To change the admission requirements of the online MA coursework option from two “academic references” to two “academic or professional references”.
- 2) To change the course requirements for the online MA coursework degree from four required and four elective courses to six required courses and two elective courses.
- 3) To change REC 621 Cultivating Justice in Practice and REC 641 Community Relations and Stakeholder Engagement from elective courses to required courses in the online MA coursework option.

Details:

- 1) The online MA coursework option is designed to provide advance training for recent graduates, international students, and working professionals. Accepting both academic and professional references as part of the admission requirements is more equitable for those applicants working in the field and potentially removed from academic study for several years.
- 2) Currently, the online MA coursework option requires completion of four required courses (REC 600, REC 601, REC 611, and REC 620) and four elective courses. The proposed changes (items 2 and 3 above) are to change these requirements to include six required courses (REC 600, REC 601, REC 611, REC 620, REC 621, and REC 641) and two elective courses. These changes to the course requirements for the MA coursework option will allow the degree option to have a

greater and more consistent focus on recreation and leisure leadership topics and issues, while retaining some flexibility for students to explore their specific areas of interest through electives. The new required courses (REC 621 and REC 641) reflect core areas of our department's expertise and relate to critical knowledge, skills, and values that are shaping professional practice.

HLTH 617 revising course description

Background and Rationale:

- This course is no longer a capstone – this statement is removed.
- Description of content has been revised to be clearer, and explicitly reflect the content of the two CEPH competencies this course addresses (7. Assess population needs, assets and capacities that affect communities' health; 9. Design a population-based policy, program, project or intervention).

Details

OLD DESCRIPTION:

The first of two capstone courses in the MPH program, this course presents the principles and methods for the effective design, selection and implementation of public health interventions to address environmental, social, and behavioural risk factors. Students will determine when interventions are justified; differentiate between individual and population level interventions; describe various types of interventions; use theory and evidence to select and design interventions including the appropriate mixes of intervention types, sites, and delivery systems. Emphasis is placed on developing a final project that integrates methods, concepts and theories in public health through reading and problem-based learning.

NEW DESCRIPTION:

This course covers the principles and methods for effectively designing, selecting, and implementing public health interventions that address environmental, social, and behavioural risk factors, in order to improve population health. Students will determine when interventions are justified, including by assessing specific communities' needs, assets, capacities, and desired health outcomes. Students will also differentiate between individual and population level interventions; explore various types of interventions; and use theory and evidence to design population-based interventions. Emphasis is placed on integrating and applying methods, concepts, and theories.

HLTH 649 splitting to HLTH 649A

Background and Rationale:

We are adding the "A" to 649 because we are developing a second modular course HLTH 649B (6wks modular) and we need to divide the course into 649A and 649B.

This is a new modular course (6 weeks) proposed as a core module for the MHI program in light of recent developments in artificial intelligence and big data applications in healthcare and public health. This course is also a foundational component of AI literacy for all graduate programs in the School of Public Health, including MHI, MPH, MHE, MSc and PhD programs.

Students will be exposed to some of the most significant challenges that individuals and society are likely to face as a result of emerging digital technologies and AI applications. Students will develop the ability to spot and analyze ethical issues and articulate their values and opinions and respectfully address contrary values and opinions, both orally and in writing. This course will equip students to confidently advocate positions to those responsible for designing or developing the next generation of digital technologies and AI applications, those who will be analyzing the inputs and outputs of those technologies and applications, and/or those who will be creating the regulatory frameworks and public policies surrounding those technologies and applications.

Topics to be addressed in this course include, but are not limited to: (i) what current and proposed laws and regulations exist for the protection of privacy of patients and other persons in the area of digital health and AI; (ii) what ethical considerations AI and big data implicate and how we can best align new technologies with human values; (iii) what being an ethical data scientist means; (iv) what generative AI can be expected to do in the reasonably foreseeable future, and whether this poses existential or other risks; (v) the impact of bias and discrimination in data, algorithms, and developers; and (vi) whether privacy can co-exist in a data-driven world.

[New HLTH 649B](#)

This is a new modular course (6 weeks) proposed as a core module for the MHI program. Leadership and change management for digital transformation have been identified as a knowledge gap that exists in the current MHI curriculum. This course is designed to fill this gap by providing students with leadership skills and tools to plan and implement digital health projects at national, provincial and local levels.

Students will be exposed to key aspects of digital health initiatives/projects at national, provincial and local levels. They will develop leadership qualities essential for driving digital transformation, such as strategic thinking, communication, and decision-making.

Topics to be addressed in this course include, but are not limited to (i) Exploration of the responsibilities and challenges faced by innovation leaders in the health environment, including strategic planning and overseeing the implementation of health information systems; (ii) Techniques for assessing and prioritizing the technological needs of digital health projects, including stakeholder analysis and needs assessment methodologies. (iii) Strategies for leading change in a complex environment, including overcoming resistance, fostering a culture of innovation, and implementing new technologies successfully; (iv) Fundamental principles of project management as they apply to health informatics projects, including planning, execution, monitoring, and closure; and (v) Understanding the financial aspects of digital health projects, including cost-benefit analysis, ROI calculations, and budget management.

Learning in this course can benefit students in all graduate programs in the School of Public Health, including MHI, MPH, MHE, MSc and PhD programs.

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: Health

Effective date: Term: Spring 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: HLTH

Course number: 643

Course ID: TBD

Course title (max. 100 characters including spaces): Global Health Innovation

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: Innovation is needed to address some of the world's biggest global health challenges. This course will explore the development, implementation, and evaluation of new ideas and approaches to address contemporary global health needs. Emphasis will be placed on interdisciplinary, multi-sectoral, and community-engaged efforts to achieve health equity. Held with HLTH 403.

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

Primary meet type: Lecture

Delivery mode: On-campus

Requisites: HLHT 403

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: HLTH 403

Rationale for request: *This graduate level course will be held with the current undergraduate level global health course HLTH 403. Global health is an area of interest for many graduate students in SPHS. However, due to retirements, we no longer offer two of the courses taken by students and also used by students to meet the field in Global Health for SPHS PhD and MSc programs. This course will allow existing and future students to engage further with global health content and the course will be included in the field program requirements.*

Form completed by: Megan Aikens

Department/School approval date (06/12/24):

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 05/29/24

Faculty approval date (mm/dd/yy): 10/25/24

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: Health

Program: Master of Science (MSc) in Public Health Sciences

Program contact name(s): Samantha Meyer

Form completed by: Samantha Meyer

Description of proposed changes:

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

Adding HLTH 643 to the list of courses associated with the Graduate Research Field in Global Health.

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

Rationale for change(s):

The Global Health field is of interest to students, but we have difficulties in supporting them to meet current field requirements due to courses being discontinued (as the result of retirements and teaching needs elsewhere in the department). HLTH 643 would make the field in Global Health more accessible and avoid the administrative burden of creating tailor-made field requirements for students.

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#/programs/BJZagJRCsh>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Degree requirements Course requirements - The normal minimum requirement will be 5 one-term (0.50 unit weight) graduate courses (3 required and 2 free electives or approved equivalents): - Required courses:	Degree requirements Course requirements - The normal minimum requirement will be 5 one-term (0.50 unit weight) graduate courses (3 required and 2 free electives or approved equivalents): - Required courses:

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
▪ HLTH 601 Lifespan Determinants of Health and Disease - o 2 of the following: ▪ HLTH 605A Regression Models (or equivalent) or HLTH 705 Advanced Statistical Methods for Analyzing Public Health and Health Systems Data* ▪ HLTH 606A Epidemiological Methods (or equivalent) or HLTH 706 Advanced Epidemiological Methods* ▪ HLTH 619 Fundamental Research Methods in Health Informatics (or equivalent) or HLTH 719 Advanced Research Methods in Health Data Science* ▪ HLTH 625 Foundations of Qualitative Research Methodologies (or equivalent) or HLTH 704 Advanced Qualitative Methods for Health Research* - o Elective courses: ▪ 2 free elective courses, selected in consultation with the supervisor (may include courses outside of the School of Public Health Sciences (SPHS), or any courses offered by the SPHS, including additional courses from the required list, online courses, etc.) ▪ *It is highly recommended that MSc students with a strong background or previous training in one of these areas take the 700-level equivalent in place of the 600-level course requirement (e.g., those with a strong statistical background may opt to take HLTH 705). Such decisions should be made in collaboration with the supervisor. • At a minimum, students must obtain an average of 75% or higher in aggregate on the courses presented in fulfilment of the degree requirements. Grades on all courses presented to fulfill the degree requirements must be 70% or higher. A grade below 70% in any course or failing to maintain an average of 75% will necessitate a review of the student's status by the School and may result in a student being	▪ HLTH 601 Lifespan Determinants of Health and Disease - o 2 of the following: ▪ HLTH 605A Regression Models (or equivalent) or HLTH 705 Advanced Statistical Methods for Analyzing Public Health and Health Systems Data* ▪ HLTH 606A Epidemiological Methods (or equivalent) or HLTH 706 Advanced Epidemiological Methods* ▪ HLTH 619 Fundamental Research Methods in Health Informatics (or equivalent) or HLTH 719 Advanced Research Methods in Health Data Science* ▪ HLTH 625 Foundations of Qualitative Research Methodologies (or equivalent) or HLTH 704 Advanced Qualitative Methods for Health Research* - o Elective courses: ▪ 2 free elective courses, selected in consultation with the supervisor (may include courses outside of the School of Public Health Sciences (SPHS), or any courses offered by the SPHS, including additional courses from the required list, online courses, etc.) ▪ *It is highly recommended that MSc students with a strong background or previous training in one of these areas take the 700-level equivalent in place of the 600-level course requirement (e.g., those with a strong statistical background may opt to take HLTH 705). Such decisions should be made in collaboration with the supervisor. • At a minimum, students must obtain an average of 75% or higher in aggregate on the courses presented in fulfilment of the degree requirements. Grades on all courses presented to fulfill the degree requirements must be 70% or higher. A grade below 70% in any course or failing to maintain an average of 75% will necessitate a review of the student's status by the School and may result in a student being

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
required to complete additional coursework or being required to withdraw from the program. The School reserves the right to stipulate additional coursework if it is necessary for the student's preparation. - Students in the MSc in Public Health Sciences program may also wish to pursue one of the following Graduate Research Fields: 1. Aging and Health 2. Epidemiology and Biostatistics 3. Global Health 4. Health and Environment 5. Health Evaluation 6. Health Informatics 7. Work and Health - 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 and a set of courses that together provide an in-depth study in the area of the Graduate Research Field. A student will only obtain the Graduate Research Field on their transcript if they have completed the requirements associated with the MSc degree and the requirements associated with the Graduate Research Field. - All MSc Graduate Research Fields in the SPHS consist of Graduate Studies Seminars I and II, a Master's Thesis that is confirmed by the SPHS to be in the chosen Graduate Research Field, and a set of 5 graduate (0.50 weight) level courses. This set of courses is comprised of a mix of required and elective courses. Required courses are those that are prescribed as part of the Graduate Research Field. Elective courses are those that are on a list of courses designated as electives for a given Graduate Research Field. - For any of the Graduate Research Fields below, a directed studies course (HLTH 620 or HLTH 720) focused on the Graduate Research Field or an appropriate alternate course may replace a required or elective course, with the approval of the Associate Director, Graduate Programs, School of Public Health Sciences. - The course requirements for each of the Graduate Research Fields are described below. 3. Graduate Research Field in Global Health	required to complete additional coursework or being required to withdraw from the program. The School reserves the right to stipulate additional coursework if it is necessary for the student's preparation. - Students in the MSc in Public Health Sciences program may also wish to pursue one of the following Graduate Research Fields: 1. Aging and Health 2. Epidemiology and Biostatistics 3. Global Health 4. Health and Environment 5. Health Evaluation 6. Health Informatics 7. Work and Health - 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 and a set of courses that together provide an in-depth study in the area of the Graduate Research Field. A student will only obtain the Graduate Research Field on their transcript if they have completed the requirements associated with the MSc degree and the requirements associated with the Graduate Research Field. - All MSc Graduate Research Fields in the SPHS consist of Graduate Studies Seminars I and II, a Master's Thesis that is confirmed by the SPHS to be in the chosen Graduate Research Field, and a set of 5 graduate (0.50 weight) level courses. This set of courses is comprised of a mix of required and elective courses. Required courses are those that are prescribed as part of the Graduate Research Field. Elective courses are those that are on a list of courses designated as electives for a given Graduate Research Field. - For any of the Graduate Research Fields below, a directed studies course (HLTH 620 or HLTH 720) focused on the Graduate Research Field or an appropriate alternate course may replace a required or elective course, with the approval of the Associate Director, Graduate Programs, School of Public Health Sciences. - The course requirements for each of the Graduate Research Fields are described below. 3. Graduate Research Field in Global Health

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
• Students must successfully complete 3 required courses and 2 elective courses. An assessment of whether or not the student's thesis warrants the Global Health Graduate Research Field designation will be completed by the SPHS. - o Required courses: ▪ HLTH 601 Lifespan Determinants of Health and Disease ▪ HLTH 632 Health Economics and Public Health ▪ HLTH 662 Global Health - o Elective courses: ▪ Select 2 from the following list: ▪ HLTH 605A Regression Models ▪ HLTH 606A Epidemiological Methods ▪ HLTH 619 Fundamental Research Methods in Health Informatics ▪ HLTH 625 Foundations of Qualitative Research Methodologies or HLTH 652 Qualitative Methods and Analysis ▪ Select 1 from the following list (these courses are global-health focused in all examples and assignments): ▪ HLTH 611 The Health Care System ▪ HLTH 632 Health Economics and Public Health	• Students must successfully complete 3 required courses and 2 elective courses. An assessment of whether or not the student's thesis warrants the Global Health Graduate Research Field designation will be completed by the SPHS. - o Required courses: ▪ HLTH 601 Lifespan Determinants of Health and Disease ▪ HLTH 632 Health Economics and Public Health ▪ HLTH 662 Global Health - o Elective courses: ▪ Select 2 from the following list: ▪ HLTH 605A Regression Models ▪ HLTH 606A Epidemiological Methods ▪ HLTH 619 Fundamental Research Methods in Health Informatics ▪ HLTH 625 Foundations of Qualitative Research Methodologies or HLTH 652 Qualitative Methods and Analysis ▪ Select 1 from the following list (these courses are global-health focused in all examples and assignments): ▪ HLTH 611 The Health Care System ▪ HLTH 632 Health Economics and Public Health ▪ <u>HLTH 643 Global Health Innovation</u>

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

This will make it easier for students to fulfill program requirements for the Global Health field.

Department/School approval date (06/12/24):

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 05/29/24

Faculty approval date (mm/dd/yy): 10/25/24

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: Health

Program: Doctor of Philosophy (PhD) in Public Health Sciences

Program contact name(s): Samantha Meyer

Form completed by: Samantha Meyer

Description of proposed changes:

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

Adding HLTH 643 to the list of courses associated with the Graduate Research Field in Global Health.

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

Rationale for change(s):

The Global Health field is of interest to students, but we have difficulties in supporting them to meet current field requirements due to courses being discontinued (as the result of retirements and teaching needs elsewhere in the department). HLTH 643 would make the field in Global Health more accessible and avoid the administrative burden of creating tailor-made field requirements for students.

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#/programs/ryQ6lyRCs3>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Degree requirements Course requirements 9 one-term graduate courses beyond the Bachelor's degree, including at least 4 courses (2 required and 2 electives) beyond the Master's degree, is the normal minimum requirement. - Required courses (2):	Degree requirements Course requirements 9 one-term graduate courses beyond the Bachelor's degree, including at least 4 courses (2 required and 2 electives) beyond the Master's degree, is the normal minimum requirement. - Required courses (2):

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
- o HTLH 701 Interdisciplinary Seminar in Public Health and Health Systems - o 1 of the following required methods courses: ▪ HLTH 704 Advanced Qualitative Methods for Health Research ▪ HLTH 705 Advanced Statistical Methods for Analyzing Public Health and Health Systems Data ▪ HLTH 706 Advanced Epidemiological Methods ▪ HLTH 719 Advanced Research Methods in Health Data Science • Elective courses (2): - o 1 methods elective course at the 600-or 700-level, selected in consultation with the supervisor (may include courses outside the SPHS), or courses offered by SPHS, including additional courses from the required course list. - o 1 additional elective, selected in consultation with the supervisor. Students without a background in public health and health systems, and focusing in research areas other than Health Informatics, should take HLTH 601 Lifespan Determinants of Health and Disease. Students focusing in Health Informatics may choose to take HLTH 611 The Health Care System or an equivalent course approved by the SPHS Graduate Officer. • Plus other free electives as may be required - o It is important to keep in mind that these are minimum requirements. Many students complete at least three courses within their area of research interest, which may require the addition of one or more extra courses to the minimum coursework requirement. • At a minimum, students must obtain an average of 75% or higher in aggregate on the courses presented in fulfilment of the degree requirements. Grades on all courses presented to fulfill the degree requirements must be 70% or higher. A grade below 70% in any course or failing to maintain an average of 75% will necessitate a review of the student's status by the School and may result in a student being required to complete additional coursework or being required to withdraw from the program. The School reserves the right to stipulate additional coursework if it is necessary for the student's preparation.	- o HTLH 701 Interdisciplinary Seminar in Public Health and Health Systems - o 1 of the following required methods courses: ▪ HLTH 704 Advanced Qualitative Methods for Health Research ▪ HLTH 705 Advanced Statistical Methods for Analyzing Public Health and Health Systems Data ▪ HLTH 706 Advanced Epidemiological Methods ▪ HLTH 719 Advanced Research Methods in Health Data Science • Elective courses (2): - o 1 methods elective course at the 600-or 700-level, selected in consultation with the supervisor (may include courses outside the SPHS), or courses offered by SPHS, including additional courses from the required course list. - o 1 additional elective, selected in consultation with the supervisor. Students without a background in public health and health systems, and focusing in research areas other than Health Informatics, should take HLTH 601 Lifespan Determinants of Health and Disease. Students focusing in Health Informatics may choose to take HLTH 611 The Health Care System or an equivalent course approved by the SPHS Graduate Officer. • Plus other free electives as may be required - o It is important to keep in mind that these are minimum requirements. Many students complete at least three courses within their area of research interest, which may require the addition of one or more extra courses to the minimum coursework requirement. • At a minimum, students must obtain an average of 75% or higher in aggregate on the courses presented in fulfilment of the degree requirements. Grades on all courses presented to fulfill the degree requirements must be 70% or higher. A grade below 70% in any course or failing to maintain an average of 75% will necessitate a review of the student's status by the School and may result in a student being required to complete additional coursework or being required to withdraw from the program. The School reserves the right to stipulate additional coursework if it is necessary for the student's preparation.

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
- Students in the PhD in Public Health Sciences program may also wish to pursue one of the following Graduate Research Fields: 1. Aging and Health 2. Epidemiology and Biostatistics 3. Global Health 4. Health and Environment 5. Health Evaluation 6. Health Informatics 7. Work and Health - 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 and a set of courses that together provide an in-depth study in the area of the Graduate Research Field. A student will only obtain the Graduate Research Field on their transcript if they have completed the requirements associated with the PhD degree and the requirements associated with the Graduate Research Field. - All PhD Graduate Research Fields in the SPHS consist of a Comprehensive Examination, a PhD Thesis that is confirmed by the SPHS to be in the chosen Graduate Research Field, and a set of 4 graduate (0.50 weight) level courses. This set of courses is comprised of a mix of required and elective courses. Required courses are those that are prescribed as part of the Graduate Research Field. Elective courses are those that are on a list of courses designated as electives for a given Graduate Research Field. - Students who have completed the MSc in Public Health Sciences and obtained a Graduate Research Field can obtain the same or another Field or (by taking the applicable required/elective courses) as part of their PhD program. - For any of the Graduate Research Fields below, a directed studies course (HLTH 620 or HLTH 720) focused on the Graduate Research Field or an appropriate alternate course may replace a required or elective course, with the approval of the Associate Director, Graduate Programs, School of Public Health Sciences. - The course requirements for the Graduate Research Fields are described below. 3. Graduate Research Field in Global Health	- Students in the PhD in Public Health Sciences program may also wish to pursue one of the following Graduate Research Fields: 1. Aging and Health 2. Epidemiology and Biostatistics 3. Global Health 4. Health and Environment 5. Health Evaluation 6. Health Informatics 7. Work and Health - 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 and a set of courses that together provide an in-depth study in the area of the Graduate Research Field. A student will only obtain the Graduate Research Field on their transcript if they have completed the requirements associated with the PhD degree and the requirements associated with the Graduate Research Field. - All PhD Graduate Research Fields in the SPHS consist of a Comprehensive Examination, a PhD Thesis that is confirmed by the SPHS to be in the chosen Graduate Research Field, and a set of 4 graduate (0.50 weight) level courses. This set of courses is comprised of a mix of required and elective courses. Required courses are those that are prescribed as part of the Graduate Research Field. Elective courses are those that are on a list of courses designated as electives for a given Graduate Research Field. - Students who have completed the MSc in Public Health Sciences and obtained a Graduate Research Field can obtain the same or another Field or (by taking the applicable required/elective courses) as part of their PhD program. - For any of the Graduate Research Fields below, a directed studies course (HLTH 620 or HLTH 720) focused on the Graduate Research Field or an appropriate alternate course may replace a required or elective course, with the approval of the Associate Director, Graduate Programs, School of Public Health Sciences. - The course requirements for the Graduate Research Fields are described below. 3. Graduate Research Field in Global Health

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
• Students must successfully complete 2 required courses and 2 elective courses. An assessment of whether or not the student's thesis warrants the Global Health Graduate Research Field designation will be completed by the SPHS. - o Required courses: ▪ HLTH 662 Global Health (or equivalent) ▪ HLTH 701 Interdisciplinary Seminar in Public Health and Health Systems - o Elective courses: ▪ Select 1 from the following list: ▪ HLTH 704 Advanced Qualitative Methods for Health Research ▪ HLTH 705 Advanced Statistical Methods for Analyzing Public Health and Health Systems Data ▪ HLTH 706 Advanced Epidemiological Methods ▪ HLTH 719 Advanced Research Methods in Health Data Science ▪ Select 1 from the following list (these courses are global-health focused in all examples and assignments): ▪ HLTH 632 Health Economics and Public Health ▪ HLTH 654 Systems Thinking and Analysis in Health Program Planning and Evaluation	• Students must successfully complete 2 required courses and 2 elective courses. An assessment of whether or not the student's thesis warrants the Global Health Graduate Research Field designation will be completed by the SPHS. - o Required courses: ▪ HLTH 662 Global Health (or equivalent) ▪ HLTH 701 Interdisciplinary Seminar in Public Health and Health Systems - o Elective courses: ▪ Select 1 from the following list: ▪ HLTH 704 Advanced Qualitative Methods for Health Research ▪ HLTH 705 Advanced Statistical Methods for Analyzing Public Health and Health Systems Data ▪ HLTH 706 Advanced Epidemiological Methods ▪ HLTH 719 Advanced Research Methods in Health Data Science ▪ Select 1 from the following list (these courses are global-health focused in all examples and assignments): ▪ HLTH 632 Health Economics and Public Health ▪ HLTH 654 Systems Thinking and Analysis in Health Program Planning and Evaluation ▪ <u>HLTH 643 Global Health Innovation</u>

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

This will make it easier for students to fulfill program requirements for the Global Health field.

Department/School approval date (06/12/24):

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 05/29/24

Faculty approval date (mm/dd/yy): 10/25/24

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: Health

Program: Master of Arts (MA) in Recreation and Leisure Studies

Program contact name(s): Bryan Grimwood

Form completed by: Bryan Grimwood

Description of proposed changes:

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

- 1) To change the admission requirements of the online MA coursework option from two “academic references” to two “academic or professional references”.
- 2) To change the course requirements for the online MA coursework degree from four required and four elective courses to six required courses and two elective courses.
- 3) To change REC 621 Cultivating Justice in Practice and REC 641 Community Relations and Stakeholder Engagement from elective courses to required courses in the online MA coursework option.

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

Rationale for change(s):

- 1) The online MA coursework option is designed to provide advance training for recent graduates, international students, and working professionals. Accepting both academic and professional references as part of the admission requirements is more equitable for those applicants working in the field and potentially removed from academic study for several years.
- 2) Currently, the online MA coursework option requires completion of four required courses (REC 600, REC 601, REC 611, and REC 620) and four elective courses. The proposed changes (items 2 and 3 above) are to change these requirements to include six required courses (REC 600, REC 601, REC 611, REC 620, REC 621, and REC 641) and two elective courses. These changes to the course requirements for the MA coursework option will allow the degree option to have a greater and more consistent focus on recreation and leisure leadership topics and issues, while retaining some flexibility for students to explore their specific areas of interest through electives. The new required courses (REC 621 and REC 641) reflect core areas of our department's expertise and relate to critical knowledge, skills, and values that are shaping professional practice.

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#/programs/Sy4pg1CAjh>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Admission requirements • Minimum requirements - o A four-year honours bachelor's degree (or equivalent) in Recreation and Leisure Studies or related field with at least a 75% standing. If the overall undergraduate average is below 75%, consideration may be given to the applicant's performance during the final year of academic work. - o Competency in written expression, including evidence of ability to conceptualize, organize ideas and reason. • Application materials - o Résumé/Curriculum vitae ▪ Indicating past academic and professional experience. - o Supplementary information form - o Transcript(s) - o Writing sample ▪ Applicants must submit at least one substantial example of their work completed during the last two years of academic study. Students with professional experience may submit a professional report of which they were the sole or senior author. • References - o Number of references: 2 - o Type of references: academic • English language proficiency (ELP) (if applicable) Degree requirements Thesis option: • Graduate Academic Integrity Module (Graduate AIM) • Courses - o Students must complete the following 5 (0.50 unit weight) courses: ▪ REC 600 Integrative Seminar in Recreation and Leisure Studies ▪ REC 662 Quantitative Inquiry	Admission requirements • Minimum requirements - o A four-year honours bachelor's degree (or equivalent) in Recreation and Leisure Studies or related field with at least a 75% standing. If the overall undergraduate average is below 75%, consideration may be given to the applicant's performance during the final year of academic work. - o Competency in written expression, including evidence of ability to conceptualize, organize ideas and reason. • Application materials - o Résumé/Curriculum vitae ▪ Indicating past academic and professional experience. - o Supplementary information form - o Transcript(s) - o Writing sample ▪ Applicants must submit at least one substantial example of their work completed during the last two years of academic study. Students with professional experience may submit a professional report of which they were the sole or senior author. • References - o Number of references: 2 - o Type of references: academic <u>for Thesis option; academic and professional for Coursework option</u> • English language proficiency (ELP) (if applicable) Degree requirements Thesis option: • Graduate Academic Integrity Module (Graduate AIM) • Courses - o Students must complete the following 5 (0.50 unit weight) courses:

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
▪ REC 663 Qualitative Inquiry ▪ 1 of REC 672 Quantitative Research Data Analysis and Interpretation or REC 673 Designing Advanced Qualitative Inquiry ▪ At least 1 other elective graduate course from within or outside the Department. Graduate courses must be selected in consultation with, and approved by, the student's supervisor or advisor. - o All graduate courses except those designated in this Calendar as CR/NCR must be assigned a numerical grade. Any student who registers for a course in a department outside the Faculty of Health must receive a numerical grade for the course. Unless the course is designated CR/NCR in the Graduate Calendar, the student must ask the instructor to submit a numerical grade. The student must clarify this requirement with the instructor within the first two weeks of each term. - o Students must obtain an average of at least 72% in the set of courses which they present in fulfillment of course requirements for any graduate degree. Unsatisfactory academic performance in any one course will result in a review of the candidate's status by the departmental Graduate Committee. If a student with a failed course is permitted to continue, additional work may be required to clear the failure in that course, or by replacement of the failed course. Alternatively, the student may be required to repeat part or all of the program. • Master's Thesis - o For the MA thesis proposal, the committee consists of at least one faculty member in addition to the supervisor appointed in the student's department, both of whom have academic appointments. The committee member may be drawn from the faculty members of any other department within the University if such an individual has a special contribution to make to the research process or may also have an adjunct appointment with	▪ REC 600 Integrative Seminar of Recreation and Leisure ▪ REC 662 Quantitative Inquiry ▪ REC 663 Qualitative Inquiry ▪ 1 of REC 672 Quantitative Research Data Analysis and Interpretation or REC 673 Designing Advanced Qualitative Inquiry ▪ At least 1 other elective graduate course from within or outside the Department. Graduate courses must be selected in consultation with, and approved by, the student's supervisor or advisor. - o All graduate courses except those designated in this Calendar as CR/NCR must be assigned a numerical grade. Any student who registers for a course in a department outside the Faculty of Health must receive a numerical grade for the course. Unless the course is designated CR/NCR in the Graduate Calendar, the student must ask the instructor to submit a numerical grade. The student must clarify this requirement with the instructor within the first two weeks of each term. - o Students must obtain an average of at least 72% in the set of courses which they present in fulfillment of course requirements for any graduate degree. Unsatisfactory academic performance in any one course will result in a review of the candidate's status by the departmental Graduate Committee. If a student with a failed course is permitted to continue, additional work may be required to clear the failure in that course, or by replacement of the failed course. Alternatively, the student may be required to repeat part or all of the program. • Master's Thesis - o For the MA thesis proposal, the committee consists of at least one faculty member in addition to the supervisor appointed in the student's department, both of whom have academic appointments. The committee member may be drawn from the faculty members of any other department within the University if such

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
the department. The thesis supervisory committee must be approved by the Associate Chair for Graduate Studies. - o For the final MA defense, an independent reader (selected by the supervisor in consultation with the student and the Associate Chair for Graduate Studies) and an independent chair (assigned by the Associate Chair for Graduate Studies) will be added. Normally, the independent reader should have an academic appointment. At least two members of the final thesis committee must be from the student's department (i.e., full-time academic appointment or adjunct appointment in the department). Coursework option: • Graduate Academic Integrity Module (Graduate AIM) • Courses - o Required courses ▪ REC 600 Integrative Seminar in Recreation and Leisure ▪ REC 601 Methods and Analysis for Evaluation ▪ REC 611 Leading Organizations ▪ REC 620 Program Evaluation in Recreation and Sport - o Elective courses ▪ 4-elective graduate courses from within or outside the Department. - o All graduate courses except those designated in this Calendar as CR/NCR must be assigned a numerical grade. Any student who registers for a course in a department outside the Faculty of Health must receive a numerical grade for the course. Unless the course is designated CR/NCR in the Graduate Calendar, the student must ask the instructor to submit a numerical grade. The student must clarify this requirement with the instructor within the first two weeks of each term. - o Students must obtain an average of at least 72% in the set of courses which they present in fulfillment of course requirements for any graduate degree. Unsatisfactory academic performance	an individual has a special contribution to make to the research process or may also have an adjunct appointment with the department. The thesis supervisory committee must be approved by the Associate Chair for Graduate Studies. - o For the final MA defense, an independent reader (selected by the supervisor in consultation with the student and the Associate Chair for Graduate Studies) and an independent chair (assigned by the Associate Chair for Graduate Studies) will be added. Normally, the independent reader should have an academic appointment. At least two members of the final thesis committee must be from the student's department (i.e., full-time academic appointment or adjunct appointment in the department). Coursework option: • Graduate Academic Integrity Module (Graduate AIM) • Courses - o Required courses ▪ REC 600 Integrative Seminar in Recreation and Leisure ▪ REC 601 Methods and Analysis for Evaluation ▪ REC 611 Leading Organizations ▪ REC 620 Program Evaluation in Recreation and Sport ▪ <u>REC 621 Cultivating Justice in Practice</u> ▪ <u>REC 641 Community Relations and Stakeholder Engagement</u> - o Elective courses ▪ <u>2</u> elective graduate courses from within or outside the Department. - o All graduate courses except those designated in this Calendar as CR/NCR must be assigned a numerical grade. Any student who registers for a course in a department outside the Faculty of Health must receive a numerical grade for the course. Unless the course is designated CR/NCR in the Graduate Calendar, the student must ask the instructor to submit a numerical grade. The student must clarify this

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
in any one course will result in a review of the candidate's status by the departmental Graduate Committee. If a student with a failed course is permitted to continue, additional work may be required to clear the failure in that course, or by replacement of the failed course. Alternatively, the student may be required to repeat part or all of the program.	- o requirement with the instructor within the first two weeks of each term. - o Students must obtain an average of at least 72% in the set of courses which they present in fulfillment of course requirements for any graduate degree. Unsatisfactory academic performance in any one course will result in a review of the candidate's status by the departmental Graduate Committee. If a student with a failed course is permitted to continue, additional work may be required to clear the failure in that course, or by replacement of the failed course. Alternatively, the student may be required to repeat part or all of 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 apply only to students admitted to the MA coursework option as of Fall 2025.

Department/School approval date (10/04/2024):
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/25/24
Faculty approval date (mm/dd/yy): 11/21/24
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: Health

Effective date: Term: Spring 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*):
To be revised: course description

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

Course subject code: HLTH

Course number: 617

Course ID: 012533

Course title (max. 100 characters including spaces): Population Intervention for Disease Prevention and Health Promotion

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

OLD DESCRIPTION:

The first of two capstone courses in the MPH program, this course presents the principles and methods for the effective design, selection and implementation of public health interventions to address environmental, social, and behavioural risk factors. Students will determine when interventions are justified; differentiate between individual and population level interventions; describe various types of interventions; use theory and evidence to select and design interventions including the appropriate mixes of intervention types, sites, and delivery systems. Emphasis is placed on developing a final project that integrates methods, concepts and theories in public health through reading and problem-based learning.

NEW DESCRIPTION:

This course covers the principles and methods for effectively designing, selecting, and implementing public health interventions that address environmental, social, and behavioural risk factors, in order to improve population health. Students will determine when interventions are justified, including by assessing specific communities' needs, assets, capacities, and desired health outcomes. Students will also differentiate between individual and population level interventions; explore various types of interventions; and use theory and evidence to design population-based interventions. Emphasis is placed on integrating and applying methods, concepts, and theories.

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

Primary meet type: Lecture

Delivery mode: Only offered online

Requisites: Enrolled in Master of Health Evaluation (MHE), Master of Health Informatics (MHI), Master of Public Health (MPH), MSc in Public Health Sciences, MSc in Public Health Sciences-Water, PhD in Public Health Sciences, PhD in Public Health Sciences-Aging, Health & Well-Being, or PhD in Public Health Sciences-Water

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 is no longer a capstone – this statement is removed.
- Description of content has been revised to be clearer, and explicitly reflect the content of the two CEPH competencies this course addresses (7. Assess population needs, assets and capacities that affect communities' health; 9. Design a population-based policy, program, project or intervention).

Form completed by: Shannon Majowicz (course instructor, SPHS/HEALTH)

Department/School approval date (mm/dd/yy): 10/20/24

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

Faculty approval date (mm/dd/yy): 11/21/24

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: Health

Effective date: Term: Spring 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*):

Changing the HLTH 649 course number to **HLTH 649A**.

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

Course subject code: HLTH

Course number: 649A

Course ID: 016781

Course title (max. 100 characters including spaces): Ethics and Privacy Considerations for Digital Technology and AI in Health

Course short title (max. 30 characters including spaces): Ethics and Privacy in HI

Grading basis: Numerical

Course credit weight: 0.25

Course consent required: Not required

Course description: This course will explore the legal, ethical, and policy implications of the use of digital

technology, artificial intelligence and big data applications in healthcare and public health.

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

Primary meet type: Seminar

Delivery mode: On-campus and also offered online

Requisites: N/A

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:

We are adding the "A" to 649 because we are developing a second modular course HLTH 649B (6wks modular) and we need to divide the course into 649A and 649B.

This is a new modular course (6 weeks) proposed as a core module for the MHI program in light of recent developments in artificial intelligence and big data applications in healthcare and public health. This course is also a foundational component of AI literacy for all graduate programs in the School of Public Health, including MHI, MPH, MHE, MSc and PhD programs.

Students will be exposed to some of the most significant challenges that individuals and society are likely to face as a result of emerging digital technologies and AI applications. Students will develop the ability to spot and analyze ethical issues and articulate their values and opinions and respectfully address contrary values and opinions, both orally and in writing. This course will equip students to confidently advocate positions to those responsible for designing or developing the next generation of digital technologies and AI applications, those who will be analyzing the inputs and outputs of those technologies and applications, and/or those who will be creating the regulatory frameworks and public policies surrounding those technologies and applications.

Topics to be addressed in this course include, but are not limited to: (i) what current and proposed laws and regulations exist for the protection of privacy of patients and other persons in the area of digital health and AI; (ii) what ethical considerations AI and big data implicate and how we can best align new technologies with human values; (iii) what being an ethical data scientist means; (iv) what generative AI can be expected to do in the reasonably foreseeable future, and whether this poses existential or other risks; (v) the impact of bias and discrimination in data, algorithms, and developers; and (vi) whether privacy can co-exist in a data-driven world.

Form completed by: Maura Grossman and Michelle Fluit

Department/School approval date (mm/dd/yy): 09/18/24

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

Faculty approval date (mm/dd/yy): 11/21/24

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: Health

Effective date: Term: Spring 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: HLTH

Course number: 649B

Course ID: TBD

Course title (max. 100 characters including spaces): Leadership in Digital Health and Transformation

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

Grading basis: Numerical

Course credit weight: 0.25

Course consent required: Not required

Course description: This course equips students to effectively drive innovation and transformation in the rapidly evolving landscape of digital health. Students will engage in case studies and projects that simulate real-world digital health initiatives, learning essential leadership skills to identify business and clinical needs, manage change, and oversee budget and project management. Designed for future leaders in the field, this course offers practical insights and strategies to navigate and influence advancements in digital health.

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

Primary meet type: Seminar

Delivery mode: On-campus and also offered 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:

Sections combined/held with:

Rationale for request:

This is a new modular course (6 weeks) proposed as a core module for the MHI program. Leadership and change management for digital transformation have been identified as a knowledge gap that exists in the current MHI curriculum. This course is designed to fill this gap by providing students with leadership skills and tools to plan and implement digital health projects at national, provincial and local levels.

Students will be exposed to key aspects of digital health initiatives/projects at national, provincial and local levels. They will develop leadership qualities essential for driving digital transformation, such as strategic thinking, communication, and decision-making.

Topics to be addressed in this course include, but are not limited to (i) Exploration of the responsibilities and challenges faced by innovation leaders in the health environment, including strategic planning and overseeing the implementation of health information systems; (ii) Techniques for assessing and prioritizing the technological needs of digital health projects, including stakeholder analysis and needs assessment methodologies. (iii) Strategies for leading change in a complex environment, including overcoming resistance, fostering a culture of innovation, and implementing new technologies successfully; (iv) Fundamental principles of project management as they apply to health informatics projects, including planning, execution, monitoring, and closure; and (v) Understanding the financial aspects of digital health projects, including cost-benefit analysis, ROI calculations, and budget management.

Learning in this course can benefit students in all graduate programs in the School of Public Health, including MHI, MPH, MHE, MSc and PhD programs.

Form completed by: Helen Chen

Department/School approval date (mm/dd/yy): 09/20/2024

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

Faculty approval date (mm/dd/yy): 11/21/24

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

Mathematics Graduate Studies report

Motion 1: Calendar changes for Statistics and Actuarial Science

1.1 - Remove department consent and add a program level requisite for:

- ACTSC 895
- ACTSC 900
- ACTSC 969
- STAT 845
- STAT 900

1.2 - Remove instructor consent for:

- ACTSC 991
- STAT 946
- STAT 947

1.3 - Create the course STAT 903 High-Dimensional Probability

Motion 2: Calendar changes for Pure Mathematics

2.1 - Update/ change course description and title for PMATH 650

2.2 - Inactivate the course PMATH 651 Measure and Integration

2.3 - Create the courses:

- PMATH 655 Convex Analysis and Geometry
- PMATH 754 Fourier Analysis
- PMATH 757 Topological Dynamics and Ergodic Theory

Motion 3: Calendar changes for Data Science

3.1 - Change to the program requirement replacing core course option CS 631/ CS 638 with CS 738 for:

- Master of Data Science and Artificial Intelligence
- Master of Data Science and Artificial Intelligence Co-operative
- Master of Mathematics (MMath) in Data Science

These have been approved by the Mathematics Faculty Council on Tuesday, November 26, 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: Spring 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 department consent and adding a program level requisite.

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

Course subject code: ACTSC

Course number: 895

Course ID: 015699

Course title (max. 100 characters including spaces): Communications in Actuarial Science

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: This course is designed to develop students' oral and written communication skills, using examples from actuarial risk management. It includes elements of writing, and also reading and summarizing leading edge work in actuarial theory and practice. Presentations and collaborative work are used to develop essential communication skills in both academic and professional contexts.

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

Primary meet type: Lecture

Delivery mode: On-campus

Prerequisites: enrolled in Master of Mathematics (MMath) in Actuarial Science, Master of Mathematics (MMath) in Statistics, Master of Mathematics (MMath) in Biostatistics

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:

A program level restriction makes more sense than requiring consent as this course is intended to be open to all Actuarial Science, Statistics, and Biostatistics masters' students.

Form completed by: Heather McLaughlin

Department/School approval date (mm/dd/yy): 10/11/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy):

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: Spring 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 department consent and adding a program level requisite.

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

Course subject code: ACTSC

Course number: 900

Course ID: 015988

Course title (max. 100 characters including spaces): PhD Research Skills

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: This course acts as a capstone on the coursework based part of the PhD program and as a stepping stone to the PhD proposal and to research. It is aimed at developing research skills: critically reading published research, summarizing and synthesizing areas of research, writing and orally presenting summaries of

research problems, data sets and theoretical and applied results. The course is designed to be integrative across core areas of the student discipline.

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

Primary meet type: Lecture

Delivery mode: On-campus

Prerequisites: enrolled in Doctor of Philosophy (PhD) in Actuarial Science

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: STAT 900 (course revision form for the cross-listed STAT course also submitted)

Sections combined/held with:

Rationale for request:

A program level restriction makes more sense than requiring consent as this is a mandatory course for all PhD Actuarial Science students.

Form completed by: Heather McLaughlin

Department/School approval date (mm/dd/yy): 10/11/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy):

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: Spring 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 department consent and adding a program level requisite.

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

Course subject code: ACTSC

Course number: 969

Course ID: 016648

Course title (max. 100 characters including spaces): Stochastic Calculus for Quantitative Finance

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: The course provides an introduction to Itô calculus and stochastic processes in the context of quantitative finance. Topics include: quadratic variation, Itô formula, Itô differential equations, Brownian motion, geometric Brownian motion, martingales, connection between diffusion processes and partial differential equations, Girsanov transform.

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

Primary meet type: Lecture

Delivery mode: On-campus

Prerequisites: enrolled in Master of Quantitative Finance (MQF)

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:

A program level restriction makes more sense than requiring consent as this is a required course for all MQF students.

Form completed by: Heather McLaughlin

Department/School approval date (mm/dd/yy): 10/11/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy):

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: Spring 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 department consent and adding a program level requisite.

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

Course subject code: STAT

Course number: 845

Course ID: 015587

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

Course short title (max. 30 characters including spaces): Stat Concepts for Data Science

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: This is a foundational survey course designed for Data Science students who do not have an undergraduate degree in statistics. It provides an understanding and appreciation of the essential statistical concepts needed for Data Science. It has modular design with the following modules: probability for statistics, concepts of statistical inference, simulation and Monte Carlo methods, regression modelling, planning empirical

studies, and drawing conclusions from data. Emphasis will be on exposing students to the core concepts and illustrating them largely through examples.

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

Primary meet type: Lecture

Delivery mode: On-campus

Prerequisites: enrolled in Master of Data Science and Artificial Intelligence (MDSAI), Master of Data Science and Artificial Intelligence (MDSAI) - Co-operative Program (direct entry), Master of Mathematics (MMath) in Data Science

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:

A program level restriction makes more sense than requiring consent as this is a required course for MDSAI and MMath Data Science students.

Form completed by: Heather McLaughlin

Department/School approval date (mm/dd/yy): 10/11/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy):

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: Spring 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 department consent and adding a program level requisite.

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

Course subject code: STAT

Course number: 900

Course ID: 015988

Course title (max. 100 characters including spaces): PhD Research Skills

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: This course acts as a capstone on the coursework based part of the PhD program and as a stepping stone to the PhD proposal and to research. It is aimed at developing research skills: critically reading published research, summarizing and synthesizing areas of research, writing and orally presenting summaries of

research problems, data sets and theoretical and applied results. The course is designed to be integrative across core areas of the student discipline.

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

Primary meet type: Lecture

Delivery mode: On-campus

Prerequisites: enrolled in Doctor of Philosophy (PhD) in Statistics, Doctor of Philosophy (PhD) in Statistics - Biostatistics

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: ACTSC 900 (course revision form for the cross-listed ACTSC course also submitted)

Sections combined/held with:

Rationale for request:

A program level restriction makes more sense than requiring consent as this is a required course for all PhD Statistics and Biostatistics students.

Form completed by: Heather McLaughlin

Department/School approval date (mm/dd/yy): 10/11/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy):

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: Spring 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 instructor consent.

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

Course subject code: ACTSC

Course number: 991

Course ID: 000085

Course title (max. 100 characters including spaces): Topics in Actuarial Science

Course short title (max. 30 characters including spaces): Topics in Actuarial Science

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: Consult the schedule of classes for specific topics being offered.

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

Primary meet type: Lecture

Delivery mode: On-campus

Requisites: N/A

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:

Removal of consent from topics courses will increase the number of students that have access to them. For topics that should target a specific group of students, the department can set reserves to ensure that group has priority.

Form completed by: Heather McLaughlin

Department/School approval date (mm/dd/yy): 10/11/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy):

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: Spring 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 instructor consent.

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

Course subject code: STAT

Course number: 946

Course ID: 010557

Course title (max. 100 characters including spaces): Topics in Probability and Statistics

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: Topics of current interest.

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

Primary meet type: Lecture

Delivery mode: On-campus

Requisites: N/A

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:

Removal of consent from topics courses will increase the number of students that have access to them. For topics that should target a specific group of students, the department can set reserves to ensure that group has priority.

Form completed by: Heather McLaughlin

Department/School approval date (mm/dd/yy): 10/11/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy):

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: Spring 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 instructor consent.

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

Course subject code: STAT

Course number: 947

Course ID: 010558

Course title (max. 100 characters including spaces): Topics in Biostatistics

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: Topics of current interest.

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

Primary meet type: Lecture

Delivery mode: On-campus

Requisites: N/A

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:

Removal of consent from topics courses will increase the number of students that have access to them. For topics that should target a specific group of students, the department can set reserves to ensure that group has priority.

Form completed by: Heather McLaughlin

Department/School approval date (mm/dd/yy): 10/11/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy):

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: Fall 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: 903

Course ID: N/A

Course title (max. 100 characters including spaces): High-Dimensional Probability

Course short title (max. 30 characters including spaces): High-Dimensional Probability

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: An introductory course in high-dimensional probability and its applications. Topics will include: the concentration of measure phenomenon, isoperimetric and functional inequalities, and asymptotic and non-asymptotic random matrix theory. Applications may include empirical processes, dimension reduction, sparse models including compressed sensing, BBP transitions and high-dimensional PCA, mean-field methods, and optimization in high-dimensions.

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: N/A

Sections combined/held with: N/A

Rationale for request:

High-dimensional probability is a part of the theoretical core of modern data science, statistics, and machine learning, and aids our understanding high-dimensional phenomena in engineering, computer science, and the sciences more broadly. There currently is no regular course on this topic in the Faculty of Math. The area has been well established for at least a decade, and numerous textbooks on the subject targeting education at the graduate level have been created. Many comparable units at different institutions regularly offer courses with the same or similar title to cover this material. Numerous topics courses across the Faculty of Math, including several in SAS, have been offered over the past 5 years, and have been well attended.

Form completed by: Gregory Rice (Statistics and Actuarial Sciences, Associate Chair, Graduate Studies)

Department/School approval date (mm/dd/yy): 10/11/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 04/30/24

Faculty approval date (mm/dd/yy):

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: Spring 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 course title.

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

elements) Course subject code: PMATH

Course number: 650

Course ID: 013667

Course title (max. 100 characters including spaces):

Current Title: Lebesgue Integration and Fourier Analysis

Proposed Title: Measure Theory

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

Current Title: Lebesgue Integration and Fourier Analysis

Proposed Title: Measure Theory

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

Current course description: Lebesgue measure on the line, the Lebesgue integral, monotone and dominated convergence theorems, LP spaces, completeness and dense subspaces; separable Hilbert space, orthonormal bases; Fourier analysis on the circle, Dirichlet kernel, Riemann-Lebesgue lemma, Fejer's theorem and convergence of Fourier series.

Proposed course description: Review of Riemann integration. Measure spaces: sigma-algebras, Borel sets, outer measure, Caratheodory condition, Lebesgue-Stieltjes measures, translation invariance and regularity of Lebesgue measure. Measurable functions: simple approximation, Egorov's and Lusin's theorems. Integration: monotone convergence theorem, Fatou's lemma, Lebesgue dominated convergence theorem. Signed measures: Hahn and Jordan decompositions, absolute continuity of measures, Radon-Nikodym theorem. Lp spaces: completeness, separability, Riesz representation theorem.

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

Primary meet type: Lecture

Delivery mode: Choose an item.

Anti-requisites: PMATH 450

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: PMATH 450

Rationale for request: To remove duplication of topics between courses. (This is part of a larger rearrangement of the PMATH 4xx analysis courses. This course is held with PMATH 451, which is being inactivated.)

Form completed by:

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

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/22/24

Faculty approval date (mm/dd/yy):

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: Spring 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: PMATH

Course number: 651

Course ID: 002346

Course title (max. 100 characters including spaces): Measure and Integration

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: PMATH 451

Rationale for request: This course is held with PMATH 451, which is being inactivated. This is part of a larger rearrangement of the PMATH 4xx analysis courses, to remove duplication of topics between courses.

Form completed by:

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

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/22/24

Faculty approval date (mm/dd/yy):

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: Spring 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: PMATH

Course number: 655

Course ID: TBD

Course title (max. 100 characters including spaces): Convex Analysis and Geometry

Course short title (max. 30 characters including spaces): Convex Analysis and Geometry

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: Basic convexity, Caratheodory theorem, Radon and Helly theorems, geometry of polytopes, isoperimetric inequality, symmetrizations, rearrangement inequalities, duality.

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

Primary meet type: Lecture

Delivery mode: Choose an item.

Anti-requisites: PMATH 455

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: PMATH 455

Rationale for request:

The introduction of a Convex Analysis and Geometry course allow us to introduce more modern topics and methods of analysis to our students. This also reflects emerging strengths in our faculty composition.

Form completed by:

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

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/22/24

Faculty approval date (mm/dd/yy):

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: Spring 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: PMATH

Course number: 754

Course ID: TBD

Course title (max. 100 characters including spaces): Fourier Analysis

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: Fourier analysis on the circle: Fourier series; Hilbertian analysis; convolutions and summability kernels; pointwise, uniform and L_p convergence of Fourier series. Fourier analysis on the real line: test and Schwarz class functions, distributions and tempered distributions, Fourier transforms, inversion theorem, L_1 and L_2 analysis. Selected applications.

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

Primary meet type: Lecture

Delivery mode: Choose an item.

Anti-requisites: PMATH 457

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: PMATH 457

Rationale for request: This course will be held with PMATH 457 which is also new. This is part of a larger rearrangement of the PMATH 4xx analysis courses, to remove duplication of topics between courses. This course will follow PMATH 650, though PMATH 650 will not be a prerequisite for it. Some of the material is taken from the present version of PMATH 650. The style of having this as an independent course is more in line with many comparable institutions. This also introduces topics which are important in modern mathematics but not traditionally covered in present PMATH 650, namely topics around Fourier analysis on the real line.

Form completed by:

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

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/22/24

Faculty approval date (mm/dd/yy):

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: Spring 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: PMATH

Course number: 757

Course ID: TBD

Course title (max. 100 characters including spaces): Topological Dynamics and Ergodic Theory

Course short title (max. 30 characters including spaces): Top. Dynamics & Ergodic Theory

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: Compact topological dynamical systems, the greatest ambit, spaces of ultrafilters, Van der Waerden and Hales Jewett theorems, minimal flows, boundary actions, invariant measures, probability measure preserving actions, Rokhlin's lemma, ergodic theorems, orbit equivalence, entropy, Ornstein's theorem.

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

Primary meet type: Lecture

Delivery mode: Choose an item.

Anti-requisites: PMATH 457

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: PMATH 457

Rationale for request:

The introduction of a Topological Dynamics and Ergodic Theory course allow us to introduce more modern topics and methods of analysis to our students. This also reflects emerging strengths in our faculty composition.

Form completed by:

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

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/22/24

Faculty approval date (mm/dd/yy):

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 Data Science and Artificial Intelligence (MDSAI)

2) Master of Data Science and Artificial Intelligence (MDSAI) - Co-operative Program (direct entry)

Program contact name(s): Yuying Li, Marie Kahkejian

Form completed by: Mu Zhu, Marie Kahkejian

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 to include CS 738 as a core course, removing CS 631 and CS 638 as options from the core course list, and moving CS 651 from the core course list to the elective course list.

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

Rationale for change(s):

Computer Science (CS) has generated a new course for our Data Science graduate students, CS 738, which must be added to the GSAC, to replace CS 631 and CS 651.

CS 631 and CS 638 will no longer be course options for the MMath in DS and MDSAI programs and must be removed. The intention is that CS 631 will be inactivated while CS 651 will transition from a core course to an elective/another course option, while CS 638 should be made an anti-requisite to CS 738, but this is yet to be approved.

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#/programs/SJ4ax1AAsh>

<https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/programs/BJqZkAAi2>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Course requirements	Course requirements

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
- Students must complete at least 9 courses: normally 1 foundation course, 5 core courses, and 3 elective courses. - Foundation courses - Students are expected to take at most 1 of the following 2 foundational courses depending on their undergraduate major: - CS 600 Fundamentals of Computer Science for Data Science (designed for non-CS major background students) - STAT 845 Statistical Concepts for Data Science (designed for non-STAT major background students) - Core courses - Students are normally required to take the following core courses: - STAT 847 Exploratory Data Analysis ~~1 of:~~ ~~CS 651 Data-Intensive Distributed Computing (designed for CS major background students), or~~ ~~CS 631 Data-Intensive Distributed Analytics (designed for non-CS major background students)~~ 1 of: - STAT 841 / CM 763 Statistical Learning - Classification - STAT 842 / CM 762 Data Visualization - STAT 844 / CM 764 Statistical Learning - Advanced Regression 1 of: ~~CS 638 Principles of Data Management and Use~~ - CS 648 Database Systems Implementation - CS 680 Introduction to Machine Learning - CS 685 Machine Learning: Statistical and Computational Foundations 1 of: - CO 602 / CS 795 / CM 740 Fundamentals of Optimization - CO 673 / CS 794 Optimization for Data Science - CO 663 Convex Optimization and Analysis	- Students must complete at least 9 courses: normally 1 foundation course, 5 core courses, and 3 elective courses. - Foundation courses - Students are expected to take at most 1 of the following 2 foundational courses depending on their undergraduate major: - CS 600 Fundamentals of Computer Science for Data Science (designed for non-CS major background students) - STAT 845 Statistical Concepts for Data Science (designed for non-STAT major background students) - Core courses - Students are normally required to take the following core courses: - STAT 847 Exploratory Data Analysis <u>CS 738 Data Engineering for Data Science</u> 1 of: - STAT 841 / CM 763 Statistical Learning - Classification - STAT 842 / CM 762 Data Visualization - STAT 844 / CM 764 Statistical Learning - Advanced Regression 1 of: - CS 648 Database Systems Implementation - CS 680 Introduction to Machine Learning - CS 685 Machine Learning: Statistical and Computational Foundations 1 of: - CO 602 / CS 795 / CM 740 Fundamentals of Optimization - CO 673 / CS 794 Optimization for Data Science - CO 663 Convex Optimization and Analysis - At the discretion of the Data Science Committee, substitutions may be allowed. - Elective courses - Students must take enough additional elective courses to fulfill the 9-course requirement. These courses must normally be taken from the following list of selected graduate courses. Courses

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
- o At the discretion of the Data Science Committee, substitutions may be allowed. • Elective courses - o Students must take enough additional elective courses to fulfill the 9-course requirement. These courses must normally be taken from the following list of selected graduate courses. Courses not on this list are subject to the approval of the Graduate Director. ▪ CO 602 / CS 795 / CM 740 Fundamentals of Optimization ▪ CO 673 / CS 794 Optimization for Data Science ▪ CO 650 Combinatorial Optimization ▪ CO 663 Convex Optimization and Analysis ▪ CO 769 Topics in Continuous Optimization(*) ▪ ~~CS 638 Principles of Data Management and Use~~ ▪ CS 648 Database Systems Implementation ▪ CS 654 Distributed Systems ▪ CS 680 Introduction to Machine Learning ▪ CS 685 Machine Learning: Statistical and Computational Foundations ▪ CS 686 Introduction to Artificial Intelligence ▪ CS 740 Database Engineering ▪ CS 742 Parallel and Distributed Database Systems ▪ CS 743 Principles of Database Management and Use ▪ CS 786 Probabilistic Inference and Machine Learning ▪ CS 798 Advanced Research Topics(*) ▪ CS 848 Advanced Topics in Databases(*) ▪ CS 856 Advanced Topics in Distributed Computing(*) ▪ CS 885 Advanced Topics in Computational Statistics(*) ▪ CS 886 Advanced Topics in Artificial Intelligence ▪ STAT 840 / CM 761 Computational Inference ▪ STAT 841 / CM 763 Statistical Learning - Classification	not on this list are subject to the approval of the Graduate Director. ▪ CO 602 / CS 795 / CM 740 Fundamentals of Optimization ▪ CO 673 / CS 794 Optimization for Data Science ▪ CO 650 Combinatorial Optimization ▪ CO 663 Convex Optimization and Analysis ▪ CO 769 Topics in Continuous Optimization(*) ▪ CS 648 Database Systems Implementation ▪ <u>CS 651 Data-Intensive Distributed Computing</u> ▪ CS 654 Distributed Systems ▪ CS 680 Introduction to Machine Learning ▪ CS 685 Machine Learning: Statistical and Computational Foundations ▪ CS 686 Introduction to Artificial Intelligence ▪ CS 740 Database Engineering ▪ CS 742 Parallel and Distributed Database Systems ▪ CS 743 Principles of Database Management and Use ▪ CS 786 Probabilistic Inference and Machine Learning ▪ CS 798 Advanced Research Topics(*) ▪ CS 848 Advanced Topics in Databases(*) ▪ CS 856 Advanced Topics in Distributed Computing(*) ▪ CS 885 Advanced Topics in Computational Statistics(*) ▪ CS 886 Advanced Topics in Artificial Intelligence ▪ STAT 840 / CM 761 Computational Inference ▪ STAT 841 / CM 763 Statistical Learning - Classification ▪ STAT 842 / CM 762 Data Visualization ▪ STAT 844 / CM 764 Statistical Learning - Advanced Regression ▪ STAT 946 Topics in Probability and Statistics(*) ▪ DATSC 701/702 Data Science Project 1 & 2

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
▪ STAT 842 / CM 762 Data Visualization ▪ STAT 844 / CM 764 Statistical Learning - Advanced Regression ▪ STAT 946 Topics in Probability and Statistics(*) ▪ DATSC 701/702 Data Science Project 1 & 2 ▪ Note (*): CO 769, CS 798, CS courses at the 800 level, and STAT courses at the 900 level should be on a topic in Data Science or Artificial Intelligence; they are subject to the approval of the Graduate Officer. • In order to remain in good academic standing, students must maintain an average of 75% and a minimum grade of 70% in all their courses. Progress reports are not required; however, the Director will review students' overall average every term. Students whose average falls below the program's minimum requirements may be required to withdraw from the program. The minimum average required by the program is higher than the university's minimum requirement (70%).	▪ Note (*): CO 769, CS 798, CS courses at the 800 level, and STAT courses at the 900 level should be on a topic in Data Science or Artificial Intelligence; they are subject to the approval of the Graduate Officer. • In order to remain in good academic standing, students must maintain an average of 75% and a minimum grade of 70% in all their courses. Progress reports are not required; however, the Director will review students' overall average every term. Students whose average falls below the program's minimum requirements may be required to withdraw from the program. The minimum average required by the program is higher than the university's minimum requirement (70%).

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

With the removal of CS 631, current students that took CS 631 will still have it count towards their course requirements. Students that have not yet completed either CS 631 or CS 651 can take CS 651 and still count it as a core course or take the new course being added to the GSAC, which replaces CS 631/CS 651, CS 738 which will be offered in the winter 2025 term.

With the removal of CS 638, students can take one of the following, CS 648, CS 680 or CS 685, and should not be impacted. Those that already took CS 638 will have the course counted as part of their CS course requirements.

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

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 06/21/24

Faculty approval date (mm/dd/yy):

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 Mathematics (MMath) in Data Science

Program contact name(s): Yuying Li, Marie Kahkejian

Form completed by: Mu Zhu, Marie Kahkejian

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 to include CS 738 as a mandatory course, removing CS 631 and CS 638 as options from the course list, and moving CS 651 from the core course list to the elective course list.

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

Rationale for change(s):

Computer Science (CS) has generated a new course for our Data Science graduate students, CS 738, which must be added to the GSAC, to replace CS 631 and CS 651.

CS 631 and CS 638 will no longer be course options for the MMath in DS and MDSAI programs and must be removed. The intention is that CS 631 will be inactivated while CS 651 will transition from a core course to an elective/another course option, while CS 638 should be made an anti-requisite to CS 738, but this is yet to be approved.

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#/programs/SJSa1ARi2>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Thesis option: Course requirements Students must complete at least 4 courses. Students lacking adequate background in computer science may be required to take CS 600 Fundamentals of Computer Science for Data Science, and students lacking adequate	Thesis option: Course requirements Students must complete at least 4 courses. Students lacking adequate background in computer science may be required to take CS 600 Fundamentals of Computer Science for Data Science, and students lacking adequate

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
background in statistics may be required to take STAT 845 Statistical Concepts for Data Science. Neither of these courses may be counted toward the 4 course requirement. The 4 courses must normally include: - o 1. STAT 847 Exploratory Data Analysis ~~o 2. Exactly 1 of:~~ ~~▪ CS 631 Data Intensive Distributed Analytics, or~~ ~~▪ CS 651 Data Intensive Distributed Computing~~ - o 3. At least 1 of: ▪ CS 680 Introduction to Machine Learning ▪ CS 685 Machine Learning: Statistical and Computational Foundations ▪ CS 686 Introduction to Artificial Intelligence ▪ CS 795 / CO 602 / CM 740 Fundamentals of Optimization ▪ CS 794 / CO 673 Optimization for Data Science ▪ CO 650 Combinatorial Optimization ▪ CO 663 Convex Optimization and Analysis ▪ CS 786 Probabilistic Inference and Machine Learning ▪ CS 886 Advanced Topics in Artificial intelligence ▪ STAT 840 / CM 761 Computational Inference ▪ STAT 841 / CM 763 Statistical Learning - Classification ▪ STAT 844 / CM 764 Statistical Learning - Advanced Regression ▪ STAT 946 Topics in Probability and Statistics(*) - o 4. The fourth course is normally chosen from the following list: - o Machine learning / statistical learning / optimization ▪ CS 680 Introduction to Machine Learning ▪ CS 685 Machine Learning: Statistical and Computational Foundations ▪ CS 686 Introduction to Artificial Intelligence ▪ CS 795 / CO 602 / CM 740 Fundamentals of Optimization ▪ CS 794 / CO 673 Optimization for Data Science	background in statistics may be required to take STAT 845 Statistical Concepts for Data Science. Neither of these courses may be counted toward the 4 course requirement. The 4 courses must normally include: - o 1. STAT 847 Exploratory Data Analysis - o <u>2. CS 738 Data Engineering for Data Science</u> - o 3. At least 1 of: ▪ CS 680 Introduction to Machine Learning ▪ CS 685 Machine Learning: Statistical and Computational Foundations ▪ CS 686 Introduction to Artificial Intelligence ▪ CS 795 / CO 602 / CM 740 Fundamentals of Optimization ▪ CS 794 / CO 673 Optimization for Data Science ▪ CO 650 Combinatorial Optimization ▪ CO 663 Convex Optimization and Analysis ▪ CS 786 Probabilistic Inference and Machine Learning ▪ CS 886 Advanced Topics in Artificial intelligence ▪ STAT 840 / CM 761 Computational Inference ▪ STAT 841 / CM 763 Statistical Learning - Classification ▪ STAT 844 / CM 764 Statistical Learning - Advanced Regression ▪ STAT 946 Topics in Probability and Statistics(*) - o 4. The fourth course is normally chosen from the following list: - o Machine learning / statistical learning / optimization ▪ CS 680 Introduction to Machine Learning ▪ CS 685 Machine Learning: Statistical and Computational Foundations ▪ CS 686 Introduction to Artificial Intelligence ▪ CS 795 / CO 602 / CM 740 Fundamentals of Optimization ▪ CS 794 / CO 673 Optimization for Data Science ▪ CO 650 Combinatorial Optimization

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
▪ CO 650 Combinatorial Optimization ▪ CO 663 Convex Optimization and Analysis ▪ CO 769 Topics in Continuous Optimization(*) ▪ CS 786 Probabilistic Inference and Machine Learning ▪ CS 885 Advanced Topics in Computational Statistics(*) ▪ CS 886 Advanced Topics in Artificial intelligence ▪ STAT 840 / CM 761 Computational Inference ▪ STAT 841 / CM 763 Statistical Learning - Classification ▪ STAT 844 / CM 764 Statistical Learning - Advanced Regression ▪ STAT 946 Topics in Probability and Statistics(*) - o Computer systems and databases ▪ ~~CS 638 Principles of Database Management and Use~~ ▪ CS 648 Database Systems Implementation ▪ CS 656 Computer Networks ▪ CS 657 System Performance Evaluation ▪ CS 658 Computer Security and Privacy ▪ CS 740 Database Engineering ▪ CS 741 Non-Traditional Databases ▪ CS 742 Parallel and Distributed Database Systems ▪ CS 743 Principles of Database Management and Use ▪ CS 755 Systems and Network Architectures and Implementation ▪ CS 848 Advanced Topics in Databases(*) - o Distributed computing ▪ CS 654 Distributed Systems ▪ CS 856 Advanced Topics in Distributed Computing(*) - o Data exploration ▪ STAT 842 / CM 762 Data Visualization - o Other ▪ CS 798 Advanced Research Topics(*)	▪ CO 663 Convex Optimization and Analysis ▪ CO 769 Topics in Continuous Optimization(*) ▪ CS 786 Probabilistic Inference and Machine Learning ▪ CS 885 Advanced Topics in Computational Statistics(*) ▪ CS 886 Advanced Topics in Artificial intelligence ▪ STAT 840 / CM 761 Computational Inference ▪ STAT 841 / CM 763 Statistical Learning - Classification ▪ STAT 844 / CM 764 Statistical Learning - Advanced Regression ▪ STAT 946 Topics in Probability and Statistics(*) - o Computer systems and databases ▪ CS 648 Database Systems Implementation ▪ <u>CS 651 Data-Intensive Distributed Computing</u> ▪ CS 656 Computer Networks ▪ CS 657 System Performance Evaluation ▪ CS 658 Computer Security and Privacy ▪ CS 740 Database Engineering ▪ CS 741 Non-Traditional Databases ▪ CS 742 Parallel and Distributed Database Systems ▪ CS 743 Principles of Database Management and Use ▪ CS 755 Systems and Network Architectures and Implementation ▪ CS 848 Advanced Topics in Databases(*) - o Distributed computing ▪ CS 654 Distributed Systems ▪ CS 856 Advanced Topics in Distributed Computing(*) - o Data exploration ▪ STAT 842 / CM 762 Data Visualization - o Other ▪ CS 798 Advanced Research Topics(*) - o At the discretion of the Data Science Committee, substitutions may be allowed.

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
- o At the discretion of the Data Science Committee, substitutions may be allowed. - o (*) Note: CO 769, CS 798, CS courses at the 800 level, and STAT courses at the 900 level should be on a topic in Data Science; they are subject to the approval of the Graduate Director. Master's Research Paper option: Course requirements • Students must complete at least 6 courses. Students lacking adequate background in computer science may be required to take CS 600 Fundamentals of Computer Science for Data Science, and students lacking adequate background in statistics may be required to take STAT 845 Statistical Concepts for Data Science. Neither of these courses may be counted toward the 6 course requirement. The 6 courses must normally include: - o 1. STAT 847 Exploratory Data Analysis ~~o 2. Exactly 1 of:~~ ~~• CS 631 Data Intensive Distributed Analytics, or~~ ~~• CS 651 Data Intensive Distributed Computing~~ - o 3. At least 1 of: ▪ CS 680 Introduction to Machine Learning ▪ CS 685 Machine Learning: Statistical and Computational Foundations ▪ CS 686 Introduction to Artificial Intelligence ▪ CS 795 / CO 602 / CM 740 Fundamentals of Optimization ▪ CS 794 / CO 673 Optimization for Data Science ▪ CO 650 Combinatorial Optimization ▪ CO 663 Convex Optimization and Analysis ▪ CS 786 Probabilistic Inference and Machine Learning ▪ CS 886 Advanced Topics in Artificial intelligence ▪ STAT 840 / CM 761 Computational Inference ▪ STAT 841 / CM 763 Statistical Learning - Classification ▪ STAT 844 / CM 764 Statistical Learning - Advanced Regression	- o (*) Note: CO 769, CS 798, CS courses at the 800 level, and STAT courses at the 900 level should be on a topic in Data Science; they are subject to the approval of the Graduate Director. Master's Research Paper option: Course requirements • Students must complete at least 6 courses. Students lacking adequate background in computer science may be required to take CS 600 Fundamentals of Computer Science for Data Science, and students lacking adequate background in statistics may be required to take STAT 845 Statistical Concepts for Data Science. Neither of these courses may be counted toward the 6 course requirement. The 6 courses must normally include: - o 1. STAT 847 Exploratory Data Analysis - o 2. <u>CS 738 Data Engineering for Data Science</u> - o 3. At least 1 of: ▪ CS 680 Introduction to Machine Learning ▪ CS 685 Machine Learning: Statistical and Computational Foundations ▪ CS 686 Introduction to Artificial Intelligence ▪ CS 795 / CO 602 / CM 740 Fundamentals of Optimization ▪ CS 794 / CO 673 Optimization for Data Science ▪ CO 650 Combinatorial Optimization ▪ CO 663 Convex Optimization and Analysis ▪ CS 786 Probabilistic Inference and Machine Learning ▪ CS 886 Advanced Topics in Artificial intelligence ▪ STAT 840 / CM 761 Computational Inference ▪ STAT 841 / CM 763 Statistical Learning - Classification ▪ STAT 844 / CM 764 Statistical Learning - Advanced Regression ▪ STAT 946 Topics in Probability and Statistics(*) - o 4. The 3 additional courses are normally chosen from the following list: - o Machine learning / statistical learning / optimization

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
▪ STAT 946 Topics in Probability and Statistics(*) - o 4. The 3 additional courses are normally chosen from the following list: - o Machine learning / statistical learning / optimization ▪ CS 680 Introduction to Machine Learning ▪ CS 685 Machine Learning: Statistical and Computational Foundations ▪ CS 686 Introduction to Artificial Intelligence ▪ CS 795 / CO 602 / CM 740 Fundamentals of Optimization ▪ CS 794 / CO 673 Optimization for Data Science ▪ CO 650 Combinatorial Optimization ▪ CO 663 Convex Optimization and Analysis ▪ CO 769 Topics in Continuous Optimization(*) ▪ CS 786 Probabilistic Inference and Machine Learning ▪ CS 885 Advanced Topics in Computational Statistics(*) ▪ CS 886 Advanced Topics in Artificial intelligence ▪ STAT 840 / CM 761 Computational Inference ▪ STAT 841 / CM 763 Statistical Learning - Classification ▪ STAT 844 / CM 764 Statistical Learning - Advanced Regression ▪ STAT 946 Topics in Probability and Statistics(*) - o Computer systems and databases ▪ ~~CS 638 Principles of Database Management and Use~~ ▪ CS 648 Database Systems Implementation ▪ CS 656 Computer Networks ▪ CS 657 System Performance Evaluation ▪ CS 658 Computer Security and Privacy ▪ CS 740 Database Engineering ▪ CS 741 Non-Traditional Databases ▪ CS 742 Parallel and Distributed Database Systems ▪ CS 743 Principles of Database Management and Use	▪ CS 680 Introduction to Machine Learning ▪ CS 685 Machine Learning: Statistical and Computational Foundations ▪ CS 686 Introduction to Artificial Intelligence ▪ CS 795 / CO 602 / CM 740 Fundamentals of Optimization ▪ CS 794 / CO 673 Optimization for Data Science ▪ CO 650 Combinatorial Optimization ▪ CO 663 Convex Optimization and Analysis ▪ CO 769 Topics in Continuous Optimization(*) ▪ CS 786 Probabilistic Inference and Machine Learning ▪ CS 885 Advanced Topics in Computational Statistics(*) ▪ CS 886 Advanced Topics in Artificial intelligence ▪ STAT 840 / CM 761 Computational Inference ▪ STAT 841 / CM 763 Statistical Learning - Classification ▪ STAT 844 / CM 764 Statistical Learning - Advanced Regression ▪ STAT 946 Topics in Probability and Statistics(*) - o Computer systems and databases ▪ CS 648 Database Systems Implementation ▪ <u>CS 651 Data-Intensive Distributed Computing</u> ▪ CS 656 Computer Networks ▪ CS 657 System Performance Evaluation ▪ CS 658 Computer Security and Privacy ▪ CS 740 Database Engineering ▪ CS 741 Non-Traditional Databases ▪ CS 742 Parallel and Distributed Database Systems ▪ CS 743 Principles of Database Management and Use ▪ CS 755 Systems and Network Architectures and Implementation ▪ CS 848 Advanced Topics in Databases(*) - o Distributed computing

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
▪ CS 755 Systems and Network Architectures and Implementation ▪ CS 848 Advanced Topics in Databases(*) - o Distributed computing ▪ CS 654 Distributed Systems ▪ CS 856 Advanced Topics in Distributed Computing(*) - o Data exploration ▪ STAT 842 / CM 762 Data Visualization - o Other ▪ CS 798 Advanced Research Topics(*) - o At the discretion of the Data Science Committee, substitutions may be allowed. - o (*) Note: CO 769, CS 798, CS courses at the 800 level, and STAT courses at the 900 level should be on a topic in Data Science; they are subject to the approval of the Graduate Director.	▪ CS 654 Distributed Systems ▪ CS 856 Advanced Topics in Distributed Computing(*) - o Data exploration ▪ STAT 842 / CM 762 Data Visualization - o Other ▪ CS 798 Advanced Research Topics(*) - o At the discretion of the Data Science Committee, substitutions may be allowed. - o (*) Note: CO 769, CS 798, CS courses at the 800 level, and STAT courses at the 900 level should be on a topic in Data Science; they are subject to the approval of the Graduate Director.

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

With the removal of CS 631, current students who have already taken this course will still have it count towards their course requirements. Students who have not yet completed either CS 631 or CS 651 can opt to take CS 651 and have it fulfill their core course requirement. Alternatively, they can choose the new course, CS 738, which replaces CS 631/CS 651 and will be offered in the winter 2025 term.

With the removal of CS 638, students can take one of the other course options. Those that already took CS 638 will have the course counted as part of their course requirements.

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

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 06/21/24

Faculty approval date (mm/dd/yy):

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

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

WatCAR: Your Partner for Future Mobility

Renewal Application
for
Senate Graduate and Research Council

January 2025

Executive Summary

The Waterloo Centre for Automotive Research (WatCAR) stands as Canada's largest automotive-academic enterprise, fostering and supporting collaborative research between the University of Waterloo and automotive manufacturers, parts suppliers, and related industries at the provincial, national, and global levels. Since its establishment, WatCAR has played a pivotal role in advancing automotive research and innovation, serving as the primary representative of the University of Waterloo's automotive research activities. Through its collaborative efforts, WatCAR supports hundreds of faculty members and researchers from across a diverse range of academic disciplines, making it a cornerstone of the University's engagement with the automotive sector.

This renewal application has been prepared for the Senate Graduate and Research Council's consideration to outline WatCAR's continued role in advancing automotive research, education, and industry partnerships. As the automotive industry faces unprecedented changes, particularly in the realm of mobility, WatCAR has sharpened its focus to better align with these industry transformations. In response to the evolving landscape, WatCAR has identified three core pillars to guide its activities and support the needs of the automotive sector over the next five years. These pillars are:

1. **Research Partnership with Focus on SMEs:** This pillar emphasizes fostering collaboration between the University of Waterloo and small-to-medium enterprises (SMEs), which are critical to driving innovation and addressing key challenges in the automotive sector, including autonomous systems, electrification, and manufacturing technologies.
2. **Professional Development and Training:** This pillar aims to provide support to cutting-edge training and development programs that equip both students and industry professionals with the skills and expertise needed to address the rapidly changing demands of the automotive and mobility industries.
3. **Stakeholder Engagement and Public Outreach:** Aimed at broadening the impact of WatCAR's research and innovations, this pillar will focus on outreach efforts to engage stakeholders across the automotive ecosystem, including industry partners, policymakers, and communities. This outreach will help align research with industry needs, influence policy development, and ensure that emerging technologies are accessible and beneficial to society.

With these pillars, WatCAR seeks to advance its mission of supporting our Waterloo faculties on groundbreaking research, promoting industry collaboration, and preparing the workforce of tomorrow. This renewal application outlines the strategic direction and future goals of WatCAR, reinforcing its commitment to support driving innovation and the automotive sector's transition to a sustainable, connected, and autonomous future.

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Introduction

Since its establishment in 2003 within a single engineering department, the Waterloo Centre for Automotive Research (WatCAR) has grown into a multidisciplinary hub that benefits not only all departments within Engineering but also Mathematics, Science, Health, Environment, and Arts. Over the past two decades, WatCAR has played a pivotal role in enabling large-scale research initiatives, fostering collaboration among researchers, industry partners, and government bodies. As the face of the University of Waterloo's automotive and mobility research, WatCAR has earned national and international recognition for its leadership, innovation, and impact on the automotive sector.

The automotive industry is undergoing profound transformation, driven by electrification, autonomous and connected vehicle technologies, smart infrastructure, and sustainability imperatives. These changes present both challenges and opportunities that demand innovative solutions, multidisciplinary collaboration, and alignment with industry trends and government priorities. In response, WatCAR must evolve to continue serving as a catalyst for impactful research and innovation while addressing the shifting needs of the automotive and mobility ecosystem.

With this in mind, WatCAR has developed a renewed vision for the next five years to guide its mission and activities. This updated vision is designed to:

1. Align with the major transitions in the automotive industry, including electrification, intelligent transportation systems, and sustainable manufacturing.
2. Strengthen support for the University of Waterloo's automotive research community, spanning diverse disciplines and fostering interdisciplinary collaboration.
3. Enhance engagement with industry and government partners to accelerate innovation, secure funding, and influence policy.
4. Ensure that Waterloo continues to lead nationally and internationally by addressing emerging challenges and opportunities in the automotive and mobility sectors.

This new vision is justified by the rapid pace of change within the industry and the need for WatCAR to remain relevant, influential, and forward-thinking. By sharpening its mission, WatCAR aims to better serve the University's research community, support the development of transformative technologies, and contribute to Canada's position as a global leader in automotive innovation. Over the next five years, WatCAR will focus on three strategic pillars—Research Partnerships with a focus on SMEs, Professional Development and Training, and Stakeholder Engagement and Public Outreach—to achieve this renewed vision and continue driving meaningful impact in the automotive and mobility sectors.

Before presenting WatCAR's mission for 2025–2030, the following provides a review of WatCAR's accomplishments since the last renewal in 2016.

Accomplishments: 2016 - 2024

WatCAR groups faculty researchers and their competencies into five key areas:

1. **Connected and Autonomous**
2. **Lightweighting and Fabrication**
3. **Structure and Safety**

4. Powertrain and Emissions

5. Software and Data

Faculty researchers and their competencies are detailed on the WatCAR website.

On behalf of faculty involved in automotive and mobility research, WatCAR identifies, qualifies, and introduces prospective research partners. It facilitates and contributes to the development of research engagements, then steps aside, leaving the faculty member and industry partner to execute the project. Upon request, WatCAR remains involved, assisting in the early stages of larger projects or supporting junior faculty with less experience in industry engagement.

WatCAR proactively manages relationships with key automotive and mobility clients, a responsibility not undertaken by any other group on campus. Providing a consistent point of contact for outreach and inquiries has been highly effective in engaging key industry partners, including Toyota, General Motors, Magna, and Multimatic. When appropriate, WatCAR collaborates with Engineering Advancement, yielding notable results (e.g., Toyota's \$2M donation in December 2019 following a two-year joint effort).

WatCAR actively participates in eight industry associations, including membership in three:

- **APMA:** Automotive Parts Manufacturers' Association of Canada
- **ITS Canada:** Intelligent Transportation Systems Society of Canada
- **EMC:** Electric Mobility Canada

WatCAR has hosted on-campus meetings for organizations such as APMA, Global Automakers of Canada, Ontario Traffic Council, and ITS Canada.

Additionally, WatCAR engages regularly with 22 departments, agencies, and policy/regulatory units across the Canadian federal, Ontario provincial, and Waterloo regional governments. Both federal and provincial governments frequently seek WatCAR's input and feedback on proposed initiatives, use of campus facilities for policy announcements, and participation in working groups and Minister's roundtables.

WatCAR Major Activities

WatCAR's major activities from 2017 to 2024 are summarized in the following tables. This summary highlights the types of services and contributions WatCAR has made to university automotive research.

From 2017 to 2019, WatCAR engaged in an average of 91 activities per year. However, under pandemic restrictions, this number decreased by 54%, averaging 49 activities per year in 2020 and 2021. Activity levels have been increasing since 2022, as shown in the tables below.

2017 WatCAR Engagement

Activity	Highlights
31 Groups hosted on campus	<u>Meetings:</u> Toyota Michigan, BMW Germany, Daimler Germany, VW Germany, Ford Michigan, Stellantis Michigan (Chrysler), Magna, Canadian Tire, Denso, OMRON, Renesas

	<u>Delegations:</u> Canadian Senate (Autonomous Vehicles Comm.), Magna, Ontario Government Int'l Trade reps, Global Automakers Canada (Cybersecurity), Czech Republic, China
21 Corporate Engagements	General Motors, Magna, Ford Michigan and California, Linamar onsite in Michigan (McLaren), Panasonic California, BlackBerry/ QNX, Continental onsite in Michigan
4 Major Programs Managed	1) Green and Intelligent Automotive (GAIA) facility 2) Locate, lease, and operate off campus garage (pre-AVRIL) 3) Host/ co-organize AutoTech Symposium 4) Open HD Maps (Ontario AVIN ¹ program w/ Communitech)
2 Exhibits @ Trade Events	a) Detroit Auto show, supported by Magna b) Cdn Auto Parts Manufacturers Assoc. (APMA) conference
16 Supporting Activities for on campus partners	President's office, Government Relations, Co-operative Education, autonomous vehicle insurance and MTO approvals, Student Design Centre, School of Planning, Researchers, Student Vehicle Teams
1 Recognition	MTO Road Safety Award
22 Industry Events Attended	Across Ontario; in Québec and Michigan
97 Total Activities	
+ on-going Media liaison	Assisted or directly handled numerous autonomous driving media requests for University Communications & researchers

2018 WatCAR Engagement

Activity	Highlights
30 Groups hosted on campus	<u>Meetings:</u> Toyota Japan, GM Canada Executive Team, Honda Japan, Honda California, Daimler Germany, Ford Canada VP, Nissan, Subaru, Canada Defense Dep't, Loblaw, Aisin, Fauercia, Renesas, Musashi Japan, OMRON Japan, Thales <u>Delegations:</u> Austria, Invest Canada, China
7 Corporate Engagements	Honda in Michigan, Denso, Toyota, ODG/ Argo, Stantec
4 Major Programs Managed	1) Green and Intelligent Automotive (GAIA) facility 2) Operate off campus garage (pre-AVRIL) 3) Host/ co-organize AutoTech Symposium 4) Open HD Maps (Ontario AVIN program w/ Communitech)
5 Exhibits @ Trade Events	a) CES Las Vegas, supported by Renesas b) Detroit Auto show, supported by Magna c) APMA conference (Auto Parts), Windsor d) ITS Canada conference (Transportation), Niagara Falls e) IDDRG conference (Metal Forming), Waterloo
9 Supporting Activities for	Government Relations, Office of Research, Student Design Centre, Researchers, Industry tours for IDDRG delegates,

¹ AVIN – Autonomous Vehicle Innovation Network, an \$80M Ontario funding program in place from 2017 to 2022.

on campus partners	Student Vehicle Teams, License plates for student autonomous vehicle
1 Recognition	UWaterloo/ WatCAR named 2018 Automotive News All-Star
25 Industry Events Attended	Across Ontario; in Québec, Michigan, and France
81 Total Activities	
+ on-going Media liaison	Assisted or directly handled numerous autonomous driving media requests for University Communications & researchers

2019 WatCAR Engagement

Activity	Highlights
35 Groups hosted on campus	<u>Meetings:</u> GM Canada President and 2 Directors, Toyota, Toyota Japan, Honda, Renault France, Volvo, Magna, Multimatic, Kapsch Austria, Kapsch Canada, Linamar, Musashi_ <u>Delegations:</u> Germany, Hungary, Korea, India, Cdn Trade Commissioner Service
18 Corporate Engagements	VW, Bosch in Michigan, Transport Canada (TC) Advisory, NGen ² / Woodbridge proposal, Waymo, Stellantis (Chrysler) in Michigan, BlackBerry
4 Major Programs Managed	1) Green and Intelligent Automotive (GAIA) facility 2) Manage off campus garage (pre-AVRIL) 3) AVRIL building move in, operate, oversee vehicle projects 4) Open HD Maps (Ontario AVIN program w/ Communitech)
3 Exhibits @ Trade Events	a) Detroit Auto show, supported by Magna b) Detroit Telematics Update, Open HD Maps booth c) APMA conference (Auto Parts), Windsor
14 Supporting Activities for on campus partners	Government Relations, Office of Research, University Relations, Engineering Advancement, Engineering Communications, Engineering GenE program, Student Design Centre, Researchers, Student Vehicle Teams
1 Recognition	\$2M Toyota donation to Engineering, WatCAR recognized
22 Industry Events Attended	Across Ontario; in Québec, Nova Scotia, Michigan, and Germany
97 Total Activities	
+ on-going Media liaison	Assisted or directly handled numerous autonomous driving media requests for University Communications & researchers

² NGen – Next Generation Manufacturing Canada – a \$230M federal funding program announced in 2017

2020 WatCAR Engagement

Activity	Highlights
4 Groups hosted	<u>On campus meetings</u> : Hexagon, Great Wall Motors, Rogers <u>Virtual meetings</u> : Magna
17 Corporate Engagements	General Motors, Toyota, Multimatic, Rogers, DLR, Canadian Tire, Mitsui, NGen/ Woodbridge proposal ³ , Link, Xanadu, BlackBerry, Oro Station
4 Major Programs Managed	1) Green and Intelligent Automotive (GAIA) facility 2) Move out from off campus garage (Colby Drive) 3) AVRIL building operation, oversee vehicle projects 4) Open HD Maps (Ontario AVIN program w/ Communitech)
0 Exhibits @ Trade Events	Cancelled - pandemic
12 Supporting Activities for on campus partners	Government Relations, Office of Research, Engineering Communications, Engineering GenE program, IDEAs Clinic, RoboHub, Researchers, Student Vehicle Teams
1 Building Opening	AVRIL opening; organized and managed with Engineering Advancement
17 Industry Events Attended	Ontario, Nevada and virtual
55 Total Activities	
+ Media liaison	Assisted University Communications with some autonomous driving media requests (through March)

2021 WatCAR Engagement

Activity	Highlights
6 Groups hosted	<u>On campus meetings</u> : Magna, Rogers, Nissan, Foxconn <u>Virtual meetings</u> : General Motors, DLR Workshop
9 Corporate Engagements	Magna, Mitsui, Letenda, DLR, Ridecell, BlackBerry, Oro Station, Volatus, Flex'N'Gate
3 Major Programs Managed	1) Green and Intelligent Automotive (GAIA) facility 2) AVRIL building operation, oversee vehicle projects 3) Open HD Maps (Ontario AVIN program w/ Communitech) + input for Ontario OVIN ⁴ proposal w/ Communitech
1 Exhibit @ Trade Events	Detroit Motorbella
4 Presentations @ Virtual Trade Events	Future of Transportation and Mobility, Ontario Traffic Council, MTO/ Rogers, MBS – Center for Automotive Research

³ NGen/ Woodbridge proposal – WatCAR represented the university as the lead academic partner in a proposal to create an Industry 4.0 production facility at a Woodbridge plant in Kitchener. NGen did not approve the proposal.

⁴ OVIN – Ontario Vehicle Innovation Network, a \$56.4M Ontario funding program beginning in 2022

10 Supporting Activities for on campus partners	Government Relations, Office of Research, Engineering Communications, Researchers, Student Vehicle Teams
11 Industry Events Attended	All virtual
44 Total Activities	
+ Media liaisons	Assisted University Communications with several automotive media requests

2022 WatCAR Engagement

Activity	Highlights
40+ Groups hosted	<u>On campus or virtual meetings:</u> 40+
30 Corporate & Government Engagements	Intact, Nissan, Rogers, NRC, BlackBerry, eCamion, WindRiver, Toyota, BMW, Loblaw, APMA, OCI, OVIN, Magna, Zebra, MTO, Stellantis, Alstom Group, Bison Transport, GM, Transport Canada, Bosch, various MPPs, Mitsui, Continental, Kitchener Hydro (Enova), Nasarc Technologies, City of Vaughn, Mitshubishi, CUTRIC
6 Major Programs Managed	Green and Intelligent Automotive (GAIA) facility operation AVRIL building operation, oversee vehicle projects CFREF FutureCar (led by U.Windsor) proposal coordination of UW Components Advanced Manufacturing Consortium 2.0 proposal development FedDev-funded Additive Manufacturing to support sectors including Automotive SMEs APMA Project Arrow Powertrain (MVS Lab)
0 Exhibit @ Trade Events	None
3 Presentations @ Virtual Trade Events	Canadian Trade Commissioners, Waterloo Region Economic Dev.(2)
5 Supporting Activities for on campus partners	Government Relations, Office of Research, Engineering Communications, Researchers, Student Vehicle Teams (Ecocar renewal etc.)
1 Conferences Attended	OVIN Partnering Forum
85 Total Activities	

+ Media liaisons	Assisted University Communications with several automotive media requests

2023 WatCAR Engagement

Activity	Highlights
40+ Groups hosted	<u>On campus or virtual meetings:</u> 40+
32 Corporate & Government Engagements	Magna, City of Vaughn, Enova, Transport Canada, ETAS, OVIN, DLR, Nissan, Intact, Communitex, EnerTech, Linamar, Alectra, APMA, Cummins, Rogers, AVL, FedDev, Multimatic, MP Tassi, NRC, Bosch, GM, Toyota, Dana, e-Leap Power, Adient, S2e, Macnica, Mercedes Benz, Michelin, Saleri,
7 Major Programs Managed	Green and Intelligent Automotive (GAIA) facility operation AVRIL building operation, oversee vehicle projects CFREF FutureCar (led by U.Windsor) proposal coordination of UW Components FedDev-funded Additive Manufacturing to support sectors including Automotive SMEs APMA Project Arrow2.0 Initial Meeting NRC e-Auto program initiation of discussions
1 Exhibit @ Trade Events	Canadian Trade Commissioners campus tour
3 Presentations @ Virtual Trade Events	JapanTrade Commissioners, Waterloo Region Economic Dev.(2)
5 Supporting Activities for on campus partners	Government Relations, Office of Research, Engineering Communications, Researchers, Student Vehicle Teams
6 Conferences Attended	Future eCar Conference (CFREF), OVIN Partnering Forum, Vehicle Cybersecurity Conference, EnerTech Forum, APMA Annual Conference, Canadian Manufacturing Technology Show
94 Total Activities	
+ Media liaisons	Assisted University Communications with several automotive media requests

2024 WatCAR Engagement (Jan. 1 to Nov. 30, 2024)

Activity	Highlights
40+ Groups hosted	<u>On campus or virtual meetings: 40+</u>
41 Corporate & Government Engagements	OVIN, OCI, Miovision, Transport Canada, Precision Resource, Samuel Automation, GM, Stellantis, SEW Eurodrive, Ocado, Toyota, Quantum Valley, APMA, Region of Waterloo, Enertech, NRC, Linamar, American Axle, Woven, Mercedes Benz, Horiba-Mira, Continental, ESCrypt, FedDev, Rolls Royce, Squint Inc., Metrolinx, Schaeffler, Rockwell Automation, Alectra, Magna, Honda, CME, Dana, Electric Mobility Canada, Ford, e-Zinc, AVL, Calspan, Kautex, ETAS,
7 Major Programs Managed	Green and Intelligent Automotive (GAIA) facility operation AVRIL building operation, oversee vehicle projects FedDev-funded Additive Manufacturing to support sectors including Automotive SMEs APMA Project Arrow2.0 EOI Submission NRC e-Auto program EOI submission Transport Canada Intelligent Transportation Community of Practice Workshop
1 Exhibit @ Trade Events	UK Dept. For Business and Trade
4 Presentations @ Virtual Trade Events	Canada Trade Commissioners tour of Engineering, Waterloo Region Economic Dev. (3)
5 Supporting Activities for on campus partners	Government Relations, Office of Research, Engineering Communications, Researchers, Student Vehicle Teams
6 Conferences Attended	Future eCar Conference (CFREF), OVIN Partnering Forum, NRC e-Auto Workshop, APMA Canadian Automotive Summit, eV Innovation & Technology Conference (Electric Mobility), Windsor Mobility Transformation Conference
104 Total Activities	
+ Media liaisons	Assisted University Communications with several automotive media requests

Facility Oversight

When the Green and Intelligent Automotive (GAIA) facility opened in 2016, WatCAR was tasked with overseeing the management and administration of this shared resource facility. At its inception, eight faculty members from four departments were expected to utilize GAIA to support their research activities, fostering collaboration across disciplines within the automotive and mobility sectors.

In 2019, the Dean of Engineering expanded WatCAR's responsibilities by assigning it to oversee the Autonomous Vehicle Research & Intelligence Laboratory (AVRIL). This cutting-edge facility further enhanced the Faculty of Engineering's capacity to advance autonomous vehicle research and development.

By Spring 2021, senior leadership in the Faculty of Engineering reviewed the administrative structure of these facilities and accepted the recommendation that WatCAR should no longer manage and administer GAIA and AVRIL. This decision was made to allow WatCAR to focus on its core mandate of facilitating research partnerships and advancing automotive innovation.

As of 2022, the management and administration of both GAIA and AVRIL were transitioned to the Office of the Associate Dean, Resources and Planning, ensuring streamlined oversight and alignment with faculty-wide strategic priorities.

Faculty Engagement

With a mission to foster collaborative research in the automotive sector, WatCAR was established in 2003, initially bringing together 20 faculty researchers primarily from the Departments of Mechanical and Mechatronics Engineering (MME) and Electrical and Computer Engineering (ECE). Its creation generated significant interest, and by 2007, the number of affiliated faculty had grown to 50. Since 2015, WatCAR has consistently maintained over 100 members, reflecting its sustained growth and relevance.

Today, WatCAR is the largest automotive research enterprise in Canadian academia by the number of researchers and ranks as the third-largest in North America, behind only the University of Michigan and Ohio State University. According to the Ontario government's 2018 database of automotive researchers at all Ontario universities, 25% were affiliated with the University of Waterloo, underscoring WatCAR's significant impact on both provincial and national research landscapes.

Over the past 21 years, the Waterloo Centre for Automotive Research (WatCAR) has served as the University of Waterloo's central hub for automotive and mobility research. It unites faculty from all six of the university's faculties, although its strength is deeply rooted in Engineering, which accounts for 88% of its researchers (106 of 120, as shown in Table 2). This strong representation highlights the Faculty of Engineering's pivotal role in advancing automotive innovation and contributing to WatCAR's success as a leading force in the field.

WatCAR's ongoing commitment to fostering interdisciplinary collaboration and engaging with industry partners ensures its continued leadership in the rapidly evolving automotive and mobility sectors. Through its efforts, the University of Waterloo has solidified its position as a key contributor to global automotive research and innovation. The following table shows the number of active WatCAR researchers in the Faculty of Engineering departments and other faculties.

WatCAR Faculty Researchers by Faculty/ Department

Faculty/ Department	Researchers
Engineering	
- Chemical	20
- Civil & Environmental	8
- Electrical and Computer	22

- Mechanical and Mechatronics	37
- Management Sciences	8
- Systems Design	11
Arts	2
Environment	3
Health	1
Mathematics	10
Science	2
Total	124

Our researchers in the Faculty of Engineering include:

CHEM: Aiping Yu, Alexander Penlidis, Ali Elkamel, Christian Euler, Costas Tzoganakis, David Simakov, Eric Croiset, Flora Ng, Hector Budman, Jeff Gostick, Joshua Pulsipher, Leonardo Simon, Linda Nazar, Mark Pritzker, Michael Fowler, Michael Pope, Milad Kamkar, Nasser Mohieddin Abukhdeir, Tizazu Mekonnen, Valerie Ward, Yverick Rangom

CEE: Alana Lund, Bruce Hellinga, Chris Bachmann, Chul Min Yeum, Dipanjan Basu, Hassan Baaj, Jeffrey Casello, Liping Fu, Rebecca Saari

ECE: Amir-Hossein Karimi, Catherine Rosenberg, Claudio Canizares, Derek Rayside, Elliot Creager, Fakhreddine Karray, Gennaro Notomista, George Shaker, Guang Gong, Kankar Bhattacharya, Krzysztof Czarnecki, Magdy Salama, Mehrdad Kazerani, Michael Fisher, Patrick Lam, Safieddin Safavi-Naeini, Sebastian Fischmeister, Siva Sivoththaman, Slim Boumaiza, Weihua Zhuang, Yash Vardham Pant, Zhou Wang

MME: Adrian Gerlich, Amir Khajepour, Armaghan Salehian, Baris Fidan, Behrad Khamesee, Brandon DeHart, Cecile Devaud, Clifford Butcher, Duane Cronin, Ehsan Marzbanrad, Ehsan Toyserkani, Elizabeth Weckman, Elliot Biro, Hamidreza Jahedmotlagh, Hyock Ju Kwon, Jean-Pierre Hickey, John Magliaro, John Montesano, John Wen, Kaan Erkorkmaz, Kaan Inal, Kevin Musselman, Kyle Daun, Mary Wells, Michael Worswick, Mihaela Vlasea, Roydon Fraser, Saeed Maleksaeedi, Sanjeev Bedi, Serhiy Yarusevych, Soo Jeon, Stephen Smith, Steven Waslander, Vinny Gupta, William Melek, Xianguo Li, XiaoYu Wu, Yimin Wu

MSE: Fatma Gzara, Hossein Abouee Mehrizi, Mark Hancock, Mehrdad Pirnia, Oliver Schneider, Samir Elhedhli, Sibel Alumur Alev, Sirisha Rambhatla

SYDE: Alexander Wong, Catherine Burns, Christopher Eliasmith, Jessie Ma, John McPhee, John Zelek, Lisa Aultman-Hall, Mohammad Shafiee, Nasser Lashgarian Azad, Shi Cao, Siby Samuel

Mathematics: Jun Liu, Kirsten Morris, Edward Vrscay, Joanne M. Atlee, Jian Zhao, Samir Al-Kiswany, Sujaya Maiyya, Freda Shi, Shoja Chenuri, Ali Ghodsi

Health: Jack Callahan

Environment: Jeff Casello, Peter Johnson, Jonathan Li

Arts: Randy Harris, Neil Randall

Science: Holger Kleinke, Linda Nazar

It should be noted that as a Senate-recognized research center, WatCAR is open to all faculty members whose work aligns with the automotive, transportation systems, and mobility sectors. WatCAR's primary role is to promote, support, and strengthen the University's research community in these critical areas, fostering innovation and collaboration. We recognize all faculty engaged in these fields as members of WatCAR and are committed to providing tailored support to advance their research initiatives. This includes showcasing their work, fostering industry partnerships, and creating opportunities for interdisciplinary collaboration, all while maximizing the use of our available resources.

Members Feedback

In order to assess the impact of WatCAR on our members' research and their connections with industry, the following email was sent to a group of WatCAR members.

Hello all,

I hope this message finds you well. As part of the renewal process for WatCAR, we are gathering input from some of our members to highlight your experience and the impact that WatCAR has had on your research and industry connections.

Could you kindly provide a few sentences about your experience and how WatCAR has influenced or contributed to your research activities? Your input will be invaluable in showcasing the importance of WatCAR in supporting research excellence.

The deadline for submitting the renewal application is in one week, and I apologize in advance for the short notice. We only learned about the feedback requirement a few days ago, as it was not included in our previous renewal application. If you could kindly send your feedback by next Monday at the latest, we will have enough time to incorporate it into the application.

Thank you again, and I truly appreciate your support.
Amir

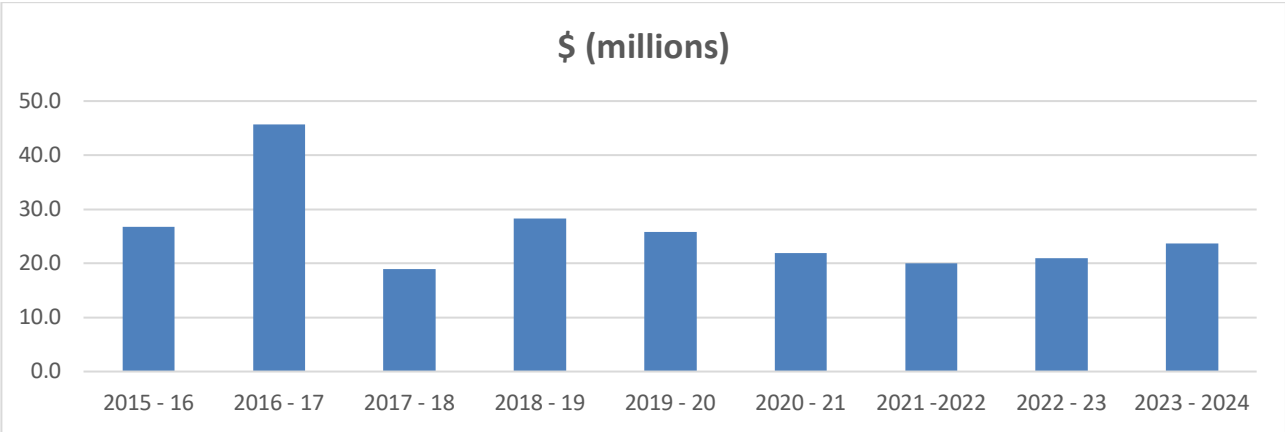
It is important to note that WatCAR is not a centralized entity focused on a single domain. Instead, it serves as a platform that connects faculty members across the University of Waterloo with automotive companies, showcases and promotes Waterloo's automotive research at various national and international venues, and facilitates large-scale automotive research initiatives.

Given this unique structure, the impact of WatCAR is best illustrated not only through the feedback and testimonials of its members but also through support letters from the Dean of Engineering and the Chairs of the Faculty of Engineering departments. These letters emphasize the importance and success of WatCAR in achieving its mission to expand and support automotive research within the Faculty of Engineering and the University of Waterloo.

The Dean’s and Chairs’ support letters can be found in Appendix A, while the feedback and testimonials from WatCAR members are included in Appendix B. Together, these documents provide a comprehensive view of the critical role WatCAR plays in fostering research excellence and industry collaboration in the automotive sector.

Research Funding

Between 2016 and 2024, automotive-related funding from sponsored research agreements in the Faculty of Engineering surpassed \$232 million, showcasing the robust support from industry and government for research at the University of Waterloo, as detailed in the following table.



Industry partners and their trust in our research capabilities have been instrumental in achieving this level of funding. The figures highlight the substantial financial commitment from both public and private sectors toward advancing automotive innovation.

The table below presents the breakdown of automotive-related funding across the Faculty of Engineering departments from 2021 to 2024. Notably, annual research funding began to grow significantly after the end of COVID-19, reflecting WatCAR’s success in fostering collaboration between academic researchers and industry stakeholders. This growth underscores the trust placed in the University of Waterloo to deliver impactful research that addresses critical challenges and opportunities in the automotive and mobility sectors. These investments continue to drive cutting-edge advancements, strengthen industry partnerships, and solidify Waterloo’s reputation as a global leader in automotive research.

	2021-22	2022-23	2023-24
MME	\$13,526,937	\$11,697,278	\$14,583,622
ECE	\$2,616,901	\$4,123,157	\$3,696,651
CHEM	\$1,531,691	\$1,713,657	\$2,553,923
SYDE	\$1,330,065	\$2,086,948	\$1,430,134
MSE	\$281,300	\$789,147	\$953,000
CEE	\$736,468	\$600,839	\$492,092
FoE	\$20,023,362	\$21,011,026	\$23,709,422

Currently, WatCAR actively engages with the majority of automotive OEMs and SMEs. These strategic engagements enable WatCAR to establish and maintain strong relationships, facilitate impactful research partnerships, and position the University of Waterloo as a key collaborator in driving innovation within the automotive and mobility sectors. This proactive approach ensures that WatCAR remains at the forefront of industry-academia collaboration, creating solutions that address emerging challenges and unlock new opportunities in a rapidly evolving industry.

Students and Publications

Since 2015, the University of Waterloo has been a leading contributor to automotive and mobility research, with hundreds of graduate students conducting cutting-edge studies in this field. These efforts have resulted in thousands of peer-reviewed publications, advancing knowledge in areas such as autonomous vehicles, lightweight materials, connected systems, alternative powertrains, and advanced manufacturing. This extensive body of work underscores the significant contributions made by Waterloo researchers to the global automotive ecosystem.

WatCAR has played a crucial role in fostering this academic and research excellence. By connecting faculty members with industry partners, facilitating research collaborations, and securing funding opportunities, WatCAR has supported graduate students in conducting impactful research. Through initiatives such as industry-sponsored projects and access to advanced facilities like GAIA and AVRIL (prior to 2022), WatCAR has provided students with hands-on experience in solving real-world automotive challenges.

Additionally, WatCAR has facilitated knowledge dissemination by organizing workshops, seminars, and conferences, where students and faculty members can present their findings to both academic and industry audiences. This active engagement has enhanced the visibility of Waterloo's automotive research globally, further solidifying its reputation as a hub for innovation in the sector.

Since WatCAR's activities are primarily industry-focused and interdisciplinary, graduate student involvement is inherently tied to individual research projects rather than a centralized program. This decentralized model allows graduate students and postdoctoral researchers to engage in a wide variety of initiatives, each tailored to specific research needs and industry collaborations. As a result, while we can highlight the significant contributions of graduate students to key initiatives, specific numbers are challenging to quantify given the diverse range of collaborations WatCAR has facilitated in the past.

However, to provide an estimate of WatCAR's impact, we considered the large research initiatives supported and facilitated by WatCAR over the past five years. Even with a conservative approach, the number of graduate students and postdoctoral researchers supervised and graduated by WatCAR-affiliated faculty exceeds 500. These individuals have played crucial roles in advancing cutting-edge research and have gained valuable experience working on interdisciplinary, industry-relevant projects, further enhancing their career prospects and contributions to the field.

WatCAR also supports undergraduate student experiences by actively promoting co-operative education and working closely with our co-op office staff to provide introductions to new companies in the mobility space. This has resulted in expanded and new work placement opportunities for our students. WatCAR also promotes other experiential activities including our successful student teams by connecting them with companies for team sponsorship and mentorship. WatCAR has worked closely with our Advancement teams to facilitate sponsorship of scholarships and also the Ideas Clinic and its activities. The Ideas Clinic provides additional design and hands-on learning opportunities for our undergraduate students, and examples of supporting companies include Toyota

and Magna. All of these activities help to develop a strong workforce, and also exposure and interest among our students for the job opportunities in the automotive and mobility sectors. Again, it is difficult to quantify impact of WatCAR support for these activities, but it can be estimated that overall thousands of students a year would have received benefit.

WatCAR Organizational Structure

Oversight and Financial Responsibility

The Waterloo Centre for Automotive Research (WatCAR) will operate under the Faculty of Engineering Research Office at the University of Waterloo and will adhere to the principles and framework outlined in Policy 44. Oversight and financial responsibility for WatCAR will rest with the Faculty of Engineering Research Office, which will provide operational funding and support.

Steering Committee

The Steering Committee will serve as the governing body for WatCAR, ensuring alignment with the Centre's mission and compliance with university policies, procedures, and guidelines. The Steering Committee will oversee the Centre's strategic planning, financial management, and policy development, as well as the implementation of rules governing its activities.

The Steering Committee will meet at least once annually, with additional meetings as needed. Members of the Steering Committee will include:

- Dean of the Faculty of Engineering (Chair)
- WatCAR Director
- Two regular faculty members from the Faculty of Engineering (rotating every three years)
- Two representatives from the industry or public sector relevant to WatCAR's activities (rotating every three years)

The Steering Committee will also be responsible for approving key appointments, such as the Director(s), advisory board members, and WatCAR overall planning and directions.

Director

The WatCAR Director will be a tenured faculty member in the Faculty of Engineering, appointed for a renewable three-year term. The Director will report to the Steering Committee and will oversee the day-to-day operations of the Centre, including research initiatives, outreach, and engagement with members and external partners.

The Director's responsibilities include:

- Promoting interdisciplinary and cross-sectoral collaboration within Industry
- Representing WatCAR at internal and external engagements
- Managing WatCAR activities and ensuring alignment with the Centre's mission and objectives

The Director will be supported by an Associate Director(s), appointed for a three-year term, who will assist in specific areas such as industry outreach, and coordination of events like workshops and seminars. The Associate Director(s) will act on behalf of the Director in their absence.

Advisory Board

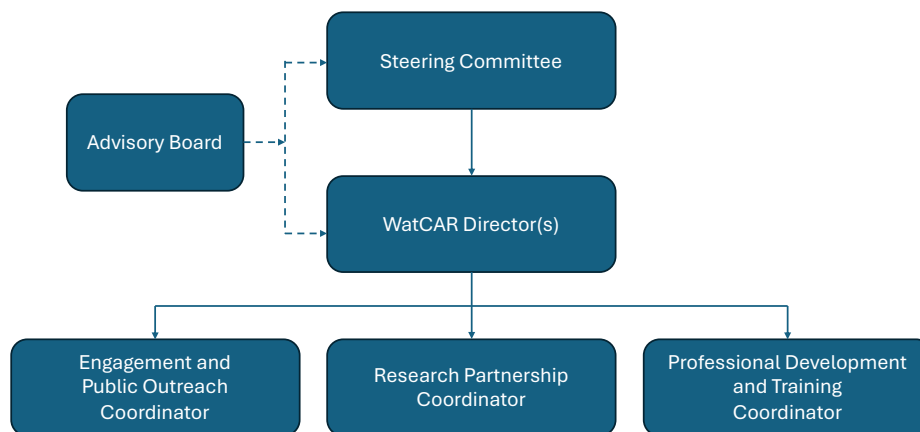
An Advisory Board will provide guidance on WatCAR's strategic direction and ensure its activities align with stakeholder interests. The Board will serve in an advisory capacity to the Steering Committee and Director, offering recommendations on research priorities, partnerships, and outreach initiatives.

The Advisory Board will consist of:

- WatCAR Director (Chair)
- One representative from the automotive industry (rotating every three years)
- One representative from a public-sector organization (rotating every three years)
- Two representatives from the Faculty of Engineering (rotating every three years)

The Advisory Board will meet biannually and provide feedback to the Steering Committee on WatCAR's performance and future initiatives.

The overall organizational chart of WatCAR is shown below.



Reporting and Review

As per Policy 44, WatCAR will report annually to the Faculty of Engineering Research Office. The Centre will undergo a formal review every five years to evaluate its progress, impact, and alignment with the university's strategic goals.

Current WatCAR Leadership

WatCAR is currently led by three appointed faculty members: an Executive Director and two Associate Directors, each serving limited terms of up to 3 years. This leadership structure ensures both continuity and fresh perspectives as WatCAR adapts to the evolving needs of the automotive research community.

The Executive Director of WatCAR is **Amir Khajepour**, a Professor in Mechanical and Mechatronics Engineering. Amir brings extensive experience in vehicle systems and autonomous mobility to his leadership role. As the Executive Director, he is responsible for overseeing the Centre's overall direction, ensuring alignment with the WatCAR's mission, and fostering strong partnerships with industry and government. His leadership drives WatCAR's vision to be a national and international leader in automotive and mobility research.

Krzysztof Czarnecki, an Associate Director specializing in Connectivity & Cybersecurity, plays a critical role in driving research and outreach in these rapidly evolving fields. Krzysztof is a Professor in Electrical and Computer Engineering and brings deep expertise in vehicle connectivity and cybersecurity. His focus is on ensuring that WatCAR remains at the forefront of cutting-edge technologies that are essential for the development of connected and secure autonomous mobility systems.

Michael Benoit, an Associate Director for Crashworthiness & Advanced Manufacturing, focuses on advancing vehicle safety and the integration of innovative manufacturing techniques. Michael is an Assistant Professor in Mechanical and Mechatronics Engineering, and his work supports WatCAR's efforts to enhance vehicle lightweighting and improve crashworthiness using advanced materials and manufacturing processes. His expertise helps ensure that WatCAR contributes to the development of safer, more efficient vehicles.

Other key members of the WatCAR team include **Dave Dietz**, Director of Engineering Research, and **Michele Van Dyke**, Manager of Industry Partnerships, from the **Engineering Research Office**. They play crucial roles in supporting WatCAR's day-to-day activities and fostering connections between academia and industry.

Together, this leadership team ensures that WatCAR remains responsive to the evolving needs of the automotive sector while maintaining a focus on academic excellence and industry collaboration.

Budget and Financial Support

WatCAR became a University Senate-recognized research center in 2006, marking a significant milestone in its establishment as a leader in automotive research. Initially, its funding was jointly supported by the Dean of Engineering and the Provost's Office through 2012. Starting in 2013, the Provost's Office became the sole source of financial support, sustaining WatCAR's operations until the 2020 budget year, which concluded on April 30, 2021. During this period, WatCAR was renewed as a Senate-recognized center in both 2011 and 2016, affirming its continued relevance and impact.

In 2020, the Provost's Office announced it would no longer provide funding for WatCAR after the 2020 budget year, which ended on April 30, 2021. In response, the Dean of Engineering stepped in to provide funding for one additional year, covering the fiscal year of 2021, which ended in April 2022. The following table outlines WatCAR's budget years from 2006 to 2021.

Summary of WatCAR budget and funding sources

Year	Annual Budget	Funding Source
2006-2012	\$250,000	50% Provost/ 50% Dean of Engineering
2013-2016	\$250,000	100% Provost
2017-2020	\$350,000	100% Provost
2021	\$207,400	100% Dean of Engineering

With no financial support available from the university's central administration—such as the Provost's Office or the Office of Research—the Faculty of Engineering has assumed responsibility for WatCAR's operational and financial needs. This includes providing administrative support through the Faculty's Research Office and funding for travel, industry outreach, and participation in conferences and exhibitions. Consequently, after the 2021 budget year, WatCAR no longer maintains a distinct budget, with its funding and expenditures incorporated into the broader Faculty

of Engineering's operational framework. This arrangement allows WatCAR to focus on facilitating interdisciplinary research collaborations and industry partnerships without the administrative burden of managing a separate financial entity.

As an example, some of the expenses of WatCAR covered by the Faculty of Engineering are listed below. Hospitality for external visitors, including expenses for parking, food, and beverages for visiting partners and collaborators, is allocated an annual budget of approximately \$4,000. Memberships in key organizations, such as the Automotive Parts Manufacturers' Association (APMA) and the Canadian Urban Transit Research & Innovation Consortium (CUTRIC), cost around \$5,000 annually. Attendance at critical industry events is supported with an approximate annual budget of \$12,000, covering registration and travel costs for conferences, including five within Ontario and two to three in the United States. These events include the Detroit Auto Show, Enertech Forum, Canadian Auto Show, APMA Conference, Ontario Vehicle Innovation Network (OVIN) partnering forums, and Electric Autonomy Canada gatherings. Lastly, outreach activities, including company and partner visits, incur an annual expense of approximately \$5,000.

The Faculty of Engineering is committed to continuing this financial support for the next five years, contingent upon WatCAR's renewal as a Senate-recognized center. This commitment underscores the Faculty's recognition of WatCAR's importance in advancing automotive research and fostering partnerships that benefit both the university and the broader industry.

WatCAR Mission: 2025 -2030

The automotive industry is undergoing significant transformation, driven by advancements in technology, increasing global competition, regulatory pressures, and changing consumer preferences. The push towards electrification, connected and autonomous vehicle technologies, and sustainable manufacturing processes is reshaping the global automotive landscape. As the industry shifts towards greener and smarter vehicles, it faces both challenges and opportunities in innovation, supply chain management, and workforce development.

The automotive sector plays a vital role in the economies of Ontario and Canada, serving as a cornerstone of manufacturing, innovation, and employment. Ontario, in particular, is home to a highly skilled workforce, world-class research institutions, and a thriving ecosystem of automotive manufacturers and suppliers, contributing significantly to Canada's GDP and exports. Supporting this critical industry ensures not only economic stability but also strengthens Canada's position as a global leader in the automotive sector's transformation.

WatCAR (Waterloo Centre for Automotive Research) is uniquely positioned to support the automotive industry during this period of transformation. By facilitating collaborative research with University of Waterloo professors, through continual training and development programs, and extensive outreach efforts to strengthen partnerships with industry leaders, government bodies, and international stakeholders, ensuring that the Canadian automotive sector remains competitive and prepared for the future.

The Government of Canada and the Government of Ontario have launched several strategic programs to foster innovation and sustainability in the automotive sector, which are critical to driving the industry's ongoing transition. These initiatives aim to support advancements in electrification, connected and autonomous vehicle technologies, and sustainable manufacturing processes, ensuring Canada and Ontario remain leaders in the global automotive landscape.

The University of Waterloo, with its proven track record of collaboration with the automotive industry, is well-positioned to serve as a strong research partner. Leveraging its expertise, the university can attract significant grants to advance research, foster innovation, and train highly qualified personnel (HQP) to meet the industry's evolving needs.

Outlined below are some of the key automotive-related programs that highlight the commitment of federal and provincial governments to support the sector's transformation.

Government of Canada Initiatives

1. Net Zero Accelerator (NZA):

The Net Zero Accelerator is a \$8 billion fund that supports projects aimed at reducing greenhouse gas emissions. In the automotive sector, it focuses on promoting electric vehicle (EV) production, battery innovation, and the development of clean energy solutions.

2. Zero-Emission Vehicles (ZEV) Program:

The ZEV program offers incentives for the purchase of electric vehicles and funds the expansion of EV charging infrastructure. This program is a key component of Canada's broader strategy to reduce carbon emissions and support the transition to a low-carbon economy.

3. Strategic Innovation Fund (SIF):

The Strategic Innovation Fund provides financial support for large-scale, transformative projects in the automotive industry, particularly those that advance EVs, autonomous vehicles, and connected technologies. The fund is instrumental in enhancing the competitiveness of Canada's automotive sector.

4. NRC e-Auto Initiative:

The National Research Council of Canada (NRC) launched the **e-Auto Initiative** to drive the development and commercialization of electric vehicle (EV) technologies. The initiative aims to support the Canadian automotive sector by accelerating the research and development of next-generation EV components, such as batteries, powertrains, and lightweight materials. The e-Auto Initiative focuses on overcoming technical barriers to EV adoption, including improving battery performance and reducing production costs. By providing expertise, facilities, and collaborative opportunities, the NRC e-Auto Initiative plays a critical role in positioning Canada as a leader in the global shift toward electric mobility.

Government of Ontario Initiatives

1. Ontario Vehicle Innovation Network (OVIN):

OVIN supports the development and commercialization of next-generation automotive technologies, including electric, connected, and autonomous vehicles. It provides funding

for research, testing, and demonstration projects, positioning Ontario as a leader in automotive innovation.

2. Ontario's Electric Vehicle (EV) Strategy:

Ontario's EV strategy aims to increase the adoption of electric vehicles by expanding the province's EV charging network, offering incentives, and supporting local EV production. The strategy is part of Ontario's broader goal to reduce greenhouse gas emissions and transition to a more sustainable transportation system.

3. Automotive Supplier Competitiveness Improvement Program (ASCIP):

ASCIP helps Ontario-based automotive suppliers enhance their competitiveness through the adoption of new technologies and lean manufacturing processes. The program provides funding to support innovation and advanced product development within the automotive supply chain.

4. Driving Prosperity - The Future of Ontario's Automotive Sector:

The Driving Prosperity program is a comprehensive strategy designed to secure Ontario's position as a global leader in the automotive sector. The program focuses on three key pillars:

- Innovation and Excellence: Supporting R&D in electric and autonomous vehicles, connected technologies, and smart manufacturing to keep Ontario at the cutting edge of automotive innovation.
- Talent Development: Ensuring Ontario's workforce is equipped with the skills needed for the future of mobility through education, training, and partnerships between industry and academia.
- Business Environment: Creating a favorable business environment by enhancing the supply chain, attracting investment, and supporting small and medium-sized enterprises (SMEs) in the automotive sector.

These initiatives underscore the government's commitment to maintaining and advancing Ontario's leadership in the automotive industry during this transformative period.

Pillars of the WatCAR Mission

To align WatCAR with the current and future landscape of the automotive industry, address key government initiatives, and ensure continued relevance while contributing to shaping major policies, we have identified three strategic pillars for our mission over the next five years. These pillars are designed to solidify the University of Waterloo's position as a leader in automotive research and innovation, strengthen partnerships with industry and government, and increase our impact on the evolving automotive ecosystem. They aim to drive technological advancements, support workforce development, and facilitate knowledge transfer to address the challenges and opportunities facing the automotive sector. These pillars are:

Pillar 1: Research Partnership

As the automotive industry undergoes a significant transformation, driven by advancements in technology and shifting regulatory pressures, **Research Partnerships with a Focus on Small and Medium Enterprises (SMEs)** will play a critical role in supporting innovation and driving the sector's transition to a greener and more connected future. At WatCAR, we aim to foster collaborative research efforts that align with the industry's evolving needs and provide the industry with the resources, expertise, and cutting-edge research required to stay competitive in this dynamic environment. Our strategic focus is on areas that directly align with the industry's transformation, ensuring that especially SMEs can leverage advanced technologies and research to remain at the forefront of this transition.

The following areas of research represent our core strengths and are critical to advancing the future of the automotive sector, as well as supporting the needs of the industry:

1. **Autonomous and Connected Mobility Systems:** Autonomous and connected vehicles represent the future of transportation, offering benefits such as increased safety, reduced congestion, and improved mobility. At Waterloo, we are at the forefront of research in autonomous systems, including vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication. Through collaborative partnerships with the industry, particularly with many startups and SMEs, we aim to accelerate the development of advanced autonomous technologies and connected mobility solutions. This includes research into intelligent algorithms, sensors, and communication protocols that will enable safer and more efficient autonomous mobility systems in transportation, mining, farming, and indoor applications.
2. **Electric Vehicles and Alternative Fuels:** With the global push toward sustainability, the automotive industry's shift to hybrid and electric vehicles and alternative fuels is paramount. Research at the University of Waterloo in EV battery technology, charging infrastructure, and alternative fuels (such as hydrogen and biofuels) is designed to support both large manufacturers and SMEs in adapting to this new landscape. By working closely with SMEs, we facilitate the development of cost-effective, scalable EV solutions and support innovation in green technologies, allowing companies to capitalize on the growing demand for sustainable mobility.
3. **Active Safety and Advanced Driver Assistance Systems (ADAS):** The demand for safer vehicles has driven the development of advanced driver assistance systems (ADAS) that enhance vehicle safety through technologies like adaptive cruise control, lane-keeping assist, and emergency braking. Our research focuses on improving these systems' reliability, efficiency, and integration into everyday vehicles. By partnering with the industry and especially SMEs, we help bring these technologies to market, ensuring that small and medium-sized companies have the tools to integrate cutting-edge safety features that align with both consumer demands and regulatory requirements.
4. **Smart Infrastructure and Intelligent Transportation Systems (ITS):** The shift towards smart cities and intelligent transportation systems is central to creating more efficient and sustainable urban environments. Our strong research in smart infrastructure aims to develop systems that optimize traffic flow, reduce congestion, and improve the overall transportation experience. By collaborating with city planners and industry in the development and deployment of ITS, we help bring innovative solutions to market that integrate advanced sensors, data analytics, and AI to improve mobility on a large scale.
5. **Cybersecurity and Data Privacy in Mobility:** As vehicles become more connected, the need for robust cybersecurity and data privacy becomes critical. Our researchers are committed to advancing research in automotive cybersecurity to ensure the safety and privacy of both vehicle systems and consumers. We focus on developing solutions that protect vehicles from cyber threats, ensuring the integrity of connected systems and user data. Through partnerships with large and SMEs, we aim to provide the tools and expertise

needed to develop secure automotive technologies that meet the demands of a highly connected world.

6. **Crashworthiness and Advanced Manufacturing:** As the automotive industry adopts new materials and manufacturing processes, ensuring vehicle safety in the event of a crash remains a top priority. Our strong research in crashworthiness and advanced manufacturing techniques focuses on improving the structural integrity of vehicles while also optimizing manufacturing efficiency. By collaborating with the industry, we support the adoption of new lightweight materials, additive manufacturing, and other innovative production methods that not only improve vehicle safety but also enhance cost-effectiveness for manufacturers.

Pillar 2: Professional Development and Training

WatCAR is committed to supporting the training of next generation talent for the automotive and mobility sectors. As the industry undergoes rapid transformation driven by electrification, autonomous systems, and smart infrastructure, the demand for a highly skilled and adaptable workforce has never been greater. Our Professional Development and Training pillar focuses on equipping professionals, students, and industry partners with the knowledge and skills required to thrive in this evolving landscape.

Key initiatives under this pillar include:

1. **Hands-On Training Programs:** Offering specialized workshops, certifications, and technical training in emerging fields such as electric vehicles, autonomous systems, advanced manufacturing, cybersecurity, and intelligent transportation systems.
2. **Interdisciplinary Learning:** Promoting and organizing cross-disciplinary seminars and workshops that connect engineering, computer science, and data analytics to foster collaboration and address complex challenges in mobility and smart infrastructure.
3. **Upskilling for Industry Professionals:** Collaborating with industry partners to provide upskilling opportunities tailored to their workforce, ensuring employees remain competitive and well-prepared for industry shifts.
4. **Workforce Development for SMEs:** Supporting small and medium-sized enterprises by offering targeted training programs that address their specific needs, enhancing their capacity to innovate and adapt to market changes.
5. **Knowledge Exchange:** Facilitating interaction between academia, industry, and policymakers through seminars, conferences, and collaborative projects, ensuring a continuous flow of expertise and insights across the ecosystem.

By prioritizing professional development and training, WatCAR will play a pivotal role in building a future-ready workforce, bridging the gap between academia and industry, and supporting Canada's leadership in automotive innovation.

Pillar 3: Stakeholder Engagement and Public Outreach

Stakeholder engagement and public outreach are vital components of WatCAR's mission, ensuring that its research and training extend beyond academia to influence and benefit society at large. This pillar complements WatCAR's focus on research partnerships and professional development by fostering connections with key stakeholders, driving innovation, and addressing the broader challenges and opportunities in the evolving automotive ecosystem. The goals of this third pillar include:

- **Knowledge Transfer:** Facilitate the dissemination of research findings and technological

advancements from our Waterloo researchers to the broader community, ensuring societal and industry-wide benefits from its innovations.

- **Building Strategic Partnerships:** Strengthen relationships with industry leaders, government bodies, startups, and SMEs to align research efforts with real-world needs, secure resources, and foster collaboration.
- **Shaping Public Policy:** Provide evidence-based insights to policymakers on emerging automotive technologies, ensuring regulations support innovation, sustainability, and societal well-being.
- **Supporting Economic Growth:** Engage with startups and SMEs to foster entrepreneurship and innovation, driving economic development and job creation within the automotive sector.
- **Community Engagement:** Raise awareness and build public trust in transformative technologies like autonomous vehicles and electric mobility through local community involvement and public talks and seminars.

We will adopt a multi-faceted approach in our outreach activities to ensure broad and meaningful engagement with diverse stakeholders. Our efforts will focus on reaching out to:

1. **Industry Partners:** Engaging with automotive manufacturers, suppliers, and technology companies to align research with industry needs, foster collaboration, and support the adoption of innovative technologies.
2. **Government Bodies:** Collaborating with federal, provincial, and municipal governments to secure funding, influence policies, and contribute to national and regional priorities, such as sustainability and economic development.
3. **Startups and SMEs:** Supporting small and medium-sized enterprises and startups by offering access to research expertise, fostering innovation, and connecting them with larger industry players to bridge gaps in the ecosystem.
4. **Policymakers:** Providing evidence-based insights and research findings to policymakers to shape regulations that support innovation, safety, and sustainability in the automotive and mobility sectors.
5. **Academic and Research Institutions:** Strengthening ties with other universities and research centers to foster interdisciplinary collaboration and share knowledge that can address complex challenges in mobility and infrastructure.

This comprehensive approach ensures that our outreach efforts amplify the impact of Waterloo's innovations, foster meaningful collaborations, and contribute to the development of policies and technologies that benefit society and the automotive industry.

Conclusion

We believe that this document is comprehensive and provides all the necessary components for the Senate Graduate and Research Council to conduct a thorough evaluation of WatCAR's renewal application. This application reflects our ongoing commitment to advancing automotive research and fostering interdisciplinary collaboration within the University of Waterloo.

We are committed to sustaining and expanding the positive impact WatCAR has had on Waterloo's research, industry partnerships, and workforce development. Our vision for the next five years aims to address the evolving needs of the automotive sector and align with the broader academic and industrial trends that are shaping the future of transportation and mobility.

We deeply appreciate the time and attention that the Senate Graduate and Research Council will devote to reviewing this application. We remain confident that WatCAR's mission, objectives, and potential for

future growth will resonate with the council's goals for supporting cutting-edge research and innovation at the University of Waterloo.

Thank you for your thoughtful consideration of WatCAR's renewal request. We look forward to the opportunity to continue contributing to the university's success and advancing research that will shape the future of the automotive industry.

Amir Khajepour, Executive Director
Krzysztof Czarnecki, Associate Director
Michael Benoit, Associate Director

Appendix A: Support Letters



Faculty of Engineering | Office of the Dean
519-888-4885
Dean.engineering@uwaterloo.ca | Uwaterloo.ca/engineering

December 5, 2024

Bernard P. Duncker
Associate Vice-President, Research and International

Dear Bernard,

I am writing to express my strong support for the renewal of WatCAR (Waterloo Centre for Automotive Research). Over the years, WatCAR has proven to be an invaluable asset to the Faculty of Engineering and the broader University of Waterloo community, serving as a vital hub for cutting-edge automotive research and innovation.

WatCAR's impact is evident in its ability to foster meaningful collaborations between our faculty members and industry partners, driving innovation in critical areas such as autonomous systems, electric vehicles, and advanced manufacturing. These partnerships not only elevate the Faculty of Engineering's reputation but also enhance Canada's position as a leader in the global automotive industry.

Between 2016 and 2024, automotive-related funding from sponsored research agreements in the Faculty of Engineering surpassed \$232 million, underscoring the trust and commitment of industry and government partners. This success is a testament to WatCAR's exceptional leadership in bridging the gap between academia and industry to address key challenges and opportunities in the automotive and mobility sectors.

Looking forward, WatCAR's proactive engagement with SMEs and OEMs positions it as a critical player in advancing automotive technologies and strengthening Canada's automotive value chain. By renewing WatCAR, the Faculty of Engineering will continue to support transformative research that addresses industry needs, attracts talent, and fosters innovation.

I wholeheartedly endorse the renewal of WatCAR and its ongoing contributions to the University of Waterloo, the Faculty of Engineering, and the broader automotive ecosystem. I am confident that WatCAR will continue to drive significant advancements in automotive research and education.

Thank you for considering this request. Please let me know if there is any additional information I can provide in support of this renewal.

Sincerely,

A handwritten signature in black ink, appearing to be "A. Duncker", written over a light blue circular stamp.

Acting Dean of Engineering

200 UNIVERSITY AVENUE WEST, WATERLOO, ON, CANADA N2L 3G1



Faculty of Engineering
Department of Mechanical and Mechatronics Engineering

December 2, 2024

Dear Amir,

As Chair of the Department of Mechanical and Mechatronic Engineering, I am pleased to express my full support for WatCAR's renewal as a Senate-recognized research center. Over the years, WatCAR has played a pivotal role in advancing automotive innovation and providing our faculty with unparalleled opportunities for collaboration with industry leaders.

The department has benefited immensely from WatCAR's focus on transformative technologies, such as lightweight materials, advanced manufacturing, and vehicle systems and autonomous mobility. These efforts have not only strengthened our department's reputation but also enabled our faculty and students to make significant contributions to the automotive sector.

I am confident that WatCAR's continued work will be instrumental in driving interdisciplinary research, fostering industry partnerships, and supporting the next generation of innovators.

Sincerely,



Mike Collins, Ph.D., P.Eng.
Professor and Chair



200 UNIVERSITY AVENUE WEST, WATERLOO, ON, CANADA N2L 3G1



FACULTY OF ENGINEERING | Electrical and Computer Engineering
519-888-4567, ext. 32097 | fax 519-746-3077
ece.uwaterloo.ca

**Kankar Bhattacharya, PhD, P.Eng., FIEEE,
Professor & Department Chair,
Department of Electrical & Computer Engineering**

December 2, 2024

**To:
Professor Amir Khajepour
Director, WatCAR,
Faculty of Engineering.**

Dear Amir,

I am very happy to endorse WatCAR's renewal as a Senate-recognized research center. As Chair of the Department of Electrical and Computer Engineering, I have witnessed firsthand the critical role WatCAR plays in supporting research initiatives within our department, particularly in areas such as autonomous systems, connectivity and cybersecurity.

WatCAR's ability to connect faculty with key industry players has been invaluable in securing research funding, advancing cutting-edge projects and enabling impactful collaborations. The center's commitment to aligning its mission with emerging trends in electrification and intelligent transportation underscores its importance to the university and the automotive sector.

I strongly support WatCAR's renewal and its continued contributions to the ECE Department and the broader research community.

Sincerely,

Kankar Bhattacharya,
Professor and ECE Department Chair



EIT, 200 UNIVERSITY AVENUE WEST, WATERLOO, ON, CANADA N2L 3G1



FACULTY OF ENGINEERING | Systems Design Engineering
519-888-4567, ext. 32600
sydedept@uwaterloo.ca | systems.uwaterloo.ca

December 6, 2024

Amir Khajepour, Director of WatCAR
University of Waterloo
200 University Ave West
E3 4116
Waterloo ON, N2L 3G1

Dear Amir,

On behalf of the Department of Systems Design Engineering, I am pleased to express our support for WatCAR's renewal as a Senate-recognized research center. WatCAR has been an integral partner in advancing interdisciplinary research and innovation, particularly in areas such as intelligent transportation systems and human-machine interfaces.

Our department has been a key partner with WatCAR as they facilitate collaboration across disciplines and connect us with key stakeholders in the automotive ecosystem. We look forward to the next stage of growth for WatCAR as they expand their contributions to the university and the automotive industry to include sustainability and equity.

Sincerely,

Lisa Aultman-Hall
Professor and Chair
Systems Design Engineering

Nasser Lashgarian Azad

Nasser Lashgarian Azad
Professor and Associate Chair, Graduate Studies and Research
Systems Design Engineering



200 UNIVERSITY AVENUE WEST, WATERLOO, ON, CANADA N2L 3G1

Appendix B: Members Feedback

RE: WatCAR Renewal application and your feedbackk

 **Soo Jeon** <soojeon@uwaterloo.ca>
To:  Amir Khajepour

Yesterday at 3:02 PM

Hi Amir,

This was already quite a while ago, but it was good to have WatCAR when I tried to attract research collaborations with KATECH (Korea Automotive Technology Institute). Ross was a big help throughout the process. We were able to get a small seed funding from Korean government with the expectation to establish a longer term project which didn't materialize unfortunately, but I think it's good to have WatCAR (as a brand) for this kind of efforts.

Thanks.

Soo Jeon

Re: WatCAR Renewal application and your feedbackk

 **Sebastian Fischmeister** <sfischme@uwaterloo.ca>
To:  Amir Khajepour

Yesterday at 3:09 PM

WatCAR has been an invaluable asset in my journey as a professor, offering the support and infrastructure necessary to collaborate with industry such as APMA, Magna, QNX, Renesas, and many others. It provided the foundation and reputation to launch new initiatives, foster joint collaborations, and apply cutting-edge research in the automotive sector. Thinking back 16 years ago, WatCAR was a key factor in my decision to join the University of Waterloo as an assistant professor. To this day, I share with potential hires how it has played a pivotal role in shaping my career and what it can do for them.

Cheers,
Sebastian

RE: WatCAR Renewal application and your feedbackk

😊 ↩️ ⏪ ⏩



📧 Mihaela Vlasea <mihaela.vlasea@uwaterloo.ca>

Yesterday at 9:10 PM

To: 📧 Amir Khajepour

Hello Amir,

Please see below for impact statements.

WatCAR is an important pillar in our Engineering ecosystem. It serves as the front door for engaging with industry to understand problems, to connect stakeholders internal and external to the University, as well as to ensure that the important automotive research done in the Faculty of Engineering has excellent visibility. WatCar has been instrumental in providing industry engagements in the metal additive manufacturing domain, which resulted in direct collaborations and service engagements with industry. Such engagements span Linamar, Magna, Dana, Constellium, and many more.

Kind regards,
Mihaela

Re: WatCAR Renewal application and your feedbackk

😊 ↩️ ⏪ ⏩



📧 HJ Kwon <hjkwon@uwaterloo.ca>

Today at 1:53 AM

To: 📧 Amir Khajepour

Hi Amir,

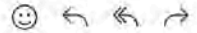
Below is my supporting paragraph for WatCAR:

WatCAR has been an outstanding platform for showcasing Waterloo's innovation and leadership in automotive research. Through its collaborative initiatives, WatCAR has facilitated significant opportunities to connect with industry partners and advance cutting-edge research. We have hosted numerous tours for visitors, providing them with a firsthand view of our state-of-the-art facilities and groundbreaking projects. These interactions have not only enhanced the visibility of our work but also strengthened industry-academic partnerships, driving impactful outcomes in both research and commercialization. WatCAR continues to play a critical role in fostering research excellence and solidifying Waterloo's position as a hub for automotive innovation.

If you need anything else, pls let me know. Thanks.

HJ

Re: WatCAR Renewal application and your feedbackk



✓ Bruce Hellinga <bruce.hellinga@uwaterloo.ca>

Yesterday at 12:32 PM

To: ✓ Amir Khajepour

Amir:

Input as requested is below. Let me know if you need more.

Though my research program has never been funded directly by the automotive industry, WatCAR has provided the following direct benefits on my research program:
Through WatCAR, I became aware of the vehicle simulator located at AVRIL and the work that Dr. Siby Samuel (SYDE) is doing using the simulator for road safety research. Since then, my colleagues, Professors Fu and Bachmann, and I have been successful in securing a research project (\$342k) partially funded by Transport Canada that leverages this driving simulator. My colleagues and I also submitted a proposal to MTO with Dr. Samuel as a co-investigator. Though this proposal was ultimately not selected for funding, the collaborations have continued to be productive. Prof Bachmann and I are co-supervising a new MASc student starting W25 who will be taking Prof. Samuel's graduate course entitled Applications of Driving Simulators to Driving Safety. These opportunities and collaborations would not have happened without WatCAR providing those connections (and the AVRIL infrastructure in the first place).

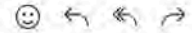
Regards,

- Bruce

Bruce Hellinga, PhD, PEng
Professor, Department of Civil & Environmental Engineering



Re: WatCAR Renewal application and your feedbackk



Shi Cao <shi.cao@uwaterloo.ca>

Today at 6:12 PM

To: Amir Khajepour

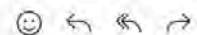
Hi Amir,

WatCAR helped me connect with an industry partner a few years ago, and we did two projects. I am not currently using the driving simulator at WatCAR, but having it available is a good asset for my future grant application.

Shi

Shi Cao (pronounced like SHER TSAO), PhD, PEng
Associate Professor, Department of Systems Design Engineering (SYDE) [Link](#)
Director, Human Optimization Modelling Lab (HOMLab) [Link](#)
Program Committee Chair, Collaborative Aeronautics Program, Waterloo Institute for Sustainable Aeronautics [Link](#)
University of Waterloo
200 University Avenue West
Waterloo, Ontario, Canada N2L 3G1
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Phone: 519-888-4567 ext. 36377

RE: WatCAR Renewal application and your feedbackk



Roydon Fraser <rafraser@uwaterloo.ca>

Yesterday at 1:13 PM

To: Amir Khajepour

Amir,

A bit of feedback from my experience:

“WatCAR assistance has been instrumental many times in the past in obtaining continuing support for the University of Waterloo Alternative Fuels Team (UWAFT) by connecting with, and assisting the conversations with, Canadian automotive industry contacts. With the help of WatCAR UWAFT has been able to secure over the years hundreds of thousands of dollars in cash and in-kind support towards projects primarily geared to producing highly trained personnel, i.e., in support of the training of hundreds of undergraduate students in addition to graduate student training over the years.”

This quote relates to the tremendous help Ross provided. Since Ross left I have not engaged WatCAR much.

Thank you.

Roydon Fraser, P.Eng.
Mechanical & Mechatronics Engineering

RE: WatCAR Renewal application and your feedbackk

😊 ↩ ⏪ ⏩



Nasser Lashgarian Azad <nlashgarianazad@uwaterloo.ca>

Today at 10:15 AM

To: Amir Khajepour

Good Morning,

Hope you are doing well. Please see the following sentences and let me know if something else is needed.

"I have done multiple collaboration research projects with Toyota. WatCAR was instrumental in helping with project discussions with Toyota, securing cash and in-kind contributions from them and obtaining support letters for my funding applications, as well as assisting with our vehicle testing activities like the transport of our test vehicles to Toyota test tracks and getting licence plates and insurance for them, along with facilitating our Toyota partners' visits and maintaining our relationship with them. Also, WatCAR has helped promote our automotive research activities at different events, along with introducing new partnerships and funding opportunities in automotive systems."

Thanks,
Nasser

Dr. Nasser L. Azad, Ph.D., P.Eng.
Professor and Associate Chair, Graduate Studies and Research
Director, Automation and Intelligent Systems (AIS) Group
Department of Systems Design Engineering
University of Waterloo, Office: E7-6424
Phone: 519-888-4567 x48797
Email: nlashgar@uwaterloo.ca
Website: <https://uwaterloo.ca/automation-intelligent-systems-group/>

Re: WatCAR Renewal application and your feedbackk

😊 ↩ ⏪ ⏩



Krzysztof Czarnecki <k2czarne@uwaterloo.ca>

Today at 12:44 AM

To: Amir Khajepour

Hi Amir,

Here is a short testimonial:

WatCAR has been invaluable for networking with industry and to build a strong story about automotive research at UW in government grant submissions. For example, I had \$80k grant from Denso North America back in 2016, which came out of contacts through WatCAR. Also, WatCAR was a key element in our CFI grant that funded AVRIL.

Thanks,
Krzysztof

Re: WatCAR Renewal application and your feedbackk

😊 ↩ ⏪ ⏩



🟢 John McPhee <mcphee@uwaterloo.ca>

Today at 8:20 AM

To: 🟢 Amir Khajepour

Sorry Amir, but super-busy wrapping up exams, theses, and projects. Here's a blurb:

WatCAR has been invaluable in supporting my automotive-related research. An initial meeting with Toyota, facilitated by WatCAR, led to more than \$5M in collaborative research projects, as well as the \$10M Green and Intelligent Automotive (GAIA) research facility. This is just one example of numerous university-industry research programs that were initiated and supported by WatCAR.

John.

Re: WatCAR Renewal application and your feedback

😊 ↩ ⏪ ⏩



🟡 Yash Vardhan Pant <yash.pant@uwaterloo.ca>

Today at 2:48 AM

To: 🟡 Amir Khajepour

Hi Amir,

My apologies for the late reply; I was traveling and missed your email. I haven't had much experience with WatCAR, but do appreciate the initial support I had at AVRIL back when Chris Shum was working there. Beyond that, I don't have anything meaningful to add.

regards,

--

Yash Vardhan Pant, Ph.D.
Assistant Professor, Electrical and Computer Engineering
David R. Cheriton School of Computer Science, Faculty of Mathematics (Cross-Appointed)
Faculty Affiliate, Waterloo Artificial Intelligence (AI) Institute
University of Waterloo, Ontario, Canada.

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Centre for Advanced Materials Joining 2025 Renewal Progress Report

Director: Prof. Adrian Gerlich

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Centre for Advanced Materials Joining: Progress Report to SGRC

December 16, 2024

Dear SGRC:

It is my pleasure to request renewal of the Centre for Advanced Materials Joining (CAMJ) at the University of Waterloo. Formally established in 2008, it comprises faculty members from departments in Faculties from Engineering and Science, Biology, Earth and Environmental Sciences, Civil & Environmental Engineering, Electrical & Computer Engineering, Physics & Astronomy, Systems Design Engineering and Mechanical & Mechatronics Engineering.

Based on the staff and facilities present at Waterloo, CAMJ can be considered in the top 5 university centres globally focusing on research and education in the field of advanced materials joining, including microjoining and nanojoining. The activities span a wide range of areas which carry both high scholarly and industrial impact, including processes, materials and devices; joint performance and properties; along with process monitoring and control. CAMJ has attracted and interacted with more than 20 companies from different industries (including manufacturing, automotive, medical, aerospace, and energy) and raised over \$11M dollars in research funds in the past five years directly for welding research. Over the past 5 years it has continued to grow, with two faculty members added in 2021 and 2024 respectively. This growth has been a response to the industrial and institutional support, along with growing collaborations with other centers on campus and abroad, along with partnerships built through consortia such as the Advanced Manufacturing initiative on campus.

Over the last 5 years, CAMJ currently hosts 53 graduate students (including 24 PhDs) and more than 6 post-doctoral students and visiting researchers. In addition, the research activities have resulted in over 233 publications, including the highest impact journals in the fields of materials science. The centre also enhances the undergraduate Welding & Joining Specialization program at Waterloo, by incorporating cutting-edge welding processes into the undergraduate welding courses, and supporting recruitment of this specialization to undergrads, along with teaching of welding-related electives. The superb industrial and institutional support that the center has received has made it possible for dozens of faculty members and hundreds of students to be directly involved with the center, and will continue to flourish with the new faculty members and support for the renovation of a new space for undergraduate welding courses.

Best regards,



Adrian Gerlich

Professor, Mechanical and Mechatronics Engineering

Introduction

The University of Waterloo has a long history in research and development involving welding and joining. This has largely grown out of industrial needs, and faculty members have responded to these demands since the early 1960 by first teaching undergraduate courses related to welding. The history of this is detailed in Appendix A, in which the focus on welding continued with multiple faculty members ultimately being consolidated into The Centre for Advanced Materials Joining (CAMJ), formally established under the Senate's mandate in November 2008, and has been exhibiting strong growth in all aspects since that time. The formal **mission** for CAMJ is to: *develop and disseminate innovative world-class research in advanced materials joining from the macro to the nano-scale, in the areas of: automotive, energy, electronics, medical, sensing devices, aerospace, and nuclear industries.*

In order to execute this mission, CAMJ has become a multidisciplinary focal-point of research with leading-edge facilities, expertise, personnel and professional development. As a result of this unique combination of resources, CAMJ has been able to promote welding and joining innovations which have impacts on a wide range of industries and aspects in society. Aside from a considerable number of academic contributions to fundamental knowledge, during the past 5 years there have also been 2 startups which were founded based on research in CAMJ.

How the Centre/Institute has achieved its objectives

The key objectives of the centre have been addressed as follows:

- To coordinate and facilitate interdisciplinary activities in welding and joining research areas of: (i) developing new and optimizing existing welding and joining processes, such as laser, arc and resistance welding, microjoining, nanojoining, brazing or soldering, and hybrid processes; (ii) improving joint performance in aspects such as fracture and fatigue, corrosion, electrical, optical; and (iii) advancing welding and joining automation and control. This has been achieved through securing numerous grants focusing on these topic areas, and drawing on collaborators with interdisciplinary areas of expertise to highlight new joining methods and materials.
- To advance the level and utilization of joining technologies across Canada. This has been achieved by partnering with industry which can leverage the technology developments in our labs. As a result, new joining technologies in industrial production and innovations developed formed the basis for 2 spin offs, and generated multiple patents.
- To establish a single point-of-contact for outside companies, government laboratories and public policy makers to reach joining researchers and programs on campus. This has been achieved by maintaining the visibility of CAMJ members at conferences, in online resources, and in the literature with a team that includes the most highly cited researchers in welding.

- To develop, promote and deliver educational programs for advanced materials joining and to provide world-class training of graduate students. This has been achieved through acquiring unique cutting-edge facilities, recruiting top graduate students, and leading the delivery of the only undergraduate specialization in Canada.

The following summarizes activities that have advanced these objectives over the past 5 years. These objectives have been greatly upheld by the recognition of CAMJ as one of the key centres at UW, since this provides a brand recognition to the outside world that is admired and respected. This has also created a comradery and cohesion between the faculty and HQP towards the common goal of elevating the CAMJ to new levels of excellence.

Research Accomplishments

Research Support and Collaborations

From 2019 to 2024, a total of \$11M has been secured by the core 5 regular members of CAMJ, which includes both operating costs and \$3.85M of new infrastructure through a Canadian Foundation for Innovation (CFI) Innovation Fund (IF) grant. This infrastructure has modernized and updated the capability to investigate novel processes, and all of these facilities were commissioned and made operational over the pandemic period. This infrastructure has brought leading-edge welding capabilities which can replicate nearly any of welding done in industry (a hybrid laser welding system unique in the world, and dedicated micro laser fabrication systems), while also developing novel methods which are yet to be investigated. The infrastructure has also included new characterization facilities (such as microprobes, and nano-electronic characterization) which are vital to producing the ground-breaking insights into the materials and joints. These facilities are added to the prior CFI grants which have made CAMJ one of the top two centres in North America, and top 5 centres in the world.

The faculty members in CAMJ have also continued to secure considerable operational funding as well, with Dr. Gerlich securing new 3 new Alliance Grants on Small Modular Reactors and welding technologies valued at \$1.2M this year, and Dr. Zhou having renewed a Canada Research Chair in Advanced Materials Joining and Processing valued at \$1.4M. Currently, Profs Gerlich and Zhou are the two most highly cited welding researchers in Canada, with Google Scholar indexes of 67 and 84 respectively. The majority of grants have actually involved collaborative grants with multiple other faculty within the department, in particular with multiple members in the MSAM additive manufacturing group, as a result of the Intelligent Metal Additive Manufacturing grant. This year a new CFI grant led by a collaborator, Prof Jahed was also submitted which will combine tools on cold spray additive manufacturing and welding facilities at CAMJ. The collaborations with the solids group in the department have made CAMJ a major partner in the Advanced Manufacturing Consortium (AMC), which represents a \$35M project between Waterloo, Western, and McMaster. Many CAMJ members are also active in other University Centres and Institutions, such as WatCar, WIN, Centre for Bioengineering and Biotechnology, WISE, since welding and joining are important parts of many research fields. The newer faculty members in CAMJ have also made enormous contributions as well, with Dr. Peng and Benoit already having secured multiple Alliance grants. These successes have hinged on the resources and collaborations that are available to these member through CAMJ, as it is showcased in their proposals and projects depend on access to the infrastructure and resources through CAMJ related to welding, material testing, modeling, and characterization of materials. A summary of past research, facilities, and sponsors is shown in Figure 1.

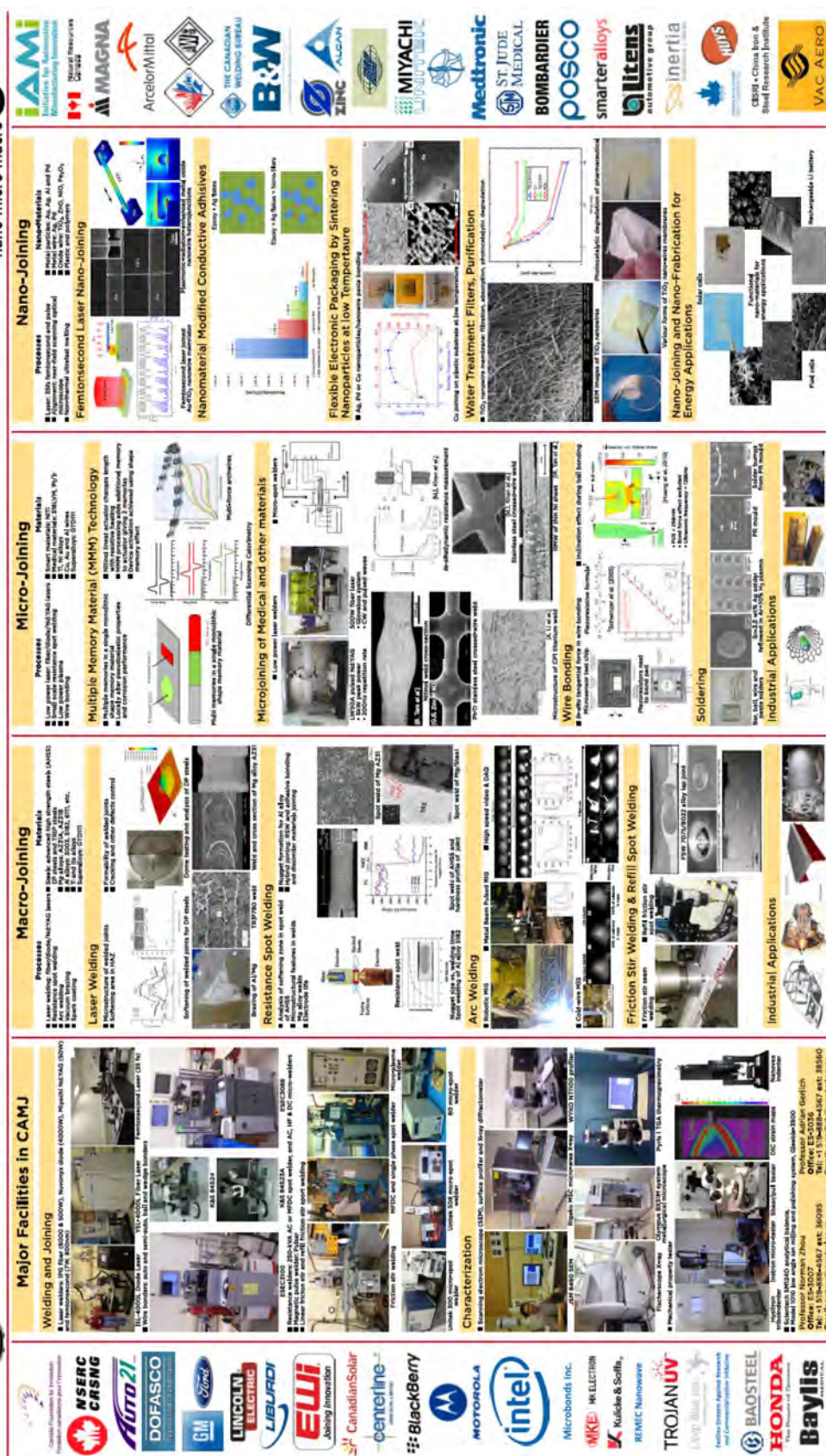


Fig. 1: Summary of the facilities, research areas and sponsors at CAMJ.

Interdisciplinary collaborations are an integral feature of the centre, with multiple collaborations developed between engineer departments, as well as other faculties such as Science. have been built with other departments as well, with Chemical Engineering (B. Zaho), Systems Design Engineering (D. Ban, J. Zelek), Civil Engineering (S. Walbridge), Biology (M. Servos), Earth and Environmental Science (M. Dusseault), Physics (W. Duley, J. Sanderson), along with those in other multi-disciplinary institutes (W. Tsen). These collaborations are truly essential to the success of research at CAMJ, given the highly multi-disciplinary nature of the studies, since connections between materials must meeting a wide range of functional requirements in a wide range of applications. The members of CAMJ have also been involved with large-scale multi-university proposals, for example a CREATE proposal with Prof. Diak in Queens was developed this year, a \$1.2M grant in collaboration with J. McDermid at McMaster was approved. Collaborative grants with University of Guelph (H. Simha) and Queen's University (B. Diak) have been awarded as well, with follow-up grants with these partners moving forward this year with these partners, including an NSERC Create proposal with Queen's in preparation. The ongoing grants also facilitated collaborations with major centres such as Marine Additive Manufacturing Centre of Excellence (led by Dr. Mohsen Mohammadi) in New Brunswick. The faculty leading CAMJ have also been successful in securing funding from private companies and government agencies over the world, including international grants such as the Gerald Schwartz & Heather Reisman Foundation, of which two were awarded both Dr. Gerlich and Zhou with collaborators overseas.

Technology Transfer

One of the first private corporations to emerge from CAMJ was Smarter Alloys, which was based on the pioneering work of Dr. Zhou with his PhD student, Ibraheem Khan who received their first patent in November 17, 2015. This company has continued to grow and develop new products and patents in collaboration with multiple other researchers at UW, and have commercialized multiple products. In the past 5 years, Dr. Zhou has also founded a second company, AquaSensing, which uses technology developed at UW to produce passive water sensors for leak detection, which become activated to wirelessly send an alert when they are exposed to moisture.

Another company that spun off from CAMJ, Retinex.ca, has also been founded in the past 5 years, co-founded by Dr. Gerlich and Dr. Khajepour in the same department. This company now has 2 employees which are working towards finishing their PhD part-time, and is based on a patent for feedback control of both geometry and cooling rates during laser deposition or welding ("System and method for real time closed-loop monitoring and control of material properties in thermal material processing", US Patent Application No. US20170102689A1). They have now developed a commercial hardware and software product, and are currently performing tests with several companies in Canada, and have also performed trials in Europe to develop new markets for their technology.

HQP, Publications, Workshops, Conferences, and Outreach

CAMJ has been training highly qualified personnel (HQP) at all different levels, i.e., undergraduate co-op students, MAsC and PhD students, post-doctoral fellows. Over the past 5 years the centre has been home to more than 55 HQP, with more than 15 of these being PhD students that have gone on to secure positions both in national research centres (eg: NRCan-Canmet) and at leading universities around the world (Beihang University, Southwest University, University of Toledo). The students have been recognized as some of the top leaders in the field of welding,

CAMJ members are highly productive, publishing hundreds of journal articles, conference presentations and proceedings in the past five years. A partial list of journal papers (233 in total) since 2019, is provided in Appendix D, which include many of the top-tier international materials science

journals. Out of these papers, aside from a handful of review papers and collaborators abroad, approximately 90% has resulted from activities and experiments that were directly performed at and using the CAMJ facilities. The infrastructure and knowledgebase among the core members was critical to uncovering the findings in these publications. By using the framework of dedicated collaborators and HQP, the CAMJ members have been able to organize and attended many workshops and conferences, for example:

- Active Canadian Welding Bureau Association UW Student chapter, organizing guest talks and industrial tours to gain exposure and networking to the welding industry
- Multiple presentations by several members at every annual CanWeld conference, which connects our members to the key welding industry contacts within Canada
- Info sessions and demonstrations for undergraduates and high-school camps, such as Catalyst as shown in Figure 2 below.
- Most recent CAMJ workshop on Innovations in Welding in December 2024 brought together more than 50 attendees from academia and industry, see Figure 3.

Since 2023, the group has also begun outreach activities to promote the centre and recruit HQP, by launching social media page. Since that time, the Youtube channel “CAMJ uWaterloo” has published 10 videos which have garnered 1922 views, and 8,612 impressions. A new Linkedin page for CAMJ has also garnered 504 followers, and 34,033 impressions since May 1 of this year. These outlets have become an impactful venue for both showcasing the activities and achievements of members at CAMJ, announcing activities and meetings, and have been an initial point of contact for some graduate student applications.



Figure 2: Catalyst summer camp tour and demonstrations, multiple dates in summer of 2022.

Along with the promotion of the centre online, the recognition of CAMJ as a focal point for welding research and training has been enormously valuable as branding tool for us to recruit talent and attract funding in support of our mission. In the past year the Canadian Welding Bureau have provided funding to supply all new equipment for a new welding lab. As matching for this donation, the department has also provided space and funding for the renovation of a new room for this lab which will host undergraduate welding courses.



Figure 3: Overview of CAMJ Workshop on December 13, 2024

International Collaborations

CAMJ attracts international researchers and students to both conduct collaborative research and visit Waterloo, such as visiting PhD students and researchers from Denmark, Italy, Japan, Sweden, China and Korea. This has been done by creating a network of past visitors and alumni, generating an extensive body of published work, and promoting our online media presence. Ongoing collaborative projects with international partners have also expanded during the past 5 years, including: Jönköping University in Sweden, Tsinghua University and Beijing University of Technology in China, IIT Kanpur in India, Universidad Autónoma de Zacatecas in Mexico, POSCO in Korea, and Technion-Israel Institute of Technology in Israel, and these have all been represented in the co-authored publications list. In the past, internationally reputed professors have visited and/or provided lectures at Waterloo from Penn State University, Ohio State, University of Delft, Helmholtz Institute, and Hiroshima University, although in-person visits have been mainly curtailed in the past 5 years due to the pandemic. However, currently an active exchange program has been revived to allow graduate students from Hiroshima University to visit multiple summer terms (as was resumed in 2022), and new students are also coming from various institutes in India through the MITACS Globalink program. This provides these students with experience at UW, and two of these undergraduates in the past had returned to UW to pursue MSc degrees at CAMJ.

One of the most prominent international collaborations, the Ma2JIC consortium based in Ohio State University, involves all core regular members of CAMJ. This provides excellent exposure to several institutes in the USA, along with their industrial partners, and has considerably elevated our presence on the international stage. This consortium holds annual meetings which are attended by multiple CAMJ members, and projects are vetted by an advisory committee. International visitors are also regularly hosted by faculty members, for example, in 2023-2024 CAMJ hosted Prof. Ninshu Ma, Joining and Welding Research Institute, Osaka University, and Prof. Kazuki Matsuda from Kyushu University in Japan. These collaborations resulted in co-authored publications and sharing of research know-how. Also, both Dr. Gerlich and Zhou have secured grants in 2022 from the Gerald Schwartz & Heather Reisman Foundation, which has supported collaborations with top researchers at Technion-Israel Institute of Technology. These have already produced publications with plans for future collaborations with a potential for commercialization of technology.

Undergraduate Welding and Joining Specialization Program

Each year approximately 15% of our undergraduate Mechanical Engineering students register in in the Welding and Joining Specialization, the only one of its kind in Canada, with the first graduating class shown below. This specialization includes 5 required courses (4th year technical electives), with the graduates receiving a special Certificate of Completion of the Welding & Joining Specialization, in addition to their Bachelor of Applied Science Diploma in Mechanical Engineering (see Fig 4). Dr. Biro is now the Coordinator for the program and many of the CAMJ core members have been teaching the required technical elective courses. In 2023, in recognition of CAMJ as a key centre for promoting welding in Canada, the Canadian Welding Bureau (CWB) provided a \$100,000 donation the for the purpose of developing our own dedicated undergraduate welding facilities, which will be used to purchase equipment for the new facility, including several new advanced process arc welding machines, and a novel hand-held laser welding system. This donation is also being recognized by the department with an in-kind commitment to renovate a new room for this facility, such that air handling and power supply meet the requirements for this infrastructure, and renovations to the new lab are currently underway. This new facility will allow UW to become self-sufficient in the delivery of these welding courses in the future, as previously the labs in Conestoga College were rented for some of the hands-on aspects of the courses. The CWB organization has also provided an additional \$17,500 per year for 5 years for promotion of welding activities at UW, which includes supporting final year design projects, welding demos to recruit undergrads (see below), and organizing workshops to promote industry networking. In addition, CWB sponsors \$25,000 for scholarships each year at UW.



Figure 4: a) First graduating class of the Welding and Joining Specialization, and b) attendance at undergraduate “Try Welding Night”.

Training Environment

A staple of the CAMJ has been weekly seminars for approximately the last 20 years in which graduate students and PDFs regularly present their research progress once every term. Many internationally reputed researchers are also guest speakers of this event. The weekly seminars greatly improve oral presentation and communication skills of the HQPs.

Graduate students have access to the world-class research environment because of the leading-edge infrastructure at CAMJ, and they also work alongside industrial partners (e.g., from ArcelorMittal Dofasco, Liburdi, Medtronic, MartinRea, Magna) and visiting scholars from all over the world (i.e., Osaka University, Japan; University of Lisbon, Portugal; etc.) who visit the centre. This provides a dynamic and enriching training environment that exposes graduate students to various technologies, industries and scientific knowledge.

Notable Recognitions

Both the staff and students at CAMJ have received significant achievements in the past 5 years, for example, Dr. Zhou received the NSERC Synergy Award for Innovation in 2022 for his work with Huys, Dofasco, and IZA to advance steel welding, and presented his work to the speaker of the House of Commons. This is a strong testament to the close collaboration with industry, and high impact of their research on the Canadian economy. Internationally, Dr. Gerlich received the title of “Fellow of the American Welding Society” in 2022 and Fellow of the Canadian Welding Association in 2023. for contributions to the science and technology of welding. Dr Zhou was also honoured by the American Welding Society by giving the Comfort Adams Lecture for their career-long contributions to the field of welding and developing the field of nanojoining in particular (see Figure 5 below).

Doctoral students Alireza Mohamadizadeh and Josh He also received the 2019/2020 Toyota Canada Automotive Safety Graduate Scholarship, valued at \$10,000. Within campus, Mohammad Hadi Razmpoosh selected as one of the best oral presenters at the (MMEGA) Symposium Award 2019. Abroad, we also find our students winning awards, for example Christopher Di Giovanni was awarded the best student presentation in Ma2JIC meeting, which is a peer-reviewed meeting that was nominated based on attendee votes. In 2022, Ali Ghatei-Kalashami (a PhD candidate supervised by Norman Zhou) was awarded the Paul Niessen-Teck Award as well for their demonstrated outstanding leadership with an exceptional publication record. These awards are a testament to the excellent training that is instilled through regular seminar presentations that our students prepare and constantly refine each term.



Figure 5: CAMJ members receiving awards at AWS and CWB conferences.

Also, the support of technology development with industrial sponsors has been recognized in industry and trade magazines, and by our industrial sponsors which have directly commercialized technologies developed at CAMJ. For example, in the case of the collaborative project with Liburdi Engineering a new type of power supply was developed that allowed for reduced spatter in arc welding,

and the technology improvements were directly incorporated into their commercial power supplies, as published recently in an industrial trade magazine, (<https://www.canadianmetalworking.com/canadianfabricatingandwelding/article/welding/automotive-demands-push-welding-research>). The support of our members in developing innovative new joining techniques such as solid state welding is also acknowledged by our partners regularly in online media as well (eg: https://www.linkedin.com/posts/sorsys-technologies-inc_innovation-weldingtechnology-solidstatewelding-activity-7257402759451189248-uLkv/). Also, these are important recognitions which demonstrate the capacity of the welding centre to put knowledge into practice, elevating the productivity of Canadian industry.

List of Members (core/regular members in bold, bios are in Appendix B)

- **Benoit, Michael** – Mechanical & Mechatronics Engineering
- **Biro, Elliot** – Mechanical & Mechatronics Engineering
- Cronin, Duane – Mechanical & Mechatronics Engineering
- Duley, Walter (Emeritus) – Physics & Astronomy
- Dusseault, Maurice – Earth and Environmental Sciences
- **Gerlich, Adrian** (Director) – Mechanical & Mechatronics Engineering
- Jahedmotlagh, Hamid – Mechanical & Mechatronics Engineering
- **Mayer, Michael** – Mechanical & Mechatronics Engineering
- Nguyen, Tam – Mechanical & Mechatronics Engineering
- **Peng, Peng** – Mechanical & Mechatronics Engineering
- Sanderson, Joe – Physics & Astronomy
- Sazonov, Andrei – Electrical & Computer Engineering
- Servos, Mark – Biology
- Tsen, (Adam) Wei – Institute for Quantum Computing, Chemistry
- Toyserkani, Ehsan - Mechanical & Mechatronics Engineering
- Walbridge, Scott – Civil & Environmental Engineering
- Weckman, Dave (Emeritus) – Mechanical & Mechatronics Engineering
- Wei, Lan – Electrical & Computer Engineering
- Wen, John – Mechanical & Mechatronics Engineering
- Worswick, Mike – Mechanical & Mechatronics Engineering
- Yeow, John – Systems Design Engineering
- Yavus, Mustafa – Mechanical & Mechatronics Engineering
- Zelek, John – Systems Design Engineering
- Zhao, Boxin – Chemical Engineering
- **Zhou, Norman** (Associate Director) – Mechanical & Mechatronics Engineering

Reflection of members

“CAMJ is the preeminent university welding research centre in North America. Being part of CAMJ has allowed me to expand both the scope of the research that I have conducted and my ability to train young people both the advantages that it offers both inside and outside of the University. CAMJ comprises a diverse selection of world-renown experts in the field of materials science, welding process, and weld testing. The scope of the expertise covers all scales of joining research from nano-welding of nano-powders to heavy welding for pipeline industries. This makes CAMJ a unique lab to that can foster internal collaborations due to the wide-ranging expertise of the researchers and facilitate the exploration of a wide range of research questions due to its well-equipped lab. It is these factors that enabled

CAMJ to be the leading lab in North America with 343 result papers written between 2020 and 2024, compared to 179 for Ohio State University and 144 for Colorado School of Mines. It is exactly this track-record of success that makes CAMJ a magnet for companies seeking to understand their welding problems to come to the University of Waterloo to find answers. The factors have made CAMJ a successful institute have also facilitated my personal success, allowing me to conduct ground breaking research in the area of automotive joining, and allowed me to develop a world-wide network of collaborators from as far away as South Korea and Germany, and international research partners such as Honda and Auto/Steel Partnership furthering my research.” – Prof. Elliot Biro

“As a member of the Centre for Advanced Materials Joining (CAMJ), I have had the privilege of working alongside the leaders in the field of materials joining science. The collaborative and innovative environment at CAMJ fosters creativity and drives the development of cutting-edge solutions in materials welding and joining. The team’s commitment to research excellence and continuous learning ensures that we are always at the forefront of technological advancements, tackling complex challenges and transforming ideas into tangible results. One of the standout aspects of being a member of CAMJ is the weekly student research seminars. These seminars offer a platform for students and early-career researchers to present their work, exchange ideas, and receive valuable feedback from peers and faculty. The seminars foster a culture of collaboration and intellectual curiosity, allowing us to stay updated on the latest advancements and methodologies in materials joining research. CAMJ’s international recognition speaks to the high standards of research and innovation it consistently upholds. Our work is respected globally, contributing to shaping the future of materials joining across multiple industries. The center’s reputation for excellence provides its members with the opportunity to engage with leading experts and institutions worldwide, reinforcing CAMJ’s role as a global leader in this field.”

– Prof Michael Benoit

“In the past 3 years when I connected with industries, ‘CAMJ’ offered me great confidence to solve engineering problems by not only broadening research scope that an individual researcher could not have, but also providing strongest support from expertise, experiences to necessary equipment. Without CAMJ’s support the waterloo campus undergrad teaching on welding would be impossible, particularly on those hands-on trainings of some advanced welding joining processes that the mechanical engineering students really want to learn.” - Prof Peng

“CAMJ provides access to excellent joining facilities that are specifically geared towards research and innovation, enabling cutting-edge advancements in the field. It has been instrumental in integrating joining technologies with Cold Spray Additive Manufacturing, fostering the development of innovative solutions for optimal performance and fatigue-resistant designs. Additionally, I have greatly benefited from co-supervising students with CAMJ researchers and collaborating with them on multiple proposal developments, which has significantly enhanced our collective research efforts.” – Prof. Hamid Jahed

Faculty Involved in the Centre's Activities

The centre is based in the Faculty of Engineering, however it incorporates faculty members on campus engaged in welding and joining related research from several other faculties and institutes, including Engineering as well as those in Science, such as Biology, Earth and Environmental Sciences, Physics & Astronomy, and the Institute for Quantum Computing. The center also maintains strong collaborations with other engineering departments with collaborators in Civil & Environmental Engineering, Electrical & Computer Engineering, Systems Design Engineering. A list of members and their brief biographical profiles are included in Appendix B with each of their affiliation denoted, where the core members (whose research areas are mainly welding and joining related) are bolded and only their particular metrics such as funding, and publications are summarized in this progress report. In the past 5 years, the centre has also experienced growth in the number of academic staff, with an additional faculty being added to the CAMJ group (Peng Peng) who is an assistant professor and specializes in a nano-scale joining. In 2024 Prof Michael Benoit joined the centre and has immediately started collaborations, co-authoring, and co-supervision of students with other CAMJ members, with a focus on the joining and solidification of aluminum alloys.

The center has maintained strong technical support over the last 5 years as well, partly through the Advanced Manufacturing Consortium (AMC) and combination of other grants which have brought a full-time research engineer on staff in 2018. The operation and maintenance of the CAMJ laboratory facilities is also enabled by technologists in Mechanical & Mechatronics Engineering (including Dr. Yuquan Ding, Neil Griffet, and others) together with graduate students and post-doctoral fellows. The operational cost (e.g., materials and supplies, and repairs) are covered by user fees from a wide range of facilities in operation. In order to guide the development of new research directions and educational needs, an Industrial Advisory Committee (Appendix C) has been set based on a combination of current and past industrial collaborators and graduates from the program.

Numbers of Graduate Students Involved (Graduated in 2020-2024, or continuing in 2024)

PDF	8
PhD:	19
MASc:	24

Organizational Chart



Funding overview

Note: A detailed funding statement is not applicable since CAMJ does not collect fees for membership or manage a central account. The operations of the centre activities are funded through user fees paid through research grants, or direct sponsorship through partners. Hence an itemized annual budget is not applicable, as all the activities are done through ad-hoc organization teams composed of members and HQP that are involved in each activity.

For example, there has been direct support in the form of a donation from the Canadian Welding Bureau to CAMJ, to support the welding engineering activities at UW. This has included a commitment to annually sponsor bursaries and scholarships to undergraduates in the welding specialization in Mechanical Engineering, CAMJ graduate students, and workshops which include funding for travel of guest speakers.

The operation of shared equipment in CAMJ is administered by designated members that are responsible for each piece of infrastructure, and the costs of operation are either covered by operating grants, returned overhead, or user fees that are tracked through an online system. All the equipment is available to the HQP supervised by Regular Members of CAMJ, and any user fees paid based on hourly usage to specific work orders.

The total funds awarded to the core CAMJ members noted in Figure 6, which includes both operation and equipment funds. It can be noted that the substantial grant award in 2019 is mainly the CFI award for new infrastructure, and otherwise the funding for research projects has been steadily increasing each year. Of all the operating funds, >90% are industrially sponsored projects, however the complete list of partners and project titles is confidential, although it includes many of the partners shown in Figure 1 and Appendix D.

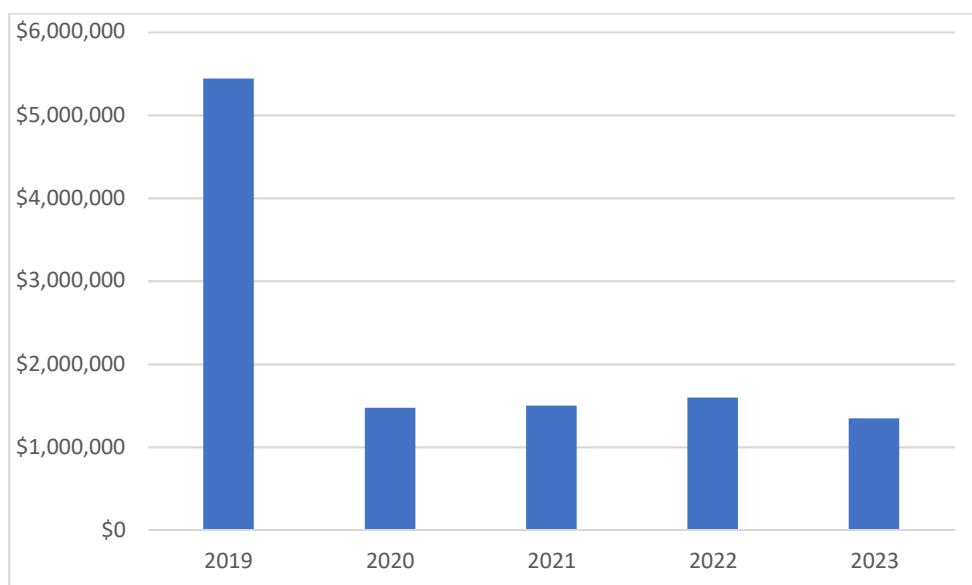


Figure 6: Annual funding secured by regular CAMJ members.

Future 5-year plan

Projected Budget

As noted above, there is no single account for centre administered costs, as the operating costs only cover some individual user fees for equipment, and there is no dedicated technical or administrative staff on payroll. However, the donation from the Canadian Welding Bureau to the CAMJ has provided an opportunity to support activities and recruitment of students, and this is planned to be distributed in the form of awards and workshop activities as summarized below.

Table 1: Funding for promotion of welding at UW

New Undergrad Awards:	# of awards	Value	Total
URA and Co-op	5	\$250	\$3,750
4A/4B FYDP Projects	3	\$1,000	\$3,000
3A/3B Outreach and Demonstrations	2	\$500	\$1,000
		<i>Sub Total:</i>	<i>\$7,750</i>
Workshops and Guest Speakers	1	\$2,000	\$2,000
		<i>Sub Total:</i>	<i>\$9,750</i>
Scholarships			
Undergrads in Welding Specialization	2	\$5,000	\$10,000
Graduate Student Scholarship	1	\$15,000	\$15,000
		<i>Sub Total:</i>	<i>\$25,000</i>
	Total per year:		\$42,500

Future Research Directions and Development Strategies

The combination of talent and capabilities at CAMJ has made it one of the top institutes for studying welding in the world, and offers a unique training environment which have prepared numerous HQP for the Canadian economy. The faculty and students have made impacts in academia are supporting the wide range of manufacturing industries which come to the centre to address welding problems. There has be an increase in new faculty members and commercialization in the past 5 years in particular, and it is expected that these promising talents and start-ups will be further enhance the reputation of the centre. The renewal of the CAMJ is supported by the department and a letter of support from the Dean of Engineering and Chair of Mechanical and Mechatronics Engineering below.

In the next five years, CAMJ will continue advance its mission and objectives in following ways:

1. Foster deeper collaborative interactions with existing centres on campus and abroad. There are already a few projects between CAMJ, MSAM and WatCar, and this will be further expanded to build synergy between the these unique centres and thus stimulate cutting-edge research which is unattainable elsewhere in the world. This will also be further expanded in new and rapidly growing areas such as welding for light-weight electric vehicles, wire arc additive manufacturing, and cold spray technology with the recently awarded CFI grant on “Canadian Alliance in Cold Spray Technology (CACST)” of which two CAMJ members are co-applicants (Profs Gerlich and Biro). This will also provide new opportunities for novel research which addresses the challenging material joining issues in this area.
2. Leverage new outreach activities to attract top talent. This will be done by tapping resources made available for promoting the undergraduate specialization to identify top candidates from the final year undergraduate program to pursue MSc degrees. This will involve sponsoring final year design projects

related to welding, and showcasing these online with the collaborating sponsors. The frequency of demonstrations and lab will also be increased with new opportunities for second- and third-year undergraduate students as well. The opening of the new undergrad labs will further support these efforts and incorporate advanced welding technologies in lab courses. Outreach to potential PhD candidates will be enhanced by reinforcing and expanding the online presence of the centre with social media channels. A team of graduate students will be recruited to solicit attention-grabbing demonstrations and examples which will be produced into videos that have broader reach online by amplifying the new channels developed this year.

3. Develop new international partnerships which can complement the research and help to recruit new talent at the undergraduate and graduate level. This will involve building stronger connections to institutions in Japan that sent visiting Professors in the years. Also, contacts have been made with researchers at Cranfield University (UK), and Federal University of Santa Catarina (Brazil) where very closely related research on welding processes is also underway, and the preliminary discussions have pointed to some possible mechanisms for creating funding vehicles to support travel and collaborations through EU agencies and MITACS. This will further enhance the status of CAMJ on the international stage, and promote recruitment of more top talent.

4. Promote pathways for entrepreneurship through graduate studies. This will be done by recruiting more MEng students which are able to attend courses at the Conrad School at UW to target business strategies that can be developed with the research graduate students in CAMJ. In addition, a collaborative CREATE proposal submitted with Queens will provide a funding for graduate students that will have access to a unique business program to learn how to leverage research outcomes with industry. The trainees will be mentored in the strategies for bringing ideas to market, and weathering the manufacturing environment.

Support Letters



FACULTY OF ENGINEERING | Office of the Dean
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Dec 19, 2024

To The Senate Graduate and Research Council (SGRC),

It is my pleasure to provide my strongest support for renewal of the Centre for Advanced Materials Joining (CAMJ) at the University of Waterloo, led by Professor Adrian Gerlich.

The University recognizes welding and joining as one cornerstone of its research program in the thrust area of both DEVELOPING TECHNOLOGIES FOR THE FUTURE (including Advancements in big and small manufacturing, and the quantum-nano revolution) and ACCELERATING SUSTAINABILITY (in areas such as Clean technology and responsible production, and Sustainable water management), which are identified in Waterloo's Strategic Research Plan (SRP). This center is based in The Faculty of Engineering; however, they have various activities and collaborators which involve individuals in the Faculty of Science and internationally at several other institutions.

The CAMJ centre has been a key pillar of manufacturing research and has rapidly expanded in the past 5 years both in terms of funding and personnel. Their faculty have won international recognition through awards, and their students have also received prestigious scholarships.

The operational of the centre is maintained in a self-sustained manner through user fees to their exclusive facilities which have been installed through multiple CFI and NSERC funds. Also, in the past year the Canadian Welding Bureau (CWB) has recognized CAMJ as a vital centre to promoting welding engineering in Canada and committed to our center and supporting the Undergrad Specialization via \$100k in new equipment, with additional funding for scholarships and welding outreach. It is expected that the centre will continue to grow and solidify Waterloo's position as a leader in advanced manufacturing.

Yours sincerely,

Mary Wells

Mary Wells,
Dean, Faculty of Engineering
University of Waterloo



E7-7302, 200 UNIVERSITY AVENUE WEST, WATERLOO, ON, CANADA N2L 3G1



To: Charmaine Dean, Vice President Research

From: Sean Peterson, Interim Chair, Mechanical and Mechatronics Engineering

CC: Adrian Gerlich, Director, Centre for Advanced Material Joining

Date: January 7, 2025

Re: Renewal of the Centre for Advanced Material Joining (CAMJ)

On behalf of the Department of Mechanical & Mechatronics Engineering (MME), I would to extend my support for the renewal of the Centre for Advanced Materials Joining (CAMJ). This centre is recognized as a key institute for welding and joining research at an international level, and it has become a focal point for welding research in Canada. This center is managed by Adrian Gerlich as Director, with Norman Zhou as the Associate Director.

Within MME, CAMJ represents a key research strength. The team has grown further with another core faculty member (Dr. Michael Benoit). As a group, CAMJ has been exceptionally productive in scholarly contributions, industrial support, and training of highly qualified personnel. In the past 5 years it has been supported by over \$11M in research funds directly supporting welding processes and technology, and making it the 2nd largest welding research facility in North America. Interdisciplinary activities have ranged from collaborations with other engineering departments (including Civil, Systems Design, and Chemical Engineering), as well as inter-faculty collaborations with colleagues in Biology and Physics. CAMJ members have active research programs with collaborators across the country at McMaster University, Queens University, University of Guelph, and University of New Brunswick, as well as internationally in Ohio State University. Their research activities also compliment our undergraduate Welding Specialization, and ensure that our teaching maintains a strong relevance to Canadian industry. Recently, CAMJ secured \$100k in equipment to support the upgrade of the undergraduate welding laboratory. Within CAMJ, students have worked closely together and share a culture of knowledge sharing and pursuit of excellence, and this has attracted many visiting scholars and post-doctoral fellows from around the world.

I am confident that CAMJ will continue to be a vital research centre at the University of Waterloo and make great contributions to the science and technology of welding, while providing valuable support to industry in Canada.

Sincerely

A handwritten signature in black ink, appearing to read "Sean Peterson".

Sean D. Peterson



Appendix A: History of CAMJ

The welding and joining research and education at the University of Waterloo began shortly after the University was founded in 1957. An undergraduate course on “welding”, by Marc Hillier, began in the early 1960s in Mechanical Engineering. Welding research began about 1967, when David Burns arrived from Imperial College, where he had worked on design of welded structures, such as liquefied natural gas ships. At Waterloo he extended these studies, along with Roy Pick, Udo Mohaupt and Steve Lambert, all of whom later became faculty members at Waterloo. Welding and joining metallurgy began around 1969, evolving from earlier studies on solidification by Paul Niessen and Hugh Kerr. Studies of solders, brazing, spot welding and arc welding were carried out during the 1970s to 1990s by Hugh Kerr and David Weckman and their students. Collaboration between the materials and design groups in the Department of Mechanical Engineering on welding topics also was common during this period. The single optional 4th year technical elective undergraduate course on welding was taught jointly by the two groups, encompassing welding processes, metallurgy and design. A part-time Master’s Program Specializing in Welding was offered jointly with the University of Toronto from the late 1970s to mid-1990s, when budget cuts cancelled all off-campus programs in Engineering.

The founding of Provincial Centres of Excellence in the mid-1980s led to major funding for laser welding and for the automation of arc welding, involving Hugh Kerr, David Weckman, Jan Huissoon, and others, and many students. Walt Duley came to Waterloo (Physics) in the 1990s, with an established reputation in lasers and laser welding. Meanwhile, the reputations of the welding design faculty, plus the addition of Gregory Glinka, provided funding for large industrial projects, such as full-scale testing of partially completed pipeline welds, and fatigue testing of subway car carriages.

Experience with the part-time Master’s Program in Welding and numerous expressions of need for mechanical engineering graduates with enhanced welding and joining engineering expertise from many Canadian manufacturing industries spawned the idea of the “Welding Specialization” within the Mechanical Engineering undergraduate studies program. In 1998, after raising sufficient industrial money, the Department of Mechanical Engineering hired Norman Zhou in a new faculty position. New 4th year technical elective courses were added on welding processes, metallurgy and design which were based in part on consideration of the new International Institute of Welding (IIW) International Welding Engineer (IWE) post-graduate curriculum. The first group of undergraduate students graduated in 1999 from the Welding and Joining Specialization. Since his arrival at Waterloo, Norman Zhou became a Canada Research Chair (CRC) in Microjoining (2003-2013) and has interacted with numerous companies throughout North America and Asia on a very wide range of joining topics, along with Hugh Kerr, David Weckman, Steve Corbin, Mike Worswick and others. His Chair also permitted the hiring of Michael Mayer, thus strengthening the research on sensing and its applications to joining. The centre was bolstered by the addition of Adrian Gerlich as an NSERC/IRC in 2014, which permitted the hiring of Elliot Biro as an incremental position. Most recently Norman Zhou has renewed at CRC in 2014, and the facilities have been expanded with a \$4M CFI grant in 2017, in addition to \$6M in CFI infrastructure grants in 2003 and 2008.

Appendix B: Faculty Biographies for CAMJ Members

Adrian Gerlich joined the University of Waterloo in 2012, and obtained his BAsC and PhD in Materials Science and Engineering at the University of Toronto. Shortly after graduating, he took up a position as Assistant Professor at the University of Alberta in 2007, and was involved in establishing the Canadian Centre for Welding and Joining. He has been awarded a CFI-IF fund which has secured more than \$3.85M in funding for CAMJ and its collaborators, and this will reinforce existing strengths and develop new directions in the coming years. He has published over 200 journal papers, and 30 conference papers in these areas, and has supervised more than 25 graduate and undergraduate students. He was awarded a Fellow of the American Welding Society and Canadian Welding Association, and currently teaches materials science courses in the department of Mechanical and Mechatronics Engineering and continues research in physical metallurgy of welded components, and materials characterization using quantitative electron microscopy.

Norman Zhou received his BAsC and MASc from the Department of Mechanical Engineering, Tsinghua University, Beijing, China and PhD from the Department of Metallurgy and Materials Science, University of Toronto, Toronto, Canada. He worked as a Lecturer at Tsinghua University and as a Materials Scientist at Atomic Energy of Canada, Ltd, Chalk River, Ontario, Canada. He also worked as a Senior Research Engineer at the Edison Welding Institute, Columbus, Ohio, USA. Dr. Zhou, a holder of University Research Chair, is also Professor and Associate Director of the Centre for Advanced Materials Joining, University of Waterloo. He holds Canada Research Chair (Tier I) in Advanced Materials Joining and Processing since 2017, held University Research Chair (2013-2017) and Canada Research Chair (Tier II) in Microjoining from 2003-2013. He has more than 25 years industrial, teaching and research experience in welding and joining technologies. His research interests cover process and materials development, bonding mechanisms and materials science in advanced materials joining, including microjoining and nanojoining. Dr. Zhou is currently leading a group of about 20 graduate students, post-doctoral fellows and other researchers. He has authored or co-authored over 330 refereed journal papers and several books, including “Microjoining and Nanojoining” and “Joining and Assembly of Medical Materials and Devices”. He is an IWE and PEng, and also a fellow of ASM International and AWS.

Michael Mayer studied experimental physics at ETH Zurich, Switzerland, where he developed a novel family of CMOS microsensors for real-time monitoring of the thermosonic ball bonding process used for microelectronics joining. He was awarded the ETH Medal in 2001 for this work. He then worked in industry in Europe, developing new methods for improving wire bond quality by equipment self-monitoring, which led to an Inventor of the Year Award from his employer in 2003. He joined the University of Waterloo in 2004 and has continued his research in the field of microjoining, ie. the welding or joining of micro-scale components for microelectronics and other micro-scale devices. The current focus is on the understanding of the process mechanisms of microjoining and on contributing practical solutions to current problems in industrial microjoining.

Elliot Biro is an Assistant Professor in the Department of Mechanical and Mechantronics Engineering. He has over 20 years researching welding process and metallurgy in both academic and industrial settings. Biro's experience includes process optimization for a variety of welding techniques (gas metal arc welding, spot welding, laser welding, high frequency induction welding, flash butt welding, and seam welding), understanding property changes and cracking during welding (heat affected zone softening and LME cracking), and development of simulation techniques to understand the metallurgical changes during welding and other steel manufacturing processes. Prof. Biro's primary research interests are: metallurgical changes during welding, development of defects during welding, increasing process robustness to improve manufacturability, physical simulation of the welding process, welding of advanced high strength steels (AHSS), dissimilar material joining and weld evaluation. He currently sits on a variety of industry committees with the AWS and the CCIW. From his work with industry Dr. Biro was responsible for \$25M in savings to manufacturing costs from the results his projects. He has been awarded over \$2M in grants and currently has over 95 journal papers and 60 conference papers, and won the Engineering Research Excellence (Assistant Professor) award in 2022.

Peng Peng received his BAsC and MASc degrees in Materials Science and Engineering from the China University of Geosciences at Beijing in 2007 and 2010, respectively, and the PhD degree in Mechanical Engineering and Nanotechnology from the Department of Mechanical and Mechantronics Engineering, University of Waterloo in 2014. He worked as a postdoctoral fellow in the Centre for Advanced Materials Joining at the University of Waterloo from 2014 to 2015. He then took an associate professor position in the Mechanical Engineering department at the Beihang University, China. In 2021, he moved back to the University of Waterloo and joined the Department of Mechanical and Mechantronics Engineering as an assistant professor. Dr. Peng's research activities and interests are in the area of materials science and processing technologies for micro/nano electronics, medical and aerospace applications, specialized in micro/nano-joining, laser processing, and brazing.

Michael Benoit joined in the Department of Mechanical and Mechantronics Engineering in 2024, having been an assistant professor of manufacturing engineering in the School of Engineering at The University of British Columbia (Okanagan campus). His research interests relate to material processing and industrial metallurgy. Dr. Benoit received his PhD and BASc degrees from the University of Waterloo. As a Banting Postdoctoral Fellow, he investigated the development of crack-free Al alloys for additive manufacturing at RMIT University in Melbourne, Australia. His industrial experiences include performing field trials at Dana Canada Corporation's R&D facilities during his PhD, as well as internships at Titan Medical Inc., Ontario Power Generation, Ambri Inc., and Thapar University in India. He has already begun collaborating and co-supervising students in multiple projects in CAMJ on automotive materials, and is building a new program on wire arc additive materials that will involve other collaborations with the MSAM and WatCar centres.

Mark Servos is currently the Canada Research Chair in Water Quality Protection in the Department of Biology. He joined the University of Waterloo as a Professor of Biology in 2003 and served as Scientific Director of the Canadian Water Network until 2011. In 1988, Dr. Servos started as a Research Scientist with the Lakes Research Branch of Environment Canada and later joined the Department of Fisheries

and Oceans, Great Lakes Laboratory for Fisheries and Aquatic Sciences where he researched environmental fate and effects of contaminants in the Great Lakes. He joined the National Water Research Institute, Environment Canada, in 1996, as Project Chief, and led a group of scientists studying exposure and effects of priority substances. He has helped to organize numerous international meetings/workshops, participated in several expert panels in this field and plays an active role in several major international societies (e.g. Society of Environmental Toxicology and Chemistry). He has published numerous peer reviewed articles on the treatment, exposure, fate and effects of organic contaminants in the environment.

Scott Walbridge has been a faculty member at the University of Waterloo since 2006. Prior to that, he conducted his doctoral studies at the EPFL in Lausanne, Switzerland and his master's degree at the University of Alberta, and he worked for several years in a structural consulting firm in Edmonton (Cohos Evamy – now DIALOG) specializing primarily in institutional building design. His research focuses on various issues related to steel and aluminum structures, including: welded and bolted connection design, fatigue performance, and pedestrian-induced vibration design. His research employs a broad range of tools, including: fracture mechanics, structural reliability, and life-cycle cost analysis and laboratory testing. He currently serves on the following design code committees: CSA S6 Chapter 17 (Aluminum Structures – he is the current Chair), CSA W59 (Structural Welding Code), and S157 (Aluminum Structures). He is an Associate Editor for the ASCE Bridge Engineering Journal. He is also currently serving as the Director of Waterloo's new Architectural Engineering program.

Maurice Dusseault is a professor of Geological Engineering in the Earth and Environmental Sciences Department. In 1982, he became Chairman of the Geological Engineering Program at Waterloo and was Director of the Porous Media Research Institute from 1995 to 2000. Maurice carries out research in petroleum geomechanics and is the recognized world expert in new production methods, deep waste sequestration in sedimentary basins, and reservoir geomechanics. He has co-authored two textbooks, over 470 conferences and journal articles, and works with industry as an advisor and instructor. Dr Dusseault was a SPE Distinguished Lecturer in the year 2002-2003, visiting 19 different countries and speaking about new oil production technologies to 28 separate SPE Sections. He has taught in 16 different countries, and has a reputation for clear presentations based on simple but useful material.

Tong Leung was born in Hong Kong in 1959 and immigrated to Canada in 1974. He completed his Ph.D. work in 1984 at UBC on molecular electron coincidence spectroscopy under the direction of Professor Chris Brion in the Chemistry Department. From 1984 to 1986, he was an NSERC-NATO Science and honorary Killam postdoctoral fellow at the University of California at Berkeley, surface science group. In 1987, Leung joined the Department of Chemistry at the University of Waterloo and is currently a Professor of Chemistry and Physics. With the help of NSERC, MMO, the federal NCE in Molecular, Atomic and Interfacial Dynamics and CFI, Leung has established a multi-mission laboratory in nanoscale sciences and technology, semiconductor surface chemistry and molecular electron scattering. He has over a hundred publications and has given many invited lectures in Canada and abroad. He has also served as a member of the organizing committee or chairman for several major meetings including Surface Canada

at Waterloo, Pacifichem 2000, and several Special CSC Symposia. He is a fellow of the Chemical Institute of Canada and the founding Director of the recently established Waterloo Advanced Technology Laboratories (WATLabs), a multimission research centre for materials characterization, fabrication (including joining) and research at the University of Waterloo.

Lan Wei received her Ph.D degree from Stanford University in 2010. She is an Assistant Professor at University of Waterloo since 2014. Her research interests focus on nanoelectronics and integrated circuits. Prior to joining UWatelo, she worked as a Member of Technical Staff at Altera Corporation (now part of Intel Corporation) and as a postdoc at Massachusetts Institute of Technology.

John Yeow received his B.A.Sc. degree in electrical and computer engineering in 1997, and the M.A.Sc. and Ph.D. degrees in mechanical and industrial engineering in 1999 and 2003, respectively, from the University of Toronto, Ontario, Canada. He is currently an Assistant Professor at the Department of Systems Design Engineering, University of Waterloo, Ontario, Canada. His research interests include the development of microsystem and nanodevices. Dr. Yeow is the recipient of the Micralyn Microsystem Design Award, NSERC Innovation Challenge Award, Colton's Medal of Research Excellence, and Early Research Award.

Joseph Sanderson is an associate professor in the department of Physics and Astronomy. His research field is the interaction of high intensity femtosecond laser pulses with matter. His experimental studies focus on gas phase imaging of molecules undergoing Coulomb explosion and more recently the study of novel nano scale laser processing. Dr Sanderson received his BSc and PhD from University College London and was a postdoctoral fellow at Tokyo Metropolitan University and Imperial College London before Joining UW in 2001.

(Adam) Wei Tsen joined the Institute for Quantum Computing and the Department of Chemistry at the University of Waterloo as an assistant professor in 2016. After receiving a BS in Electrical Engineering and Computer Sciences, as well as a BS in Engineering Physics at the University of California, Berkeley, he completed his PhD in Applied Physics at Cornell University under the guidance of Jiwoong Park. Tsen then joined the Department of Physics at Columbia University as a postdoctoral associate with Abhay Pasupathy and Philip Kim, where he studied atomically thin quantum materials and incorporated them in nanoscale electronic devices. At Waterloo, his group continues to explore these materials and develop novel quantum devices based on their exotic properties.

Professor Zelek is an Associate Professor and co-director of the VIP (Vision Image Processing) lab in Systems Design Engineering. He is formerly the Associate Graduate Chair of Systems Design Engineering, serving from 2013 to 2017. Professor Zelek's current main research interests include autonomous robotic mapping and localization, 3D scene understanding, man-made infrastructure assessment (e.g., roads, buildings, bridges), eye (fundus, OCT) image understanding for disease, learning 3D models from single-views, athletic sport tracking & biomechanical understanding of play & ability from video feeds, to name a few. Some of these projects make use of AI & deep learning techniques.

Boxin Zhao is a full-time faculty member in the Department of Chemical Engineering at the University of Waterloo. His research interests include biomimetic adhesives, conductive adhesives, hydrogel soft materials, nanocomposites, interfacial phenomena, micro and nano-tribology, advanced coating and adhesive bonding technology. He is currently leading a NSERC Strategic Project to develop novel conductive adhesives as a Lead-free and multifunctional joining alternative for electronic packaging. Before joining Waterloo, Dr. Zhao had worked as a NSERC postdoctoral fellow at the University of California, Santa Barbara. Dr. Zhao also worked as a visiting scientist at the Australian Pulp and Paper Institute on peeling adhesion measurements.

Appendix C: A List of CAMJ Partners

1. Private sector companies

- **Canada:** Arcelor-Mittal Dofasco, Alcan, Magna, John Deere, Centreline (Windsor), Babcock & Wilcox, Ventra Group, Air Liquide, Liburdi, Huys, Lincoln Electric, Panasonic, Teck Cominco, Microbonds, REMEC Nanowave, Litens, Inertia, Bombardier, Emcara, Canadian Solar, Trojan UV, Mersen Canada, Defense R&D Canada, Baylis Medical (Boston Scientific), ForceN, MartinRea, Canadian Nuclear Labs
- **USA:** Intel, Motorola, St. Jude Medical, Medtronic, Unitek, GM, Auto/steels Partnership, Ford, EWI, Trumpf, ILZRO, K&S, Ormco,
- **Europe:** ESEC, Bosch, Rautaruukki, Nexperia, NANEOPrecision IBS Coatings
- **Asia:** MK Electron, POSCO, JFE Steel, Baosteel

2. Universities, colleges and research organizations

- **Canada:** University of Toronto, McMaster University, Ryerson University, University of Alberta, University of Manitoba, Conestoga College, Ecole Polytechnique Montreal, University of Guelph, University of New Brunswick
- **USA:** Harvard University, Portland State University, Ohio State University, University of Toledo
- **Europe:** Aalto University (Finland), TU Berlin, TU Denmark, Università di Catania (Italy)
- **Asia:** RIST University of Seoul (Korea), University of Kyushu (Japan), Osaka University (Japan)

Appendix D: List of CAMJ Member Published Journal Papers since 2019

2019

1. Liang, Robert, et al. Utilizing UV-LED pulse width modulation on TiO₂ advanced oxidation processes to enhance the decomposition efficiency of pharmaceutical micropollutants Chemical Engineering Journal 361 (2019): 439-449.
2. Khodabakhshi, F., L. H. Shah, and A. P. Gerlich. Dissimilar laser welding of an AA6022-AZ31 lap-joint by using Ni-interlayer: Novel beam-wobbling technique, processing parameters, and metallurgical characterization. Optics & Laser Technology 112 (2019): 349-362.
3. Xing, Songling, et al. Plasmon Induced Heterointerface Thinning for Schottky Barrier Modification of Core/shell SiC/SiO₂ Nanowire. ACS applied materials & interfaces(2019).
4. Gopkalo, Olga, et al. Non-isothermal thermal cycle process model for predicting post-weld hardness in friction stir welding of dissimilar age-hardenable aluminum alloys. Materials Science and Engineering: A (2019).
5. Russo, Paola, Ming Xiao, and Norman Y. Zhou. Electrochemical Oxidation Induced Multi-Level Memory in Carbon-Based Resistive Switching Devices. Scientific reports9.1 (2019): 1564.
6. Ranjan, Rakesh, et al. Fatigue analysis of friction stir welded butt joints under bending and tension load. Engineering Fracture Mechanics 206 (2019): 34-45.
7. Schneider, Olivia M., et al. Photocatalytic Degradation of Microcystins by TiO₂ Using UV-LED Controlled Periodic Illumination. Catalysts 9.2 (2019): 181.
8. Shen, Z., et al. Microstructure, static and fatigue properties of refill friction stir spot welded 7075-T6 aluminium alloy using a modified tool. Science and Technology of Welding and Joining (2019): 1-14.
9. He, L., et al. Suppression of liquid metal embrittlement in resistance spot welding of TRIP steel. Science and Technology of Welding and Joining (2019).
10. Huang, G. Q., et al. Microstructure and mechanical properties of fine-grained aluminum matrix composite reinforced with nitinol shape memory alloy particulates produced by underwater friction stir processing. Journal of Alloys and Compounds (2019).
11. Enrique, Pablo D., et al. Surface modification of binder-jet additive manufactured Inconel 625 via electrospark deposition. Surface and Coatings Technology (2019).
12. Shah, L. H., S. Walbridge, and A. Gerlich. Tool eccentricity in friction stir welding: a comprehensive review. Science and Technology of Welding and Joining (2019): 1-13.
13. Shokati, Ali Akbar, Norman Y. Zhou, and John Z. Wen. Dissimilar joining of carbon/carbon composites to Ti6Al4V using reactive resistance spot welding." Journal of Alloys and Compounds 772 (2019): 418-428.
14. Khodabakhshi, F., et al. Nano-indentation behavior of layered ultra-fine grained AA8006 aluminum alloy and AA8006-B4C nanostructured nanocomposite produced by accumulative fold forging process. Materials Science and Engineering: A 744 (2019): 120-136.
15. Wintjes, E., et al. Quantifying the link between crack distribution and resistance spot weld strength reduction in liquid metal embrittlement susceptible steels. Welding in the World (2019): 1-8.
16. Shen, Z., et al. Interfacial bonding mechanism in Al/coated steel dissimilar refill friction stir spot welds. Journal of Materials Science & Technology (2019).

17. Enrique, Pablo D., Zhen Jiao, and Norman Y. Zhou. Effect of Direct Aging on Heat-Affected Zone and Tensile Properties of Electrospark-Deposited Alloy 718. *Metallurgical and Materials Transactions A* 50.1 (2019): 285-294.
18. Ribeiro, Rafael A., et al. Application of Cold Wire Gas Metal Arc Welding for Narrow Gap Welding (Ngw) of High Strength Low Alloy Steel. *Materials* 12.3 (2019): 335.
19. Panton, Boyd, et al. Effects of post-processing on the thermomechanical fatigue properties of laser modified NiTi. *International Journal of Fatigue* 118 (2019): 307-315.
20. Shah, L. H., F. Khodabakhshi, and A. Gerlich. Effect of beam wobbling on laser welding of aluminum and magnesium alloy with nickel interlayer. *Journal of Manufacturing Processes* 37 (2019): 212-219.
21. Kisaka, Yuji, Nick Senior, and Adrian P. Gerlich. A Study on Sulfide Stress Cracking Susceptibility of GMA Girth Welds in X80 Grade Pipes. *Metallurgical and Materials Transactions A50.1* (2019): 249-256.
22. Guo, Shihui, et al. Effect of quality control parameter variations on the fatigue performance of aluminum friction stir welded joints. *International Journal of Fatigue* 118 (2019): 150-161.

2020

23. Shamsolhodaei, A., et al. "Controlling intermetallic compounds formation during laser welding of NiTi to 316L stainless steel." *Intermetallics* 116 (2020): 106656.
24. Xiao, Ming, et al. "Threshold Switching in Single Metal-Oxide Nanobelt Devices Emulating an Artificial Nociceptor." *Advanced Electronic Materials* (2019): 1900595.
25. DiGiovanni, C., et al. "Role of spot weld electrode geometry on liquid metal embrittlement crack development." *Journal of Manufacturing Processes* 49 (2020): 1-9.
26. Shen, Daozhi, et al. "Exhaling-Driven Hydroelectric Nanogenerators for Stand-Alone Nonmechanical Breath Analyzing." *Advanced Materials Technologies* (2019): 1900819.
27. Hui, Zhuang, et al. "A Self-Powered Nanogenerator for the Electrical Protection of Integrated Circuits from Trace Amounts of Liquid." *Nano-Micro Letters* 12.1 (2020): 5.
28. Lin, Luchan, et al. "Contact engineering of single core/shell SiC/SiO₂ nanowire memory unit with high current tolerance using focused femtosecond laser irradiation." *Nanoscale* 12.9 (2020): 5618-5626.
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Recommendations for the University of Waterloo's Course Outline Tool

Course Outline Working Group
January 2025

Acknowledgements

This report represents the findings of the consultations and contributions of the members of the Course Outline Tool Working Group ('Working Group) and the broader University of Waterloo campus community. The Working Group engaged a variety of stakeholders in consultations over the Fall 2024 term. The recommendations below capture the guidance provided by campus stakeholders who engaged the Working Group in this work.

The Working Group members include:

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Section 1: Introduction

1.1 Goals of the Outline Working Group

Waterloo's Course Outline tool ('Outline') was developed in 2017 by the Science Computing Office with the aim of establishing an in-house course repository system for courses offered at the University of Waterloo. Since then, Outline has undergone a series of updates and upgrades to provide a user-oriented experience for instructors. In September 2024, the Working Group was established under the leadership of the Associate Vice President, Academic, with the task of generating recommendations on improving the state of the Outline tool, recommend pathways for ensuring institutional compliance with legislative requirements laid out in *Bill 166: Strengthening Accountability and Student Supports Act*, determine Waterloo's institutional requirements to be included on the outline tool, and, to make recommendations about future processes for effectively managing the content of course outlines at the University of Waterloo.

1.2 Summary of Consultations

The Working Group engaged with a variety of stakeholders through consultations during the Fall 2024 term. Alongside, the diverse perspectives of the Working Group team members, the Working Group also consulted with Associate Deans for undergraduate and graduate studies from all Faculties, AFIWs, FAUW, academic support unit staff, teaching fellows and undergraduate and graduate students. Undergraduate and graduate students were approached via in-person group meetings hosted by the Student Life Centre. Additionally, feedback was solicited from undergraduate students employed within academic support units to gain their perspectives on the skeleton structure of the course outline tool. The consultations allowed the Working group to consider both Bill 166 and the Accessibility for Ontarians with Disabilities Act (AODA) compliance as well as capturing updated teaching and learning best practices.

The recommendations below capture the guidance provided by campus stakeholders who participated in consultation sessions with the Working Group. Feedback from these sessions allowed the Working Group to directly integrate recommendations into the course outline template. More substantive recommendations (e.g., structural changes or compliance considerations) are detailed below, along with their justifications. These consultations enabled the Working Group to consider Bill 166, compliance with the Accessibility for Ontarians with Disabilities Act, teaching and learning best practices.

Section 2: Recommendations for Content within Outlines

The use of the outline tool has allowed the University of Waterloo to rapidly include the cost of learning materials in a consistent fashion into course outlines. This has permitted the institution to effectively track and report the compliance rates across faculties.

Moving forward, the Outline tool will continue to support instructors and students by providing outlines that are AODA-compliant, incorporate updated Senate-approved boilerplate language, and ensure all required elements under Bill 166 are included. Recommendations from the AODA Teaching Innovation Incubator working group are expected in 2026. Any recommendations impacting the Outline template, including recommendations regarding the listing of platforms used in a course, will be captured in future updates to the Outline template. The platform's adaptability allows for updates, ensuring it remains capable of meeting future compliance or reporting requirements.

2.1 Enhancing the Required Components of Course Outlines

The University of Waterloo's course outlines are required to state course learning material costs to align with Bill 166 requirements. The updates to the template detailed by the recommendations below captures the course costs requirements as well as providing best practice guidance obtained from consultations. These updates improve clarity, accessibility, and consistency for students. These updates aim to ensure course outlines not only meet compliance requirements but also provide comprehensive, student-centered information. Below are the key updates, accompanied by recommendations and justifications based on consultation feedback.

Recommendation 1: That Senate approve the requirement of inclusion of course materials costs into course outlines.

Justification: To comply with Bill 166, course outlines will be required to clearly list the costs of course learning materials. The Outline template provides this information in a new table divided into three sections: Readings, Technology, and Other Materials.

- **Readings Table:** Enables instructors to specify required, recommended, and optional reading materials, with costs explicitly included for required and recommended items. This ensures students have transparent access to financial expectations for assigned materials.
- **Technology Table:** Lists required or recommended hardware and software, including UW-supported platforms such as LEARN and Crowdmark. While these platforms are free for students, their inclusion enhances accessibility, particularly for students with disabilities. Software with subscription costs is also detailed here to provide full cost transparency. It is understood that some software may not incur a cost to students; however, the inclusion of all platforms to be used in a course here will benefit all students especially students with disabilities, increasing the accessibility to the course content.
- **Other Materials Table:** Captures additional course materials not covered in the other sections, such as safety equipment or other tools or supplies, ensuring students are informed about these courses required or recommended supplies.

While these tables increase the length of the document, they also clearly outline the different components of the course for students and should any of these tables not have any inserted items, the table will not appear once the outline is published.

Recommendation 2: That Senate approve an update to the required list of basic elements to be included in a course outline

The Working Group recommends that all course outlines contain the elements previously listed as recommended items on the Secretariat's page on Course Outline Requirements. This page states that: Every course outline should contain the following basic elements:

- Course number and title
- Term and year of offering
- Class days, times, building, and room number
- Class instructor's name, office, contact information, office hours
- Teaching assistant's name, office, contact information, office hours (if applicable)
- Course description
- Course objectives*
- Required text and/or readings
- A general overview of the topics to be covered
- The evaluation structure for the course including course requirements, deadlines, weight of requirements toward the final course grade
- Acceptable rules for group work
- Indication of how late submission of assignments and missed assignments will be treated
- Indication of where students are to submit assignments and pick up marked assignments
- Any other element required by the program/department/faculty
- Any institutional-required statements – there are required statements that have to be published with regard to academic integrity.

*As an update to the above list, the Working Group supports instructors also relying on learning outcomes to address course objectives

Justification: To update the list of required content in a course outline will better align with statements included into the Undergraduate Calendar.

Examples of Calendar statements that require the inclusion of the above course elements include:

- The Calendar states that for religious accommodations: students must consult with their instructor(s) within two weeks of the announcement of the due date or scheduled examination date for which academic accommodation is being sought.
- The Calendar states for Academic Considerations: When instructors are asked to consider student's extenuating circumstances, the options available to students vary based on the nature of the extenuating circumstances/events they are facing, on the kind of assessment they are unable to complete on time, and the instructor's own grading practices stated in the course outline.

The mandatory inclusion of assessment dates and weights, as well as missed assessment outcomes and late submission policy will provide clarity to students. With new short-term absences permitted since the generation of course outline requirements,

it becomes increasingly necessary to articulate the consequences of missed assessment.

The Outline tool has already been updated to include tables clearly stating the date and weight of assessments with textboxes below to be used by instructors to insert the outcomes should any of those assessments be missed by students.

Recommendation 3: That Senate approve an update to the boilerplate text required in course outlines for Accessibility and Mental Health Supports.

Justification: These changes are recommended to support students' wellbeing, and ensure they are aware of critical support services and how to access them. This update also aligns AccessAbility Services text in course outlines with statements in the Calendar, most specifically outlining the accommodation for persons with disabilities or disabling conditions.

Boilerplate text for Mental Health Supports:

At the University of Waterloo, we are dedicated to supporting your mental and emotional well-being. Our Counselling Services offer confidential support, including individual counselling, workshops, and crisis intervention. If you're struggling, please reach out for help at 519-888-4096 or visit [their website](#) for more information.

Boilerplate text for Accessibility Services:

The University of Waterloo recognizes its obligations under the Ontario Human Rights Code to accommodate students with known or suspected disabilities and disabling conditions (e.g. medical conditions, injuries, impacts of trauma such as from violence or discrimination) to the point of undue hardship. To support this obligation, [AccessAbility Services](#) (AAS) collaborates with all academic departments and schools to facilitate academic accommodations for students with disabilities and disabling conditions without compromising the academic integrity of the curriculum. If you believe you may require academic accommodations (e.g., testing accommodation, classroom accommodation), register with AAS as early in the term as possible by completing the [online application](#). Students already registered with AAS must activate their accommodations for each of their courses at the beginning of each term using AAS' online system. If you require assistance, contact AAS by phone (519-888-4567 ext. 35082), email (access@uwaterloo.ca) or in-person (Needles Hall North, 1st Floor, Room 1401).

Further updates to Boilerplate text:

It is the expectation of the Working Group that the content of boilerplate text will be subject to change moving forward as technologies and policies continue to evolve. Due to the timelines set by Bill 166, further updates are not recommended at this time, however this will be examined in future recommendations.

Section 3: Establishing a Process for Outline Template Updates

To ensure the course outline template remains a dynamic, effective, and compliant resource for instructors, a clear and sustainable process for updates must be established. As technologies and policies evolve, the template's content, including mandatory boilerplate text, will need periodic revisions. Below are the key recommendations to support this process.

Recommendation 4: That the AVPA Office assign clear ownership and resources for template updates

Justification: To provide consistent and reliable support for instructors, the Working Group recommends establishing a clear pathway for outline template updates, detailing ownership over Outline and associated website, membership of an advisory group to oversee the updates, and support from IST as needed.

The Working Group recommends the formation of an Outline Advisory Group, with representation from faculty and staff to oversee updates to the required content in course outlines as well as the format and content within the Outline tool. This will include ensuring the content within the Calendar, and any Secretariat pages therein, are up to date with approved content and language.

The outline template may require resources capable of undertaking adjustments to the underlying coding of the Outline platform. Specialized support from Information Systems & Technology (IST) will be necessary to implement these changes effectively and maintain the platform's functionality. Ensuring technical support is readily available will enable the template to evolve in response to changing institutional needs and policies.

Any updates to boilerplates or to the requirements within outlines will be brought to Senate by an Outline Working Group, tasked with coordination of content on websites, coordination with IST resources, and consultation with Faculty and Staff using the Outline tool.

Section 4: Generating Best Practices Guidance for Instructor

Recommendation 5: That the Centre for Teaching Excellence (CTE), alongside the Outline Advisory Group, develop examples and guidelines for effective course outlines

Justification: To ensure consistent and effective incorporation of the required elements within course outlines, the Working Group recommends the creation of detailed best practice guidance for instructors.

CTE and the Outline Advisory Group are well positioned, with expertise and connections with instructors in all Faculties, to collaboratively develop and disseminate high-quality course outline examples that illustrate best practices. These examples will help instructors better understand how to structure and populate the template effectively. Providing clear examples will serve as a valuable resource for both new and experienced instructors, to enhance teaching and learning.

Best Practice Guidance should include:

- Examples of Outlines and Text Recommendations
- Links to Resources and Third-Party Fee Guidelines
- Student Access to Outlines Recommendations
- How to best Navigate Changes once Outline is Published/Distributed
- Learning Outcome Writing and Development
- Assessment Design
- Inclusive and Student-Centered Language

These instructor supports will promote clarity, consistency, and student-centered practices across all courses. Instructors will be able to reach out to CTE for support as they develop assessments and policies in their courses and can reach out to the Outline Advisory Group for recommendations for updates or changes.

Section 5: Conclusion and Next Steps

Conclusion

The work of the Outline Working Group represents a significant step forward in improving the course outlines used at the University of Waterloo. These recommendations ensure alignment with Bill 166 and the AODA, while also prioritizing student-centered practices, transparency, and accessibility. The updates to the template, from the inclusion of detailed material cost tables to the refinement of assessment policies and boilerplate text, provide clarity and consistency for both instructors and students. The proposed process for a future working group will ensure the content in course outlines remains updated as the teaching landscape evolves.

By consulting with a wide range of campus stakeholders, the Working Group developed actionable recommendations to enhance the functionality, compliance, and usability of the Outline tool. The updates to Outline will better support instructors obtain approved language and accessible outlines, as well as ensure the capacity for institutional compliance reporting. Additionally, the proposed processes for the generation of best practices guidance will provide support for instructors regarding content in course outlines as well as in the use of the Outline tool.

Next Steps

1. Approvals:

The recommendations outlined in this report, particularly those requiring Senate approval (e.g., the mandatory inclusion of course materials costs and updates to boilerplate text), should be prioritized for review and approval. This approval will allow for compliance reporting as needed by Bill 166.

2. Update Responsibilities Establish a Governance Structure Through the AVPA's Office:

The Outline Advisory Group, should be formally established to address content updates needed to course outlines and to oversee the ongoing maintenance of the Outline tool. This group will ensure there is appropriate consultation with leadership in the Faculties and AFIWs and will have representatives from Outline tool users, faculty and staff.

3. Implementation with Best Practice Guidance:

Once approved, the updates to the required content in course outlines will be provided to instructors for use in upcoming academic terms. This will be accompanied with best practice guidelines from CTE and the Outline Advisory Group. This guidance will be instrumental in helping instructors navigate the updated template, ensure compliance, and maintain clarity and accessibility in their course outlines.

4. Further Update to Boilerplate Text:

While updates to boilerplate text have been addressed in this report, further examination of this text will be needed as technologies, policies, and student needs evolve. Future updates should include a review process to ensure that boilerplate language remains relevant, concise, and compliant with institutional and legislative requirements.

5. Encourage Continuous Feedback:

Feedback mechanisms should be established to allow instructors, students, and staff to provide ongoing input to the Outline Advisory Group on modifications to content of course outlines as well as improvements to the Outline tool. This feedback will help identify areas for improvement and ensure the tool continues to meet the needs of its users.

By taking these next steps, the University of Waterloo can ensure that course outlines remain compliant with Ministry initiatives, accessibility needs for students with disabilities, and contain the latest approved boilerplate language. The Outline tool, created to facilitate this process, will be supported and updated as needed to remain a dynamic, reliable, and student-centered resource that supports teaching and learning excellence across the institution.

Outline Below (Editable)

BIOL 999 Winter 2025
Bugs, Probably

Template

UW Standard 2.0

English

Title Override

Bugs, Probably

please leave blank to use the default course title unless writing drafts or absolutely necessary.

Class Schedule

Course	Meet Days	Meet Time	Location	Instructor(s)
BIOL 999 001 [LEC]	Tue, Thu <i>Jan 6 - Apr 4</i>	11:30AM - 12:50PM	AL 116	

schedule data automatically refreshed daily

Instructional Team

(Required): Please use the textbox below to provide the instructor and (if applicable) TA contact information. Include office hours, office location, and a description of responsibilities. This section may be formatted at your discretion and may include "about this instructor" information
Note: If you opt to make this course outline publicly accessible, the content in this box will be hidden from non-authenticated users.

 Paragraph  **B** *I* U  A^2 A_2       $f(x)$

Primary instructor: Doctor Innis Ect, PhD.

TAs: **None**. Where we're going we don't need any assistance.

Office Hours:

Day of Week	Office hours and location
Mon-Wed	BIOL 0003 5pm-10pm
Wed-Fri	Wilderness (find me) 8pm+

Course Description

Calendar Description for BIOL 130:

[View requirements for BIOL 130](#)

Paragraph ▼
B
I
U

 A^2
 A_2
 $\therefore$
 $\frac{1}{3}$
 $\equiv$
 $\equiv$
 $\equiv$
 $\equiv$

 $f(x)$

Note: Course outline has been co-opted for the purposes of demonstrating the new design and functionality of the Outline.uwaterloo.ca software.

Paragraph **B** *I* U $\text{\textcircled{S}}$ A^2 A_2 $\equiv$ $\frac{1}{2}\equiv$ $\equiv$ $\equiv$ $\equiv$ $\equiv$ $\equiv$ $f(x)$

Page 616 of 775

(Required): Specify how the course will be organized (e.g., by chapter, week, or module). You may format this section as you prefer. Consider including a weekly teaching plan in a table format for clarity.

- **Week 1:** We're mostly going to read this course outline
- **Week 2:** Reviewing the course outline we read in Week 1
- **Week 3-6:** Bugs, probably
- **Week 7-10:** Bugs: **Definitely**

Required Materials & Technologies

Select one:

- ☐ This course has additional costs to students (listed in sections below). All prices are estimates in Canadian dollars and may vary between vendors.
-
- ☐ This course has **no additional costs** for students.

Readings

This section will be omitted if the table and freeform text are left blank.

List all reading materials needed in this course. If students cannot use old / different versions of a text, please indicate this along with the reason in the notes/comments column.

Please refer to the [university guidelines pertaining to fees for third-party learning resources](#).

According to [Bill 166](#) it is now required to include estimated costs for all required and recommended course learning materials. Please use the provided "Price" column in the table below to indicate these estimates (do not include shipping or tax). For Winter 2025 courses, consider referencing the [W Store](#) or other sites to find costs.

You do not need to include cost estimates for optional / supplemental readings, however, please include costs for required texts which are on library reserve.

(optional) Table Title

Title / Name	Notes / Comments	Required	Used Versions Allowed	Price (CAD)
↑BUGS!! Dorrel & ↓Jimmothy, 8th Edition	Textbook comes with required software	Required	☐	\$650.00
↑Normal Biology Textbook, 5th Ed or ↓higher	Good reference, but not mandatory.	Recommended	☐	digital: \$60-\$80 print: \$500+ (rare!)

If you can't get a copy of Windows XP, we recommend requesting a Windows XP "Virtual Machine" which can be requested from Science Computing.

Other Materials

This section will be omitted if the table and freeform text are left blank.

In the table below, please list all other required or recommended course materials and associated costs. Common examples include lab coats, travel costs, calculators.

Note: For requirements such as "laptop" or "cellphone" you do not need to include a cost.

(optional) Table Title

Item		Notes / Comments	Required	Price (CAD)	
↑ ↓	Bug Net	Fine-mesh	Recommended	\$20-80	x
(optional) Table Footer					
DELETE TABLE				ADD ANOTHER TABLE	ADD ROW

(Optional): Include any additional information about the other required course materials in the textbox below.

⏪ ⏩ Paragraph **B** *I* U ↺ A² A₂ ⋮ ⋮ ⋮ ⋮ ⋮   $f(x)$

Bug nets can be purchased at any local bug-catching store. You don't need to buy one as we have spares, but the spares are in rough shape.

DO NOT SHOP AT BUGS'R'US! Their nets are SUB-PAR and UW has severed ALL CONNECTIONS with the company.

We will NOT allow BUGS'R'US nets to be employed in this course and you will be asked to leave if you bring one.

Assessments & Activities

Enter your student assessment metrics here. If you have multiple grading schemes they may be entered as separate tables with clear titles.

Grading Scheme A

Component/Activity	Date or Due Date	Location / Submission Method	Weight(%)
↑ ↓ Assignments (x10)	Every Friday (except reading week)	LEARN	20% total
↑ ↓ Final Exam	TBD	TBD	80%

Missed assignments will have weight evenly distributed to other assignments.

Assignment Screening

(Required): In the space below, please indicate the assignment screening strategy for the course.

Consider adapting the provided boilerplate options for this section.

↶ ↷ Paragraph ▼ **B** *I* U ~~ABC~~ A^2 A_2 $\therefore$ $\therefore$ $\equiv$ $\equiv$ $\equiv$ $\equiv$ $\equiv$

 $\oint$ $f(x)$

Add Boilerplate (2)

All boilerplate options shown here for demo:

No automated assignment screening will be utilized within this course.

Text matching software (Turnitin) will be used to screen assignments in this course. This is being done to verify that use of all material and sources in assignments is documented. In the first week of the term, details will be provided about the arrangements for the use of Turnitin and alternatives in this course.

Generative AI

(Required): In the space below, please indicate your course's Generative AI statement.

Consider adapting the provided boilerplate options for this section.

↶ ↷ Paragraph ▼ **B** *I* U ~~ABC~~ A^2 A_2 $\therefore$ $\therefore$ $\equiv$ $\equiv$ $\equiv$ $\equiv$ $\equiv$

 $\oint$ $f(x)$

Add Boilerplate (3)

All boilerplate options shown here for demo:

Generative artificial intelligence (GenAI) trained using large language models (LLM) or other methods to produce text, images, music, or code, like Chat GPT, DALL-E, or GitHub CoPilot, **may be used** for assignments in this class with proper documentation, citation, and acknowledgement. [Recommendations for how to cite GenAI in student work at the University of Waterloo may be found through the Library.](#)

Please be aware that generative AI is known to falsify references to other work and may fabricate facts and inaccurately express ideas. GenAI generates content based on the input of other human authors and may therefore contain inaccuracies or reflect biases.

To protect the privacy and security of any data entered, students should use the University's version of [Co-Pilot](#) and login with their UW ID. Data entered into other systems can be added to training sets, monitored, geolocated and even reproduced as output which may share private personal information or result in intellectual property breaches.

In addition, you should be aware that the legal/copyright status of generative AI inputs and outputs is unclear. Exercise caution when using large portions of content from AI sources, especially images. [More information is available from the Copyright Advisory Committee.](#)

You are accountable for the content and accuracy of all work you submit in this class, including any supported by generative AI. You should be able to readily demonstrate your knowledge of your submissions. To demonstrate your learning, you should keep your rough notes, including sources, research notes, brainstorming, drafting notes and prompts. You may be asked to submit these notes along with earlier drafts of your work, either through saved drafts or saved versions of a document.

Generative artificial intelligence (GenAI) trained using large language models (LLM) or other methods to produce text, images, music, or code, like Chat GPT, DALL-E, or GitHub CoPilot, **may be used under specific conditions** in this course with proper documentation, citation, and acknowledgement. **Permitted uses of and expectations for using GenAI will discussed in class and outlined on assignment instructions.**

[Recommendations for how to cite generative AI in student work at the University of Waterloo may be found through the Library.](#)

Please be aware that generative AI is known to falsify references to other work and may fabricate facts and inaccurately express ideas. GenAI generates content based on the input of other human authors and may therefore contain inaccuracies or reflect biases.

To protect the privacy and security of any data entered, students should use the University's version of [Co-Pilot](#) and login with their UW ID. Data entered into other systems can be added to training sets, monitored, geolocated and even reproduced as output which may share private personal information or result in intellectual property breaches.

In addition, you should be aware that the legal/copyright status of generative AI inputs and outputs is unclear. Exercise caution when using large portions of content from AI sources, especially images. [More information is available from the Copyright Advisory Committee.](#)

You are accountable for the content and accuracy of all work you submit in this class, including any supported by generative AI. You should be able to readily demonstrate your knowledge of your submissions. To demonstrate your learning, you should keep your rough notes, including sources, research notes, brainstorming, drafting notes and prompts. You may be asked to submit these notes along with earlier drafts of your work, either through saved drafts or saved versions of a document.

This course includes the independent development and practice of specific skills, such as **[fill this in with your discipline-specific skills]**. Therefore, the use of Generative artificial intelligence (GenAI) trained using large language models (LLM) or other methods to produce text, images, music, or code, like Chat GPT, DALL-E, or GitHub CoPilot, **is not permitted** in this class. Unauthorized use in this course, such as running course materials through GenAI or using GenAI to complete a course assessment is considered a violation of [Policy 71](#) (plagiarism or unauthorized aids or assistance). Work produced with the assistance of AI tools does not represent the author's original work and is therefore in violation of the fundamental values of academic integrity including honesty, trust, respect, fairness, responsibility and courage ([ICAI](#), n.d.).

You should be prepared to show your work. To demonstrate your learning, you should keep your rough notes, including sources, research notes, brainstorming, drafting notes and prompts. You may be asked to submit these notes along with earlier drafts of your work, either through saved drafts or saved versions of a document. If the use of GenAI is suspected where not permitted, you may be asked to meet with your instructor or TA to provide explanations to support the submitted material as being your original work. If you cannot sufficiently support your work, academic misconduct allegations may be brought to the Associate Dean.

In addition, you should be aware that the legal/copyright status of generative AI inputs and outputs is unclear. [More information is available from the Copyright Advisory Committee.](#)

Students are encouraged to reach out to campus supports if they need help with their coursework including:

- [Student Success Office](#) for help with skills like notetaking and time management
- [Writing and Communication Centre](#) for assignments with writing or presentations
- [AccessAbility Services](#) for documented accommodations
- [Library](#) for research-based assignments

Notice of Recording

(Optional): If applicable, in the space below, please indicate your course notice of recording statement. **Consider using the available boilerplate options for this section.**

↶ ↷ Paragraph ▼ **B** *I* U ~~ABC~~ ^{A²} _{A₂} $\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{5}$ $\frac{1}{6}$

 $f(x)$

Add Boilerplate (1)

All boilerplate options shown here for demo:

Activities for this course involve recording, in partial fulfillment of the course learning outcomes. You will receive notification of recording via at least one of the following mechanisms: within the Learning Management System (LEARN), a message from your course instructor, course syllabus/website, or other means. Some technologies may also provide a recording indicator. Images, audio, text/chat messaging that have been recorded may be used and/or made available by the University to *[insert to whom¹]* for the purpose of *[insert purpose²]*. Recordings will be managed according to the University records classification scheme, [WatClass](#), and will be securely destroyed when no longer needed by the University. Your personal information is protected in accordance with the [Freedom of Information and Protection of Privacy Act](#), as well as [University policies and guidelines](#) and may be subject to disclosure where required by law.

The University will use reasonable means to protect the security and confidentiality of the recorded information, but cannot provide a guarantee of such due to factors beyond the University's control, such as recordings being forwarded, copied, intercepted, circulated, disclosed, or stored without the University's knowledge or permission or the introduction of malware into computer system which could potentially damage or disrupt the computer, networks, and security settings. The University is not responsible for connectivity/technical difficulties or loss of data associated with your hardware, software or Internet connection.

By engaging in course activities that involve recording, you are consenting to the use of your appearance, image, text/chat messaging, and voice and/or likeness in the manner and under the conditions specified herein. (In the case of a live stream event, if you choose not to have your image or audio recorded, you may [disable the audio and video functionality](#). Instructions to participate using a pseudonym instead of your real name are included where the feature exists; however, you must disclose the pseudonym to your instructor in advance in order to facilitate class participation.) If you choose not to be recorded, this notice serves as confirmation of your understanding that *[indicate alternative action that students can take³]*.

You are not permitted to disclose the link to/URL of an event or an event session recording or copies of recording to anyone, for any reason. Recordings are available only to authorized individuals who have been directly provided the above instructions/link for their use. Recordings for personal use, required to facilitate your learning and preparation of personal course/lecture notes, should not be shared with others without the permission of the instructor or event coordinator. Review the University's [guidelines for faculty, staff and students entering relationships with external organizations offering access to course materials](#) for more information on your

obligations with respect to keeping copies of course materials. For more information about accessibility, connect with [AccessAbility Services](#).

Administrative Policy

Include additional course-specific rules, recommendations, or policy items in the section below. This block is optional.

↶ ↷ Paragraph **B** *I* U A^2 A_2 $f(x)$

Add Boilerplate (4)

There's a whole bunch of faculty-specific boilerplate I'm not going to dump here. These are maintained by individual faculties / departments.

University Policy

The content below is pulled directly from [the senate recommendations for course outlines](#) and must be included in all course outlines.

Content source: Campus

Mental Health: At the University of Waterloo, we are dedicated to supporting your mental and emotional well-being. Our Counselling Services offer confidential support, including individual counselling, workshops, and crisis intervention.

If you're struggling, please reach out for help at 519-888-4096 or visit [their website](#) for more information.

Academic integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check [the Office of Academic Integrity](#) for more information.]

Grievance: A student who believes that a decision affecting some aspect of their university life has been unfair or unreasonable may have grounds for initiating a grievance. Read [Policy 70, Student Petitions and Grievances, Section 4](#). When in doubt, please be certain to contact the department's administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for their actions. [Check [the Office of Academic Integrity](#) for more information.] A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to [Policy 71, Student Discipline](#). For typical penalties, check [Guidelines for the Assessment of Penalties](#).

Appeals: A decision made or penalty imposed under [Policy 70, Student Petitions and Grievances](#) (other than a petition) or [Policy 71, Student Discipline](#) may be appealed if there is a ground. A student who believes they have a ground for an appeal should refer to [Policy 72, Student Appeals](#).

Note for students with disabilities and disabling conditions: The University of Waterloo recognizes its obligations under the Ontario Human Rights Code to accommodate students with known or suspected disabilities

and disabling conditions (e.g. medical conditions, injuries, impacts of trauma such as from violence or discrimination) to the point of undue hardship. To support this obligation, [AccessAbility Services](#) (AAS) collaborates with all academic departments and schools to facilitate academic accommodations for students with disabilities and disabling conditions without compromising the academic integrity of the curriculum. If you believe you may require academic accommodations (e.g., testing accommodations, classroom accommodations), register with AAS as early in the term as possible by completing the [online application](#). Students already registered with AAS must activate their accommodations for each of their courses at the beginning of each term using AAS' online system. If you require assistance, contact AAS by phone (519-888-4567 ext. 35082), email (access@uwaterloo.ca) or in-person (Needles Hall North, 1st Floor, Room 1401).

Turnitin.com: Text matching software (Turnitin®) may be used to screen assignments in this course. Turnitin® is used to verify that all materials and sources in assignments are documented. Students' submissions are stored on a U.S. server; therefore students must be given an alternative (e.g., scaffolded assignment or annotated bibliography), if they are concerned about their privacy and/or security. Students will be given due notice, in the first week of the term and/or at the time assignment details are provided, about arrangements and alternatives for the use of Turnitin in this course.

It is the responsibility of the student to notify the instructor if they, in the first week of term or at the time assignment details are provided, wish to submit alternate assignment.

Developed and Supported by the University of Waterloo

 Get Support

SGRC - Regular Agenda - Faculty of Engineering - January 27, 2025

Meeting Information

Agenda Page Title ⓘ
SGRC - Regular Agenda - Faculty of Engineering - January 27, 2025

Career Level	Faculty/Unit	
Graduate	Engineering	
Date	Time	Location
01/27/2025		

Summary
New Programs:
Master of Engineering (MEng) in Chemical Engineering - Health Technologies
Master of Engineering (MEng) in Mechanical and Mechatronics Engineering - Health Technologies
Master of Management Science (MMSc) - Health Technologies

Other Business

- Attachment(s)**
- MEng in HealthTech - Industry and Job Analysis by CEE.pdf
 - CHE - MEng in HealthTech - Program Brief and Template.pdf
 - MME - MEng in HealthTech - Program Brief and Template.pdf
 - MSE - MEng in HealthTech - Program Brief and Template.pdf

Course Proposals

Course Proposal Details

Courses: Retire
No proposals have been added.

Courses: New
No proposals have been added.

Courses: Changes
No proposals have been added.

Programs & Plans Proposals

Programs & Plans Proposal Details

Programs & Plans: Retire

No proposals have been added.

Programs & Plans: Major Modifications

No proposals have been added.

Programs & Plans: Minor Modifications

No proposals have been added.

Regulations Proposals

Regulations Proposal Details

Regulations: Retire

No proposals have been added.

Regulations: New

No proposals have been added.

Regulations: Changes

No proposals have been added.

UNIVERSITY OF WATERLOO



GRADUATE PROPOSAL COLLABORATIVE HEALTH TECHNOLOGIES PROGRAM MASTER OF ENGINEERING IN CHEMICAL ENGINEERING – HEALTH TECHNOLOGIES (CO-OP)

For submission to the
Ontario Universities Council on Quality Assurance

VOLUME I - PROPOSED BRIEF

NOVEMBER 2024

- *The Quality Council will normally require only an Expedited Approval process where:
- a) there is a proposal for a **new Collaborative Program** at the graduate level; or
 - b) there is a proposal for a **new for-credit graduate diploma**.

NOTE: This template **must** be used for submission of a new program proposal.
Please consult the University of Waterloo [Institutional Quality Assurance Process](#) and the
[Quality Assurance Framework](#) (QAF) for details or the [Quality Assurance Office](#).

****Volumes I, II must be reviewed and approved by the Quality Assurance Office, GSPA and IAP prior to submission to your Faculty Council****

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1. Introduction

Brief Listing of the Program

The Collaborative Health Technologies Program offers students professional Master of Engineering (MEng) degree with mandatory co-op, as preparation to enter the broad and rapidly evolving field of *Health Technology*. Not only is co-op highly beneficial to students while completing this program, it also offers an important opportunity to those students who *never* had co-op experience during their undergraduate degree. The program is centered around a collaborative and interdisciplinary suite of courses offered by six departments in Engineering and supported by the Faculties of Arts and Health. In addition to coursework, the mandatory co-op program serves to enrich the learning of students with practical experience in industrial settings. This is a full-time, on-campus program, with an expected duration of 4-6 terms, based on the co-op and study sequence selected by particular students. Program tuition follows the existing UW graduate home program tuition structure.

To enroll in the Collaborative Health Technologies Program, students must meet the admission requirements of, and register in, the department of Chemical Engineering (CHE). Students must complete the Collaborative Health Technologies Program requirements that are structured as a combination CHE department’s MEng degree requirement, and the additional Collaborative Health Technologies Program requirements (i.e., the completion of sufficient courses from specified pools, and successful co-op work terms/reports).

The degree conferred will be that of the participating program (i.e. Chemical Engineering), with the completion of the Collaborative Health Technologies Program indicated by a transcript notation to the degree and adjunct qualification to the degree (i.e. Master of Engineering in Chemical Engineering – Health Technologies). The proposed collaborative program also offers a platform to allow future participation of other Faculties.

Method Used for Preparation of the Brief

The Collaborative Health Technologies Program was conceptualized by the Dean of Engineering and the Associate Dean Graduate Studies – Engineering. In April 2023, the initiative to develop the program received support from the New Interdisciplinary Networks, Programs, and Initiatives Fund from the University. The proposal was developed following consultations by the Associate Dean with Graduate Associate Chairs of the departments of Chemical Engineering, Civil and Environmental Engineering, Electrical and Computer Engineering, Management Science and Engineering, Mechanical and Mechatronics Engineering, and Systems Design Engineering. The Associate Dean also had discussions with counterparts in other Faculties (e.g., Arts, Health, and Science). The general proposal was presented to the departments in Engineering for consideration within the unit. Following approval, this departmental proposal brief to participate in the collaborative program evolved, incorporating the specific requirements of the home unit.

2. Objectives of the Program ([QAF 2.1.2.1](#))

The Collaborative Health Technologies Program is timely and justified not only based on the critical need for skilled professionals at the intersection of healthcare and technology, but also by the University of Waterloo’s own goals, e.g. [Waterloo at 100, Global Futures](#). The following are some of the compelling reasons that justify the establishment of a Collaborative Health Technologies Program:

1. **Rapid Technological Advancements in Healthcare:** The healthcare industry is experiencing an unprecedented transformation due to rapid advancements in technology. Innovations such as artificial intelligence, telemedicine, wearable devices, and data analytics are reshaping healthcare delivery, diagnosis, treatment, and patient care. A dedicated program will equip future professionals with leading-edge skills needed to leverage and drive innovations in this field.
2. **Increasing Demand for Health Technology Experts:** There is a growing demand for professionals who possess a deep understanding of both healthcare and technology. This demand arises from the need to bridge the gap between traditionally siloed fields and create holistic solutions that address complex healthcare challenges. Graduates of a Collaborative Health Technology Program will fill this talent gap and drive innovation in healthcare settings.
3. **Addressing Healthcare Challenges:** The global healthcare landscape faces numerous challenges, including rising costs, an aging population, chronic diseases, disparities in healthcare access, and pandemics. A Collaborative Health Technologies Program will empower students to develop innovative solutions to address these challenges, improve healthcare access, and enhance patient outcomes.
4. **Opportunity for Interdisciplinary Collaboration:** A program that combines healthcare and technology will foster interdisciplinary collaboration. Students will learn to collaborate with healthcare professionals, engineers, data scientists, ethicists, and policymakers, fostering a diverse and comprehensive approach to problem-solving.
5. **Industry-Relevant Skill Development:** Employers in the healthcare and technology sectors seek professionals with specialized skills in areas such as health data analytics, digital health, telemedicine, medical device development, regulatory compliance, and AI applications in healthcare. Both the course-based components and the mandatory co-op of this Collaborative Health Technologies Program combine to ensure that graduates are well-prepared with these in-demand skills.
6. **Economic and Innovation Impact:** Investing in a Collaborative Health Technologies Program aligns with the current market demand and presents an opportunity to contribute to economic growth and innovation. Graduates equipped with the skills to develop and implement Health Technology solutions can drive entrepreneurship, create job opportunities, and contribute to the expansion of healthcare technology sectors.
7. **Addressing Future Healthcare Needs:** With the evolving landscape of healthcare and technology, preparing future professionals to navigate and lead in this dynamic environment is essential. Establishing a Collaborative Health Technologies Program now ensures that the workforce is ready to address the future needs and challenges of the healthcare industry.

Program Learning Outcomes and Graduate Degree Level Expectations (GDLE):

1. Depth and Breadth of Knowledge

- a. Understand the principles, concepts, terminology and tools of health technology
- b. Demonstrate awareness of key elements of both the ethical considerations and impacts of health technologies
- c. Interpret, understand, and critically assess state-of-the-art methods, theories, and advances in health technology

2. Research & Scholarship

- a. Integrate complex engineering concepts related to the breadth of health technology, and the underlying and associated sciences.

3. Level of Application of Knowledge

- a. Interpret, critically assess and apply state-of-the-art methods, theories, and advances in health technology
- b. Understand current issues faced by the health technology industry

4. Professional Capacity / Autonomy

- a. Independently recognize, define, and solve complex real-world health technology needs and associated challenges
- b. Engage in self-directed professional development and life-long learning
- c. Develop an ability to recognize, appreciate, consider and apply appropriate ethics, law, regulations, and accountability to the field of health technologies
- d. Understand the value of engaging in inter-disciplinary collaboration in health technology as well as the complexity of knowledge & limitations of different fields
- e. Adopt a mindset for collaboration (work effectively in interdisciplinary teams including healthcare professionals, engineers, designers, business developers, etc.)

5. Level of Communication Skills

- a. Effectively communicate complex concepts in health technology to a wide audience ranging from general public to experts in the field. Concepts may include health technology needs and associated challenges (includes GDLE 6 Awareness of Limits of Knowledge)
- b. The ability to communicate ideas, issues and conclusions clearly.

6. Awareness of Limits of Knowledge

- a. Cognizance of the complexity of knowledge and of the potential contributions of other interpretations, methods, and disciplines.
- b. Understand the value of inter-disciplinarity in the field of health technologies.

How does this Program align with the University of Waterloo Strategic Plan and Strategic Mandate Agreement?

The Collaborative Health Technologies Program aligns well with the University of Waterloo's strategic plan in several ways:

1. **Interdisciplinary Collaboration:** The program's collaboration between the departments in Engineering as well as the support by Arts and Health, demonstrate a commitment to interdisciplinary collaboration, a key focus area of the strategic plan. This collaboration

brings together diverse perspectives and expertise, fostering innovation in health technology by integrating engineering skills with insights from health, social sciences, and humanities.

2. **Work-integrated Learning through Co-op:** The mandatory co-op component of the program aligns with the strategic plan's emphasis on experiential learning. This practical work experience allows students to apply their knowledge in real-world settings, contributing to their professional development while addressing real challenges in health technology.
3. **Benefits of Innovation and Research:** The program's focus on Health Technologies aligns with the strategic plan's emphasis on fostering innovation. Even though this is a course-based program, it does enable students to connect with faculty from various departments to engage with cutting-edge technologies and understand solutions to real-world problems.
4. **Community Partnerships:** Collaboration between different departments within Engineering, along with the support, through course offering, by Faculties of Arts and Health, opens opportunities for partnership with external organizations, hospitals, and industry players. This engagement aligns with the strategic plan's focus on strengthening community partnerships. Co-op placements also will play a key role in this aspect.
5. **Technology and Global Challenges:** By addressing healthcare challenges through technology and innovation, the program contributes to addressing global challenges, which is in line with the University's strategic goal of leveraging technology for positive societal impact.
6. **Commitment to Excellence and Diversity:** The collaborative nature of the program reflects the University's commitment to excellence in education and research. Furthermore, by integrating diverse perspectives from multiple departments and faculties, the program contributes to promoting diversity and inclusion, a priority area in the strategic plan.

Overall, the Collaborative Health Technologies Program embodies many key pillars of the University of Waterloo's Strategic Plan by promoting interdisciplinary collaboration, experiential learning, innovation, community engagement, and a commitment to excellence and diversity.

3. Admission Requirements ([QAF 2.1.2.5](#))

Admission into the Collaborative Health Technologies Program is through direct application to the program offered through the home administrative unit, i.e. CHE. Admission requirements for the program will be the same as those existing for the [Master of Engineering](#) degree in CHE.

The minimum academic requirements – including admissions requirements, minimum overall averages, and timelines for any milestones – in the program will be consistent with the requirements of the primary existing master’s program for each participating department.

In detail, the admission requirements for MEng in the department of Chemical Engineering are:

- A 75% overall standing in the last two years, or equivalent, in a four-year Honours Bachelor's degree or equivalent.

- A Supplementary Information Form (SIF), which contains questions specific to the program about why applicants want to enroll and their experience in the field, must be completed.
- Required application materials include, Resume, SIF, Academic Transcript(s); Proof of English Language Proficiency (if applicable); and two reference letters with at least one academic.

Minimum English Language Proficiency requirement: TOEFL 80 (writing 22, speaking 20, reading 20, listening 18), or IELTS 6.5 (writing 6.0, speaking 6.0).

These admission requirements are appropriate given the precedent of existing co-op Master’s programs in the Faculty of Engineering. The level of required academic performance is indicative of what will be required of students during their studies within this proposed program and serves to select only students who will be capable of meeting course expectations and overall program learning outcomes. Furthermore, the Supplementary Information Form, resume, and reference letters will allow for recognition of the prior work, experience, aspirations, and career trajectory of applicants.

4. Structure ([QAF 2.1.2.2](#))

The Collaborative Health Technologies Program is a co-op only, course-based program. Completion of 9 courses, a compulsory PD course, and the Engineering Work-term Experience Report will be required to meet the coursework requirement of the program. Selection of courses will be as follows:

1 compulsory PD course:

- CHE 600: Engineering and Research Methods, Ethics, Practice, and Law (0.25 credit weight)

1 CHE core course:

- CHE 601: Theory and Application of Transport Phenomena, or
- CHE 602: Chemical Reactor Analysis

2 courses from the following University-level courses (ARTS, ENG):

- PHIL 626: Bioethics and Technology
- ECON 643: Health Economics
- MSE 619: Healthcare Analytics

1 course from the following Faculty-level courses (5 other ENG depts):

- BME 600: Design of Biomedical Technologies
- BME 602: Foundations in Biomechanical Engineering
- ENVE 585: Air Quality Engineering and Impacts
- ECE 608: Quantitative Methods in Biomedical Engineering
- MSE 630: Human-Computer Interaction

2 HLTH courses from the following list, and 3 from 500 and 600 level CHE courses:

- HLTH 612: Introduction to Health Information and Data Standards
- HLTH 633: Digital Health
- HLTH 605B: Quantitative Methods and Analysis
- HLTH 650A / 650B: Application of Artificial Intelligence in Health (0.25) / Machine Learning Techniques in Health (0.25)
- HLTH 606B: Principles of Epidemiology for Public Health
- HLTH 615: Requirements Specifications and Analysis in Health Systems

CHE 650: Engineering Work-term Reference Report (0.25 credit weight)

Of the 9 courses, no more than 2 may be at the 500 level.

Of the 9 courses, no more than one may be a reading course.

The program study / co-op sequence is illustrated below. Having co-op during the program both allows students to apply what they have learned in school to their co-op employment, but also the reverse: apply what has been learned during co-op terms to their in-school experiences. This model allows for bidirectional inspiration and gives students an important *context* for what they are learning.

Term-1	Term-2	Term-3	Term-4	Term-5	Term-6
study	study	study	Co-op	Co-op	(study)
study	study	study	Co-op	(study)	

Rationale and Justification

The structure and regulations of the Collaborative Health Technologies Program align with the program learning outcomes and Degree-Level Expectations. More detail is given below.

Alignment with Program Learning Outcomes:

1. **Diversity of Course Offerings:** The coursework structure ensures a breadth of courses from various levels (University, Faculty, Department) covering different aspects of health technologies, such as ethics, analytics, biomedical engineering, rehabilitation engineering, human-computer interaction, health-care systems, epidemiology, systems theory etc. The proposed program is designed in such a way that potential future participation of additional Faculties with their own master’s program model is both possible and would further enrich the program content.
2. **Integration of Practical Experience:** The mandatory incorporation of co-op allows students to apply theoretical knowledge gained in the classroom to real-world scenarios, and vice versa. This aligns with the objective of the program to foster practical application and real-world learning.

Meeting Degree Level Expectations:

1. **Depth and Breadth of Knowledge:** The variety of courses spanning different Departments and Faculties suggests a comprehensive coverage of topics relevant to health technologies, meeting the depth and breadth of knowledge expected at the master's level.
2. **Professional Skills Development:** The incorporation of co-op experiences facilitates the development of professional skills, preparing students for practical challenges in the field.

Rationale for Program Length:

The proposed program length is reasonable for several reasons:

1. **Course Load and Requirements:** 9 courses within the program, structured across different units and levels, can be reasonably completed within three to four study terms.
2. **Integration of Co-op Experience:** The inclusion of co-op necessitates a program duration that allows students to engage in these practical experiences without significantly extending the program length.
3. **Balancing Academic and Practical Learning:** The program aims to balance academic learning with real-world application. A structured timeframe enables students to attain both theoretical knowledge and practical skills within a manageable period.

5. Program Content ([QAF 2.1.2.3](#))

Health Technologies represent the dynamic intersection of healthcare and cutting-edge technology, encompassing a diverse array of innovations designed to revolutionize patient care, improve healthcare accessibility, and enhance overall well-being. Embracing a multidisciplinary approach, Health Technologies integrate advancements in artificial intelligence, data analytics, telemedicine, medical imaging, ethics, and more, to drive transformative changes in the diagnosis, treatment, and management of health conditions. The Collaborative Health Technologies Program is a multi-disciplinary course-based program in the Faculty of Engineering with mandatory co-op, integrated within the timeline of the program. Its multi-disciplinarity is derived on the basis of the participation, through course offerings, of the Faculties of Arts and Health. Additionally, the enrolled students will also take appropriate courses across several departments within Engineering. All courses taken are at the graduate level. An overview of the program’s course structure was given in Section 4. Here, additional information on the courses is given.

A brief description of the University-level courses, from which a student would be required to take two courses, is given below:

- **PHIL 626: Bioethics and Technology (Arts)**

Students will grapple with a sample of ethical issues related to advanced and emerging medical technologies and/or biotechnologies. The primary goals of doing so are: (1) To gain familiarity with key ethical concepts and values, which may include patient autonomy, beneficence, justice, care, anti-ableism, inclusion, and others; and (2) to enhance core critical thinking skills needed for ethics, which will help improve each student’s self-understanding (of not only what they think is right and wrong, but, more importantly, why) and their capacity to engage with different perspectives on the “whats” and “whys” of ethics in a spirit

of open-mindedness, mutual respect, and constructive cooperation. Frequent in-class discussion is typically an important element of student learning in this course.

- **ECON 643: Health Economics (Arts)**

This course introduces students to the role of economics in health care and health policy. It is meant to be a survey of major topics in health economics and an introduction to the ongoing debate over health care policy. Topics include the economic determinants of health and health policy, the market for medical care, the market for health insurance, and the role of the government in health care, and health care reform.

- **MSE 619: Healthcare Analytics (Engineering)**

This course provides an introductory course 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.

A brief description of the Faculty-level courses offered by other engineering departments is given below, and the student would be required to one course from this list:

- **BME 600: Design of Biomedical technologies (SYDE)**

Systems theory and formulation of system dynamics problems. Design and research methods for biomedical technologies. Problem formulation and definition, stakeholder engagement, needs analysis, generation of alternative solutions, feasibility analysis, optimization, selection, and solution implementation.

- **BME602: Foundations in Biomechanical Engineering (MME)**

This course focuses on equipping students with foundational knowledge in the biomechanics of human physiology, pathology and treatment. The overarching aim of this course is to develop students’ literacy in applying biomechanics principles and modern tools towards understanding the human body. The course will build on existing knowledge in mathematics and physics to develop new expertise and hands-on experience in the biomechanical modeling and analysis of physiological systems.

- **ENVE 585: Air Quality Engineering and Impacts (CEE)**

This course introduces air quality design of engineering solutions and associated health and economic impacts. It includes topics focused on the indoor environment, the outdoor environment, or both, such as: air pollution sources, emission estimation, control strategies, measurement, modeling methods, health impact assessment, cost-benefit analysis, technical policy analysis, and co-impacts with climate change.

- **ECE 608: Quantitative Methods in Biomedical Engineering (ECE)**

This course focuses on topics related to the use of quantitative tools in biomedical engineering research studies. Educational emphasis will be placed on developing students'

core competence in biostatistics and biomedical computing, so as to prepare them to pursue biomedical engineering investigations that are backed by quantitative reasoning and numerical insights.

- **MSE 630: Human Computer Interaction (MSE)**

This course concentrates on the theoretical and practical issues related to the design of the human-computer interfaces. Aspects of human perception, cognition and various models of task analysis are discussed.

A brief description of the Faculty of Health courses from which the student would be required to take 2 courses, is given below:

- **HLTH 612: Introduction to Health Information and Data Standards**

This course focuses on health data as a key component of all health informatics systems. Topics include ontologies and other classification taxonomies found in health systems, data standards (with a focus on Canadian implementations of international standards), privacy and security of health data, client/patient assessment tools, and ethical considerations.

- **HLTH 633: Digital Health**

The wide adoption of mobile technology presents a new opportunity. Leveraging this existing technology, healthcare systems can deliver remote care and collect real-time data on patients outside of health centres, minimizing unnecessary visits to hospitals and providing healthcare access to remote populations. In this course, we will explore how digital health technology has been designed, evaluated, and deployed in different countries. Case studies will be used to demonstrate how institutional and governmental constraints have a strong impact on the success of the deployment. The course will address the different digital health technologies in the market, such as Telehealth, remote patient monitoring, tele radiology, consumer health informatics, and mHealth. Important aspects of technology development like patient confidentiality, privacy, standards, communication and security protocols, regulatory requirements, among others, will be discussed when presenting the development of each digital health solution. By the end of this course, students will be prepared to design, evaluate, and deploy a digital health intervention and will have a solid understanding of the barriers and requirements for deploying digital health technology.

- **HLTH 605B: Quantitative Methods and Analysis**

This course is a rigorous introduction to biostatistics for those planning a career in public health. Students will learn various biostatistical techniques, how to apply those techniques in the analysis of data from health studies, and how to interpret the results from those analyses. After a brief review of material from a basic statistics course, topics covered will include simple and multiple linear regression, analysis of categorical data, simple and multiple logistic regression, and survival analysis. Emphasis will be on (i) conceptual understanding of topics, including literacy necessary for understanding scientific papers in public health, as well as (ii) carrying out various data analysis applications.

- **HLTH 650A / 650B: Application of Artificial Intelligence in Health (0.25) / Machine Learning Techniques in Health (0.25)**

HLTH 650A focuses on the application of machine learning (ML) and artificial intelligence (AI) techniques in the field of healthcare and public health settings. Big data sources available for population health studies will be introduced to students and challenges related to AI in health data will also be discussed. The learning activities consist of lectures, student-led journal club discussions and a term paper to propose the application of ML techniques to solve population health or public health problems.

HLTH 650B focusses on the techniques of machine learning (ML) commonly used to solve healthcare and public health problems. Various analytics techniques, including data wrangling, visualization, unsupervised and supervised learning, will be introduced to students. Challenges and strategies related to missing data, imbalanced data and model selections will also be discussed. The learning activities consist of lectures, labs, and a final project to demonstrate the proficiency of ML techniques to solve population health or public health problems.

- **HLTH 606B: Principles of Epidemiology for Public Health**

This course introduces the principles, methods, and uses of epidemiology in the practice of public health. After completion of this course, students will be able to critically read and interpret epidemiologic research and clearly communicate epidemiologic findings. They will be familiar with health status measurement, data sources, screening, surveillance, outbreak investigation, and methods to support program planning and evaluation. Students will have a sound understanding of basic epidemiologic concepts, including prevalence, incidence, study designs, measures of association, bias, confounding and causal inference.

- **HLTH 615: Requirements Specifications and Analysis in Health Systems**

This course introduces students to the requirements of definition phase of software development. Models, notations, and processes for software requirements identification, representation, validation, and analysis are discussed, as are mechanisms to evaluate the efficacy and efficiency of health information systems.

6. **Mode of Delivery ([QAF 2.1.2.2](#))**

Courses made available for students of the Collaborative Health Technologies Program use a wide variety of teaching and learning methodologies (e.g., lectures, case-studies, student presentations, in-class group discussion, etc.) designed to provide students with an engaging learning experience. Though not specific to this program, at the University of Waterloo, instructors from all faculties are encouraged to make use of the Center for Teaching Excellence, which offers many resources to aid instructors in improving their teaching, course design, and delivery, emphasising *Active Learning* techniques. Instructors of courses offered to Collaborative Health Technologies Program students will be reminded of these resources.

Following program approval and implementation, the faculty-level administrative staff will ensure the program is continually meeting both intended learning outcomes and degree-level expectations.

7. Assessment of Teaching and Learning ([QAF 2.1.2.4](#))

The performance of students will be assessed both on conventional and existing methods stipulated by the courses they will take, but also based on input from the co-operative education component of this program.

Assessment of teaching and learning will be conducted at the *student* and *program* levels. The program will be assessed at the program level by the Graduate Program Committee and program director. As part of this assessment, the Program Committee will review statistics, such as program performance versus learning objectives, student success rates and teaching evaluations – as provided through both student perception surveys and peer-assessment of teaching. The committee will identify opportunities to improve performance, such as enriching course content or teaching.

Performance indicators that will be considered by the Program Committee will include:

- Applications to and enrollment within the program;
- Student evaluations of courses;
- Student graduation rates;
- Surveys of alumni; and
- Surveys of employers/industry partners.

At the student level, there will be the following types of activities with assessments:

- a) Coursework: Students will be assigned a grade based on typical assessment methods used in other graduate courses, such as papers, reports, tests, projects, and presentations.
- b) Co-operative Education Work-Term Reports.

Refer to the table in Appendix A for more specific information on how assessments will be made, both for course-based and co-operative education components of this program.

8. Resources for All Programs ([QAF 2.1.2.6](#))

For the anticipated enrolment numbers of the Collaborative Health Technologies Program, the additional students enrolling into pre-existing courses will not present a significant burden on the University's resources (i.e., students take courses from large pools and therefore, there will likely not be so many additional students per course that additional sections and having more instructors would be necessary – in fact, in some cases, the additional grad students enrolling may help improve the instructor utilization efficiency for courses that typically have too low of enrollment numbers). The program would not necessitate hiring any new faculty members and instead would rely on existing known-to-be qualified faculty members already teaching courses. In addition, students will have access to the University's facilities and spaces, including library resources, working spaces, access to existing resources for student well-being and counselling, as well as technology support from their home department. This program is not expected to impose additional student costs for use of resources. Program coordination can be handled by existing staff resources in the home

departments with the Faculty of Engineering providing additional support as needed, as is the case for other existing collaborative programs.

9. Resources for Graduate Programs ([QAF 2.1.2.7](#))

Given the course-based nature of the Collaborative Health Technologies Program, an assessment of the research-related and supervisory expertise of faculty is not required for this program to function. The breadth of courses available for students to take is immense and course instructors may change from term-to-term. Therefore, nearly *all* faculty from the participating units may serve this program through the teaching of courses in which Health Technology students may enroll. On a course-by-course /offering-to-offering basis, ensuring instructor competence is left to the discretion of the corresponding department. Following the precedent of existing professional master’s programs in Engineering, no financial assistance will be provided to students. Ensuring the quality of incoming students, will be left to the discretion of the home departments and will be put into action through the standard program admission requirements, as are described in Section 3.

10. Quality and Other Indicators ([QAF 2.1.2.8](#))

To ensure the quality of the program a Program Committee will be created to oversee and regularly evaluate the program, to ensure all program requirements and course related graduate-level degree requirements are met. This committee will consist of a Program Director, the Course Coordinator, a faculty member from each participating department, and a graduate student representative. Furthermore, the co-op office will principally oversee all co-op related activities and components of this program. Within each department of Engineering, Graduate Associate Chairs will monitor the progress of their constituent students from this program, as is already their responsibility for existing professional programs. Specifically, student progression through the program, grades, and successful completion of co-op terms will be tracked. Where needed, remedial action will be taken to ensure students remain on-track and able to maximally benefit from participation in this program.

Appendix A - Summary of Learning Outcomes Mapped to Courses and Assessment Methods

Specific GDLEs and Associated Learning Outcomes	Courses									Co-operative Education			Assessment method							
	University-level ARTS ENG			Faculty-level SYDE MME CIVE ECE MSE					Dept-level CHE HEALTH											
	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	ENVE 585: Air Quality Engineering & Impact	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Health-specific electives , and Department-specific courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
1. Depth and Breadth of Knowledge																				
Understand the principles, concepts, terminology, tools of health technology	A	A	A	C	A	A	A	A	AC	NA	NA	A	NA	A	A	A	A	A	A	NA
Demonstrate awareness of key elements of both the ethical considerations and impacts of health technologies	A	A	A	NA	C	NA	NA	C	AC	A	NA	A	NA	A	A	A	A	A	A	NA
Interpret, understand, and critically assess state-of-the-art methods, theories, and advances in health technology	C	C	A	NA	A	C	A	A	AC	NA	NA	C	NA	A	A	A	A	A	A	NA
2. Research & Scholarship																				
Integrate complex engineering concepts related to the breadth of health technology, and the underlying and associated sciences.	NA	NA	A	C	A	A	A	A	AC	C	NA	C	NA	A	A	A	A	A	A	NA

Specific GDLEs and Associated Learning Outcomes	Courses									Co-operative Education			Assessment method							
	University-level ARTS ENG			Faculty-level SYDE MME CIVE ECE MSE					Dept-level CHE HEALTH											
	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	ENVE 585: Air Quality Engineering & Impact	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Health-specific electives , and Department-specific courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
3. Level of Application of Knowledge																				
Interpret, critically assess and apply state-of-the-art methods, theories, and advances in health technology	A	A	A	C	A	A	A	A	AC	NA	NA	A	NA	A	A	A	A	A	A	NA
Understand current issues faced by the health technology industry	A	A	C	C	A	NA	C	A	AC	A	C	A	NA	A	A	A	A	A	A	NA
4. Professional Capacity / Autonomy																				
Independently recognize, define, and solve complex real-world health technology needs and associated challenges	A	A	NA	C	C	C	C	C	AC	A	A	A	NA	AC	AC	AC	AC	C	AC	NA
Engage in self-directed professional development and life-long learning	NA	NA	NA	NA	NA	NA	NA	NA	NA	C	C	A	NA	NA	NA	NA	NA	A	NA	NA
Develop an ability to recognize, appreciate, consider and apply appropriate ethics, law, regulations, and accountability to the field of health technologies	A	A	C	C	C	NA	C	C	AC	A	C	A	NA	A	A	A	A	A	A	NA

Specific GDLEs and Associated Learning Outcomes	Courses									Co-operative Education	Assessment method									
	University-level ARTS ENG			Faculty-level SYDE MME CIVE ECE MSE					Dept-level CHE HEALTH											
	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	ENVE 585: Air Quality Engineering & Impact	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Health-specific electives , and Department-specific courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
Understand the value of engaging in inter-disciplinary collaboration in health technology as well as the complexity of knowledge & limitations of different fields	C	C	C	C	NA	NA	NA	NA	AC	NA	NA	A	NA	NA	NA	C	NA	A	C	NA
Adopt a mindset for collaboration (work effectively in interdisciplinary teams including healthcare professionals, engineers, designers, business developers, etc.)	NA	NA	NA	NA	NA	NA	NA	NA	NA	A	A	C	NA	NA	NA	NA	NA	C	NA	NA
5. Level of Communications Skills																				
Effectively communicate complex concepts in health technology to a wide audience ranging from general public to experts in the field. Concepts may include health technology needs and associated challenges (includes GDLE 6 Awareness of Limits of Knowledge)	C	C	C	NA	NA	NA	NA	NA	NA	C	C	C	NA	NA	NA	NA	NA	C	C	NA
The ability to communicate ideas, issues and conclusions clearly.	C	C	NA	NA	NA	NA	NA	NA	NA	C	C	A	NA	NA	NA	NA	NA	A	C	NA

Specific GDLEs and Associated Learning Outcomes	Courses									Co-operative Education			Assessment method							
	University-level ARTS ENG			Faculty-level SYDE MME CIVE ECE MSE					Dept-level CHE HEALTH											
	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	ENVE 585: Air Quality Engineering & Impact	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Health-specific electives , and Department-specific courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
6. Awareness of Limits of Knowledge																				
Cognizance of the complexity of knowledge and of the potential contributions of other interpretations, methods, and disciplines.	A	A	C	C	C	C	C	C	AC	A	A	A	NA	C	NA	NA	NA	A	A	NA
Understand the value of inter-disciplinarity in the field of health technology.	C	C	C	C	C	C	C	C	AC	C	C	C	NA	C	NA	C	NA	C	C	NA

Table Legend:

Assessed (A) The outcome is addressed and is formally assessed.

Covered (C) The outcome is addressed but not assessed.

Assessed or Covered (AC)..... The outcome may be addressed and assessed but is at least covered (depending on selected courses).

Not addressed (NA) The outcome is not addressed

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

Program: Master of Engineering (MEng) in Chemical Engineering - Health Technologies - Co-operative Program

Program contact name(s): Jeff Gostick, Siva Sivoththaman

Form completed by:

Description of the proposed new program option:

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

The Department of Chemical Engineering is joining the inaugural Collaborative Health Technologies Program and is thus adding a Master of Engineering (MEng) in Chemical Engineering - Health Technologies - Co-operative Program (direct entry).

Is this a [major modification](#) to the program? Yes

Rationale for change(s):

Please refer to the attached brief for full details.

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#/programs?group=Chemical%20Engineering>

Current primary program in the home unit: MEng in Chemical Engineering - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MEng in Chemical Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
Master of Engineering (MEng) in Chemical Engineering - Co-operative Program (direct entry) Admit term(s) - Fall - Winter - Spring Delivery mode - On-campus	Master of Engineering (MEng) in Chemical Engineering - <u>Health Technologies</u> - Co-operative Program (direct entry) Admit term(s) - Fall - Winter - Spring Delivery mode - On-campus

Current primary program in the home unit: MEng in Chemical Engineering - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MEng in Chemical Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
Registration option(s) • Full-time Program type(s) • Co-operative Study option(s) • Coursework Length of program • 5-6 terms (20-24 months) Additional program information • Important notice for MEng applicants: applicants to the MEng program are expected to be entirely self funded. No financial assistance will be provided from the Department of Chemical Engineering or the University of Waterloo. Graduate specializations • Biological Engineering • Entrepreneurship • Polymer Science and Engineering • Process Systems Engineering Admission requirements: Minimum requirements • A 75% overall standing in the last two years, or equivalent, in a four-year Honours Bachelor's degree or equivalent. • 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 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 Chemical Engineering - Co-operative Program will enable students to combine graduate studies with work experience. The program includes completion	Registration option(s) • Full-time Program type(s) • Co-operative • <u>Collaborative</u> Study option(s) • Coursework Length of program • 5-6 terms (20-24 months) Additional program information • Important notice for MEng applicants: applicants to the MEng program are expected to be entirely self funded. No financial assistance will be provided from the Department of Chemical Engineering or the University of Waterloo. Graduate specializations • ~~Biological Engineering~~ • ~~Entrepreneurship~~ • ~~Polymer Science and Engineering~~ • ~~Process Systems Engineering~~ Admission requirements: Minimum requirements • A 75% overall standing in the last two years, or equivalent, in a four-year Honours Bachelor's degree or equivalent. • 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 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 Chemical Engineering - <u>Health Technologies</u> - Co-operative Program will enable students to combine graduate studies

Current primary program in the home unit: MEng in Chemical Engineering - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MEng in Chemical Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
of 1-2 required work terms. The work term(s) typically takes place in term 4 (or terms 4 and 5). The work term(s) must meet Co-operative and Experiential Education (CEE) standard work term requirements and Departmental requirements. Student's 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 - Students must complete CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 credit weight), CHE 650 Engineering Work-term Experience Report (0.25 credit weight, must be completed in term 5 or 6) and 8 graduate courses (0.50 unit weight per course) as follows: - Either CHE 601 Theory and Application of Transport Phenomena or CHE 602 Chemical Reactor Analysis 7 graduate level electives of which 4 must be CHE courses - No more than 2 may be 500 level courses. - No more than 1 may be a reading course. - Graduate courses offered by the Faculty of Engineering are numbered as 600 or 700 series courses and are assigned a unit weight of 0.50, which means that they are one-term courses as defined in the Graduate Studies Academic Calendar. - Only courses taken within five years prior to the completion of the MEng degree may be counted for credit towards a degree, unless a request for revalidation is granted. - Students must achieve a: - Minimum cumulative average of 70%. - Minimum grade of 65% in each individual course. - Note: Probationary students may have specific grade requirements, which will be specified in their admission letter. - Each student is responsible for monitoring their own academic records and must immediately notify the Graduate Coordinator of any inadequate grade or average. - Students in the MEng in Chemical Engineering program may choose to pursue one of the following Graduate Specializations:	with work experience. The program includes completion of 1-2 required work terms. The work term(s) typically takes place in term 4 (or terms 4 and 5). The work term(s) must meet Co-operative and Experiential Education (CEE) standard work term requirements and Departmental requirements. Student's 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 - Students must complete CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 credit weight), CHE 650 Engineering Work-term Experience Report (0.25 credit weight, must be completed in term 5 or 6) and <u>8</u> graduate courses (0.50 unit weight per course) as follows: - Either CHE 601 Theory and Application of Transport Phenomena or CHE 602 Chemical Reactor Analysis <u>2 of the following Health Technologies core courses:</u> <u>ECON 643 Health Economics</u> <u>MSE 619 Healthcare Analytics</u> <u>PHIL 626 Bioethics and Technology</u> <u>1 of the following Faculty of Engineering Health Technologies elective courses:</u> <u>BME 600 Design of Biomedical Technologies</u> <u>BME 602 Foundations in Biomechanical Engineering</u> <u>ECE 608 Quantitative Methods in Biomedical Engineering</u> <u>ENVE 585 Air Quality Engineering and Impacts</u> <u>MSE 630 Human-Computer Interaction</u> <u>2 of the following Health Technologies elective courses:</u> <u>HLTH 605B Quantitative Methods and Analysis</u> <u>HLTH 606B Principles of Epidemiology for Public Health</u> <u>HLTH 612 Introduction to Health Information and Data Standards</u>

Current primary program in the home unit: MEng in Chemical Engineering - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MEng in Chemical Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
1. Biological Engineering 2. Entrepreneurship 3. Polymer Science and Engineering 4. Process Systems 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 Chemical Engineering consist of a set of 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: Students are limited to one Graduate Specialization designation for their MEng in Chemical Engineering degree. 1. Graduate Specialization in Biological Engineering • To receive the Graduate Specialization in Biological Engineering, students must successfully complete 3 compulsory courses and 1 elective course: - o Compulsory courses: ▪ CHE 562 Advanced Bioprocess Engineering ▪ CHE 660 Principles of Biochemical Engineering ▪ CHE 663 Bioseparations - o Elective courses (choose 1 from the following list): ▪ CHE 561 Biomaterials & Biomedical Design ▪ CHE 564 Food Process Engineering 2. Graduate Specialization in Entrepreneurship • Students must obtain approval from the Chemical Engineering Graduate Officer in order to pursue the Graduate Specialization in Entrepreneurship. Interested students will be	▪ <u>HLTH 615 Requirements Specifications and Analysis in Health Systems</u> ▪ <u>HLTH 633 Digital Health</u> ▪ <u>HLTH 650A Application of Artificial Intelligence in Health (0.25) and 650B Machine Learning Techniques in Health (0.25)</u> - o <u>3 CHE courses at the 500 and 600 level</u> - o ~~7 graduate level electives of which 4 must be CHE courses~~ • No more than 2 may be 500 level courses. • No more than 1 may be a reading course. • Graduate courses offered by the Faculty of Engineering are numbered as 600 or 700 series courses and are assigned a unit weight of 0.50, which means that they are one-term courses as defined in the Graduate Studies Academic Calendar. • Only courses taken within five years prior to the completion of the MEng degree may be counted for credit towards a degree, unless a request for revalidation is granted. • Students must achieve a: - o Minimum cumulative average of 70%. - o Minimum grade of 65% in each individual course. - o Note: Probationary students may have specific grade requirements, which will be specified in their admission letter. • Each student is responsible for monitoring their own academic records and must immediately notify the Graduate Coordinator of any inadequate grade or average. • ~~Students in the MEng in Chemical Engineering program may choose to pursue one of the following Graduate Specializations:~~ 1. Biological Engineering 2. Entrepreneurship 3. Polymer Science and Engineering 4. Process Systems 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~~

Current primary program in the home unit: MEng in Chemical Engineering - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MEng in Chemical Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
required to submit a short proposal following matriculation describing their entrepreneurship idea and suitability to pursue it. - To receive the Graduate Specialization in Entrepreneurship, students must successfully complete the following 4 compulsory courses: - Compulsory courses: - BE 600 Management and Leadership - BE 605 Project Management - BE 606 Entrepreneurship and Innovation - CHE 651 Technology Entrepreneurship Project 3. Graduate Specialization in Polymer Science and Engineering - To receive the Graduate Specialization in Polymer Science and Engineering, students must successfully complete 2 compulsory courses and 2 elective courses: - Compulsory courses: - CHE 541 Introduction to Polymer Science and Properties - CHE 621 Model Building and Response Surface Methodology - Elective courses (choose 2 from the following list): - CHE 543 Polymer Production: Polymer Reaction Engineering - CHE 640 Polymer Property Characterization - CHE 641 Fundamentals of Polymer Processing Operations 4. Graduate Specialization in Process Systems Engineering - To receive the Graduate Specialization in Process Systems Engineering, students must successfully complete 2 compulsory courses and 2 elective courses: - Compulsory courses: - CHE 620 Applied Engineering Mathematics - CHE 621 Model Building and Response Surface Methodology - Elective courses (choose 2 from the following list): - CHE 520 Process Flowsheet Analysis - CHE 521 Process Optimization - CHE 522 Advanced Process Dynamics and Control	requirements associated with the MEng degree and the requirements associated with the Graduate Specialization. ~~All MEng Graduate Specializations in Chemical Engineering consist of a set of 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: Students are limited to one Graduate Specialization designation for their MEng in Chemical Engineering degree.~~ 1. Graduate Specialization in Biological Engineering <del>To receive the Graduate Specialization in Biological Engineering, students must successfully complete 3 compulsory courses and 1 elective course: - Compulsory courses: - CHE 562 Advanced Bioprocess Engineering - CHE 660 Principles of Biochemical Engineering - CHE 663 Bioprocess Engineering - Elective courses (choose 1 from the following list): - CHE 561 Biomaterials & Biomedical Design - CHE 564 Food Process Engineering </del> 2. Graduate Specialization in Entrepreneurship ~~Students must obtain approval from the Chemical Engineering Graduate Officer in order to pursue the Graduate Specialization in Entrepreneurship. Interested students will be required to submit a short proposal following matriculation describing their entrepreneurship idea and suitability to pursue it.~~ <del>To receive the Graduate Specialization in Entrepreneurship, students must successfully complete the following 4 compulsory courses: - Compulsory courses: - BE 600 Management and Leadership - BE 605 Project Management - BE 606 Entrepreneurship and Innovation </del>

Current primary program in the home unit: MEng in Chemical Engineering - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MEng in Chemical Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
Coursework option: Milestone requirements Seminar Attendance - Over the course of their degree program, all students must attend 12 seminars from departments and research institutions where Chemical Engineering faculty members have a membership. The Chemical Engineering seminars are documented in the Events section of the Chemical Engineering Department website. - Note: At Chemical Engineering seminars, attendance is documented. At other approved seminars, students must complete an attendance form and get it signed by the seminar organizer. Full instructions are available on the Department website. Graduate Studies Work Report - Students must complete one or two work-term experience(s). 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 roles and responsibilities of Co-operative and Experiential Education (CEE).	~~CHE 651 Technology Entrepreneurship Project~~ 3. Graduate Specialization in Polymer Science and Engineering - To receive the Graduate Specialization in Polymer Science and Engineering, students must successfully complete 2 compulsory courses and 2 elective courses: - Compulsory courses: - CHE 541 Introduction to Polymer Science and Properties - CHE 621 Model Building and Response Surface Methodology - Elective courses (choose 2 from the following list): - CHE 543 Polymer Production: Polymer Reaction Engineering - CHE 640 Polymer Property Characterization - CHE 641 Fundamentals of Polymer Processing Operations 4. Graduate Specialization in Process Systems Engineering - To receive the Graduate Specialization in Process Systems Engineering, students must successfully complete 2 compulsory courses and 2 elective courses: - Compulsory courses: - CHE 620 Applied Engineering Mathematics - CHE 621 Model Building and Response Surface Methodology - Elective courses (choose 2 from the following list): - CHE 520 Process Flowsheet Analysis - CHE 521 Process Optimization - CHE 522 Advanced Process Dynamics and Control Coursework option: Milestone requirements Seminar Attendance - Over the course of their degree program, all students must attend 12 seminars from departments and research institutions where Chemical Engineering faculty members have a membership. The Chemical Engineering seminars are documented in the Events section of the Chemical Engineering Department website.

Current primary program in the home unit: MEng in Chemical Engineering - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MEng in Chemical Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
	- Note: At Chemical Engineering seminars, attendance is documented. At other approved seminars, students must complete an attendance form and get it signed by the seminar organizer. Full instructions are available on the Department website. Graduate Studies Work Report - Students must complete one or two work-term experience(s). 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 roles and responsibilities of Co-operative and Experiential Education (CEE).

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

Current students will not be impacted. The program will be open to new students once it goes into effect.

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

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 12/05/24

Faculty approval date (mm/dd/yy): 12/17/24

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

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

UNIVERSITY OF WATERLOO



GRADUATE PROPOSAL COLLABORATIVE HEALTH TECHNOLOGIES PROGRAM MASTER OF ENGINEERING IN MECHANICAL AND MECHATRONICS ENGINEERING – HEALTH TECHNOLOGIES (CO-OP)

For submission to the
Ontario Universities Council on Quality Assurance

VOLUME I - PROPOSED BRIEF

NOVEMBER 2024

*The Quality Council will normally require only an Expedited Approval process where:

- a) there is a proposal for a **new Collaborative Program** at the graduate level; or
- b) there is a proposal for a **new for-credit graduate diploma**.

NOTE: This template **must** be used for submission of a new program proposal.

Please consult the University of Waterloo [Institutional Quality Assurance Process](#) and the [Quality Assurance Framework](#) (QAF) for details or the [Quality Assurance Office](#).

****Volumes I, II must be reviewed and approved by the Quality Assurance Office, GSPA and IAP prior to submission to your Faculty Council****

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1. Introduction

Brief Listing of the Program

The Collaborative Health Technologies Program offers students professional Master of Engineering (MEng) degree with mandatory co-op, as preparation to enter the broad and rapidly evolving field of *Health Technology*. Not only is co-op highly beneficial to students while completing this program, it also offers an important opportunity to those students who *never* had co-op experience during their undergraduate degree. The program is centered around a collaborative and interdisciplinary suite of courses offered by six departments in Engineering and supported by the Faculties of Arts and Health. In addition to coursework, the mandatory co-op program serves to enrich the learning of students with practical experience in industrial settings. This is a full-time, on-campus program, with an expected duration of 4-6 terms, based on the co-op and study sequence selected by particular students. Program tuition follows the existing UW graduate home program tuition structure.

To enroll in the Collaborative Health Technologies Program, students must meet the admission requirements of, and register in, the department of Mechanical and Mechatronics Engineering (MME). Students must complete the Collaborative Health Technologies Program requirements that are structured as a combination MME department’s MEng degree requirement, and the additional Collaborative Health Technologies Program requirements (i.e., the completion of sufficient courses from specified pools, and successful co-op work terms/reports).

The degree conferred will be that of the participating program (i.e. Mechanical and Mechatronics Engineering), with the completion of the Collaborative Health Technologies Program indicated by a transcript notation to the degree and adjunct qualification to the degree (i.e. Master of Engineering in Mechanical and Mechatronics Engineering – Health Technologies). The proposed collaborative program also offers a platform to allow future participation of other Faculties.

Method Used for Preparation of the Brief

The Collaborative Health Technologies Program was conceptualized by the Dean of Engineering and the Associate Dean Graduate Studies – Engineering. In April 2023, the initiative to develop the program received support from the New Interdisciplinary Networks, Programs, and Initiatives Fund from the University. The proposal was developed following consultations by the Associate Dean with Graduate Associate Chairs of the departments of Chemical Engineering, Civil and Environmental Engineering, Electrical and Computer Engineering, Management Science and Engineering, Mechanical and Mechatronics Engineering, and Systems Design Engineering. The Associate Dean also had discussions with counterparts in other Faculties (e.g., Arts, Health, and Science). The general proposal was presented to the departments in Engineering for consideration within the unit. Following approval, this departmental proposal brief to participate in the collaborative program evolved, incorporating the specific requirements of the home unit.

2. Objectives of the Program ([QAF 2.1.2.1](#))

The Collaborative Health Technologies Program is timely and justified not only based on the critical need for skilled professionals at the intersection of healthcare and technology, but also by the University of Waterloo’s own goals, e.g. [Waterloo at 100, Global Futures](#). The following are some of the compelling reasons that justify the establishment of a Collaborative Health Technologies Program:

1. **Rapid Technological Advancements in Healthcare:** The healthcare industry is experiencing an unprecedented transformation due to rapid advancements in technology. Innovations such as artificial intelligence, telemedicine, wearable devices, and data analytics are reshaping healthcare delivery, diagnosis, treatment, and patient care. A dedicated program will equip future professionals with leading-edge skills needed to leverage and drive innovations in this field.
2. **Increasing Demand for Health Technology Experts:** There is a growing demand for professionals who possess a deep understanding of both healthcare and technology. This demand arises from the need to bridge the gap between traditionally siloed fields and create holistic solutions that address complex healthcare challenges. Graduates of a Collaborative Health Technology Program will fill this talent gap and drive innovation in healthcare settings.
3. **Addressing Healthcare Challenges:** The global healthcare landscape faces numerous challenges, including rising costs, an aging population, chronic diseases, disparities in healthcare access, and pandemics. A Collaborative Health Technologies Program will empower students to develop innovative solutions to address these challenges, improve healthcare access, and enhance patient outcomes.
4. **Opportunity for Interdisciplinary Collaboration:** A program that combines healthcare and technology will foster interdisciplinary collaboration. Students will learn to collaborate with healthcare professionals, engineers, data scientists, ethicists, and policymakers, fostering a diverse and comprehensive approach to problem-solving.
5. **Industry-Relevant Skill Development:** Employers in the healthcare and technology sectors seek professionals with specialized skills in areas such as health data analytics, digital health, telemedicine, medical device development, regulatory compliance, and AI applications in healthcare. Both the course-based components and the mandatory co-op of this Collaborative Health Technologies Program combine to ensure that graduates are well-prepared with these in-demand skills.
6. **Economic and Innovation Impact:** Investing in a Collaborative Health Technologies Program aligns with the current market demand and presents an opportunity to contribute to economic growth and innovation. Graduates equipped with the skills to develop and implement Health Technology solutions can drive entrepreneurship, create job opportunities, and contribute to the expansion of healthcare technology sectors.
7. **Addressing Future Healthcare Needs:** With the evolving landscape of healthcare and technology, preparing future professionals to navigate and lead in this dynamic environment is essential. Establishing a Collaborative Health Technologies Program now ensures that the workforce is ready to address the future needs and challenges of the healthcare industry.

Program Learning Outcomes and Graduate Degree Level Expectations (GDLE):

1. Depth and Breadth of Knowledge

- a. Understand the principles, concepts, terminology and tools of health technology
- b. Demonstrate awareness of key elements of both the ethical considerations and impacts of health technologies
- c. Interpret, understand, and critically assess state-of-the-art methods, theories, and advances in health technology

2. Research & Scholarship

- a. Integrate complex engineering concepts related to the breadth of health technology, and the underlying and associated sciences.

3. Level of Application of Knowledge

- a. Interpret, critically assess and apply state-of-the-art methods, theories, and advances in health technology
- b. Understand current issues faced by the health technology industry

4. Professional Capacity / Autonomy

- a. Independently recognize, define, and solve complex real-world health technology needs and associated challenges
- b. Engage in self-directed professional development and life-long learning
- c. Develop an ability to recognize, appreciate, consider and apply appropriate ethics, law, regulations, and accountability to the field of health technologies
- d. Understand the value of engaging in inter-disciplinary collaboration in health technology as well as the complexity of knowledge & limitations of different fields
- e. Adopt a mindset for collaboration (work effectively in interdisciplinary teams including healthcare professionals, engineers, designers, business developers, etc.)

5. Level of Communication Skills

- a. Effectively communicate complex concepts in health technology to a wide audience ranging from general public to experts in the field. Concepts may include health technology needs and associated challenges (includes GDLE 6 Awareness of Limits of Knowledge)
- b. The ability to communicate ideas, issues and conclusions clearly.

6. Awareness of Limits of Knowledge

- a. Cognizance of the complexity of knowledge and of the potential contributions of other interpretations, methods, and disciplines.
- b. Understand the value of inter-disciplinarity in the field of health technologies.

How does this Program align with the University of Waterloo Strategic Plan and Strategic Mandate Agreement?

The Collaborative Health Technologies Program aligns well with the University of Waterloo's strategic plan in several ways:

1. **Interdisciplinary Collaboration:** The program's collaboration between the departments in Engineering as well as the support by Arts and Health, demonstrate a commitment to interdisciplinary collaboration, a key focus area of the strategic plan. This collaboration

brings together diverse perspectives and expertise, fostering innovation in health technology by integrating engineering skills with insights from health, social sciences, and humanities.

2. **Work-integrated Learning through Co-op:** The mandatory co-op component of the program aligns with the strategic plan's emphasis on experiential learning. This practical work experience allows students to apply their knowledge in real-world settings, contributing to their professional development while addressing real challenges in health technology.
3. **Benefits of Innovation and Research:** The program's focus on Health Technologies aligns with the strategic plan's emphasis on fostering innovation. Even though this is a course-based program, it does enable students to connect with faculty from various departments to engage with cutting-edge technologies and understand solutions to real-world problems.
4. **Community Partnerships:** Collaboration between different departments within Engineering, along with the support, through course offering, by Faculties of Arts and Health, opens opportunities for partnership with external organizations, hospitals, and industry players. This engagement aligns with the strategic plan's focus on strengthening community partnerships. Co-op placements also will play a key role in this aspect.
5. **Technology and Global Challenges:** By addressing healthcare challenges through technology and innovation, the program contributes to addressing global challenges, which is in line with the University's strategic goal of leveraging technology for positive societal impact.
6. **Commitment to Excellence and Diversity:** The collaborative nature of the program reflects the University's commitment to excellence in education and research. Furthermore, by integrating diverse perspectives from multiple departments and faculties, the program contributes to promoting diversity and inclusion, a priority area in the strategic plan.

Overall, the Collaborative Health Technologies Program embodies many key pillars of the University of Waterloo's Strategic Plan by promoting interdisciplinary collaboration, experiential learning, innovation, community engagement, and a commitment to excellence and diversity.

3. Admission Requirements ([QAF 2.1.2.5](#))

Admission into the Collaborative Health Technologies Program is through direct application to the program offered through the home administrative unit, i.e. MME. Admission requirements for the program will be the same as those existing for the [Master of Engineering](#) degree in MME.

The minimum academic requirements – including admissions requirements, minimum overall averages, and timelines for any milestones – in the program will be consistent with the requirements of the primary existing master’s program for each participating department.

In detail, the admission requirements for MEng in the department of Mechanical and Mechatronics Engineering are:

- 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).
- A Supplementary Information Form (SIF), which contains questions specific to the program about why applicants want to enroll and their experience in the field, must be completed.
- Required application materials include, Resume, SIF, Academic Transcript(s); Proof of English language Proficiency (if applicable); and two academic references.

Minimum English Language Proficiency requirement: TOEFL 80 (writing 22, speaking 20, reading 20, listening 18), or IELTS 6.5 (writing 6.0, speaking 6.0).

These admission requirements are appropriate given the precedent of existing co-op Master's programs in the Faculty of Engineering. The level of required academic performance is indicative of what will be required of students during their studies within this proposed program and serves to select only students who will be capable of meeting course expectations and overall program learning outcomes. Furthermore, the Supplementary Information Form, resume, and reference letters will allow for recognition of the prior work, experience, aspirations, and career trajectory of applicants.

4. Structure ([QAF 2.1.2.2](#))

The Collaborative Health Technologies Program is a co-op only, course-based program. Completion of 9 courses and a compulsory PD course will be required to meet the coursework requirement of the program. Selection of courses will be as follows:

1 compulsory PD course (0.25 unit weight)

- ME 600: Engineering Practice, Research Methods, Ethics & Professional Development for MME Graduate students

2 courses from the following University-level courses (ARTS, ENG):

- PHIL 626: Bioethics and Technology
- ECON 643: Health Economics
- MSE 619: Healthcare Analytics

2 courses from the following Faculty-level courses (6 ENG depts):

- BME 600: Design of Biomedical Technologies
- BME 602: Foundations in Biomechanical Engineering
- CHE 621: Model Building and Response Surface Methodology

- ENVE 585: Air Quality Engineering and Impacts
- ECE 608: Quantitative Methods in Biomedical Engineering
- MSE 630: Human-Computer Interaction

1 HLTH course from the following Faculty of Health courses:

- HLTH 612: Introduction to Health Information and Data Standards
- HLTH 633: Digital Health
- HLTH 605B: Quantitative Methods and Analysis
- HLTH 650A / 650B: Application of Artificial Intelligence in Health (0.25) / Machine Learning Techniques in Health (0.25)
- HLTH 606B: Principles of Epidemiology for Public Health
- HLTH 615: Requirements Specifications and Analysis in Health Systems

4 additional graduate courses from Engineering.

Of the 9 courses (not counting ME 600), at least 3 must be MME courses of which at least 2 must be at the 600-level. (BME 602 may count towards 600-level MME courses).

Of the 9 courses (not counting ME 600), a maximum of 2 courses may be at the 500 level. Students must attend at least 4 MME research seminars.

The program study / co-op sequence is illustrated below. Having co-op during the program both allows students to apply what they have learned in school to their co-op employment, but also the reverse: apply what has been learned during co-op terms to their in-school experiences. This model allows for bidirectional inspiration and gives students an important *context* for what they are learning.

Term-1	Term-2	Term-3	Term-4	Term-5	Term-6
study	study	Co-op	Co-op	study	(study)
study	study	Co-op	study	(study)	

Rationale and Justification

The structure and regulations of the Collaborative Health Technologies Program align with the program learning outcomes and Degree-Level Expectations. More detail is given below.

Alignment with Program Learning Outcomes:

1. **Diversity of Course Offerings:** The coursework structure ensures a breadth of courses from various levels (University, Faculty, Department) covering different aspects of health technologies, such as ethics, analytics, biomedical engineering, rehabilitation engineering, human-computer interaction, health-care systems, epidemiology, systems theory etc. The proposed program is designed in such a way that potential future participation of additional Faculties with their own master’s program model is both possible and would further enrich the program content.
2. **Integration of Practical Experience:** The mandatory incorporation of co-op allows students to apply theoretical knowledge gained in the classroom to real-world scenarios, and vice versa. This aligns with the objective of the program to foster practical application and real-world learning.

Meeting Degree Level Expectations:

1. **Depth and Breadth of Knowledge:** The variety of courses spanning different Departments and Faculties suggests a comprehensive coverage of topics relevant to health technologies, meeting the depth and breadth of knowledge expected at the master's level.
2. **Professional Skills Development:** The incorporation of co-op experiences facilitates the development of professional skills, preparing students for practical challenges in the field.

Rationale for Program Length:

The proposed program length is reasonable for several reasons:

1. **Course Load and Requirements:** 9 courses within the program, structured across different units and levels, can be reasonably completed within three to four study terms.
2. **Integration of Co-op Experience:** The inclusion of co-op necessitates a program duration that allows students to engage in these practical experiences without significantly extending the program length.
3. **Balancing Academic and Practical Learning:** The program aims to balance academic learning with real-world application. A structured timeframe enables students to attain both theoretical knowledge and practical skills within a manageable period.

5. Program Content ([QAF 2.1.2.3](#))

Health Technologies represent the dynamic intersection of healthcare and cutting-edge technology, encompassing a diverse array of innovations designed to revolutionize patient care, improve healthcare accessibility, and enhance overall well-being. Embracing a multidisciplinary approach, Health Technologies integrate advancements in artificial intelligence, data analytics, telemedicine, medical imaging, ethics, and more, to drive transformative changes in the diagnosis, treatment, and management of health conditions. The Collaborative Health Technologies Program is a multi-disciplinary course-based program in the Faculty of Engineering with mandatory co-op, integrated within the timeline of the program. Its multi-disciplinarity is derived on the basis of the participation, through course offerings, of the Faculties of Arts and Health. Additionally, the enrolled students will also take appropriate courses across several departments within Engineering. All courses taken are at the graduate level. An overview of the program’s course structure was given in Section 4. Here, additional information on the courses is given.

A brief description of the University-level courses, from which a student would be required to take two courses, is given below:

- **PHIL 626: Bioethics and Technology (Arts)**
Students will grapple with a sample of ethical issues related to advanced and emerging medical technologies and/or biotechnologies. The primary goals of doing so are: (1) To gain familiarity with key ethical concepts and values, which may include patient autonomy, beneficence, justice, care, anti-ableism, inclusion, and others; and (2) to enhance core critical thinking skills needed for ethics, which will help improve each student’s self-understanding (of not only what they think is right and wrong, but, more importantly, why) and their capacity to engage with different perspectives on the “whats” and “whys” of ethics in a spirit of open-mindedness, mutual respect, and constructive cooperation. Frequent in-class discussion is typically an important element of student learning in this course.
- **ECON 643: Health Economics (Arts)**
This course introduces students to the role of economics in health care and health policy. It is meant to be a survey of major topics in health economics and an introduction to the ongoing debate over health care policy. Topics include the economic determinants of health and health policy, the market for medical care, the market for health insurance, and the role of the government in health care, and health care reform.
- **MSE 619: Healthcare Analytics (Engineering)**
This course provides an introductory course 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.

A brief description of the Faculty-level courses, from which a student would be required to take two courses, is given below:

- **BME 600: Design of Biomedical technologies (SYDE)**
Systems theory and formulation of system dynamics problems. Design and research methods for biomedical technologies. Problem formulation and definition, stakeholder engagement, needs analysis, generation of alternative solutions, feasibility analysis, optimization, selection, and solution implementation.
- **BME602: Foundations in Biomechanical Engineering (MME)**
This course focuses on equipping students with foundational knowledge in the biomechanics of human physiology, pathology and treatment. The overarching aim of this course is to develop students’ literacy in applying biomechanics principles and modern tools towards understanding the human body. The course will build on existing knowledge in mathematics

and physics to develop new expertise and hands-on experience in the biomechanical modeling and analysis of physiological systems.

- **CHE 621: Model Building and Response Surface Methodology (CHE)**

This course teaches process / product optimization based on design of experiments, empirical modelling, and non-linear mechanistic models. These methodologies aid in refining healthcare processes and products, ensuring they meet stringent standards of efficiency, safety, and effectiveness.

- **ENVE 585: Air Quality Engineering and Impacts (CEE)**

This course introduces air quality design of engineering solutions and associated health and economic impacts. It includes topics focused on the indoor environment, the outdoor environment, or both, such as: air pollution sources, emission estimation, control strategies, measurement, modeling methods, health impact assessment, cost-benefit analysis, technical policy analysis, and co-impacts with climate change.

- **ECE 608: Quantitative Methods in Biomedical Engineering (ECE)**

This course focuses on topics related to the use of quantitative tools in biomedical engineering research studies. Educational emphasis will be placed on developing students' core competence in biostatistics and biomedical computing, so as to prepare them to pursue biomedical engineering investigations that are backed by quantitative reasoning and numerical insights.

- **MSE 630: Human Computer Interaction (MSE)**

This course concentrates on the theoretical and practical issues related to the design of the human-computer interfaces. Aspects of human perception, cognition and various models of task analysis are discussed.

A brief description of the Faculty of Health courses that are part of the department-specific and health-specific list of electives is given below:

- **HLTH 612: Introduction to Health Information and Data Standards**

This course focuses on health data as a key component of all health informatics systems. Topics include ontologies and other classification taxonomies found in health systems, data standards (with a focus on Canadian implementations of international standards), privacy and security of health data, client/patient assessment tools, and ethical considerations.

- **HLTH 633: Digital Health**

The wide adoption of mobile technology presents a new opportunity. Leveraging this existing technology, healthcare systems can deliver remote care and collect real-time data on patients outside of health centres, minimizing unnecessary visits to hospitals and providing healthcare access to remote populations. In this course, we will explore how digital health technology has been designed, evaluated, and deployed in different countries. Case studies will be used to demonstrate how institutional and governmental constraints have a strong impact on the success of the deployment. The course will address the different digital health technologies in the market, such as Telehealth, remote patient monitoring, tele radiology, consumer health informatics, and mHealth. Important aspects of technology development like patient confidentiality, privacy, standards, communication and security protocols,

regulatory requirements, among others, will be discussed when presenting the development of each digital health solution. By the end of this course, students will be prepared to design, evaluate, and deploy a digital health intervention and will have a solid understanding of the barriers and requirements for deploying digital health technology.

- **HLTH 605B: Quantitative Methods and Analysis**

This course is a rigorous introduction to biostatistics for those planning a career in public health. Students will learn various biostatistical techniques, how to apply those techniques in the analysis of data from health studies, and how to interpret the results from those analyses. After a brief review of material from a basic statistics course, topics covered will include simple and multiple linear regression, analysis of categorical data, simple and multiple logistic regression, and survival analysis. Emphasis will be on (i) conceptual understanding of topics, including literacy necessary for understanding scientific papers in public health, as well as (ii) carrying out various data analysis applications.

- **HLTH 650A / 650B: Application of Artificial Intelligence in Health (0.25) / Machine Learning Techniques in Health (0.25)**

HLTH 650A focuses on the application of machine learning (ML) and artificial intelligence (AI) techniques in the field of healthcare and public health settings. Big data sources available for population health studies will be introduced to students and challenges related to AI in health data will also be discussed. The learning activities consist of lectures, student-led journal club discussions and a term paper to propose the application of ML techniques to solve population health or public health problems.

HLTH 650B focusses on the techniques of machine learning (ML) commonly used to solve healthcare and public health problems. Various analytics techniques, including data wrangling, visualization, unsupervised and supervised learning, will be introduced to students. Challenges and strategies related to missing data, imbalanced data and model selections will also be discussed. The learning activities consist of lectures, labs, and a final project to demonstrate the proficiency of ML techniques to solve population health or public health problems.

- **HLTH 606B: Principles of Epidemiology for Public Health**

This course introduces the principles, methods, and uses of epidemiology in the practice of public health. After completion of this course, students will be able to critically read and interpret epidemiologic research and clearly communicate epidemiologic findings. They will be familiar with health status measurement, data sources, screening, surveillance, outbreak investigation, and methods to support program planning and evaluation. Students will have a sound understanding of basic epidemiologic concepts, including prevalence, incidence, study designs, measures of association, bias, confounding and causal inference.

- **HLTH 615: Requirements Specifications and Analysis in Health Systems**

This course introduces students to the requirements of definition phase of software development. Models, notations, and processes for software requirements identification, representation, validation, and analysis are discussed, as are mechanisms to evaluate the efficacy and efficiency of health information systems.

6. Mode of Delivery ([QAF 2.1.2.2](#))

Courses made available for students of the Collaborative Health Technologies Program use a wide variety of teaching and learning methodologies (e.g., lectures, case-studies, student presentations, in-class group discussion, etc.) designed to provide students with an engaging learning experience. Though not specific to this program, at the University of Waterloo, instructors from all faculties are encouraged to make use of the Center for Teaching Excellence, which offers many resources to aid instructors in improving their teaching, course design, and delivery, emphasising *Active Learning* techniques. Instructors of courses offered to Collaborative Health Technologies Program students will be reminded of these resources.

Following program approval and implementation, the faculty-level administrative staff will ensure the program is continually meeting both intended learning outcomes and degree-level expectations.

7. Assessment of Teaching and Learning ([QAF 2.1.2.4](#))

The performance of students will be assessed both on conventional and existing methods stipulated by the courses they will take, but also based on input from the co-operative education component of this program.

Assessment of teaching and learning will be conducted at the *student* and *program* levels. The program will be assessed at the program level by the Graduate Program Committee and program director. As part of this assessment, the Program Committee will review statistics, such as program performance versus learning objectives, student success rates and teaching evaluations – as provided through both student perception surveys and peer-assessment of teaching. The committee will identify opportunities to improve performance, such as enriching course content or teaching.

Performance indicators that will be considered by the Program Committee will include:

- Applications to and enrollment within the program;
- Student evaluations of courses;
- Student graduation rates;
- Surveys of alumni; and
- Surveys of employers/industry partners.

At the student level, there will be the following types of activities with assessments:

- a) Coursework: Students will be assigned a grade based on typical assessment methods used in other graduate courses, such as papers, reports, tests, projects, and presentations.
- b) Co-operative Education Work-Term Reports.

Refer to the table in Appendix A for more specific information on how assessments will be made, both for course-based and co-operative education components of this program.

8. Resources for All Programs ([QAF 2.1.2.6](#))

For the anticipated enrolment numbers of the Collaborative Health Technologies Program, the additional students enrolling into pre-existing courses will not present a significant burden on the University's resources (i.e., students take courses from large pools and therefore, there will likely not be so many additional students per course that additional sections and having more instructors would be necessary – in fact, in some cases, the additional grad students enrolling may help improve the instructor utilization efficiency for courses that typically have too low of enrollment numbers). The program would not necessitate hiring any new faculty members and instead would rely on existing known-to-be qualified faculty members already teaching courses. In addition, students will have access to the University’s facilities and spaces, including library resources, working spaces, access to existing resources for student well-being and counselling, as well as technology support from their home department. This program is not expected to impose additional student costs for use of resources. Program coordination can be handled by existing staff resources in the home departments with the Faculty of Engineering providing additional support as needed, as is the case for other existing collaborative programs.

9. Resources for Graduate Programs ([QAF 2.1.2.7](#))

Given the course-based nature of the Collaborative Health Technologies Program, an assessment of the research-related and supervisory expertise of faculty is not required for this program to function. The breadth of courses available for students to take is immense and course instructors may change from term-to-term. Therefore, nearly *all* faculty from the participating units may serve this program through the teaching of courses in which Health Technology students may enroll. On a course-by-course /offering-to-offering basis, ensuring instructor competence is left to the discretion of the corresponding department. Following the precedent of existing professional master’s programs in Engineering, no financial assistance will be provided to students. Ensuring the quality of incoming students, will be left to the discretion of the home departments and will be put into action through the standard program admission requirements, as are described in Section 3.

10. Quality and Other Indicators ([QAF 2.1.2.8](#))

To ensure the quality of the program a Program Committee will be created to oversee and regularly evaluate the program, to ensure all program requirements and course related graduate-level degree requirements are met. This committee will consist of a Program Director, the Course Coordinator, a faculty member from each participating department, and a graduate student representative. Furthermore, the co-op office will principally oversee all co-op related activities and components of this program. Within each department of Engineering, Graduate Associate Chairs will monitor the progress of their constituent students from this program, as is already their responsibility for existing professional programs. Specifically, student progression through the program, grades, and successful completion of co-op terms will be tracked. Where needed, remedial action will be taken to ensure students remain on-track and able to maximally benefit from participation in this program.

Appendix A - Summary of Learning Outcomes Mapped to Courses and Assessment Methods

Specific GDLEs and Associated Learning Outcomes	Courses										Co-operative Education	Assessment method									
	University-level ARTS ENG			Faculty-level SYDE MME CHE CIVE ECE MSE						Dept-level MME HEALTH											
	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	CHE 621: Model Building and Response Surface Methodology	ENVE 585: Air Quality Engineering & Impact	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Health-specific elective , and Dept-specific and Engineering courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
1. Depth and Breadth of Knowledge																					
Understand the principles, concepts, terminology, tools of health technology	A	A	A	C	A	A	A	A	A	AC	NA	NA	A	NA	A	A	A	A	A	A	NA
Demonstrate awareness of key elements of both the ethical considerations and impacts of health technologies	A	A	A	NA	C	NA	NA	NA	C	AC	A	NA	A	NA	A	A	A	A	A	A	NA
Interpret, understand, and critically assess state-of-the-art methods, theories, and advances in health technology	C	C	A	NA	A	C	C	A	A	AC	NA	NA	C	NA	A	A	A	A	A	A	NA
2. Research & Scholarship																					
Integrate complex engineering concepts related to the breadth of health technology, and the underlying and associated sciences.	NA	NA	A	C	A	A	A	A	A	AC	C	NA	C	NA	A	A	A	A	A	A	NA

Specific GDLEs and Associated Learning Outcomes	Courses										Co-operative Education			Assessment method							
	University-level ARTS ENG			Faculty-level SYDE MME CHE CIVE ECE MSE						Dept-level MME HEALTH											
	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	CHE 621: Model Building and Response Surface Methodology	ENVE 585: Air Quality Engineering & Impact	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Health-specific elective , and Dept-specific and Engineering courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
3. Level of Application of Knowledge																					
Interpret, critically assess and apply state-of-the-art methods, theories, and advances in health technology	A	A	A	C	A	A	A	A	A	AC	NA	NA	A	NA	A	A	A	A	A	A	NA
Understand current issues faced by the health technology industry	A	A	C	C	A	NA	NA	C	A	AC	A	C	A	NA	A	A	A	A	A	A	NA
4. Professional Capacity / Autonomy																					
Independently recognize, define, and solve complex real-world health technology needs and associated challenges	A	A	NA	C	C	C	C	C	C	AC	A	A	A	NA	AC	AC	AC	AC	C	AC	NA
Engage in self-directed professional development and life-long learning	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	C	C	A	NA	NA	NA	NA	NA	A	NA	NA
Develop an ability to recognize, appreciate, consider and apply appropriate ethics, law, regulations, and accountability to the field of health technologies	A	A	C	C	C	NA	NA	C	C	AC	A	C	A	NA	A	A	A	A	A	A	NA

Specific GDLEs and Associated Learning Outcomes	Courses										Co-operative Education			Assessment method							
	University-level ARTS ENG			Faculty-level SYDE MME CHE CIVE ECE MSE						Dept-level MME HEALTH											
	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	CHE 621: Model Building and Response Surface Methodology	ENVE 585: Air Quality Engineering & Impact	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Health-specific elective , and Dept-specific and Engineering courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
Understand the value of engaging in inter-disciplinary collaboration in health technology as well as the complexity of knowledge & limitations of different fields	C	C	C	C	NA	NA	NA	NA	NA	AC	NA	NA	A	NA	NA	NA	C	NA	A	C	NA
Adopt a mindset for collaboration (work effectively in interdisciplinary teams including healthcare professionals, engineers, designers, business developers, etc.)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	A	A	C	NA	NA	NA	NA	NA	C	NA	NA
5. Level of Communications Skills																					
Effectively communicate complex concepts in health technology to a wide audience ranging from general public to experts in the field. Concepts may include health technology needs and associated challenges (includes GDLE 6 Awareness of Limits of Knowledge)	C	C	C	NA	NA	NA	NA	NA	NA	NA	C	C	C	NA	NA	NA	NA	NA	C	C	NA
The ability to communicate ideas, issues and conclusions clearly.	C	C	NA	NA	NA	NA	NA	NA	NA	NA	C	C	A	NA	NA	NA	NA	NA	A	C	NA

Specific GDLEs and Associated Learning Outcomes	Courses										Co-operative Education			Assessment method							
	University-level ARTS ENG			Faculty-level SYDE MME CHE CIVE ECE MSE						Dept-level MME HEALTH											
	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	CHE 621: Model Building and Response Surface Methodology	ENVE 585: Air Quality Engineering & Impact	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Health-specific elective , and Dept-specific and Engineering courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
6. Awareness of Limits of Knowledge																					
Cognizance of the complexity of knowledge and of the potential contributions of other interpretations, methods, and disciplines.	A	A	C	C	C	C	C	C	C	AC	A	A	A	NA	C	NA	NA	NA	A	A	NA
Understand the value of inter-disciplinarity in the field of health technology.	C	C	C	C	C	C	C	C	C	AC	C	C	C	NA	C	NA	C	NA	C	C	NA

Table Legend:

Assessed (A) The outcome is addressed and is formally assessed.

Covered (C) The outcome is addressed but not assessed.

Assessed or Covered (AC)..... The outcome may be addressed and assessed but is at least covered (depending on selected courses).

Not addressed (NA) The outcome is not addressed.

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

Program: Master of Engineering (MEng) in Mechanical and Mechatronics Engineering - Health Technologies - Co-operative Program

Program contact name(s): Cecile Devaud, Siva Sivoththaman

Form completed by:

Description of the proposed new program option:

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

The Department of Mechanical and Mechatronics Engineering is joining the inaugural Collaborative Health Technologies Program and is thus adding a Master of Engineering (MEng) in Mechanical and Mechatronics Engineering - Health Technologies - Co-operative Program (direct entry).

Is this a [major modification](#) to the program? Yes

Rationale for change(s):

Please refer to the attached brief for full details.

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#/programs?group=Mechanical%20and%20Mechatronics%20Engineering>

Current primary program in the home unit: MEng in Mechanical and Mechatronics Engineering - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MEng in Mechanical and Mechatronics Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
Master of Engineering (MEng) in Mechanical and Mechatronics Engineering - Co-operative Program (direct entry) Admit term(s) - Fall - Winter	Master of Engineering (MEng) in Mechanical and Mechatronics Engineering - <u>Health Technologies</u> - Co-operative Program (direct entry) Admit term(s) - Fall - Winter

Current primary program in the home unit: MEng in Mechanical and Mechatronics Engineering - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MEng in Mechanical and Mechatronics Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
• Spring Delivery mode • On-campus Registration option(s) • Full-time Program type(s) • Co-operative Study option(s) • Coursework Length of program • 5-6 terms (20-24 months) 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. Graduate specializations • Building Systems • Materials and Advanced Manufacturing • Mechatronic Systems • Sustainable Energy 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).	• Spring Delivery mode • On-campus Registration option(s) • Full-time Program type(s) • Co-operative • <u>Collaborative</u> Study option(s) • Coursework Length of program • 5-6 terms (20-24 months) 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. Graduate specializations ~~• Building Systems~~ ~~• Materials and Advanced Manufacturing~~ ~~• Mechatronic Systems~~ • Sustainable Energy 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).

Current primary program in the home unit: MEng in Mechanical and Mechatronics Engineering - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MEng in Mechanical and Mechatronics Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
• 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 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 • 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.	• 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 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 - <u>Health Technologies</u> - 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 • Students must complete ME 600 Engineering Practice, Research Methods, Ethics & Professional Development for MME Graduate Students (0.25 unit weight) and 8 <u>9</u> one-term (0.50 unit weight) graduate level courses (or courses acceptable for graduate credit) <u>as follows:</u> - o <u>2 of the following Health Technologies core courses:</u> ▪ <u>ECON 643 Health Economics</u> ▪ <u>MSE 619 Healthcare Analytics</u> ▪ <u>PHIL 626 Bioethics and Technology</u> - o <u>2 of the following Faculty of Engineering Health Technologies elective courses:</u>

Current primary program in the home unit: MEng in Mechanical and Mechatronics Engineering - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MEng in Mechanical and Mechatronics Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
• The EMLS communication course can be waived at the discretion of the Department. • Additional Faculty regulations concerning Master's degree requirements are: - 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 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 one of the following Graduate Specializations: • 1. Building Systems • 2. Materials and Advanced Manufacturing • 3. Mechatronic Systems • 4. 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 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 Building Systems • To receive the Graduate Specialization in Building Systems, students must successfully complete 2 compulsory course and 2 elective	▪ <u>BME 600 Design of Biomedical Technologies</u> ▪ <u>BME 602 Foundations in Biomechanical Engineering</u> ▪ <u>CHE 621 Model Building and Response Surface Methodology</u> ▪ <u>ECE 608 Quantitative Methods in Biomedical Engineering</u> ▪ <u>ENVE 585 Air Quality Engineering and Impacts</u> ▪ <u>MSE 630 Human-Computer Interaction</u> - o <u>1 of the following Health Technologies elective courses:</u> ▪ <u>HLTH 605B Quantitative Methods and Analysis</u> ▪ <u>HLTH 606B Principles of Epidemiology for Public Health</u> ▪ <u>HLTH 612 Introduction to Health Information and Data Standards</u> ▪ <u>HLTH 615 Requirements Specifications and Analysis in Health Systems</u> ▪ <u>HLTH 633 Digital Health</u> ▪ <u>HLTH 650A Application of Artificial Intelligence in Health (0.25) and 650B Machine Learning Techniques in Health (0.25)</u> - o <u>4 Engineering graduate level courses</u> • At least <u>2 3</u> out of the <u>8 9</u> (0.50 unit weight) required courses must be ME <u>courses of which at least 2 must be 600-level courses (not counting ME 600). Note: BME 602 may count towards 600-level ME courses.</u> • 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: - o The candidate must obtain a pass in all courses credited to their program, with a minimum overall average of 70% (a

Current primary program in the home unit: MEng in Mechanical and Mechatronics Engineering - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MEng in Mechanical and Mechatronics Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
courses. Note: No more than 1 of the 4 courses may be 500-level. - Compulsory courses (choose 2 from the following list): - CIVE 507 Building Science and Technology or CIVE 707 Advanced Building Science - ME 567 Fire Safety Engineering - ME 654 Advanced Applied Thermal Engineering - ME 655 Advanced Building Energy Analysis - ME 656 Advanced HVAC Systems, Equipment, and Energy Efficiency - Elective courses (choose 2 from the following list): - CIVE 601 Engineering Risk and Reliability - ME 562 Experimental Methods in Fluids - ME 566 Computational Fluid Dynamics for Engineering Design - ME 651 Heat Conduction - ME 652 Convective Heat Transfer - ME 653 Radiation Heat Transfer - ME 662 Advanced Fluid Mechanics - ME 663 Computational Fluid Dynamics - ME 671 Fundamental Fire Dynamics - ME 672 Advanced Fire Dynamics - ME 673 Fire Modeling 2. Graduate Specialization in Materials and Advanced Manufacturing - 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. - Compulsory courses (choose 2 from the following list): - ME 531 Physical Metallurgy Applied to Manufacturing - ME 559 Finite Element Methods or ME 621 Advanced Finite Element Method - ME 620 Mechanics of Continua - ME 631 Mechanical Metallurgy - ME 632 Experimental Methods in Materials Engineering - ME 739 Manufacturing Processes Topics: Topic 15 Additive Manufacturing Design	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 one of the following Graduate Specializations:~~ ~~1. Building Systems~~ ~~2. Materials and Advanced Manufacturing~~ ~~3. Mechatronic Systems~~ ~~4. 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 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 Building Systems~~ ~~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.~~ ~~Compulsory courses (choose 2 from the following list):~~ ~~CIVE 507 Building Science and Technology or CIVE 707 Advanced Building Science~~ ~~ME 567 Fire Safety Engineering~~

Current primary program in the home unit: MEng in Mechanical and Mechatronics Engineering - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MEng in Mechanical and Mechatronics Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
• Elective courses (choose 2 from the following list): ○ ME 526 Fatigue and Fracture Analysis ○ ME 533 Non-Metallic and Composite Materials ○ ME 535 Welding Metallurgy ○ ME 538 Welding Design, Fabrication and Quality Control ○ ME 596 Special Topics in Mechanical Engineering: Topic 12 Manufacturing of Mechatronics Materials and Components ○ ME 627 Fatigue Analysis and Design ○ ME 628 Fracture Mechanics ○ ME 732 Thermodynamics and Phase Transformations ○ ME 734 Mechanics of Composite Materials ○ ME 735 Special Topics - Welding and Joining: Topic 2 Advanced Materials Joining ○ ME 739 Manufacturing Processes Topics: Topic 15 Additive Manufacturing ○ NANO 600 Introduction to Nanotechnology ○ NANO 603 Nanocomposites ○ NANO 605 Design of MEMS and NEMS ○ NANO 606 Advanced MicroElectroMechanical Systems: Physics, Design & Fabrication • 3. Graduate Specialization in Mechatronic Systems • 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. • Compulsory courses (choose 2 from the following list): ○ ECE 602 Introduction to Optimization ○ ECE 650 Methods and Tools for Software Engineering ○ ME 547 Robotic Manipulators: Kinematics, Dynamics and Control ○ ME 640 Autonomous Mobile Robotics ○ ME 649 Control of Machines and Processes	○ ~~ME 654 Advanced Applied Thermal Engineering~~ ○ ~~ME 655 Advanced Building Energy Analysis~~ ○ ~~ME 656 Advanced HVAC Systems, Equipment, and Energy Efficiency~~ • ~~Elective courses (choose 2 from the following list):~~ ○ ~~CIVE 601 Engineering Risk and Reliability~~ ○ ~~ME 562 Experimental Methods in Fluids~~ ○ ~~ME 566 Computational Fluid Dynamics for Engineering Design~~ ○ ~~ME 651 Heat Conduction~~ ○ ~~ME 652 Convective Heat Transfer~~ ○ ~~ME 653 Radiation Heat Transfer~~ ○ ~~ME 662 Advanced Fluid Mechanics~~ ○ ~~ME 663 Computational Fluid Dynamics~~ ○ ~~ME 671 Fundamental Fire Dynamics~~ ○ ~~ME 672 Advanced Fire Dynamics~~ ○ ~~ME 673 Fire Modeling~~ • ~~2. Graduate Specialization in Materials and Advanced Manufacturing~~ • ~~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.~~ • ~~Compulsory courses (choose 2 from the following list):~~ ○ ~~ME 531 Physical Metallurgy Applied to Manufacturing~~ ○ ~~ME 559 Finite Element Methods or ME 621 Advanced Finite Element Method~~ ○ ~~ME 620 Mechanics of Continua~~ ○ ~~ME 631 Mechanical Metallurgy~~ ○ ~~ME 632 Experimental Methods in Materials Engineering~~ ○ ~~ME 739 Manufacturing Processes Topics: Topic 15 Additive Manufacturing Design~~ • ~~Elective courses (choose 2 from the following list):~~ ○ ~~ME 526 Fatigue and Fracture Analysis~~ ○ ~~ME 533 Non-Metallic and Composite Materials~~ ○ ~~ME 535 Welding Metallurgy~~ ○ ~~ME 538 Welding Design, Fabrication and Quality Control~~

Current primary program in the home unit: MEng in Mechanical and Mechatronics Engineering - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MEng in Mechanical and Mechatronics Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
- o ME 780 Special Topics in Mechatronics: Topic 1 Precision Control Systems - o ME 780 Special Topics in Mechatronics: Topic 5 Computational Intelligence • Elective courses (choose 2 from the following list): - o ECE 682 Multivariable Control Systems - o ECE 780 Special Topics in Control: Topic 11 Model Predictive Control - o ME 540 Fundamentals in Neural and Rehabilitation Engineering - o ME 780 Special Topics in Mechatronics: Topic 17 Vehicle System Dynamics - o ME 780 Special Topics in Mechatronics: Topic 14 Electromagnetic Actuators - o ME 780 Special Topics in Mechatronics: Topic 10 Adaptive Control - o ME 780 Special Topics in Mechatronics: Topic 37 Human Movement Neuromechanics - o ME 780 Special Topics in Mechatronics: Topic 38 Design of a Mechatronic System - o MTE 546 Multi Sensor Data Fusion - o SYDE 575 Image Processing - o SYDE 652 Dynamics of Multibody Systems - o SYDE 655 Optimal and Learning-Based Control • 4. Graduate Specialization in Sustainable Energy • To receive the Graduate Specialization in Sustainable Energy, students must successfully complete 1 compulsory course and 3 elective courses. 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. • Compulsory courses (choose at least 1 from the following list): - o ME 654 Advanced Applied Thermal Engineering - o ME 659 Energy and Environment • Elective course list A: - o ME 655 Advanced Building Energy Analysis	- o ~~ME 596 Special Topics in Mechanical Engineering: Topic 12 Manufacturing of Mechatronics Materials and Components~~ - o ~~ME 627 Fatigue Analysis and Design~~ - o ~~ME 628 Fracture Mechanics~~ - o ~~ME 732 Thermodynamics and Phase Transformations~~ - o ~~ME 734 Mechanics of Composite Materials~~ - o ~~ME 735 Special Topics – Welding and Joining: Topic 2 Advanced Materials Joining~~ - o ~~ME 739 Manufacturing Processes Topics: Topic 15 Additive Manufacturing~~ - o ~~NANO 600 Introduction to Nanotechnology~~ - o ~~NANO 603 Nanocomposites~~ - o ~~NANO 605 Design of MEMS and NEMS~~ - o ~~NANO 606 Advanced MicroElectroMechanical Systems: Physics, Design & Fabrication~~ • ~~3. Graduate Specialization in Mechatronic Systems~~ • ~~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.~~ • ~~Compulsory courses (choose 2 from the following list):~~ - o ~~ECE 602 Introduction to Optimization~~ - o ~~ECE 650 Methods and Tools for Software Engineering~~ - o ~~ME 547 Robotic Manipulators: Kinematics, Dynamics and Control~~ - o ~~ME 640 Autonomous Mobile Robotics~~ - o ~~ME 649 Control of Machines and Processes~~ - o ~~ME 780 Special Topics in Mechatronics: Topic 1 Precision Control Systems~~ - o ~~ME 780 Special Topics in Mechatronics: Topic 5 Computational Intelligence~~ • ~~Elective courses (choose 2 from the following list):~~ - o ~~ECE 682 Multivariable Control Systems~~

Current primary program in the home unit: MEng in Mechanical and Mechatronics Engineering - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MEng in Mechanical and Mechatronics Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
- o ME 751 Fuel Cell Technology - o ME 753 Solar Energy - o ME 760 Special Topics in Thermal Engineering: Energy Storage - o ME 765 Special Topics in Fluid Mechanics: Topic 6 Wind Energy • Elective course list B: - o ME 562 Experimental Methods in Fluids - o ME 566 Computational Fluid Dynamics for Engineering Design - o ME 651 Heat Conduction - o ME 652 Convective Heat Transfer - o ME 653 Radiation Heat Transfer - o ME 662 Advanced Fluid Mechanics - o ME 663 Computational Fluid Dynamics - o ME 671 Fundamental Fire Dynamics - o ME 750 Advanced Engineering Thermodynamics 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).	- o ~~ECE 780 Special Topics in Control: Topic 11 Model Predictive Control~~ - o ~~ME 540 Fundamentals in Neural and Rehabilitation Engineering~~ - o ~~ME 780 Special Topics in Mechatronics: Topic 17 Vehicle System Dynamics~~ - o ~~ME 780 Special Topics in Mechatronics: Topic 14 Electromagnetic Actuators~~ - o ~~ME 780 Special Topics in Mechatronics: Topic 10 Adaptive Control~~ - o ~~ME 780 Special Topics in Mechatronics: Topic 37 Human Movement Neuromechanics~~ - o ~~ME 780 Special Topics in Mechatronics: Topic 38 Design of a Mechatronic System~~ - o ~~MTE 546 Multi Sensor Data Fusion~~ - o ~~SYDE 575 Image Processing~~ - o ~~SYDE 652 Dynamics of Multibody Systems~~ - o ~~SYDE 655 Optimal and Learning-Based Control~~ • ~~4. Graduate Specialization in Sustainable Energy~~ • ~~To receive the Graduate Specialization in Sustainable Energy, students must successfully complete 1 compulsory course and 3 elective courses. 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.~~ • ~~Compulsory courses (choose at least 1 from the following list):~~ - o ~~ME 654 Advanced Applied Thermal Engineering~~ - o ~~ME 659 Energy and Environment~~ • ~~Elective course list A:~~ - o ~~ME 655 Advanced Building Energy Analysis~~ - o ~~ME 751 Fuel Cell Technology~~ - o ~~ME 753 Solar Energy~~ - o ~~ME 760 Special Topics in Thermal Engineering: Energy Storage~~ - o ~~ME 765 Special Topics in Fluid Mechanics: Topic 6 Wind Energy~~ • ~~Elective course list B:~~ - o ~~ME 562 Experimental Methods in Fluids~~

Current primary program in the home unit: MEng in Mechanical and Mechatronics Engineering - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MEng in Mechanical and Mechatronics Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
	~~o ME 566 Computational Fluid Dynamics for Engineering Design~~ ~~o ME 651 Heat Conduction~~ ~~o ME 652 Convective Heat Transfer~~ ~~o ME 653 Radiation Heat Transfer~~ ~~o ME 662 Advanced Fluid Mechanics~~ ~~o ME 663 Computational Fluid Dynamics~~ ~~o ME 671 Fundamental Fire Dynamics~~ ~~o ME 750 Advanced Engineering Thermodynamics~~ 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).

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

Current students will not be impacted. The program will be open to new students once it goes into effect.

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

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 12/05/24

Faculty approval date (mm/dd/yy): 12/17/24

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

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

UNIVERSITY OF WATERLOO



GRADUATE PROPOSAL COLLABORATIVE HEALTH TECHNOLOGIES PROGRAM MASTER OF MANAGEMENT SCIENCE – HEALTH TECHNOLOGIES (CO-OP)

For submission to the
Ontario Universities Council on Quality Assurance

VOLUME I - PROPOSED BRIEF

NOVEMBER 2024

*The Quality Council will normally require only an Expedited Approval process where:

- a) there is a proposal for a **new Collaborative Program** at the graduate level; or
- b) there is a proposal for a **new for-credit graduate diploma**.

NOTE: This template **must** be used for submission of a new program proposal.
Please consult the University of Waterloo [Institutional Quality Assurance Process](#) and the
[Quality Assurance Framework](#) (QAF) for details or the [Quality Assurance Office](#).

****Volumes I, II must be reviewed and approved by the Quality Assurance Office, GSPA and IAP prior to submission to your Faculty Council****

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1. Introduction

Brief Listing of the Program

The Collaborative Health Technologies Program offers students professional Master of Management Science (MMSc) degree with mandatory co-op, as preparation to enter the broad and rapidly evolving field of *Health Technology*. Not only is co-op highly beneficial to students while completing this program, it also offers an important opportunity to those students who *never* had co-op experience during their undergraduate degree. The program is centered around a collaborative and interdisciplinary suite of courses offered by six departments in Engineering and supported by the Faculties of Arts and Health. In addition to coursework, the mandatory co-op program serves to enrich the learning of students with practical experience in industrial settings. This is a full-time, on-campus program, with an expected duration of 4-6 terms, based on the co-op and study sequence selected by particular students. Program tuition follows the existing UW graduate home program tuition structure.

To enroll in the Collaborative Health Technologies Program, students must meet the admission requirements of, and register in, the department of Management Science and Engineering (MSE). Students must complete the Collaborative Health Technologies Program requirements that are structured as a combination MSE department’s MMSc degree requirement, and the additional Collaborative Health Technologies Program requirements (i.e., the completion of sufficient courses from specified pools, and successful co-op work terms/reports).

The degree conferred will be that of the participating program (i.e. Management Science and Engineering), with the completion of the Collaborative Health Technologies Program indicated by a transcript notation to the degree and adjunct qualification to the degree (i.e. Master of Management Science – Health Technologies). The proposed collaborative program also offers a platform to allow future participation of other Faculties.

Method Used for Preparation of the Brief

The Collaborative Health Technologies Program was conceptualized by the Dean of Engineering and the Associate Dean Graduate Studies – Engineering. In April 2023, the initiative to develop the program received support from the New Interdisciplinary Networks, Programs, and Initiatives Fund from the University. The proposal was developed following consultations by the Associate Dean with Graduate Associate Chairs of the departments of Chemical Engineering, Civil and Environmental Engineering, Electrical and Computer Engineering, Management Science and Engineering, Mechanical and Mechatronics Engineering, and Systems Design Engineering. The Associate Dean also had discussions with counterparts in other Faculties (e.g., Arts, Health, and Science). The general proposal was presented to the departments in Engineering for consideration within the unit. Following approval, this departmental proposal brief to participate in the collaborative program evolved, incorporating the specific requirements of the home unit.

2. Objectives of the Program ([QAF 2.1.2.1](#))

The Collaborative Health Technologies Program is timely and justified not only based on the critical need for skilled professionals at the intersection of healthcare and technology, but also by the University of Waterloo’s own goals, e.g. [Waterloo at 100, Global Futures](#). The following are some of the compelling reasons that justify the establishment of a Collaborative Health Technologies Program:

1. **Rapid Technological Advancements in Healthcare:** The healthcare industry is experiencing an unprecedented transformation due to rapid advancements in technology. Innovations such as artificial intelligence, telemedicine, wearable devices, and data analytics are reshaping healthcare delivery, diagnosis, treatment, and patient care. A dedicated program will equip future professionals with leading-edge skills needed to leverage and drive innovations in this field.
2. **Increasing Demand for Health Technology Experts:** There is a growing demand for professionals who possess a deep understanding of both healthcare and technology. This demand arises from the need to bridge the gap between traditionally siloed fields and create holistic solutions that address complex healthcare challenges. Graduates of a Collaborative Health Technology Program will fill this talent gap and drive innovation in healthcare settings.
3. **Addressing Healthcare Challenges:** The global healthcare landscape faces numerous challenges, including rising costs, an aging population, chronic diseases, disparities in healthcare access, and pandemics. A Collaborative Health Technologies Program will empower students to develop innovative solutions to address these challenges, improve healthcare access, and enhance patient outcomes.
4. **Opportunity for Interdisciplinary Collaboration:** A program that combines healthcare and technology will foster interdisciplinary collaboration. Students will learn to collaborate with healthcare professionals, engineers, data scientists, ethicists, and policymakers, fostering a diverse and comprehensive approach to problem-solving.
5. **Industry-Relevant Skill Development:** Employers in the healthcare and technology sectors seek professionals with specialized skills in areas such as health data analytics, digital health, telemedicine, medical device development, regulatory compliance, and AI applications in healthcare. Both the course-based components and the mandatory co-op of this Collaborative Health Technologies Program combine to ensure that graduates are well-prepared with these in-demand skills.
6. **Economic and Innovation Impact:** Investing in a Collaborative Health Technologies Program aligns with the current market demand and presents an opportunity to contribute to economic growth and innovation. Graduates equipped with the skills to develop and implement Health Technology solutions can drive entrepreneurship, create job opportunities, and contribute to the expansion of healthcare technology sectors.
7. **Addressing Future Healthcare Needs:** With the evolving landscape of healthcare and technology, preparing future professionals to navigate and lead in this dynamic environment is essential. Establishing a Collaborative Health Technologies Program now ensures that the workforce is ready to address the future needs and challenges of the healthcare industry.

Program Learning Outcomes and Graduate Degree Level Expectations (GDLE):

1. Depth and Breadth of Knowledge

- a. Understand the principles, concepts, terminology and tools of health technology
- b. Demonstrate awareness of key elements of both the ethical considerations and impacts of health technologies
- c. Interpret, understand, and critically assess state-of-the-art methods, theories, and advances in health technology

2. Research & Scholarship

- a. Integrate complex engineering concepts related to the breadth of health technology, and the underlying and associated sciences.

3. Level of Application of Knowledge

- a. Interpret, critically assess and apply state-of-the-art methods, theories, and advances in health technology
- b. Understand current issues faced by the health technology industry

4. Professional Capacity / Autonomy

- a. Independently recognize, define, and solve complex real-world health technology needs and associated challenges
- b. Engage in self-directed professional development and life-long learning
- c. Develop an ability to recognize, appreciate, consider and apply appropriate ethics, law, regulations, and accountability to the field of health technologies
- d. Understand the value of engaging in inter-disciplinary collaboration in health technology as well as the complexity of knowledge & limitations of different fields
- e. Adopt a mindset for collaboration (work effectively in interdisciplinary teams including healthcare professionals, engineers, designers, business developers, etc.)

5. Level of Communication Skills

- a. Effectively communicate complex concepts in health technology to a wide audience ranging from general public to experts in the field. Concepts may include health technology needs and associated challenges (includes GDLE 6 Awareness of Limits of Knowledge)
- b. The ability to communicate ideas, issues and conclusions clearly.

6. Awareness of Limits of Knowledge

- a. Cognizance of the complexity of knowledge and of the potential contributions of other interpretations, methods, and disciplines.
- b. Understand the value of inter-disciplinarity in the field of health technologies.

How does this Program align with the University of Waterloo Strategic Plan and Strategic Mandate Agreement?

The Collaborative Health Technologies Program aligns well with the University of Waterloo's strategic plan in several ways:

1. **Interdisciplinary Collaboration:** The program's collaboration between the departments in Engineering as well as the support by Arts and Health, demonstrate a commitment to

interdisciplinary collaboration, a key focus area of the strategic plan. This collaboration brings together diverse perspectives and expertise, fostering innovation in health technology by integrating engineering skills with insights from health, social sciences, and humanities.

2. **Work-integrated Learning through Co-op:** The mandatory co-op component of the program aligns with the strategic plan's emphasis on experiential learning. This practical work experience allows students to apply their knowledge in real-world settings, contributing to their professional development while addressing real challenges in health technology.
3. **Benefits of Innovation and Research:** The program's focus on Health Technologies aligns with the strategic plan's emphasis on fostering innovation. Even though this is a course-based program, it does enable students to connect with faculty from various departments to engage with cutting-edge technologies and understand solutions to real-world problems.
4. **Community Partnerships:** Collaboration between different departments within Engineering, along with the support, through course offering, by Faculties of Arts and Health, opens opportunities for partnership with external organizations, hospitals, and industry players. This engagement aligns with the strategic plan's focus on strengthening community partnerships. Co-op placements also will play a key role in this aspect.
5. **Technology and Global Challenges:** By addressing healthcare challenges through technology and innovation, the program contributes to addressing global challenges, which is in line with the University's strategic goal of leveraging technology for positive societal impact.
6. **Commitment to Excellence and Diversity:** The collaborative nature of the program reflects the University's commitment to excellence in education and research. Furthermore, by integrating diverse perspectives from multiple departments and faculties, the program contributes to promoting diversity and inclusion, a priority area in the strategic plan.

Overall, the Collaborative Health Technologies Program embodies many key pillars of the University of Waterloo's Strategic Plan by promoting interdisciplinary collaboration, experiential learning, innovation, community engagement, and a commitment to excellence and diversity.

3. Admission Requirements ([QAF 2.1.2.5](#))

Admission into the Collaborative Health Technologies Program is through direct application to the program offered through the home administrative unit, i.e. MSE. Admission requirements for the program will be the same as those existing for the [Master of Management Science \(Co-op\)](#) degree in MSE.

The minimum academic requirements – including admissions requirements, minimum overall averages, and timelines for any milestones – in the program will be consistent with the requirements of the primary existing master’s program for each participating department.

In detail, the admission requirements for MMSc in the department of Management Science and Engineering are:

- (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.
- Proof of English language proficiency (ELP): TOEFL 90 (writing 25 speaking 25), or IELTS 7.0 (writing 6.5, speaking 6.5)

Additionally, the required application materials will include a resume, Supplementary Information Form (SIF), which contains questions specific to the program about why applicants want to enroll and their experience in the field, transcripts, two reference letters, academic (preferred) or professional, and proof of English language proficiency (ELP): TOEFL minimum 90 (writing 25 speaking 25), or IELTS minimum 7.0 (writing 6.5, speaking 6.5).

These admission requirements are appropriate given the precedent of existing co-op Master’s programs in the Faculty of Engineering. The level of required academic performance is indicative of what will be required of students during their studies within this proposed program and serves to select only students who will be capable of meeting course expectations and overall program learning outcomes. Furthermore, the Supplementary Information Form, resume, and reference letters will allow for recognition of the prior work, experience, aspirations, and career trajectory of applicants.

4. Structure ([QAF 2.1.2.2](#))

The Collaborative Health Technologies Program is a co-op only, course-based program. Completion of 9 courses will be required to meet the coursework requirement of the program. Selection of courses will be as follows:

2 courses, inclusive of MSE 619, from the following University-level courses (ARTS, ENG):

- PHIL 626: Bioethics and Technology
- ECON 643: Health Economics
- MSE 619: Healthcare Analytics

2 courses, inclusive of MSE 630, from the following Faculty-level courses (6 ENG depts):

- BME 600: Design of Biomedical Technologies

- BME 602: Foundations in Biomechanical Engineering
- CHE 621: Model Building and Response Surface Methodology
- ENVE 585: Air Quality Engineering and Impacts
- ECE 608: Quantitative Methods in Biomedical Engineering
- MSE 630: Human-Computer Interaction

4 MSE General requirement courses:

- MSE 603: Principles of Operations Research
(This course may be replaced with MSE 634: Deterministic Models in Operations Research, if a student has a strong Operations research background)
- MSE 605: Organizational Behavior
- MSE 607: Applied Economics for Management
- MSE 609: Quantitative Data Analysis for Management Sciences

1 course from the following Faculty of Health courses:

- HLTH 612: Introduction to Health Information and Data Standards
- HLTH 633: Digital Health
- HLTH 605B: Quantitative Methods and Analysis
- HLTH 650A/650B: Application of Artificial Intelligence in Health (0.25) / Machine Learning Techniques in Health (0.25)
- HLTH 606B: Principles of Epidemiology for Public Health
- HLTH 615: Requirements Specifications and Analysis in Health Systems

The program study / co-op sequence is illustrated below. Having co-op during the program both allows students to apply what they have learned in school to their co-op employment, but also the reverse: apply what has been learned during co-op terms to their in-school experiences. This model allows for bidirectional inspiration and gives students an important *context* for what they are learning.

Term-1	Term-2	Term-3	Term-4	Term-5	Term-6
study	study	Co-op	Co-op	study	(study)
study	study	Co-op	study	(study)	

Rationale and Justification

The structure and regulations of the Collaborative Health Technologies Program align with the program learning outcomes and Degree-Level Expectations. More detail is given below.

Alignment with Program Learning Outcomes:

1. **Diversity of Course Offerings:** The coursework structure ensures a breadth of courses from various levels (University, Faculty, Department) covering different aspects of health technologies, such as ethics, analytics, biomedical engineering, rehabilitation engineering, human-computer interaction, health-care systems, epidemiology, systems theory etc. The proposed program is designed in such a way that potential future participation of additional Faculties with their own master’s program model is both possible and would further enrich the program content.
2. **Integration of Practical Experience:** The mandatory incorporation of co-op allows students to apply theoretical knowledge gained in the classroom to real-world scenarios, and vice versa. This aligns with the objective of the program to foster practical application and real-world learning.

Meeting Degree Level Expectations:

1. **Depth and Breadth of Knowledge:** The variety of courses spanning different Departments and Faculties suggests a comprehensive coverage of topics relevant to health technologies, meeting the depth and breadth of knowledge expected at the master's level.
2. **Professional Skills Development:** The incorporation of co-op experiences facilitates the development of professional skills, preparing students for practical challenges in the field.

Rationale for Program Length:

The proposed program length is reasonable for several reasons:

1. **Course Load and Requirements:** 9 courses within the program, structured across different units and levels, can be reasonably completed within three to four study terms.
2. **Integration of Co-op Experience:** The inclusion of co-op necessitates a program duration that allows students to engage in these practical experiences without significantly extending the program length.
3. **Balancing Academic and Practical Learning:** The program aims to balance academic learning with real-world application. A structured timeframe enables students to attain both theoretical knowledge and practical skills within a manageable period.

5. Program Content ([QAF 2.1.2.3](#))

Health Technologies represent the dynamic intersection of healthcare and cutting-edge technology, encompassing a diverse array of innovations designed to revolutionize patient care, improve healthcare accessibility, and enhance overall well-being. Embracing a multidisciplinary approach, Health Technologies integrate advancements in artificial intelligence, data analytics, telemedicine, medical imaging, ethics, and more, to drive transformative changes in the diagnosis, treatment, and management of health conditions. The Collaborative Health Technologies Program is a multi-disciplinary course-based program in the Faculty of Engineering with mandatory co-op, integrated within the timeline of the program. Its multi-disciplinarity is derived on the basis of the participation, through course offerings, of the Faculties of Arts and Health. Additionally, the enrolled students will also take appropriate courses across several departments within Engineering. All courses taken are at the graduate level. An overview of the program’s course structure was given in Section 4. Here, additional information on the courses is given.

A brief description of the University-level courses, from which a student would be required to take one Arts course (PHIL 626 or ECON 643) and MSE 619, is given below:

- **PHIL 626: Bioethics and Technology (Arts)**
Students will grapple with a sample of ethical issues related to advanced and emerging medical technologies and/or biotechnologies. The primary goals of doing so are: (1) To gain familiarity with key ethical concepts and values, which may include patient autonomy, beneficence, justice, care, anti-ableism, inclusion, and others; and (2) to enhance core critical thinking skills needed for ethics, which will help improve each student’s self-understanding (of not only what they think is right and wrong, but, more importantly, why) and their capacity to engage with different perspectives on the “whats” and “whys” of ethics in a spirit of open-mindedness, mutual respect, and constructive cooperation. Frequent in-class discussion is typically an important element of student learning in this course.
- **ECON 643: Health Economics (Arts)**
This course introduces students to the role of economics in health care and health policy. It is meant to be a survey of major topics in health economics and an introduction to the ongoing debate over health care policy. Topics include the economic determinants of health and health policy, the market for medical care, the market for health insurance, and the role of the government in health care, and health care reform.
- **MSE 619: Healthcare Analytics (Engineering)**
This course provides an introductory course 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.

A brief description of the Faculty-level courses, from which a student would be required to take MSE 630 and one other course, is given below:

- **BME 600: Design of Biomedical technologies (SYDE)**
Systems theory and formulation of system dynamics problems. Design and research methods for biomedical technologies. Problem formulation and definition, stakeholder engagement, needs analysis, generation of alternative solutions, feasibility analysis, optimization, selection, and solution implementation.
- **BME602: Foundations in Biomechanical Engineering (MME)**
This course focuses on equipping students with foundational knowledge in the biomechanics of human physiology, pathology and treatment. The overarching aim of this course is to develop students’ literacy in applying biomechanics principles and modern tools towards understanding the human body. The course will build on existing knowledge in mathematics

and physics to develop new expertise and hands-on experience in the biomechanical modeling and analysis of physiological systems.

- **CHE 621: Model Building and Response Surface Methodology (CHE)**

This course teaches process / product optimization based on design of experiments, empirical modelling, and non-linear mechanistic models. These methodologies aid in refining healthcare processes and products, ensuring they meet stringent standards of efficiency, safety, and effectiveness.

- **ENVE 585: Air Quality Engineering and Impacts (CEE)**

This course introduces air quality design of engineering solutions and associated health and economic impacts. It includes topics focused on the indoor environment, the outdoor environment, or both, such as: air pollution sources, emission estimation, control strategies, measurement, modeling methods, health impact assessment, cost-benefit analysis, technical policy analysis, and co-impacts with climate change.

- **ECE 608: Quantitative Methods in Biomedical Engineering (ECE)**

This course focuses on topics related to the use of quantitative tools in biomedical engineering research studies. Educational emphasis will be placed on developing students' core competence in biostatistics and biomedical computing, so as to prepare them to pursue biomedical engineering investigations that are backed by quantitative reasoning and numerical insights.

- **MSE 630: Human Computer Interaction (MSE)**

This course concentrates on the theoretical and practical issues related to the design of the human-computer interfaces. Aspects of human perception, cognition and various models of task analysis are discussed.

A brief description of the Faculty of Health courses that are part of the department-specific and health-specific list of electives is given below:

- **HLTH 612: Introduction to Health Information and Data Standards**

This course focuses on health data as a key component of all health informatics systems. Topics include ontologies and other classification taxonomies found in health systems, data standards (with a focus on Canadian implementations of international standards), privacy and security of health data, client/patient assessment tools, and ethical considerations.

- **HLTH 633: Digital Health**

The wide adoption of mobile technology presents a new opportunity. Leveraging this existing technology, healthcare systems can deliver remote care and collect real-time data on patients outside of health centres, minimizing unnecessary visits to hospitals and providing healthcare access to remote populations. In this course, we will explore how digital health technology has been designed, evaluated, and deployed in different countries. Case studies will be used to demonstrate how institutional and governmental constraints have a strong impact on the success of the deployment. The course will address the different digital health technologies in the market, such as Telehealth, remote patient monitoring, tele radiology, consumer health informatics, and mHealth. Important aspects of technology development like patient confidentiality, privacy, standards, communication and security protocols,

regulatory requirements, among others, will be discussed when presenting the development of each digital health solution. By the end of this course, students will be prepared to design, evaluate, and deploy a digital health intervention and will have a solid understanding of the barriers and requirements for deploying digital health technology.

- **HLTH 605B: Quantitative Methods and Analysis**

This course is a rigorous introduction to biostatistics for those planning a career in public health. Students will learn various biostatistical techniques, how to apply those techniques in the analysis of data from health studies, and how to interpret the results from those analyses. After a brief review of material from a basic statistics course, topics covered will include simple and multiple linear regression, analysis of categorical data, simple and multiple logistic regression, and survival analysis. Emphasis will be on (i) conceptual understanding of topics, including literacy necessary for understanding scientific papers in public health, as well as (ii) carrying out various data analysis applications.

- **HLTH 650A / 650B: Application of Artificial Intelligence in Health (0.25) / Machine Learning Techniques in Health (0.25)**

HLTH 650A focuses on the application of machine learning (ML) and artificial intelligence (AI) techniques in the field of healthcare and public health settings. Big data sources available for population health studies will be introduced to students and challenges related to AI in health data will also be discussed. The learning activities consist of lectures, student-led journal club discussions and a term paper to propose the application of ML techniques to solve population health or public health problems.

HLTH 650B focusses on the techniques of machine learning (ML) commonly used to solve healthcare and public health problems. Various analytics techniques, including data wrangling, visualization, unsupervised and supervised learning, will be introduced to students. Challenges and strategies related to missing data, imbalanced data and model selections will also be discussed. The learning activities consist of lectures, labs, and a final project to demonstrate the proficiency of ML techniques to solve population health or public health problems.

- **HLTH 606B: Principles of Epidemiology for Public Health**

This course introduces the principles, methods, and uses of epidemiology in the practice of public health. After completion of this course, students will be able to critically read and interpret epidemiologic research and clearly communicate epidemiologic findings. They will be familiar with health status measurement, data sources, screening, surveillance, outbreak investigation, and methods to support program planning and evaluation. Students will have a sound understanding of basic epidemiologic concepts, including prevalence, incidence, study designs, measures of association, bias, confounding and causal inference.

- **HLTH 615: Requirements Specifications and Analysis in Health Systems**

This course introduces students to the requirements of definition phase of software development. Models, notations, and processes for software requirements identification, representation, validation, and analysis are discussed, as are mechanisms to evaluate the efficacy and efficiency of health information systems.

6. Mode of Delivery ([QAF 2.1.2.2](#))

Courses made available for students of the Collaborative Health Technologies Program use a wide variety of teaching and learning methodologies (e.g., lectures, case-studies, student presentations, in-class group discussion, etc.) designed to provide students with an engaging learning experience. Though not specific to this program, at the University of Waterloo, instructors from all faculties are encouraged to make use of the Center for Teaching Excellence, which offers many resources to aid instructors in improving their teaching, course design, and delivery, emphasising *Active Learning* techniques. Instructors of courses offered to Collaborative Health Technologies Program students will be reminded of these resources.

Following program approval and implementation, the faculty-level administrative staff will ensure the program is continually meeting both intended learning outcomes and degree-level expectations.

7. Assessment of Teaching and Learning ([QAF 2.1.2.4](#))

The performance of students will be assessed both on conventional and existing methods stipulated by the courses they will take, but also based on input from the co-operative education component of this program.

Assessment of teaching and learning will be conducted at the *student* and *program* levels. The program will be assessed at the program level by the Graduate Program Committee and program director. As part of this assessment, the Program Committee will review statistics, such as program performance versus learning objectives, student success rates and teaching evaluations – as provided through both student perception surveys and peer-assessment of teaching. The committee will identify opportunities to improve performance, such as enriching course content or teaching.

Performance indicators that will be considered by the Program Committee will include:

- Applications to and enrollment within the program;
- Student evaluations of courses;
- Student graduation rates;
- Surveys of alumni; and
- Surveys of employers/industry partners.

At the student level, there will be the following types of activities with assessments:

- a) Coursework: Students will be assigned a grade based on typical assessment methods used in other graduate courses, such as papers, reports, tests, projects, and presentations.
- b) Co-operative Education Work-Term Reports.

Refer to the table in Appendix A for more specific information on how assessments will be made, both for course-based and co-operative education components of this program.

8. Resources for All Programs ([QAF 2.1.2.6](#))

For the anticipated enrolment numbers of the Collaborative Health Technologies Program, the additional students enrolling into pre-existing courses will not present a significant burden on the University's resources (i.e., students take courses from large pools and therefore, there will likely not be so many additional students per course that additional sections and having more instructors would be necessary – in fact, in some cases, the additional grad students enrolling may help improve the instructor utilization efficiency for courses that typically have too low of enrollment numbers). The program would not necessitate hiring any new faculty members and instead would rely on existing known-to-be qualified faculty members already teaching courses. In addition, students will have access to the University’s facilities and spaces, including library resources, working spaces, access to existing resources for student well-being and counselling, as well as technology support from their home department. This program is not expected to impose additional student costs for use of resources. Program coordination can be handled by existing staff resources in the home departments with the Faculty of Engineering providing additional support as needed, as is the case for other existing collaborative programs.

9. Resources for Graduate Programs ([QAF 2.1.2.7](#))

Given the course-based nature of the Collaborative Health Technologies Program, an assessment of the research-related and supervisory expertise of faculty is not required for this program to function. The breadth of courses available for students to take is immense and course instructors may change from term-to-term. Therefore, nearly *all* faculty from the participating units may serve this program through the teaching of courses in which Health Technology students may enroll. On a course-by-course /offering-to-offering basis, ensuring instructor competence is left to the discretion of the corresponding department. Following the precedent of existing professional master’s programs in Engineering, no financial assistance will be provided to students. Ensuring the quality of incoming students, will be left to the discretion of the home departments and will be put into action through the standard program admission requirements, as are described in Section 3.

10. Quality and Other Indicators ([QAF 2.1.2.8](#))

To ensure the quality of the program a Program Committee will be created to oversee and regularly evaluate the program, to ensure all program requirements and course related graduate-level degree requirements are met. This committee will consist of a Program Director, the Course Coordinator, a faculty member from each participating department, and a graduate student representative. Furthermore, the co-op office will principally oversee all co-op related activities and components of this program. Within each department of Engineering, Graduate Associate Chairs will monitor the progress of their constituent students from this program, as is already their responsibility for existing professional programs. Specifically, student progression through the program, grades, and successful completion of co-op terms will be tracked. Where needed, remedial action will be taken to ensure students remain on-track and able to maximally benefit from participation in this program.

Appendix A - Summary of Learning Outcomes Mapped to Courses and Assessment Methods

Specific GDLEs and Associated Learning Outcomes	Courses										Co-operative Education			Assessment method							
	University-level ARTS ENG			Faculty-level SYDE MME CHE CIVE ECE MSE						Dept-level MSE HEALTH											
	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	CHE 621: Model Building and Response Surface Methodology	ENVE 585: Air Quality Engineering & Impact	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Dept-specific and Health-specific Elective Courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
1. Depth and Breadth of Knowledge																					
Understand the principles, concepts, terminology, tools of health technology	A	A	A	C	A	A	A	A	A	AC	NA	NA	A	NA	A	A	A	A	A	A	NA
Demonstrate awareness of key elements of both the ethical considerations and impacts of health technologies	A	A	A	NA	C	NA	NA	NA	C	AC	A	NA	A	NA	A	A	A	A	A	A	NA
Interpret, understand, and critically assess state-of-the-art methods, theories, and advances in health technology	C	C	A	NA	A	C	C	A	A	AC	NA	NA	C	NA	A	A	A	A	A	A	NA
2. Research & Scholarship																					
Integrate complex engineering concepts related to the breadth of health technology, and the underlying and associated sciences.	NA	NA	A	C	A	A	A	A	A	AC	C	NA	C	NA	A	A	A	A	A	A	NA

Specific GDLEs and Associated Learning Outcomes	Courses										Co-operative Education			Assessment method							
	University-level ARTS ENG			Faculty-level SYDE MME CHE CIVE ECE MSE						Dept-level MSE HEALTH											
	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	CHE 621: Model Building and Response Surface Methodology	ENVE 585: Air Quality Engineering & Impact	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Dept-specific and Health-specific Elective Courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
3. Level of Application of Knowledge																					
Interpret, critically assess and apply state-of-the-art methods, theories, and advances in health technology	A	A	A	C	A	A	A	A	A	AC	NA	NA	A	NA	A	A	A	A	A	A	NA
Understand current issues faced by the health technology industry	A	A	C	C	A	NA	NA	C	A	AC	A	C	A	NA	A	A	A	A	A	A	NA
4. Professional Capacity / Autonomy																					
Independently recognize, define, and solve complex real-world health technology needs and associated challenges	A	A	NA	C	C	C	C	C	C	AC	A	A	A	NA	AC	AC	AC	AC	C	AC	NA
Engage in self-directed professional development and life-long learning	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	C	C	A	NA	NA	NA	NA	NA	A	NA	NA
Develop an ability to recognize, appreciate, consider and apply appropriate ethics, law, regulations, and accountability to the field of health technologies	A	A	C	C	C	NA	NA	C	C	AC	A	C	A	NA	A	A	A	A	A	A	NA

Specific GDLEs and Associated Learning Outcomes	Courses										Co-operative Education			Assessment method							
	University-level ARTS ENG			Faculty-level SYDE MME CHE CIVE ECE MSE						Dept-level MSE HEALTH											
	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	CHE 621: Model Building and Response Surface Methodology	ENVE 585: Air Quality Engineering & Impact	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Dept-specific and Health-specific Elective Courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
Understand the value of engaging in inter-disciplinary collaboration in health technology as well as the complexity of knowledge & limitations of different fields	C	C	C	C	NA	NA	NA	NA	NA	AC	NA	NA	A	NA	NA	NA	C	NA	A	C	NA
Adopt a mindset for collaboration (work effectively in interdisciplinary teams including healthcare professionals, engineers, designers, business developers, etc.)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	A	A	C	NA	NA	NA	NA	NA	C	NA	NA
5. Level of Communications Skills																					
Effectively communicate complex concepts in health technology to a wide audience ranging from general public to experts in the field. Concepts may include health technology needs and associated challenges (includes GDLE 6 Awareness of Limits of Knowledge)	C	C	C	NA	NA	NA	NA	NA	NA	NA	C	C	C	NA	NA	NA	NA	NA	C	C	NA
The ability to communicate ideas, issues and conclusions clearly.	C	C	NA	NA	NA	NA	NA	NA	NA	NA	C	C	A	NA	NA	NA	NA	NA	A	C	NA

Specific GDLEs and Associated Learning Outcomes	Courses										Co-operative Education			Assessment method							
	University-level ARTS ENG			Faculty-level SYDE MME CHE CIVE ECE MSE						Dept-level MSE HEALTH											
	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	CHE 621: Model Building and Response Surface Methodology	ENVE 585: Air Quality Engineering & Impact	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Dept-specific and Health-specific Elective Courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
6. Awareness of Limits of Knowledge																					
Cognizance of the complexity of knowledge and of the potential contributions of other interpretations, methods, and disciplines.	A	A	C	C	C	C	C	C	C	AC	A	A	A	NA	C	NA	NA	NA	A	A	NA
Understand the value of inter-disciplinarity in the field of health technology.	C	C	C	C	C	C	C	C	C	AC	C	C	C	NA	C	NA	C	NA	C	C	NA

Table Legend:

Assessed (A) The outcome is addressed and is formally assessed.

Covered (C) The outcome is addressed but not assessed.

Assessed or Covered (AC)..... The outcome may be addressed and assessed but is at least covered (depending on selected courses).

Not addressed (NA) The outcome is not addressed.

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

Program: Master of Management Science (MMSc) - Health Technologies - Co-operative Program

Program contact name(s): Sibel Alumur Alev, Siva Sivoththaman

Form completed by:

Description of the proposed new program option:

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

The Department of Management Science and Engineering is joining the inaugural Collaborative Health Technologies Program and is thus adding a Master of Management Science (MMSc) - Health Technologies - Co-operative Program (direct entry).

Is this a [major modification](#) to the program? Yes

Rationale for change(s):

Please refer to the attached brief for full details.

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#/programs?group=Management%20Science%20and%20Engineering>

Current primary program in the home unit: MMSc - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MMSc - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
Master of Management Science (MMSc) - Co-operative Program (direct entry) Admit term(s) - Fall Delivery mode - On-campus Registration option(s) - Full-time	Master of Management Science (MMSc) - <u>Health Technologies</u> - Co-operative Program (direct entry) Admit term(s) - Fall Delivery mode - On-campus Registration option(s)

Current primary program in the home unit: MMSc - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MMSc - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
Program type(s) • Co-operative Study option(s) • Coursework Length of program • 5 terms (20 months) Graduate research fields • Applied Operations Research • Information Systems • Management of Technology Admission requirements: Minimum requirements • The Department of Management Science and 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. • 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	• Full-time Program type(s) • Co-operative • <u>Collaborative</u> Study option(s) • Coursework Length of program • 5 terms (20 months) Graduate research fields • ~~Applied Operations Research~~ • ~~Information Systems~~ • Management of Technology Admission requirements: Minimum requirements • The Department of Management Science and 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. • 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

Current primary program in the home unit: MMSc - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MMSc - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
- Type of references: academic (preferred) or professional 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 - 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 Science and Engineering	- Number of references: 2 - Type of references: academic (preferred) or professional Degree requirements - Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM). - The MMSc - Health Technologies - 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 - 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 MSE 619 Healthcare Analytics MSE 630 Human-Computer Interaction 1 of the following Health Technologies core courses: ECON 643 Health Economics PHIL 626 Bioethics and Technology 1 of the following Faculty of Engineering Health Technologies elective courses: BME 600 Design of Biomedical Technologies

Current primary program in the home unit: MMSc - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MMSc - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
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).	BME 602 Foundations in Biomechanical Engineering CHE 621 Model Building and Response Surface Methodology ECE 608 Quantitative Methods in Biomedical Engineering ENVE 585 Air Quality Engineering and Impacts 1 of the following Health Technologies elective courses: HLTH 605B Quantitative Methods and Analysis HLTH 606B Principles of Epidemiology for Public Health HLTH 612 Introduction to Health Information and Data Standards HLTH 615 Requirements Specifications and Analysis in Health Systems HLTH 633 Digital Health HLTH 650A Application of Artificial Intelligence in Health (0.25) and 650B Machine Learning Techniques in Health (0.25) ~~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 Science and Engineering Department. This These 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

Current primary program in the home unit: MMSc - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MMSc - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
	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).

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

Current students will not be impacted. The program will be open to new students once it goes into effect.

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

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 12/05/24

Faculty approval date (mm/dd/yy): 12/17/24

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

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

INDUSTRY AND JOB ANALYSIS FOR MASTER OF HEALTH TECHNOLOGIES

Prepared by Justin Kieffer, Faculty Relations Manager, Math & Eva Skuza, Faculty Relations Manager, Engineering

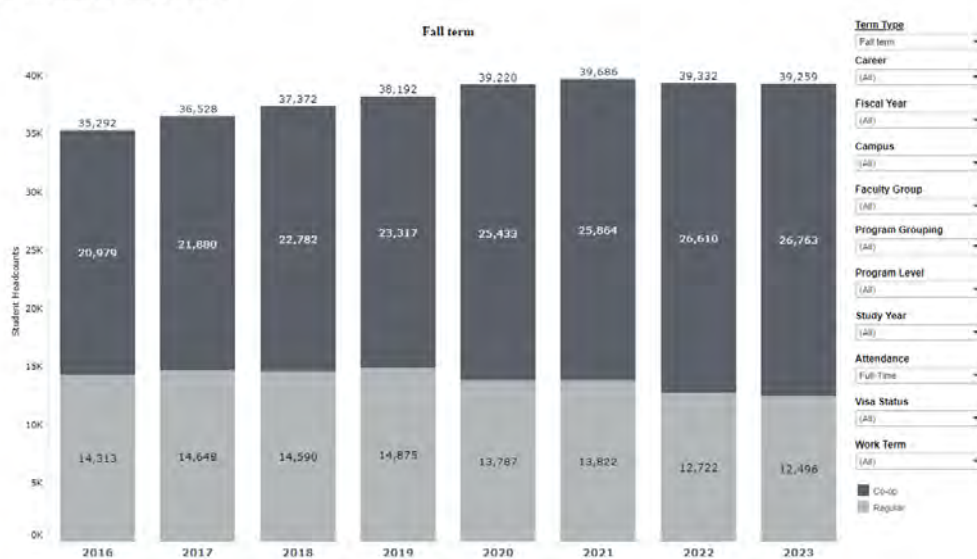
July 3, 2024

Introduction

Labour market and employment trends are volatile and may change quickly. While this report is a snapshot in time, Co-operative and Experiential Education (CEE) actively monitors labour market and employment changes. Additional insights will be provided through regular updates at the faculty and program level and more detailed data is provided in Cyclical Program Reviews.

As of fall 2023, approximately 68% or roughly 26,800 students at the University of Waterloo are enrolled in co-operative education programs. Both the number of students in co-op and the proportion of students in co-op programs have continued to increase annually (68% in 2023 vs 60% in 2017).

Student Headcounts



Graduate students in co-op programs currently represent a small proportion (~1.5%) of total co-op enrollment, with 390 total students as of fall 2023. The Faculty of Engineering has expanded its master level programs that include co-operative education as part of degree requirements. The most recently added programs are:

- Chemical Engineering
- Civil and Environmental Engineering
- Mechanical and Mechatronics Engineering
- Electrical and Computer Engineering

Upcoming programs are:

- Systems Design Engineering

Enrolment in these programs has increased the number of Engineering masters co-op students by approximately 100 students in 2024; an increase of approximately 26% in the number of masters co-op students at the University of Waterloo.

The proposed Master of Health Technologies program is expected to add an additional 50 co-op students.

To ensure that masters students are set up to succeed in co-op, Co-operative and Experiential Education (CEE) has conducted a competitive analysis to understand co-op employment trends, job opportunities, external labour markets, and surveyed employer interest in Master of Engineering co-op students.

Employment Trends

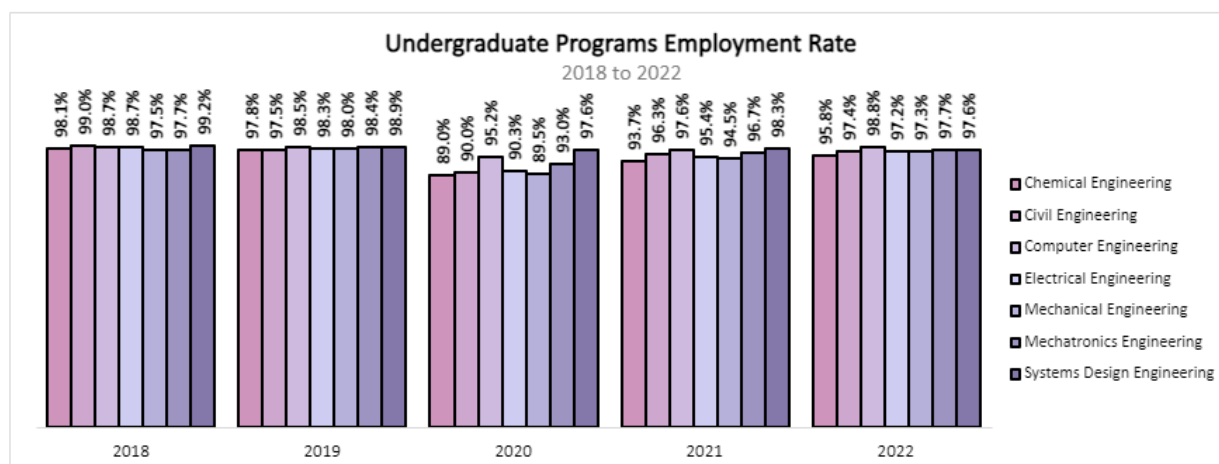
To get a sense of expected employment success for students in the Health Technologies program, CEE analyzed recent employment rates of comparable undergraduate Engineering co-op programs at Waterloo and existing master's co-op programs in the faculties of Engineering and Mathematics.

The list of programs used for comparison are listed below. While most data is summarized at the aggregate level, program level data is available upon request.

Undergraduate	Graduate
Chemical Engineering	Applied Mathematics
Civil Engineering	Computer Science
Computer Engineering	Data Science & Artificial Intelligence
Electrical Engineering	Management Sciences Engineering
Mechanical Engineering	Mechanical & Mechatronics Engineering
Mechatronic Engineering	
Systems Design Engineering	

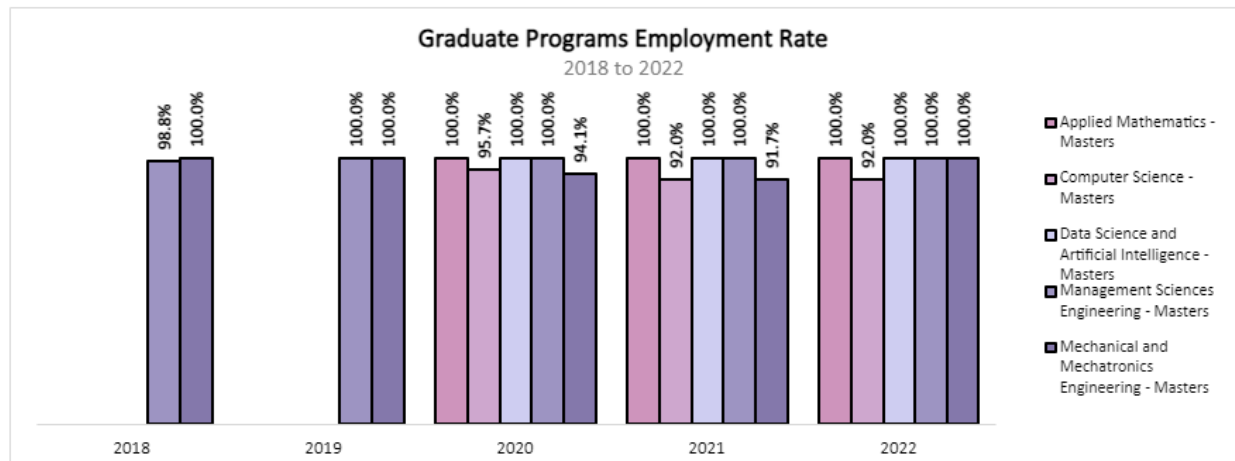
Employment rates in 2020 and 2021 were heavily impacted by the Covid-19 pandemic, the included undergraduate co-op programs in Engineering averaged an employment rate of 96.6% over the reporting period, representing more than 30,000 employed work terms. Undergraduate students in Chemical and Mechatronic Engineering programs were slightly less successful from an overall employment perspective than the other listed programs.

Shifting labour markets and economic downturns may indicate that additional focus on supporting these students in their job search by ensuring they access specific workshops and appointments offered by the Centre for Career Development to expand their work search would be beneficial. By searching for jobs both in and outside of WaterlooWorks, Undergraduate and Graduate students would uncover more work opportunities.



Unlike the undergraduate programs, co-op is not a requirement of all M. Eng degrees and students can

switch out of the co-op program, which impacts employment rates. Master's students in existing co-op programs have historically been very successful from an employment perspective, with employment rates often outperforming those at the undergraduate level. M. Eng co-op students are strongly competitive from an employment standpoint due to smaller program sizes, expertise and skills of students, different support models and increased flexibility in work term scheduling contributing to employment rate differences.



Where Students Work

Analysis by industry indicates strong alignment between the skills developed by students in the specific undergraduate Engineering programs and the sectors in which they worked. Computer systems, Architectural/building engineering, software development, universities and motor vehicle manufacturing are the five largest industries by volume of the specified undergraduate Engineering employment. Substantial growth has been observed in the Management, Scientific and Technical Consulting Services industry and its related organizations.

Overall Top 10 NAICS Codes by Employed Count for Comparable Undergraduate Programs from 2018 to 2022

Employer NAICS Code	2018 # Emp. / Rank	2019 # Emp. / Rank	2020 # Emp. / Rank	2021 # Emp. / Rank	2022 # Emp. / Rank	Overall 2018 to 2022	2018 to 2022	Overall Net Change
5415 - Computer Systems Design and Related Services	703 2	686 1	601 1	626 1	679 1	3295		0
5413 - Architectural, Engineering and Related Services	620 2	577 2	444 3	459 3	534 2	2634		0
5112 - Software Publishers	366 3	395 3	375 4	409 4	440 3	1985		0
6113 - Universities	333 4	326 4	498 2	520 2	276 5	1953		-1
3361 - Motor Vehicle Manufacturing	223 5	206 5	245 5	239 5	319 4	1232		1
5416 - Management, Scientific and Technical Consulting Services	164 9	181 6	216 6	210 6	217 6	988		3
5614 - Business Support Services	206 6	161 7	141 8	142 7	122 10	772		-4
3344 - Semiconductor and Other Electronic Component Manufacturing	182 7	133 12	142 7	131 8	166 7	754		0
3342 - Communications Equipment Manufacturing	128 12	143 9	137 9	125 9	111 11	644		1
3363 - Motor Vehicle Parts Manufacturing	165 8	126 14	97 12	124 10	123 9	635		-1

For graduate students, the landscape is slightly different in terms of industries that students are most likely to work in, which could be attributed to the skills and interests of the students in the sample list of programs used for comparison.

Overall Top 10 NAICS Codes by Employed Count for Comparable Graduate Programs from 2018 to 2022

Employer NAICS Code	2018 # Emp. / Rank	2019 # Emp. / Rank	2020 # Emp. / Rank	2021 # Emp. / Rank	2022 # Emp. / Rank	2018 to 2022	2018 to 2022	Overall Net Change
5415 - Computer Systems Design and Related Services	7 4	5 3	10 4	11 3	28 2	61		2
5221 - Depository Credit Intermediation	9 3	11 2	7 6	6 6	8 5	41		-2
5173 - Telecommunications Resellers	47	38	19 2	12 2	7 7	38		40
4451 - Grocery Stores	2 18	1 19	11 3	4 8	18 3	36		15
5241 - Insurance Carriers	4 11	1 19	7 6	7 5	6 8	25		3
9120 - Provincial and Territorial Public Administration	47	1 19	37	8 4	9 4	18		43
3361 - Motor Vehicle Manufacturing	5 5	4 4	37	3 12	6 8	18		-3
5112 - Software Publishers	5 5	2 8	3 9	4 8	4 11	18		-6
5412 - Accounting, Tax Preparation, Bookkeeping and Payroll Services	5 5	38	2 12	2 20	8 5	17		0
6113 - Universities	47	38	8 5	6 6	2 23	16		24

Focusing on industries related to health technologies, CEE analyzed recent co-op hiring data to understand the potential to source relevant employment opportunities for students in this program from

within the existing hiring base. More than 2,500 organizations by NAICS are actively participating in the co-op hiring process in relevant professional, scientific/technical services and health care industries.

UW Data - Count WW Organizations with NAICS Codes	Active
Professional, scientific and technical services	1,979
5415 - Computer Systems Design and Related Services	1,007
5416 - Management, Scientific and Technical Consulting Services	454
5417 - Scientific Research and Development Services	188
5419 - Other Professional, Scientific and Technical Services	330
Health care and social assistance	554
6211 - Offices of Physicians	36
6212 - Offices of Dentists	19
6213 - Offices of Other Health Practitioners	223
6214 - Out-Patient Care Centres	29
6215 - Medical and Diagnostic Laboratories	21
6216 - Home Health Care Services	19
6219 - Other Ambulatory Health Care Services	5
6221 - General Medical and Surgical Hospitals	56
62211 - Paediatric Hospitals	2
6222 - Psychiatric and Substance Abuse Hospitals	3
6223 - Specialty (except Psychiatric and Substance Abuse) Hospitals	7
6231 - Nursing Care Facilities	17
6232 - Residential Developmental Handicap, Mental Health and Substance Abuse Facilities	17
6233 - Community Care Facilities for the Elderly	15
6239 - Other Residential Care Facilities	13
6241 - Individual and Family Services	56
6242 - Community Food and Housing, and Emergency and Other Relief Services	12
6243 - Vocational Rehabilitation Services	4
Overall Total	2,533

Specifically, within the Healthcare industry, by volume of students hired, the 10 largest organizations have accounted for 377 work terms since 2019 (587 hires by all organizations in these NAICS).

Organization Name	Top 10 Organizations by Work Terms (2019 to 2023)
University Health Network	107
Unity Health Toronto	87
The Hospital for Sick Children	60
Sunnybrook Health Sciences Centre	31
Swift Medical Inc	18
Scispot.io	16
Centre For Addiction and Mental Health	13
William Osler Health System	12
Grand River Hospital	9
London Health Sciences Centre	8
Mount Sinai Hospital	8
Mackenzie Health	8
Grand Total	377

Some of the most common job titles held by students in these positions include: Project Coordinator, Research Assistant, QA Tester, Special Project Engineering Assistant, Software Engineering and Software Developer.

Overall co-op hiring has grown in these industries since 2019, with recent hiring peaking in 2022.

UW Hiring Data (All Students)	2019	2020	2021	2022	2023	Trend 2019 to 2023	Net Growth/Decline
Professional, scientific and technical services	3,125	2,690	3,489	3,714	3,421		796
5415 - Computer systems design and related services	2,080	1,697	2,098	2,185	1,910		-150
5416 - Management, scientific and technical consulting services	621	684	815	858	787		166
5417 - Scientific research and development services	234	213	342	399	383		149
5419 - Other professional, scientific and technical services	210	146	234	262	341		131
Health care and social assistance	787	779	942	1,140	1,130		343
6211 - Offices of physicians	14	10	40	58	78		64
6212 - Offices of dentists	2	10	12	17	18		16
6213 - Offices of other health practitioners	156	175	243	256	298		142
6214 - Out-patient care centres	69	78	44	60	50		-19
6215 - Medical and diagnostic laboratories	28	34	43	51	41		13
6216 - Home health care services	21	26	36	19	25		4
6219 - Other ambulatory health care services	6	4	2	2	4		-2
6221 - General medical and surgical hospitals	310	283	310	453	351		41
62211 - Paediatric Hospitals	44	33	42	31	46		2
6222 - Psychiatric and substance use hospitals	8	1	3	3	3		5
6223 - Specialty hospitals (except psychiatric and substance use)	19	16	18	11	21		2
6231 - Nursing care facilities	28	20	27	26	48		20
6232 - Residential facilities for persons with an intellectual or developmental disability, a mental health or substance use condition	43	58	63	75	72		29
6233 - Community care facilities for the elderly	11	18	24	22	17		6
6239 - Other residential care facilities	2	8	6	4	4		2
6241 - Individual and family services	21	3	19	42	45		24
6242 - Community food and housing, and emergency and other relief services	2	4	2	4	2		0
6243 - Vocational rehabilitation services	3	3	8	6	7		4

Hiring of Engineering students, specifically within the health care and social assistance NAICS have remained relatively flat, indicating opportunities to enhance and promote these roles to students in Engineering as well as to further promote the skills and knowledge of health technologies students to these organizations.

UW Hiring Data (Eng Only)	2019	2020	2021	2022	2023	Trend 2019 to 2023	Net Growth/Decline
Professional, scientific and technical services	1,448	1,364	1,510	1,710	1,537		89
5415 - Computer systems design and related services	978	874	918	1,036	865		-111
5416 - Management, scientific and technical consulting services	263	323	343	354	319		56
5417 - Scientific research and development services	96	105	147	198	185		89
5419 - Other professional, scientific and technical services	111	64	102	122	168		57
Health care and social assistance	115	110	90	156	114		-1
6211 - Offices of physicians		2	3	7	10		10
6212 - Offices of dentists				2	2		2
6213 - Offices of other health practitioners	14	10	10	6	4		-10
6214 - Out-patient care centres	10	10	1	6	2		-8
6215 - Medical and diagnostic laboratories	5	11	9	19	11		6
6216 - Home health care services	3	3	4	2			-3
6219 - Other ambulatory health care services	3				1		-2
6221 - General medical and surgical hospitals	54	60	49	99	67		13
62211 - Paediatric Hospitals	23	13	10	8	11		-12
6222 - Psychiatric and substance use hospitals	1						-1
6223 - Specialty hospitals (except psychiatric and substance use)			2	2	2		2
6231 - Nursing care facilities					1		1
6232 - Residential facilities for persons with an intellectual or developmental disability, a mental health or substance use condition	1			1			-1
6233 - Community care facilities for the elderly		1	2				0
6239 - Other residential care facilities							0
6241 - Individual and family services	1			4	3		2
6242 - Community food and housing, and emergency and other relief services							0
6243 - Vocational rehabilitation services							0

Analysis of the relevant occupation codes (NOCS) that Health Technologies are well suited to pursue indicate ongoing overall growth, but also indicate a need for further exploration on ways to increase Engineering student participation in these occupations.

UW Hiring Data (All Students)	2019	2020	2021	2022	2023	Trend 2019 to 2023	Net Growth/Decline
1122 – Professional occupations in business management consulting	1543	1445	1923	1899	1793		250
1211 – Court reporters, transcriptionists, records management technicians and statistical officers	45	47	66	62	72		27
2147 – Computer engineers (except software engineers and designers)	851	680	646	932	775		-76
2171 – Information systems analysts and consultants	820	643	776	807	764		-56
2172 – Database analysts and data administrators	395	472	589	656	657		262
2174 – Computer programmers and interactive media developers	774	709	726	744	678		-96
2211 – Chemical technologists and technicians	87	65	54	83	89		2
2281 – Computer network technicians	44	34	16	27	37		-7
4165 – Health policy researchers, consultants and program officers	60	43	78	69	75		15

UW Hiring Data (Eng Only)	2019	2020	2021	2022	2023	Trend 2019 to 2023	Net Growth/Decline
1122 – Professional occupations in business management consulting	348	422	468	459	418		70
1211 – Court reporters, transcriptionists, records management technicians and statistical officers	13	9	11	9	9		-4
2147 – Computer engineers (except software engineers and designers)	494	424	368	518	417		-77
2171 – Information systems analysts and consultants	307	280	303	324	328		21
2172 – Database analysts and data administrators	106	160	142	188	174		68
2174 – Computer programmers and interactive media developers	379	366	307	322	276		-103
2211 – Chemical technologists and technicians	38	36	28	45	40		2
2281 – Computer network technicians	20	17	6	14	24		4
4165 – Health policy researchers, consultants and program officers	3	1	2	0	11		8

As well as analyzing the current co-op landscape pertaining to relevant graduate and undergraduate co-op programs as a proxy for the upcoming Health Technologies program, CEE also analyzed external labour market data to understand relevant industry trends and business development opportunities to support co-op program growth.

[Statistics Canada Labour Force data](#) shows growth from 2019 to 2023 in terms of the number of people employed in the Professional, scientific, and technical services and the health care and social assistance industries.

NAICS Data (Canada)

NAICS Sector	2019	2020	2021	2022	2023	Trend 2019 to 2023	Net Growth/Decline
Professional, scientific and technical services [54]	1,343,400	1,358,900	1,470,200	1,581,900	1,645,500		302,100
Health care and social assistance [82]	1,937,900	1,908,000	1,982,300	2,061,900	2,131,000		193,100

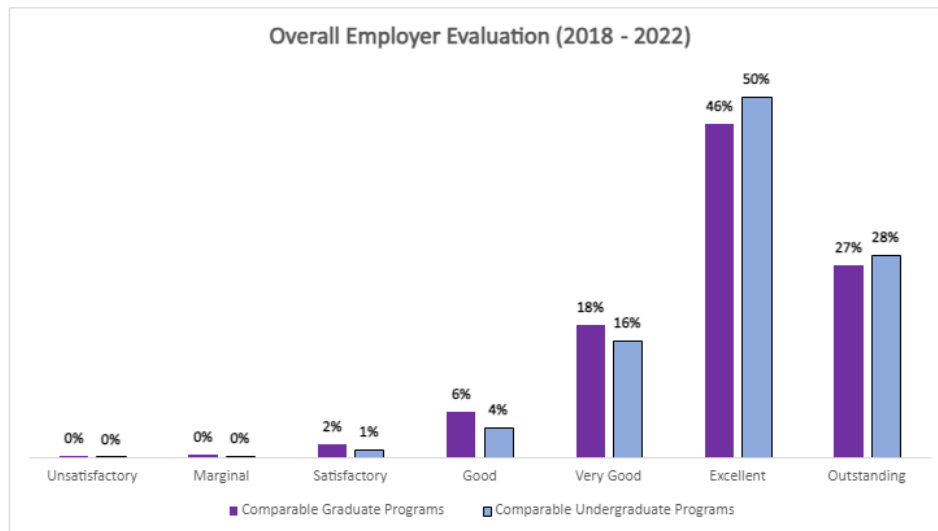
Similarly, growth in the [number of Canadians working](#) in occupations relevant to health technologies have also continued to grow over this time period.

NOCs Data

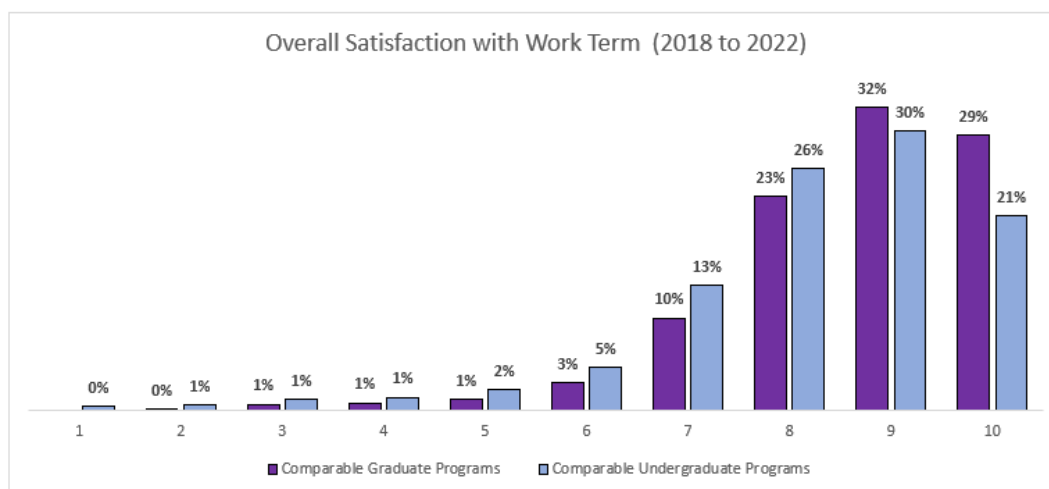
NOC	2019	2020	2021	2022	2023	Trend 2019 to 2023	Net Growth/Decline
Professional occupations in business [112]	334,500	365,900	398,700	421,600	429,700		95,200
Administrative and financial supervisors and specialized administrative occupations [12]	530,200	526,300	596,700	601,100	654,900		124,700
Professional occupations in applied sciences (except engineering) [212]	586,000	660,900	733,200	791,900	778,000		192,000
Professional occupations in engineering [213]	236,700	232,400	265,000	275,100	277,900		41,200
Technical occupations related to natural and applied sciences [22]	533,400	541,700	512,400	544,400	543,700		10,300
Health treating and consultation services professionals [311]	196,100	204,300	208,700	206,300	203,900		7,800
Therapy and assessment professionals [312]	67,200	71,800	71,800	71,800	84,300		17,100
Technical occupations in health [32]	257,200	263,700	270,900	283,200	301,900		44,700
Professional occupations in government services [414]	190,900	189,400	224,000	235,300	250,000		59,100

Student Experience

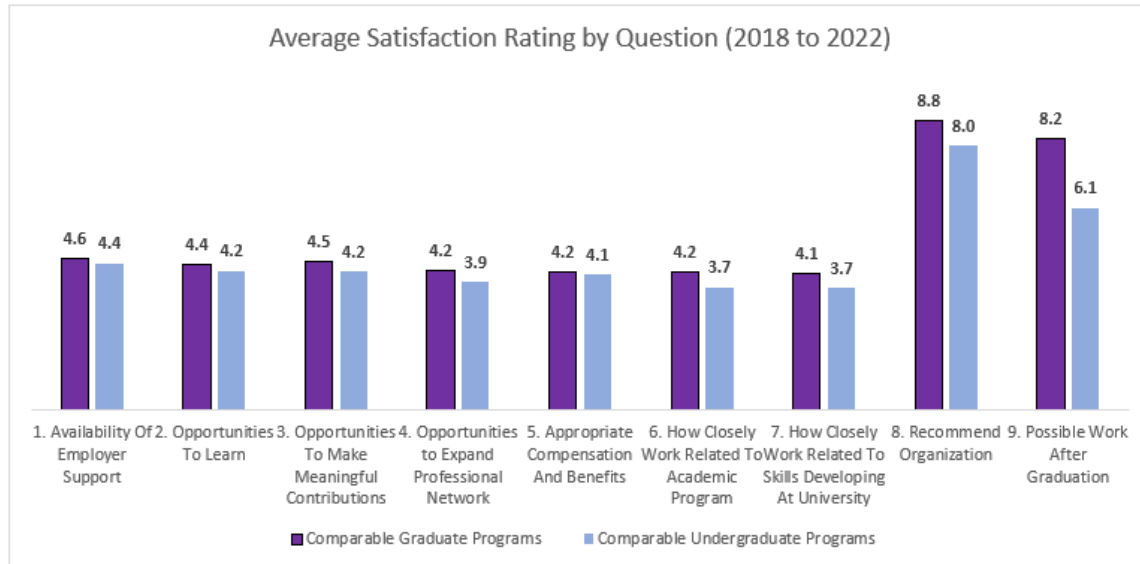
Analysis of evaluation data for comparable co-op programs reveals that undergraduate and graduate students received similar, strong overall evaluation ratings from their employers. The percentage of undergraduate students in comparable programs who received a 'Very Good' to 'Outstanding' rating was slightly higher than that of graduate co-op students (95% vs 92%).



Graduate students do appear to be more satisfied with their work term experiences compared to undergraduate students in comparable programs, with 84% of students rating their overall satisfaction an '8' or above, compared to 76% of undergraduate students (the undergraduate average is on par with the overall distribution for all students over this timeframe). This may indicate that students in graduate co-op programs are more likely to find employment in jobs that strongly align with their expectations.



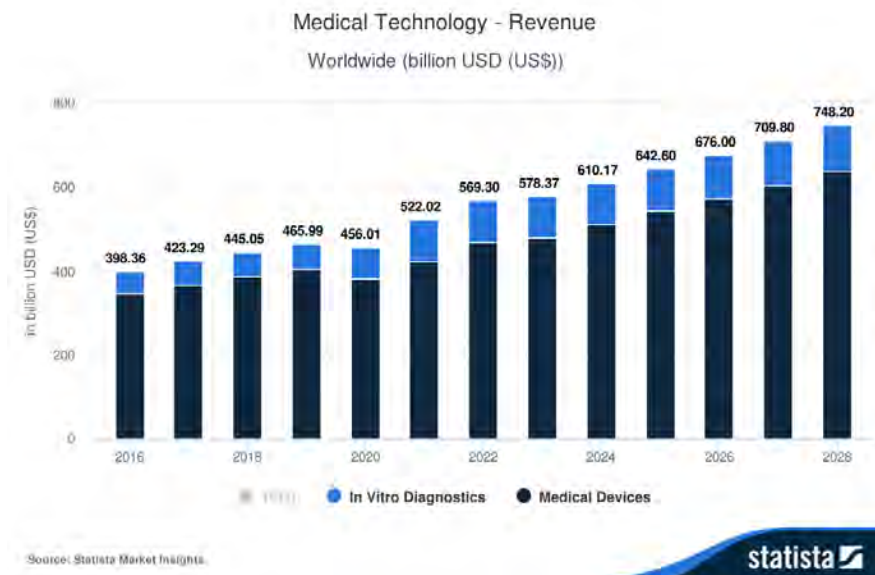
Graduate students also rate their overall average satisfaction on each of the individual work term attributes slightly higher than undergraduate students in comparable programs. Graduate co-op students are significantly more likely to rate the possibility of working with their employer post-graduation higher than undergraduate students. This may be indicative of a different employment approach or strategy by the organizations hiring graduate co-op students and the fact that these students are closer to program completion.



External Industry Projections

To understand the outlook of the medical and health technologies market, CEE analyzed industry projections conducted by Statista, which project continued growth out to 2028.

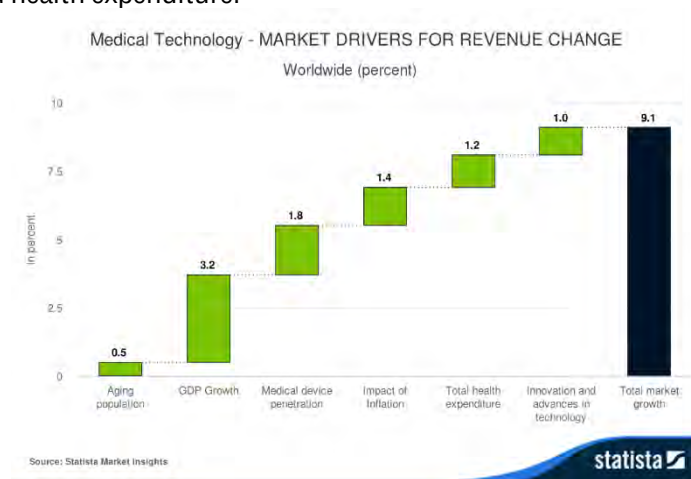
Medical Technology – The Medical Technology market, which encompasses various markets, including Medical Devices, is anticipated to witness significant revenue growth in the coming years. By 2024, the market is projected to reach a staggering US\$610.20bn worldwide.



Among these markets, Medical Devices are expected to dominate, with a projected market volume of US\$511.20bn by 2024. Furthermore, the Medical Technology market is expected to demonstrate a steady annual growth rate of 5.23% from 2024 to 2028.

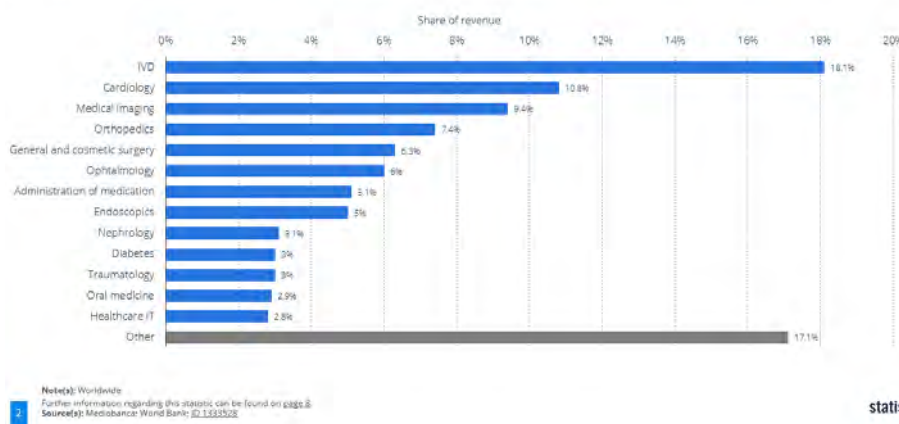
As a result, the market volume is estimated to reach US\$748.20bn by 2028. In terms of global comparison, the United States is poised to generate the highest revenue in the Medical Technology market.

This growth is expected to be driven by overall GDP growth, increased device penetration globally, inflation and increased health expenditure.



In 2021, the medical technology industry generated revenue of approximately C\$793 billion. [The below statistic](#) shows how global MedTech revenue was distributed across categories of different products. According to the data, in-vitro diagnostics generated 18.1 percent of the total MedTech revenue, while medical devices represented the remaining 81.9 percent of it. Among medical devices, the most important category was that of devices related to cardiology, which accounted for 10.8 percent of the total revenue of this industry.

Distribution of the global revenue of medical technology industry in 2021, by category
Distribution of global revenue of MedTech industry 2021, by category

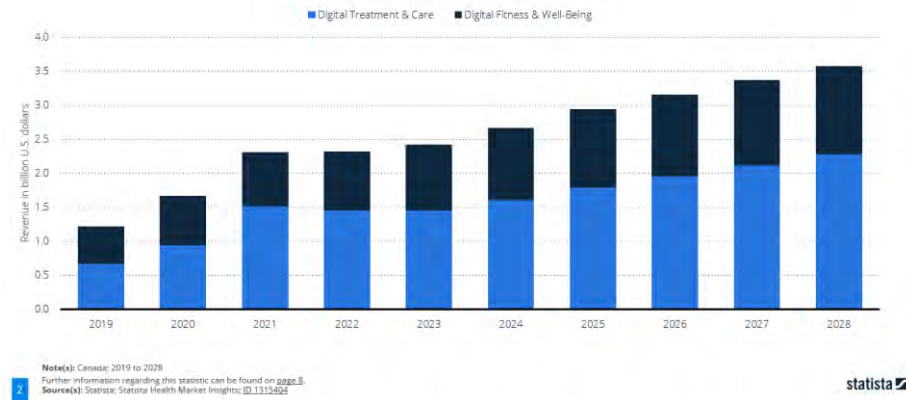


Digital Health in Canada

In 2022, the digital health market in Canada was forecast to reach revenues of approximately 2.4 billion U.S. dollars. This would represent a nine percent growth from the preceding year. When broken down, this market was projected to be made up of revenues of 1.4 billion U.S. dollars in the eHealth segment and 970 million U.S. dollars from the digital fitness and well-being division. The eHealth segment within digital health encompasses such things as doctor consultations which take place via technologies (such as video or online) rather than in-person, and devices that track the health metrics of a person.

Annual revenue of the digital health market in Canada from 2019 to 2028, by segment (in billion U.S. dollars)

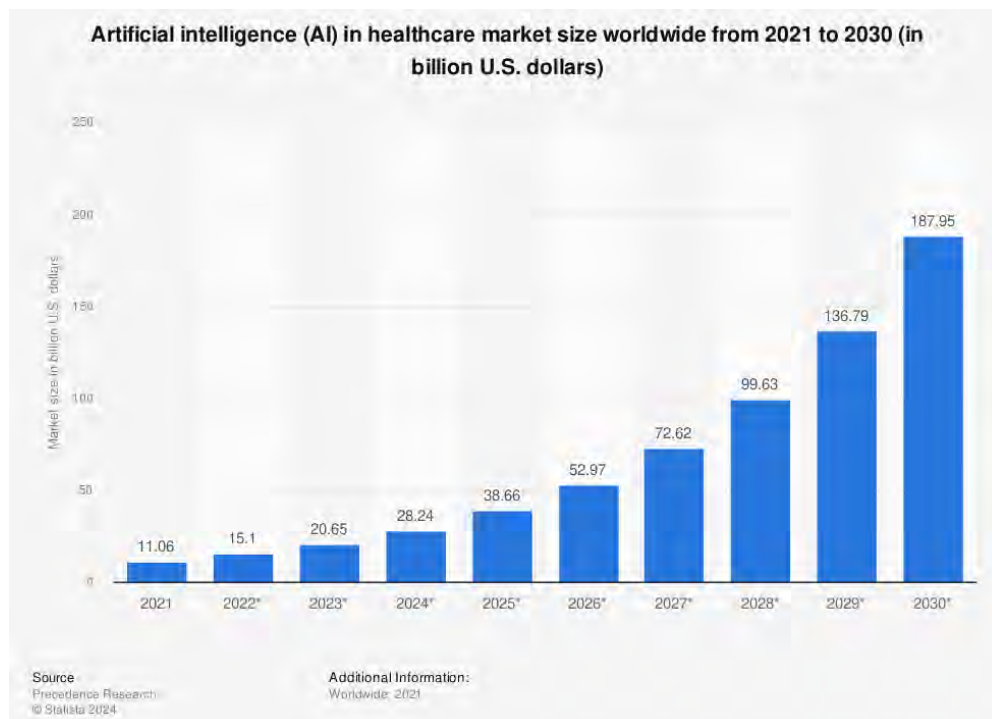
Digital health market revenue in Canada 2019-2028, by segment



Uses of AI in healthcare

As of 2021, around a fifth of healthcare organizations worldwide, which were surveyed, indicated they were in an early stage of adoption in regard to AI models. This meant that their models had been in production for less than two years. Fewer than ten percent of healthcare organizations had been utilizing AI for more than five years. The most common type of AI software in use in healthcare was functions related to healthcare data integration and natural language processing (NLP). The main intended users of AI among organizations in the mature stage of adoption were clinicians and providers, although 60 percent also reported that patients should be able to use the AI technologies implemented.

In 2021, the artificial intelligence (AI) in healthcare market was worth around 11 billion U.S. dollars worldwide. It was forecast that the global healthcare AI market would be worth almost 188 billion U.S. dollars by 2030, increasing at a compound annual growth rate of 37 percent from 2022 to 2030.



Labour Force Analysis

[Employment and Social Development Canada](#) (ESDC) uses the [Canadian Occupational Projection System](#) (COPS) and the [National Occupational Classification](#) (NOC, 2016 version) to identify occupations that may face labour shortage or labour surplus conditions over the projection period. The latest projections cover the 2022 to 2031 period. Their analysis of occupations expected to align with the Health Technologies program indicates:

[Computer and information system managers](#) – **SHORTAGE:** Over the period 2022-2031, the number of job openings (arising from expansion demand and replacement demand) are expected to total **42,600**, while the number of job seekers (arising from school leavers, immigration and mobility) is expected to total **53,400**.

This gap is not considered statistically significant, which means the number of job openings and seekers is projected to be similar over the 2022-2031 period. As such, the labour shortage conditions seen in recent years will not clear and are expected to persist over the projection period. Job openings are expected to arise equally from employment growth and retirements.

[Health information management occupations](#) – **BALANCE:** Over the period 2022-2031, the number of job openings (arising from expansion demand and replacement demand) are expected to total 10,500, while the number of job seekers (arising from school leavers, immigration, and mobility) is expected to total 10,600.

As job openings and job seekers are projected to be at relatively similar levels over the 2022-2031 period, the balance between labour supply and demand seen in recent years is expected to continue over the projection period.

[Software engineers and designers](#) – **SHORTAGE:** Over the period 2022-2031, the number of job openings (arising from expansion demand and replacement demand) for Software engineers and designers are expected to total 44,300, while the number of job seekers (arising from school leavers, immigration and mobility) is expected to total 48,800.

This gap is not considered statistically significant, which means the number of job openings and seekers is projected to be similar over the 2022-2031 period. As such, the labour shortage conditions seen in recent years will not clear and are expected to persist over the projection period. Employment is projected to grow at a significantly higher rate than the average of all occupations. As a result, job creation will represent around 68% of all openings, a proportion that is substantially above the average of all occupations (about 37% of openings). Most of these workers are employed in the computer systems design and related services industry; in telecommunications, information, and culture services; as well as in finance, insurance, real estate, and leasing services. Computer systems design will continue to outperform most industries in terms of production and employment growth, as demand is expected to be supported by technological changes. Demand for workers in this occupation will continue to be driven by the need for businesses and governments to upgrade their ICT systems to keep up with the most recent technologies and remain competitive.

Strategic Planning at UWaterloo

Part of the “Waterloo at 100” strategic plan includes [Global Futures](#), which focuses on what lies ahead for humanity and the planet and inspires collaborative and interdisciplinary approaches in educational programs, research, and innovation activities. Under Global Futures are specific calls to action regarding [Health Futures](#). As a result of these initiatives, we will be seeking to make connections with the Health Futures council to work alongside them, leverage partnerships and develop co-op opportunities for students.

Employer and Employment Relations Feedback

CEE reached out to selected, relevant employers as well as UWaterloo faculty members who have established connections to the health tech sector, by introducing the proposed program and soliciting feedback on the level of interest in future Health Technologies program students.

No faculty members and only one employer provided feedback at this time, therefore, more engagement both within Waterloo and outside of Waterloo will be necessary to identify new connections as well as those that already exist so that we can build a robust employment market for these students.

Employer Feedback

Employers were asked the same eight questions and one responded; their answers are listed below. Overall, the interest in the Health Technologies program seems to be positive, however, the employer noted that they are more interested in health sciences skills rather than engineering or business skills. It will be prudent for students in this program to focus on honing their specialized health sciences skills and to ensure they are able to differentiate themselves from other Engineering students.

Employer Survey Questions and Response from One Employer

1. Based on the introduction to the program provided, would you be interested in hiring co-op students from this program? (why or why not)

Possibly from the Electrical & Computer or Systems Design programs. We have had good bioinformatics undergraduate co-op students from both CS and Systems Design Engineering in the past. I would not be interested in students from the Chemical, Management Science, or Mechanical & Mechatronics programs.

2. What additional information about this program would be helpful for you to know?

Since Health Informatics is listed as an Area of Employment Interest, I would want to know what background the students have in the health sciences as opposed to engineering.

3. What specific skills would you expect students in this program to have?

Exceptional computer programming and scripting skills, experience with high-performance (i.e., cluster) computing and/or cloud computing, proficiency in scripting language (Python), advanced statistical analysis (likely proficiency in R/Bioconductor). These are more skills I would LIKE them to have, rather than EXPECT them to have, though.

4. Are there specific roles or job titles that you feel would be a good fit for Health Technologies co-op student within your organization?

Bioinformatician would be the most likely fit, or Programmer/Analyst. Not interested in business skills.

5. Which term(s) would you be most interested in hiring co-op students from this program? (Fall, Winter, Spring)

Any or all, we hire students continuously. The schedule above says only Spring or Fall though. The program might be more attractive if students were also available in Winter.

6. What length of time would you prefer to hire these co-op students for? (4, 8, 12 months)

8 months has usually worked well for us. 12 seems like too long a commitment, whereas 4 is often just enough time to bring a student up to speed. That works out well if they are returning, so if the intent is to have multiple terms, then 4-month terms would be ok if the student returns.

7. Is there anything else you'd like to add regarding the potential addition of the Bachelor of Business and Applied Science co-op program at the University of Waterloo?

I don't really understand the need to include the business part in here. There is an undergraduate Science & Business co-op program and I have never been impressed with the skills that these students have (and have rarely interviewed them).

8. Finally, do you have any suggestions on how Co-operative and Experiential Education at the University of Waterloo could better engage companies in your industry/sector?

You're doing a great job with us. Not sure if hitting the Toronto teaching hospitals (i.e., TAHSN network) at a higher level might get you more traction than interacting with individual institutions.

UWaterloo Employment Relations Team Feedback

The Employment Relations team within CEE was consulted and provided feedback on interactions they've had with other co-op employers as well as changes they've noticed in hiring patterns and in the current labour market.

The Employment Relations team stated that although there is demand for these kinds of specialized skillsets, this is a relatively new area of employment that is still developing, particularly in the private sector. As a result, competition between the faculties of Health and Engineering as well as competition with other universities in Ontario and Quebec suggests that students will need to engage early and often in their job search with a strong sense of independence. Employers have shared that the work in this sector does not lend itself to 4-month work terms since the responsibilities are complex and project-based and there is a strong interest to hire students for longer, 8-month work terms.

Students should also be aware that pay rates may not be as attractive as in the traditional "tech" sector. They should be encouraged to plan accordingly for remuneration to be more modest than in the tech sector.

GradWIL Pilot

Building on Waterloo's tradition and strength in experiential learning, students in graduate programs are encouraged to think beyond the classroom through engagement in work-integrated learning (WIL) opportunities. WIL provides students with crucial professional development, networking, funding, and opportunities to build skills for transition to the workforce. Through a partnership between Graduate Studies and Postdoctoral Affairs (GSPA) and Co-operative and Experiential Education (CEE), which began in 2020, the university continues to further develop graduate WIL opportunities.

Co-op is in the midst of a Graduate Work Integrated Learning pilot and in 2024 will be proposing an enhanced student support model and new program requirements for graduate students. It will leverage existing resources and infrastructure and provide customized resources and supports for programs and students. MEng programs and students involved in pilots are providing feedback and input to these changes.

Currently, the project team is also in the process of consulting with the campus community, including students, faculty, staff and senior leadership, to gather feedback on proposed models of grad WIL.

Conclusion

External industry data projects that the medical/health technologies sector will continue to grow over the next five years, driven by increases in automation, artificial intelligence, and research. This appears to

position the Health Technologies program well to address this market's needs, however, Health Technologies students will need to engage early and often in their job search with a strong sense of independence. These students will need to have clarity about their sense of purpose and their intended contributions to the sector so that CEE can support them in their job search. The planned student support model that has emerged from the GradWIL pilots will provide students with resources, programming, and advising to enable meaningful engagement with the health technologies sector.

The health technologies sector has not been an area of specific focus of opportunity development for CEE. The Health Technologies program will need engagement from those leading in Health Futures (researchers, faculty members and staff) so that relationships can be built in the sector to create opportunities for work terms and other WIL experiences for the M. Eng Health Technologies program.

CEE will leverage relationships with health-related organizations to identify potential health technology jobs, noting that historically, co-op hiring has been focused on patient care and research. To date, relatively few Engineering students are employed in health-related organizations, presenting both a challenge and opportunity for CEE and Waterloo to further investigate opportunities that would align with the skills students in the Health Technologies program would acquire.

CEE, the program, Health Futures researchers, faculty, staff, and students will need to partner to develop a plan to build a robust market of jobs for Health Technologies co-op students.

FACULTY OF ENVIRONMENT - GRADUATE STUDIES COMMITTEE

REPORT TO SENATE GRADUATE & RESEARCH COUNCIL

January 2025 (Major Modifications)

1. Program/Course Changes

- a. PhD Planning (Water) - The School of Planning is joining the Collaborative Water Program (CWP) and is thus adding a Doctor of Philosophy (PhD) in Planning - Water program.
- b. GEOG Redesign (MA, MES, MSc, PhD):
 - i. Program Updates – removing joint program wording, changing course requirements and changing electives wording
 - MA in GEOG
 - MES in GEOG
 - MSc in GEOG
 - PhD in GEOG
- c. MES in Sustainability Management – Adding coursework study option

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: Doctor of Philosophy (PhD) in Planning - Water

Program contact name(s): Jeremy Pittman

Form completed by: Jeremy Pittman

Description of proposed changes:

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

The School of Planning is joining the Collaborative Water Program (CWP) and is thus adding a Doctor of Philosophy (PhD) in Planning - Water program.

Is this a [major modification](#) to the program? Yes

Rationale for change(s):

The School of Planning is joining the Collaborative Water Program (CWP) to expand relevant program offerings available to our students. The CWP will add a foundational education in water from an interdisciplinary perspective to the PhD in Planning. The CWP will provide graduate students with water-related problems to solve in interdisciplinary teams. The addition of the CWP to PhD in Planning is intended to enhance their studies to support students understanding how their discipline applies to water-related issues. Joining the CWP will allow current and future students studying water-related issues to gain knowledge and support from CWP courses and advisors. Several students have already expressed interest in the program.

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#/programs?group=Planning>

Current PhD in Planning Graduate Studies Academic Calendar content:	Proposed PhD in Planning - Water Graduate Studies Academic Calendar content:
Doctor of Philosophy (PhD) in Planning Admit term(s) Fall Delivery mode	Doctor of Philosophy (PhD) in Planning - <u>Water</u> Admit term(s) Fall

Current PhD in Planning Graduate Studies Academic Calendar content:	Proposed PhD in Planning - Water Graduate Studies Academic Calendar content:
- On-campus Registration option(s) - Full-time - Part-time Study option(s) - Thesis Length of program - Full-time: 12 terms (48 months) - Part-time: 18 terms (72 months) Graduate research fields - Human and Built Environment - Physical/Natural Environment Admission requirements: Minimum requirements - A master's degree with excellent standing (minimum 80%) from a recognized university. Evidence of ability to pursue independent research is essential. - English language proficiency (ELP) (if applicable) Admission requirements: Application materials - Résumé - Supplementary information form - Transcript(s) - Two official academic transcripts from each post-secondary institution. - Writing sample - At least one substantial example of work completed during the last two years of academic study. Students with professional experience may submit a professional report of which they were sole or senior author. Admission requirements: References - Number of references: 3 - Type of references: at least 2 academic Degree requirements - Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM). Course requirements - Students must complete the following graduate level courses (in the following sequence): - Fall (year 1):	Delivery mode - On-campus Registration option(s) - Full-time - Part-time <u>Program type(s)</u> <u>Collaborative</u> Study option(s) - Thesis Length of program - Full-time: 12 terms (48 months) - Part-time: 18 terms (72 months) ~~Graduate research fields~~ ~~Human and Built Environment~~ ~~Physical/Natural Environment~~ Admission requirements: Minimum requirements - A master's degree with excellent standing (minimum 80%) from a recognized university. Evidence of ability to pursue independent research is essential. - English language proficiency (ELP) (if applicable) Admission requirements: Application materials - Résumé - Supplementary information form - Transcript(s) - Two official academic transcripts from each post-secondary institution. - Writing sample - At least one substantial example of work completed during the last two years of academic study. Students with professional experience may submit a professional report of which they were sole or senior author. Admission requirements: References - Number of references: 3 - Type of references: at least 2 academic Degree requirements - Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).

Current PhD in Planning Graduate Studies Academic Calendar content:	Proposed PhD in Planning - Water Graduate Studies Academic Calendar content:
▪ PLAN 700 Planning Paradigms and Theory (0.5 unit) ▪ PLAN 801 Foundations of Planning Scholarship (0.5 unit) ▪ PLAN 800A PhD Colloquium 1 (0.0 unit, credit/no credit, held with PLAN 800C) - o Winter (year 1): ▪ PLAN 802 Advanced Planning Theory (0.5 unit) ▪ PLAN 800B PhD Colloquium 2 (0.0 unit, credit/no credit, held with PLAN 800D) - o Spring (year 1): ▪ PLAN 803 Advanced Research Design in Planning (0.5 unit) - o Fall (year 2): ▪ PLAN 800C PhD Colloquium 3 (0.0 unit, credit/no credit, held with PLAN 800A) - o Winter (year 2): ▪ PLAN 800D PhD Colloquium 4 (0.0 unit, credit/no credit, held with PLAN 800B) - o Students must take 1 additional PLAN elective in Year 1 and may be directed take up to 2 additional one-term graduate level courses by the supervisory committee. Milestone requirements PhD Comprehensive Examination • Students are required to meet the University-level PhD Comprehensive Examination minimum requirements. • Further details are available from the School of Planning website. PhD Research Plan • Students must complete a research plan approved by the supervisory committee by the completion of 2nd year. PhD Thesis • A PhD thesis in planning constitutes original scholarship and an innovative contribution to knowledge in planning and related fields. The thesis must demonstrate familiarity with existing work in the field and show ability to design an approach, conduct rigorous and advanced research, present findings and results, and defend conclusions in a scholarly manner. As well, the thesis must clearly demonstrate how it advances knowledge in a	Course requirements • Students must complete the following graduate level courses (in the following sequence): - o <u>Water core courses (note: students should consult the schedule of classes to determine when the WATER courses are offered):</u> ▪ <u>WATER 601 Integrated Water Management</u> ▪ <u>WATER 602 Integrated Water Management Project</u> - o Fall (year 1): ▪ PLAN 700 Planning Paradigms and Theory (0.5 unit) ▪ PLAN 801 Foundations of Planning Scholarship (0.5 unit) ▪ PLAN 800A PhD Colloquium 1 (0.0 unit, credit/no credit, held with PLAN 800C) - o Winter (year 1): ▪ PLAN 802 Advanced Planning Theory (0.5 unit) ▪ PLAN 800B PhD Colloquium 2 (0.0 unit, credit/no credit, held with PLAN 800D) - o Spring (year 1): ▪ PLAN 803 Advanced Research Design in Planning (0.5 unit) - o Fall (year 2): ▪ PLAN 800C PhD Colloquium 3 (0.0 unit, credit/no credit, held with PLAN 800A) - o Winter (year 2): ▪ PLAN 800D PhD Colloquium 4 (0.0 unit, credit/no credit, held with PLAN 800B) - o Students must take 1 additional PLAN elective in Year 1 and may be directed take up to 2 additional one-term graduate level courses by the supervisory committee. - o <u>This degree is offered through the Collaborative Water Program. This program, jointly offered by a range of departments/schools across several academic faculties, promotes the development of interdisciplinary perspectives on water. Collaborative Water Program students complete their specialist training in their respective home departments, while working with colleagues from a variety of other departments/schools in core</u>

Current PhD in Planning Graduate Studies Academic Calendar content:	Proposed PhD in Planning - Water Graduate Studies Academic Calendar content:
chosen area of study within planning. A PhD thesis in planning must be written in compliance with the requirements outlined in the "Thesis" section of the Graduate Studies and Postdoctoral Affairs site (which includes detailed information regarding thesis exam regulations, formatting, editing, copyright, submission, etc.).	<u>interdisciplinary courses (WATER 601 and WATER 602).</u> - o <u>Students who have already completed WATER 601 and WATER 602 as part of their Masters Water degree, must complete the following course requirement:</u> ▪ <u>1 graduate level water course from outside the student's home Faculty agreed to by the student's Supervisor and the Collaborative Water Program Director.</u> Milestone requirements <u>Collaborative Research Seminar I</u> • <u>Students are required to present a seminar on their thesis or major paper research proposal and, if appropriate, early stage results to current and past Water students and Water Institute faculty members. Seminars will normally occur following the completion of WATER 601 and WATER 602. Seminars will provide the opportunity for students to discuss how learnings from Water courses were applied in, or influenced, research proposals or research work in the student's home department/school. Seminars will normally be poster presentations at Water Institute organized events. The seminar is not an oral examination of the thesis or paper; rather, its purpose is to develop the student's ability to communicate their research in an organized and informative manner.</u> <u>Collaborative Research Seminar II</u> • <u>Students who have completed the Collaborative Research Seminar 1 as part of their Masters Water degree, must complete the Collaborative Research Seminar 2.</u> • <u>Students are required to present a seminar on their PhD thesis proposal to current and past water students and Water Institute faculty members. Seminars will normally occur following the completion of required courses and the comprehensive exam. Seminars should present how learnings from the Collaborative Water Program were applied in, or influenced, thesis proposals. Seminars will normally be poster presentations or talks at Water Institute organized events. The seminar is not an oral examination of the thesis</u>

Current PhD in Planning Graduate Studies Academic Calendar content:	Proposed PhD in Planning - Water Graduate Studies Academic Calendar content:
	<u>proposal; rather, its purpose is to develop the student's ability to communicate their research in an organized and informative manner.</u> <u>Collaborative Academic Contribution</u> • <u>Students who have completed the Collaborative Water Program Research Seminar 1 as part of their Masters Water degree, must complete the Collaborative Academic Contribution milestone.</u> • <u>Students are required to make an academic contribution to the Collaborative Water Program. The proposed contribution will be documented by the student and approved by the student's Supervisor and the Collaborative Water Program Director. Potential contributions may include, but not be limited to:</u> - o <u>Development of new or improved curricula or course content;</u> - o <u>Delivery of a lecture(s);</u> - o <u>Preparation of a publication;</u> - o <u>Preparation of a case study;</u> - o <u>Mentorship of a group of students.</u> PhD Comprehensive Examination • Students are required to meet the University-level PhD Comprehensive Examination minimum requirements. • Further details are available from the School of Planning website. PhD Research Plan • Students must complete a research plan approved by the supervisory committee by the completion of 2nd year. PhD Thesis • A PhD thesis in planning constitutes original scholarship and an innovative contribution to knowledge in planning and related fields. The thesis must demonstrate familiarity with existing work in the field and show ability to design an approach, conduct rigorous and advanced research, present findings and results, and defend conclusions in a scholarly manner. As well, the thesis must clearly demonstrate how it advances knowledge in a chosen area of study within planning <u>and related to water</u>. A PhD thesis in planning must be written in compliance with the requirements outlined in the "Thesis" section of the Graduate Studies and Postdoctoral Affairs site (which includes detailed information regarding thesis

Current PhD in Planning Graduate Studies Academic Calendar content:	Proposed PhD in Planning - Water Graduate Studies Academic Calendar content:
	exam regulations, formatting, editing, copyright, submission, etc.).

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

Students currently registered in the PhD in Planning program will have the option to transfer/program change into the equivalent PhD in Planning - Water program.

Department/School approval date (09/13/2024):
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/03/24
Faculty approval date (mm/dd/yy): 11/14/24
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 Arts (MA) in Geography

Program contact name(s): Maria Strack

Form completed by: Maria Strack

Description of proposed changes:

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

Dissolving the joint program arrangement with Wilfrid Laurier University. Waterloo and Laurier will continue to offer the programs separately. Some of the required courses are also being updated due to the dissolution.

Is this a [major modification](#) to the program? Yes

Rationale for change(s):

The rationale for the creation of the joint Waterloo-Laurier Graduate Program in Geography (W-LGPIG) in 1992 was to capitalise on the relative size of the Geography departments at the two institutions at the time and to provide faculty and students with access to a PhD program. Both departments have grown since that time and in recent years the two programs had grown considerably independent of each other, and institutional priorities and infrastructural frictions challenged the cohesion and operation of the W-LGPIG. During the self-study process for the 2021/22 cyclical academic program review, faculty members of the Joint program at both institutions decided that dissolving the program was the best path forward. As a result, reviewers were asked to weigh in on the implications of this move and the quality of the programs if run independently. The reviewers concluded that both institutions are well suited to hosting excellent Geography independent graduate programs and that students and faculty in both Departments will likely continue to benefit from the positive aspects of the Joint program, such as community, shared research interests, etc.

Problems related to “jointness” of the program had been identified earlier as well. For example, the 2014/15 cyclical academic program review of the joint program included the following recommendation: “It was brought to our attention by the students that there may not exist equal ease of access to facilities at the “other” university. The problem may arise in part from lack of awareness by all students of how access may be secured, in part from lack of awareness on behalf of the UW and WLU administrative structures as to why equal access is important given the nature of this joint-program. We recommend that W-LGPIG investigate and negotiate the resolution to issues of unequal access.” In response to this recommendation, opportunities to overcome this issue were explored, but a complete solution could not be found. The fundamental issue was that students were enrolled at their home institution and this limited their access to programs and facilities at the other institution that fell outside the joint program (e.g., the Collaborative Water Program at Waterloo). This example highlights some of the institutional challenges that contributed to the mutual decision to dissolve the joint program.

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):

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Master of Arts (MA) in Geography Admit term(s) • Fall • Winter Delivery mode • On-campus Registration option(s) • Full-time • Part-time Program type(s) • Joint Study option(s) • Thesis • Master's Research Paper Length of program • Thesis option: ◦ Full-time: limit of six terms ◦ Part-time: limit of twelve terms • Master's Research Paper option: ◦ Full-time: limit of three terms ◦ Part-time: limit of six terms Graduate research fields • Environmental and Resource Management • Geomatics • Human Geography Admission requirements: Minimum requirements • An honours undergraduate degree or equivalent with at least a 75% average. Normally, the undergraduate degree will be in Geography, but applications are welcomed from superior students regardless of background. However, students must demonstrate that they have the necessary background to pursue graduate work in their field of specialization.	Master of Arts (MA) in Geography Admit term(s) • Fall • Winter Delivery mode • On-campus Registration option(s) • Full-time • Part-time Study option(s) • Thesis • Master's Research Paper Length of program • Thesis option: ◦ Full-time: limit of six terms ◦ Part-time: limit of twelve terms • Master's Research Paper option: ◦ Full-time: limit of three terms ◦ Part-time: limit of six terms Graduate research fields • Environmental and Resource Management • Geomatics • Human Geography Admission requirements: Minimum requirements • An honours undergraduate degree or equivalent with at least a 75% average. Normally, the undergraduate degree will be in Geography, but applications are welcomed from superior students regardless of background. However, students must demonstrate that they have the necessary background to pursue graduate work in their field of specialization. • English language proficiency (ELP) (if applicable)

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
- 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: academic references are required unless a professional reference is specified. Degree requirements - Students must complete the course and milestone requirements associated with their chosen study option in addition to the Graduate Academic Integrity Module (Graduate AIM). Thesis option: Course requirements - Complete all of the following - Complete all the following: - GEOG700 - Professional Skills Development for Master's Students (0.50) - Complete 1 of the following: ~~GEOG600 - Foundations in Spatial Data Handling (0.50)~~ - GEOG620 - Foundations in Human Geography (0.50) - GEOG640 - Foundations in Environmental Science (0.50) ~~GEOG660 - Foundations in Resource and Environmental Management (0.50)~~ - Any 2 other GEOG graduate level courses (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take a non-GEOG elective course with approval of the Graduate Officer. Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program.	Admission requirements: Application materials - Résumé - Supplementary information form - Transcript(s) Admission requirements: References - Number of references: 3 - Type of references: academic references are required unless a professional reference is specified. Degree requirements - Students must complete the course and milestone requirements associated with their chosen study option in addition to the Graduate Academic Integrity Module (Graduate AIM). Thesis option: Course requirements - Complete all of the following - Complete all the following: <u>GEOG700A - Geographic Scholarship and Practice 1 - Masters (0.25)</u> <u>GEOG700B - Geographic Scholarship and Practice 2 - Masters (0.25)</u> - Complete 1 of the following: <u>GEOG 604 – Spatial Statistics (0.50)</u> <u>GEOG617 - Applied Statistics in Ecology and Environment (0.50)</u> - GEOG620 - Foundations in Human Geography (0.50) <u>GEOG625 – Qualitative Methods in Geography (0.50)</u> - GEOG640 – <u>Contextualizing Research in Earth System Science (0.50)</u> - Any 2 other GEOG or GEMCC graduate level courses (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take an elective course outside of GEOG or GEMCC with approval of the Graduate Officer. Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
The coursework part of the program is designed to develop advanced understanding of issues relating to environmental studies, and also to provide students with training in additional methods/skills for their thesis research and its defence. Students will normally complete the 4 one-term courses during their first year. Thesis option: Milestone requirements Master's Thesis Proposal - During the first year, students develop a thesis proposal that will be approved by their supervisor and committee, normally before the end of the first year. Master's Thesis - Upon approval of the thesis proposal, students will then proceed to the research and writing of the thesis. Normally, students should complete and defend the thesis within two years of starting the program. Other requirements - If a student wishes to switch from the Thesis option to the Master's Research Paper option or vice versa, the change must be approved by the Graduate Officer. Master's Research Paper option: Course requirements - Complete all of the following - Complete all the following: - GEOG700 - Professional Skills Development for Master's Students (0.50) - Complete 1 of the following: ~~GEOG600 - Foundations in Spatial Data Handling (0.50)~~ - GEOG620 - Foundations in Human Geography (0.50) - GEOG640 - Foundations in Environmental Science (0.50) ~~GEOG660 - Foundations in Resource and Environmental Management (0.50)~~ - Any 4 other GEOG graduate level courses (0.50 unit weight per course)	in the program, which may require that the student withdraw from the program. The coursework part of the program is designed to develop advanced understanding of issues relating to environmental studies, and also to provide students with training in additional methods/skills for their thesis research and its defence. Students will normally complete the 4 one-term courses during their first year. Thesis option: Milestone requirements Master's Thesis Proposal - During the first year, students develop a thesis proposal that will be approved by their supervisor and committee, normally before the end of the first year. Master's Thesis - Upon approval of the thesis proposal, students will then proceed to the research and writing of the thesis. Normally, students should complete and defend the thesis within two years of starting the program. Other requirements - If a student wishes to switch from the Thesis option to the Master's Research Paper option or vice versa, the change must be approved by the Graduate Officer. Master's Research Paper option: Course requirements - Complete all of the following - Complete all the following: - GEOG700A - Geographic Scholarship and Practice 1 - Masters (0.25) - GEOG700B - Geographic Scholarship and Practice 2 - Masters (0.25) - Complete 1 of the following: - GEOG604 - Spatial Statistics (0.50) - GEOG617 - Applied Statistics in Ecology and Environment (0.50)

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
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How will students currently registered in the program be impacted by these changes?

Currently registered students can complete their degrees using the calendar requirements active at the time of their entry into the program. Most will have completed their course requirements prior to the active date for these changes. These calendar changes update the list of required courses, but retain the same number of required courses. Further, students currently registered in the program will already meet these revised course requirements in most cases.

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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 Environmental Studies (MES) in Geography

Program contact name(s): Maria Strack

Form completed by: Maria Strack

Description of proposed changes:

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

Dissolving the joint program arrangement with Wilfrid Laurier University. Waterloo and Laurier will continue to offer the programs separately. Some of the required courses are also being updated due to the dissolution.

Is this a [major modification](#) to the program? Yes

Rationale for change(s):

The rationale for the creation of the joint Waterloo-Laurier Graduate Program in Geography (W-LGPIG) in 1992 was to capitalise on the relative size of the Geography departments at the two institutions at the time and to provide faculty and students with access to a PhD program. Both departments have grown since that time and in recent years the two programs had grown considerably independent of each other, and institutional priorities and infrastructural frictions challenged the cohesion and operation of the W-LGPIG. During the self-study process for the 2021/22 cyclical academic program review, faculty members of the Joint program at both institutions decided that dissolving the program was the best path forward. As a result, reviewers were asked to weigh in on the implications of this move and the quality of the programs if run independently. The reviewers concluded that both institutions are well suited to hosting excellent Geography independent graduate programs and that students and faculty in both Departments will likely continue to benefit from the positive aspects of the Joint program, such as community, shared research interests, etc.

***Problems** related to “jointness” of the program had been identified earlier as well. For example, the 2014/15 cyclical academic program review of the joint program included the following recommendation: “It was brought to our attention by the students that there may not exist equal ease of access to facilities at the “other” university. The problem may arise in part from lack of awareness by all students of how access may be secured, in part from lack of awareness on behalf of the UW and WLU administrative structures as to why equal access is important given the nature of this joint-program. We recommend that W-LGPIG investigate and negotiate the resolution to issues of unequal access.” In response to this recommendation, opportunities to overcome this issue were explored, but a complete solution could not be found. The fundamental issue was that students were enrolled at their home institution and this limited their access to programs and facilities at the other institution that fell outside the joint program (e.g., the Collaborative Water Program at Waterloo). This example highlights some of the institutional challenges that contributed to the mutual decision to dissolve the joint program.*

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):

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Master of Environmental Studies (MES) in Geography Admit term(s) • Fall • Winter Delivery mode • On-campus Registration option(s) • Full-time • Part-time Program type(s) • Joint Study option(s) • Thesis • Master's Research Paper Length of program • Thesis option: ◦ Full-time: limit of six terms ◦ Part-time: limit of twelve terms • Master's Research Paper option: ◦ Full-time: limit of three terms ◦ Part-time: limit of six terms Graduate research fields • Environmental and Resource Management • Environmental Science • Geomatics • Human Geography Admission requirements: Minimum requirements • An honours undergraduate degree or equivalent with at least a 75% average. Normally, the undergraduate degree will be in Geography, but applications are welcomed from superior students regardless of background. However, students must	Master of Environmental Studies (MES) in Geography Admit term(s) • Fall • Winter Delivery mode • On-campus Registration option(s) • Full-time • Part-time Study option(s) • Thesis • Master's Research Paper Length of program • Thesis option: ◦ Full-time: limit of six terms ◦ Part-time: limit of twelve terms • Master's Research Paper option: ◦ Full-time: limit of three terms ◦ Part-time: limit of six terms Graduate research fields • Environmental and Resource Management • Environmental Science • Geomatics • Human Geography Admission requirements: Minimum requirements • An honours undergraduate degree or equivalent with at least a 75% average. Normally, the undergraduate degree will be in Geography, but applications are welcomed from superior students regardless of background. However, students must demonstrate that they have the necessary background to pursue graduate work in their field of specialization.

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
demonstrate that they have the necessary background to pursue graduate work in their field of specialization. - 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: academic references are required unless a professional reference is specified. Degree requirements - Students must complete the course and milestone requirements associated with their chosen study option in addition to the Graduate Academic Integrity Module (Graduate AIM). Thesis option: Course requirements - Complete all of the following - Complete all the following: - GEOG700 - Professional Skills Development for Master's Students (0.50) - Complete 1 of the following: ~~GEOG600 - Foundations in Spatial Data Handling (0.50)~~ - GEOG620 - Foundations in Human Geography (0.50) - GEOG640 - Foundations in Environmental Science (0.50) ~~GEOG660 - Foundations in Resource and Environmental Management (0.50)~~ - Any 2 other GEOG graduate level courses (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take ~~a non-GEOG elective course~~ with approval of the Graduate Officer. Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status	- 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: academic references are required unless a professional reference is specified. Degree requirements - Students must complete the course and milestone requirements associated with their chosen study option in addition to the Graduate Academic Integrity Module (Graduate AIM). Thesis option: Course requirements - Complete all the following: - GEOG700A - Geographic Scholarship and Practice 1 - Masters (0.25) - GEOG700B - Geographic Scholarship and Practice 2 - Masters (0.25) - Complete 1 of the following: - GEOG 604 – Spatial Statistics (0.50) - GEOG617 - Applied Statistics in Ecology and Environment (0.50) - GEOG620 - Foundations in Human Geography (0.50) - GEOG625 – Qualitative Methods in Geography (0.50) - GEOG640 - Contextualizing Research in Earth System Science (0.50) - Any 2 other GEOG or GEMCC graduate level courses (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take <u>an elective course outside of GEOG or GEMCC</u> with approval of the Graduate Officer. Failure to obtain a final grade of at least

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
in the program, which may require that the student withdraw from the program. The coursework part of the program is designed to develop advanced understanding of issues relating to environmental studies, and also to provide students with training in additional methods/skills for their thesis research and its defence. Students will normally complete the 4 one-term courses during their first year. Thesis option: Milestone requirements Master's Thesis Proposal - During the first year, students develop a thesis proposal that will be approved by their supervisor and committee, normally before the end of the first year. Master's Thesis - Upon approval of the thesis proposal, students will then proceed to the research and writing of the thesis. Normally, students should complete and defend the thesis within two years of starting the program. Other requirements - If a student wishes to switch from the Thesis option to the Master's Research Paper option or vice versa, the change must be approved by the Graduate Officer. Master's Research Paper option: Course requirements - Complete all of the following - Complete all the following: ~~GEOG700 – Professional Skills Development for Master's Students (0.50)~~ - Complete 1 of the following: ~~GEOG600 – Foundations in Spatial Data Handling (0.50)~~ - GEOG620 - Foundations in Human Geography (0.50) - GEOG640 - Foundations in Environmental Science (0.50)	70% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. The coursework part of the program is designed to develop advanced understanding of issues relating to environmental studies, and also to provide students with training in additional methods/skills for their thesis research and its defence. Students will normally complete the 4 one-term courses during their first year. Thesis option: Milestone requirements Master's Thesis Proposal - During the first year, students develop a thesis proposal that will be approved by their supervisor and committee, normally before the end of the first year. Master's Thesis - Upon approval of the thesis proposal, students will then proceed to the research and writing of the thesis. Normally, students should complete and defend the thesis within two years of starting the program. Other requirements - If a student wishes to switch from the Thesis option to the Master's Research Paper option or vice versa, the change must be approved by the Graduate Officer. Master's Research Paper option: Course requirements - Complete all of the following - Complete all the following: <u>GEOG700A - Geographic Scholarship and Practice 1 - Masters (0.25)</u> <u>GEOG700B - Geographic Scholarship and Practice 2 - Masters (0.25)</u> - Complete 1 of the following: <u>GEOG 604 – Spatial Statistics (0.50)</u>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
▪ ~~GEOG660 – Foundations in Resource and Environmental Management (0.50)~~ - o Any 4 other GEOG graduate level courses (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take ~~non-GEOG elective courses~~ with approval of the Graduate Officer. Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. Master's Research Paper option: Milestone requirements Master's Research Paper • Each student will have a Supervisor and a Reader. The student will develop a research proposal for approval by their Supervisor, normally prior to the end of the first term. The research paper will normally be completed in the Spring (third) term. The paper should be approximately 12,000 words/50 pages in length. Other requirements • If a student wishes to switch from the Thesis option to the Master's Research Paper option or vice versa, the change must be approved by the Graduate Officer.	▪ <u>GEOG617 - Applied Statistics in Ecology and Environment (0.50)</u> ▪ <u>GEOG620 - Foundations in Human Geography (0.50)</u> ▪ <u>GEOG625 – Qualitative Methods in Geography (0.50)</u> ▪ <u>GEOG640 - Contextualizing Research in Earth System Science (0.50)</u> - o Any 4 other GEOG <u>or GEMCC</u> graduate level courses (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take <u>elective courses outside of GEOG or GEMCC</u> with approval of the Graduate Officer. Failure to obtain a final grade of at least 70% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. Master's Research Paper option: Milestone requirements Master's Research Paper • Each student will have a Supervisor and a Reader. The student will develop a research proposal for approval by their Supervisor, normally prior to the end of the first term. The research paper will normally be completed in the Spring (third) term. The paper should be approximately 12,000 words/50 pages in length. Other requirements • If a student wishes to switch from the Thesis option to the Master's Research Paper option or vice versa, the change must be approved by the Graduate Officer.

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

Currently registered students can complete their degrees using the calendar requirements active at the time of their entry into the program. Most will have completed their course requirements prior to the active date for these changes. These calendar changes update the list of required courses, but retain the same number of required courses. Further, students currently registered in the program will already meet these revised course requirements in most cases.

Department/School approval date (mm/dd/yy): 09/20/24

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/27/24

Faculty approval date (mm/dd/yy): 11/14/24

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 Science (MSc) in Geography

Program contact name(s): Maria Strack

Form completed by: Maria Strack

Description of proposed changes:

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

Dissolving the joint program arrangement with Wilfred Laurier University. Waterloo and Laurier will continue to offer the programs separately. Some of the required courses are also being updated due to the dissolution.

Is this a [major modification](#) to the program? Yes

Rationale for change(s):

The rationale for the creation of the joint Waterloo-Laurier Graduate Program in Geography (W-LGPIG) in 1992 was to capitalise on the relative size of the Geography departments at the two institutions at the time and to provide faculty and students with access to a PhD program. Both departments have grown since that time and in recent years the two programs had grown considerably independent of each other, and institutional priorities and infrastructural frictions challenged the cohesion and operation of the W-LGPIG. During the self-study process for the 2021/22 cyclical academic program review, faculty members of the Joint program at both institutions decided that dissolving the program was the best path forward. As a result, reviewers were asked to weigh in on the implications of this move and the quality of the programs if run independently. The reviewers concluded that both institutions are well suited to hosting excellent Geography independent graduate programs and that students and faculty in both Departments will likely continue to benefit from the positive aspects of the Joint program, such as community, shared research interests, etc.

Problems related to “jointness” of the program had been identified earlier as well. For example, the 2014/15 cyclical academic program review of the joint program included the following recommendation: “It was brought to our attention by the students that there may not exist equal ease of access to facilities at the “other” university. The problem may arise in part from lack of awareness by all students of how access may be secured, in part from lack of awareness on behalf of the UW and WLU administrative structures as to why equal access is important given the nature of this joint-program. We recommend that W-LGPIG investigate and negotiate the resolution to issues of unequal access.” In response to this recommendation, opportunities to overcome this issue were explored, but a complete solution could not be found. The fundamental issue was that students were enrolled at their home institution and this limited their access to programs and facilities at the other institution that fell outside the joint program (e.g., the Collaborative Water Program at Waterloo). This example highlights some of the institutional challenges that contributed to the mutual decision to dissolve the joint program.

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):

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Master of Science (MSc) in Geography Admit term(s) • Fall • Winter Delivery mode • On-campus Registration option(s) • Full-time • Part-time Registration options information • This program will not normally be offered on a part-time basis. In exceptional circumstances, students may assume part-time status after their formal course work has been completed. Program type(s) • Joint Study option(s) • Thesis Length of program • Normally, the formal requirements of the program are to be completed in two years. Graduate research fields • Environmental Science • Geomatics Admission requirements: Minimum requirements • Students must normally hold an Honours Bachelor of Science (BSc) degree. Students with an Honours Bachelor of Environmental Science (BES) or Bachelor of Arts (BA) degree in Physical Geography, Environmental or Earth Science, Geomatics, or the equivalent, will also be considered. Students must demonstrate that they have the necessary science	Master of Science (MSc) in Geography Admit term(s) • Fall • Winter Delivery mode • On-campus Registration option(s) • Full-time • Part-time Registration options information • This program will not normally be offered on a part-time basis. In exceptional circumstances, students may assume part-time status after their formal course work has been completed. Study option(s) • Thesis Length of program • Normally, the formal requirements of the program are to be completed in two years. Graduate research fields • Environmental Science • Geomatics Admission requirements: Minimum requirements • Students must normally hold an Honours Bachelor of Science (BSc) degree. Students with an Honours Bachelor of Environmental Science (BES) or Bachelor of Arts (BA) degree in Physical Geography, Environmental or Earth Science, Geomatics, or the equivalent, will also be considered. Students must demonstrate that they have the necessary science background to pursue graduate work in their field of specialization. Students will have completed the undergraduate degree with an overall average of at least 75%.

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
background to pursue graduate work in their field of specialization. Students will have completed the undergraduate degree with an overall average of at least 75%. - 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 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 - Complete all of the following - Complete all the following: - GEOG700 - Professional Skills Development for Master's Students (0.50) - Complete 1 of the following: ~~GEOG600 - Foundations in Spatial Data Handling (0.50)~~ - GEOG620 - Foundations in Human Geography (0.50) - GEOG640 - Foundations in Environmental Science (0.50) ~~GEOG660 - Foundations in Resource and Environmental Management (0.50)~~ - Any 2 other GEOG graduate level courses (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take a non-GEOG elective course with approval of the Graduate Officer. The coursework part of the program is designed to develop advanced understanding of issues relating to environmental studies, and also to provide students with training in	- 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 Degree requirements - Students must complete the course and milestone requirements as listed below in addition to the Graduate Academic Integrity Module (Graduate AIM). Thesis option: Course requirements - Complete all of the following - Complete all the following: - GEOG700A - Geographic Scholarship and Practice 1 - Masters (0.25) - GEOG700B - Geographic Scholarship and Practice 2 - Masters (0.25) - Complete 1 of the following: - GEOG604 – Spatial Statistics (0.50) - GEOG617 - Applied Statistics in Ecology and Environment (0.50) - GEOG620 - Foundations in Human Geography (0.50) - GEOG625 – Qualitative Methods in Geography (0.50) - GEOG640 – Contextualizing Research in Earth System Science (0.50) - Any 2 other GEOG or GEMCC graduate level courses (0.50 unit weight per course) that complement the student's graduate research field. Students may elect to take an elective course outside of GEOG or GEMCC with approval of the Graduate Officer. The coursework part of the program is designed to develop advanced understanding of issues relating to

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Department/School approval date (mm/dd/yy): 09/20/24

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Faculty: Environment

Program: Doctor of Philosophy (PhD) in Geography

Program contact name(s): Maria Strack

Form completed by: Maria Strack

Description of proposed changes:

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

Dissolving the joint program arrangement with Wilfred Laurier University. Waterloo and Laurier will continue to offer the programs separately. Some of the required courses are also being updated due to the dissolution.

Is this a [major modification](#) to the program? Yes

Rationale for change(s):

The rationale for the creation of the joint Waterloo-Laurier Graduate Program in Geography (W-LGPIG) in 1992 was to capitalise on the relative size of the Geography departments at the two institutions at the time and to provide faculty and students with access to a PhD program. Both departments have grown since that time and in recent years the two programs had grown considerably independent of each other, and institutional priorities and infrastructural frictions challenged the cohesion and operation of the W-LGPIG. During the self-study process for the 2021/22 cyclical academic program review, faculty members of the Joint program at both institutions decided that dissolving the program was the best path forward. As a result, reviewers were asked to weigh in on the implications of this move and the quality of the programs if run independently. The reviewers concluded that both institutions are well suited to hosting excellent Geography independent graduate programs and that students and faculty in both Departments will likely continue to benefit from the positive aspects of the Joint program, such as community, shared research interests, etc.

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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):

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Doctor of Philosophy (PhD) in Geography Admit term(s) • Fall • Winter Delivery mode • On-campus Registration option(s) • Full-time • Part-time Program type(s) • Joint Study option(s) • Thesis Graduate research fields • Environmental and Resource Management • Environmental Science • Geomatics • Human Geography Admission requirements: Minimum requirements • A Master's degree in geography or equivalent, with at least an 80% average in all graduate work. • Exceptional students may be allowed to enter the PhD program directly from the Master's program. Such students must have completed all Master of Arts (MA)/Master of Environmental Studies (MES)/Master of Science (MSc) requirements except the thesis, have demonstrated a superior academic record and satisfied other conditions (details of which can be obtained from the ~~Director of the Program~~). • English language proficiency (ELP) (if applicable) Admission requirements: Application materials	Doctor of Philosophy (PhD) in Geography Admit term(s) • Fall • Winter Delivery mode • On-campus Registration option(s) • Full-time • Part-time Study option(s) • Thesis Graduate research fields • Environmental and Resource Management • Environmental Science • Geomatics • Human Geography Admission requirements: Minimum requirements • A Master's degree in geography or equivalent, with at least an 80% average in all graduate work. • Exceptional students may be allowed to enter the PhD program directly from the Master's program. Such students must have completed all Master of Arts (MA)/Master of Environmental Studies (MES)/Master of Science (MSc) requirements except the thesis, have demonstrated a superior academic record and satisfied other conditions (details of which can be obtained from the <u>Graduate Officer</u>). • English language proficiency (ELP) (if applicable) Admission requirements: Application materials • Résumé • Supplementary information form

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
• Résumé • Supplementary information form • Transcript(s) Admission requirements: References • Number of references: 3 • Type of references: academic references are required unless a professional reference is specified. Degree requirements • Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM). Course requirements • Complete all of the following ◦ Complete all the following: ▪ GEOG800 - Professional Skills Development for Doctoral Students (0.50) ◦ Complete 1 of the following: ▪ ~~GEOG600 – Foundations in Spatial Data Handling (0.50)~~ ▪ GEOG620 - Foundations in Human Geography (0.50) ▪ GEOG640 - Foundations in Environmental Science (0.50) ▪ ~~GEOG660 – Foundations in Resource and Environmental Management (0.50)~~ ◦ Additional coursework may be assigned subject to the needs of individual students. Failure to obtain a final grade of at least 77% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. Milestone requirements PhD Comprehensive Examination • Students are required to meet the University-level PhD Comprehensive Examination minimum requirements. • In addition to the University-level PhD Comprehensive Examination minimum requirements, students in the PhD in	• Transcript(s) Admission requirements: References • Number of references: 3 • Type of references: academic references are required unless a professional reference is specified. Degree requirements • Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM). Course requirements • Complete all of the following ◦ Complete all the following: ▪ <u>GEOG800A – Geographic Scholarship and Practice 1 - Doctoral (0.25)</u> ▪ <u>GEOG800B – Geographic Scholarship and Practice 2 - Doctoral (0.25)</u> ◦ Complete 1 of the following: ▪ <u>GEOG 604 – Spatial Statistics (0.50)</u> ▪ <u>GEOG617 - Applied Statistics in Ecology and Environment (0.50)</u> ▪ GEOG620 - Foundations in Human Geography (0.50) ▪ <u>GEOG625 – Qualitative Methods in Geography (0.50)</u> ▪ <u>GEOG640 – Contextualizing Research in Earth System Science (0.50)</u> ◦ Additional coursework may be assigned subject to the needs of individual students. Failure to obtain a final grade of at least 77% in each course will result in an automatic review of the student's status in the program, which may require that the student withdraw from the program. Milestone requirements PhD Comprehensive Examination • Students are required to meet the University-level PhD Comprehensive Examination minimum requirements.

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Geography program are also required to meet the following requirements: - o The Comprehensive Examination includes both a written and an oral component. Normally the Examination involves the student writing answers to a question or questions over a period of three weeks. The answer(s) will not exceed 10,000 words, excluding the bibliography, abstract, figures and tables. In the oral component of the Examination, which normally lasts no longer than three hours, the student defends the written document. The topics to be covered and the format of the Examination are determined by the student's Comprehensive Examination Committee, in consultation with the student. ~~With the approval of the Waterloo-Laurier Graduate Program in Geography Committee, alternative formats for the Comprehensive Examination process may be permitted, provided they meet the objectives of the Comprehensive Examination.~~ - o The Comprehensive Examining Committee will consist of the student's ~~Advisor~~ and three additional Examiners, ~~one of whom will be from outside the Waterloo-Laurier Graduate Program in Geography~~ (normally, this person will be internal to the University of Waterloo). ~~The committee must contain at least two members of the Waterloo-Laurier Graduate Program in Geography. At least one member of the committee must be from the Geography Department at the University of Waterloo or Wilfred Laurier University.~~ PhD Thesis Proposal • Students develop a thesis proposal that will be approved by their Supervisor and Comprehensive Examining Committee, normally before the end of the second year. PhD Thesis • Upon approval of the thesis proposal, students will then proceed to the research and writing of the thesis. Normally, students should complete	• In addition to the University-level PhD Comprehensive Examination minimum requirements, students in the PhD in Geography program are also required to meet the following requirements: - o The Comprehensive Examination includes both a written and an oral component. Normally the Examination involves the student writing answers to a question or questions over a period of three weeks. The answer(s) will not exceed 10,000 words, excluding the bibliography, abstract, figures and tables. In the oral component of the Examination, which normally lasts no longer than three hours, the student defends the written document. The topics to be covered and the format of the Examination are determined by the student's Comprehensive Examination Committee, in consultation with the student. - o The Comprehensive Examining Committee will consist of the student's <u>Supervisor plus three additional Examiners, all of whom must hold a PhD (or equivalent) degree. The supervisor, along with one of the committee members, must hold a faculty appointment inside the Department of Geography and Environmental Management and at least one of the two GEM members must hold a tenured or tenure-track position. Of the remaining two members, one must have a faculty appointment at the University of Waterloo but outside the Department of Geography and Environmental Management</u> (normally, this person will be internal to the University of Waterloo). PhD Thesis Proposal • Students develop a thesis proposal that will be approved by their Supervisor and Comprehensive Examining Committee, normally before the end of the second year. PhD Thesis • Upon approval of the thesis proposal, students will then proceed to the research and writing of

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
and defend the thesis within four years of starting the program.	the thesis. Normally, students should complete and defend the thesis within four years of starting the program.

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

Currently registered students can complete their degrees using the calendar requirements active at the time of their entry into the program. Most will have completed their course requirements prior to the active date for these changes. These calendar changes update the list of required courses, but retain the same number of required courses. Further, students currently registered in the program will already meet these revised course requirements in most cases.

Department/School approval date (mm/dd/yy): 09/20/24
Reviewed by GSPA (for GSPA use only) ☒ **date** (mm/dd/yy): 10/15/24
Faculty approval date (mm/dd/yy): 11/14/24
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 Environmental Studies (MES) in Sustainability Management

Program contact name(s): Jason Thistlethwaite, Heather Hall

Form completed by: Jason Thistlethwaite, 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](#).

Adding a Coursework study option to the MES in Sustainability Management program.

Is this a [major modification](#) to the program? Yes

Rationale for change(s):

Over the last few years, a number of challenges have emerged in the delivery of the Master of Environmental Studies (MES) in Sustainability Management (SUSM) program. These challenges were identified via consultations in the recent program cyclical review, along with the SEED Director, Associate Director of Grad Studies (research programs), faculty, and graduate administrators. The individuals consulted voiced support for the creation of a coursework study option within the program. Please note that none of the program learning outcomes are being revised as part of the proposed program revisions. Below is a summary of the findings from these consultations:

First, the program has a high demand with many applicants meeting the requirements, but they cannot find a supervisor due to limited department capacity. For example, since the program started in 2016 the average number of applicants is 82 per year, whereas the department average number of offers is 33. In recent years, supervisory capacity has decreased further widening the gap between eligible applicants and spots in the program. With a coursework option, students would not require a dedicated supervisor opening up capacity to admit more students who meet requirements.

Second, both students and faculty have expressed support for a coursework option as a means of introducing flexibility for streaming between a research and course-based program. Students could then transfer to the research-based option depending on their ambitions and fit. Research ready students could also be positioned for admission to the SUSM PhD program.

Third, the streaming component could also address challenges some students experience in completing the degree on time, which was also identified as a problem in the cyclical review. We have tried to move some students to other programs within the department and faculty, but aligning program requirements proves to be a barrier. With a coursework option, these students could transition and still complete the degree.

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/S1A3sRk2n>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Admit term(s) - Fall Delivery mode - On-campus Registration option(s) - Full-time - Part-time Study option(s) - Thesis Length of program - Part-time students will be obligated to complete their requirements within five calendar years from the date of their initial registration. Admission requirements: Minimum requirements - A four-year undergraduate degree equivalent in a humanities, social science, health, engineering, natural science, environmental science, or business discipline with an overall average of at least 75% in the last two years. - 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 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 - Required courses:	Admit term(s) - Fall Delivery mode - On-campus Registration option(s) - Full-time - Part-time Study option(s) - Thesis <u>Coursework</u> Length of program - Part-time students will be obligated to complete their requirements within five calendar years from the date of their initial registration. Admission requirements: Minimum requirements - A four-year undergraduate degree equivalent in a humanities, social science, health, engineering, natural science, environmental science, or business discipline with an overall average of at least 75% in the last two years. - 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 Degree requirements - Students must complete the course and milestone requirements <u>associated with their chosen study option</u> in addition to the Graduate Academic Integrity Module (Graduate AIM).

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
- o SUSM 601 Foundations for Sustainability Management (Fall) - o SUSM 602 Theories and Concepts of Sustainability Management (Fall) - o SUSM 603 Research Methods for Sustainable Management (Winter) - o SUSM 605 Thesis Development (Winter) • Elective courses: 2 graduate-level open electives that complement the student's program of study and are chosen in agreement with the supervisor and the program Graduate Administrator. • Note: 1 elective course should be taken in the Fall term and 1 should be taken in the Winter term. Thesis option: Milestone requirements Master's Thesis • The thesis should demonstrate the student's ability to conduct original research under the guidance of a faculty member. Furthermore a successful thesis in the program demonstrates knowledge of existing research within the area of inquiry, the development of a sound research question and the ability to apply appropriate methods. The results of research should be original and contribute to the existing body of knowledge in the selected field. The thesis should be approximately 100 pages.	Thesis option: Course requirements • Required courses: - o SUSM 601 Foundations for Sustainability Management (Fall) - o SUSM 602 Theories and Concepts of Sustainability Management (Fall) - o SUSM 603 Research Methods for Sustainable Management (Winter) - o SUSM 605 Thesis Development (Winter) • Elective courses: 2 graduate-level open electives that complement the student's program of study and are chosen in agreement with the supervisor and the program Graduate Administrator. • Note: 1 elective course should be taken in the Fall term and 1 should be taken in the Winter term. Thesis option: Milestone requirements Master's Thesis • The thesis should demonstrate the student's ability to conduct original research under the guidance of a faculty member. Furthermore a successful thesis in the program demonstrates knowledge of existing research within the area of inquiry, the development of a sound research question and the ability to apply appropriate methods. The results of research should be original and contribute to the existing body of knowledge in the selected field. The thesis should be approximately 100 pages. Coursework option: Course requirements • <u>Required courses:</u> - o <u>Fall:</u> ▪ <u>ENBUS 642 Stakeholder Engagement, Collaborations and Partnerships</u> ▪ <u>SUSM 601 Foundations for Sustainability Management</u> ▪ <u>SUSM 602 Theories and Concepts of Sustainability Management</u> ▪ <u>1 graduate-level elective course</u> - o <u>Winter:</u> ▪ <u>ECDEV 605 Entrepreneurship and Small Business Development</u> ▪ <u>SUSM 640 Strategies for Sustainable Enterprises</u> ▪ <u>2 graduate-level elective courses</u>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
	- o <u>Spring:</u> - A graduate-level projects course as approved by the SEED Grad Officer • <u>Suggested elective courses</u> ▪ <u>DEVP 603 Global Health</u> ▪ <u>DEVP 604 Sustainable Cities</u> ▪ <u>DEVP 605 Economics for Sustainable Development</u> ▪ <u>DEVP 606 Energy Sustainability</u> ▪ <u>DEVP 608 Water and Security</u> ▪ <u>ECDEV 601 Economic Development: Theories and Frameworks</u> ▪ <u>ECDEV 602 Economic Development Policy and Practice</u> ▪ <u>ECDEV 603 Analytical Tools for Economic Development</u> ▪ <u>ECDEV 604 Management and Policy Tools for Economic Development and Sustainability Professionals</u> ▪ <u>ECDEV 606 Innovation and Economic Development in Cities and Regions</u> ▪ <u>ECDEV 615 Community Economic Development</u> ▪ <u>ENBUS 612 Social Entrepreneurship and Scaling Social Innovation</u> ▪ <u>ENBUS 620 Business Operations and Sustainability</u> ▪ <u>ENBUS 630 Enterprise Marketing and Social Accountability</u> ▪ <u>ENBUS 632 Sustainability Reporting</u> ▪ <u>ENBUS 652 Business and Climate Change</u> ▪ <u>ENBUS 690B Enterprise Sustainability Project</u> ▪ <u>SUSM 620 Sustainable Operations</u> ▪ <u>SUSM 630 Marketing for Sustainability</u> ▪ <u>SUSM 650 Sustainable Finance</u> ▪ <u>SUSM 660 Public International Law</u> ▪ <u>SUSM 678 Governing the Commons</u> ▪ <u>SUSM 680 Industrial Ecology: Principles and Approaches</u>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
	▪ <u>GEMCC 605 Climate change and society</u> - o <u>Further details on elective courses are available from the School of Environment, Enterprise and Development (SEED) website.</u> - o <u>Students may take other electives available in the Faculty after consultation with the program administrator.</u>

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 SUSM program or switch to the new option 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 (10/25/24):
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/01/24
Faculty approval date (mm/dd/yy): 11/14/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):

Summary of Faculty of Health Grad Motions for SGRC – Jan 27, 2025

Regular/Major Modifications

Motion/Package	total # program/course change forms	Unit
Aging and Health Field Removal	1	SPHS
MHI to MHIA program change	1	SPHS

Aging and Health Field Removal

Background and Rationale:

Abolishing the Aging and Health graduate research field in the PhD program in Public Health Sciences. Students interested in pursuing a PhD in aging and health may enrol in the collaborative Aging, Health, and Well-being (AHWB) program offered in the Faculty of Health.

Details

Students interested in pursuing a PhD in aging and health may enrol in the collaborative Aging, Health, and Well-being (AHWB) program offered in the Faculty of Health. The requirements for the AHWB program and the Aging and Health field are similar enough to render the field redundant.

MHI to Master of Health Informatics and Analytics- Program Change

Description:

1. Changing the name of the “Master of Health Informatics (MHI)” program to “Master of Health Informatics and Analytics (MHIA)”.
2. Updating the degree requirements to include two new Graduate Specializations.
3. Updating the list of required and elective courses.
4. Updating the type of references required for admission.

Rationale:

1. The program name is being updated to “Master of Health Informatics and Analytics” to reflect the evolving industry demands for expertise in analytics, data science, machine learning, and artificial intelligence. Consultations with faculty, students, and an External Advisory Committee confirmed the importance of including both “Health Informatics” and “Analytics” in the name to accurately represent the program’s curriculum, meet the continuing need for health informatics specialists in Canada, and enhance students’ skills in analytics. The program learning outcomes remain unchanged.
2. The introduction of two specializations—Health Informatics and Analytics—addresses the need for targeted expertise in these areas. This structure allows students to gain a solid foundation in both areas while specializing in one, enhancing their skills and employability. Feedback from

faculty, students, and external advisors highlighted the importance of these specializations to meet industry standards and student interests.

3. We are cleaning up the elective courses because some of them were never offered online and need to be removed from the online program. Given the new specializations, some of the core courses from the original MHI program are now electives.
4. Modifying the referee language for the Admissions Requirements to make it clearer for students that they need one academic and one professional reference for a complete application to the MHIA program.

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: Health

Programs: Doctor of Philosophy (PhD) in Public Health Sciences

Program contact name(s): Mark Oremus

Form completed by: Mark Oremus

Description of proposed changes:

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

Abolishing the Aging and Health graduate research field in the PhD program in Public Health Sciences. Students interested in pursuing a PhD in aging and health may enrol in the collaborative Aging, Health, and Well-being (AHWB) program offered in the Faculty of Health.

Is this a [major modification](#) to the program? Yes

Rationale for change(s):

Students interested in pursuing a PhD in aging and health may enrol in the collaborative Aging, Health, and Well-being (AHWB) program offered in the Faculty of Health. The requirements for the AHWB program and the Aging and Health field are similar enough to render the field redundant.

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/graduate-studies-academic-calendar/applied-health-sciences/school-public-health-sciences/doctor-philosophy-phd-public-health-and-health-systems>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Graduate research fields • ~~Aging and Health~~ • Epidemiology and Biostatistics • Global Health • Health and Environment • Health Evaluation • Health Informatics • Work and Health	Graduate research fields • Epidemiology and Biostatistics • Global Health • Health and Environment • Health Evaluation • Health Informatics • Work and Health Degree requirements

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Degree requirements • Courses - o 9 one-term graduate courses beyond the Bachelor's degree, including at least 4 courses (2 required and 2 electives) beyond the Master's degree, is the normal minimum requirement. - o Required courses (2) ▪ HTLH 701 Interdisciplinary Seminar in Public Health and Health Systems - o 1 of the following required methods courses: ▪ HLTH 704 Advanced Qualitative Methods for Health Research ▪ HLTH 705 Advanced Statistical Methods for Analyzing Public Health and Health Systems Data ▪ HLTH 706 Advanced Epidemiological Methods ▪ HLTH 719 Advanced Research Methods in Health Informatics - o Elective courses (2) ▪ 1 methods elective course at the 600-or 700-level, selected in consultation with the supervisor (may include courses outside the SPHS), or courses offered by SPHS, including additional courses from the required course list. ▪ 1 additional elective, selected in consultation with the supervisor. Students without a background in public health and health systems, and focusing in research areas other than Health Informatics, should take HLTH 601 Lifespan Determinants of Health and Disease. Students focusing in Health Informatics may choose to take HLTH 611 The Health Care System or an equivalent course approved by the SPHS Graduate Officer. - o Plus other free electives as may be required ▪ It is important to keep in mind that these are minimum requirements. Many students	• Courses - o 9 one-term graduate courses beyond the Bachelor's degree, including at least 4 courses (2 required and 2 electives) beyond the Master's degree, is the normal minimum requirement. - o Required courses (2) ▪ HTLH 701 Interdisciplinary Seminar in Public Health and Health Systems - o 1 of the following required methods courses: ▪ HLTH 704 Advanced Qualitative Methods for Health Research ▪ HLTH 705 Advanced Statistical Methods for Analyzing Public Health and Health Systems Data ▪ HLTH 706 Advanced Epidemiological Methods ▪ HLTH 719 Advanced Research Methods in Health Informatics - o Elective courses (2) ▪ 1 methods elective course at the 600-or 700-level, selected in consultation with the supervisor (may include courses outside the SPHS), or courses offered by SPHS, including additional courses from the required course list. ▪ 1 additional elective, selected in consultation with the supervisor. Students without a background in public health and health systems, and focusing in research areas other than Health Informatics, should take HLTH 601 Lifespan Determinants of Health and Disease. Students focusing in Health Informatics may choose to take HLTH 611 The Health Care System or an equivalent course approved by the SPHS Graduate Officer. - o Plus other free electives as may be required ▪ It is important to keep in mind that these are minimum requirements. Many students complete at least three courses within their area of research interest, which may require the addition of one or more extra

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
complete at least three courses within their area of research interest, which may require the addition of one or more extra courses to the minimum coursework requirement. - o At a minimum, students must obtain an average of 75% or higher in aggregate on the courses presented in fulfillment of the degree requirements. Grades on all courses presented to fulfill the degree requirements must be 70% or higher. A grade below 70% in any course or failing to maintain an average of 75% will necessitate a review of the student's status by the School and may result in a student being required to complete additional coursework or being required to withdraw from the program. The School reserves the right to stipulate additional coursework if it is necessary for the student's preparation. - o Students in the PhD in Public Health and Health Systems program may also wish to pursue one of the following Graduate Research Fields: 1. ~~Aging and Health~~ 2. Epidemiology and Biostatistics 3. Global Health 4. Health and Environment 5. Health Evaluation 6. Health Informatics 7. Work and Health - o 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 and a set of courses that together provide an in-depth study in the area of the Graduate Research Field. A student will only obtain the Graduate Research Field on their transcript if they have completed the requirements associated with the PhD degree and the requirements associated with the Graduate Research Field. - o All PhD Graduate Research Fields in the SPHS consist of a Comprehensive Examination, a PhD Thesis that is confirmed by the SPHS to be in the chosen Graduate Research Field, and a set of 4 graduate (0.50 weight) level	courses to the minimum coursework requirement. - o At a minimum, students must obtain an average of 75% or higher in aggregate on the courses presented in fulfillment of the degree requirements. Grades on all courses presented to fulfill the degree requirements must be 70% or higher. A grade below 70% in any course or failing to maintain an average of 75% will necessitate a review of the student's status by the School and may result in a student being required to complete additional coursework or being required to withdraw from the program. The School reserves the right to stipulate additional coursework if it is necessary for the student's preparation. - o Students in the PhD in Public Health and Health Systems program may also wish to pursue one of the following Graduate Research Fields: 1. Epidemiology and Biostatistics 2. Global Health 3. Health and Environment 4. Health Evaluation 5. Health Informatics 6. Work and Health - o 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 and a set of courses that together provide an in-depth study in the area of the Graduate Research Field. A student will only obtain the Graduate Research Field on their transcript if they have completed the requirements associated with the PhD degree and the requirements associated with the Graduate Research Field. - o All PhD Graduate Research Fields in the SPHS consist of a Comprehensive Examination, a PhD Thesis that is confirmed by the SPHS to be in the chosen Graduate Research Field, and a set of 4 graduate (0.50 weight) level courses. This set of courses is comprised of a mix of required and elective courses. Required courses are those that are prescribed as part of the Graduate Research Field. Elective

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
courses. This set of courses is comprised of a mix of required and elective courses. Required courses are those that are prescribed as part of the Graduate Research Field. Elective courses are those that are on a list of courses designated as electives for a given Graduate Research Field. - o Students who have completed the MSc in Public Health and Health Systems and obtained a Graduate Research Field can obtain the same or another Field or (by taking the applicable required/elective courses) as part of their PhD program. - o For any of the Graduate Research Fields below, a directed studies course (HLTH 620 or HLTH 720) focused on the Graduate Research Field or an appropriate alternate course may replace a required or elective course, with the approval of the Associate Director, Graduate Studies, School of Public Health Sciences. - o The course requirements for the Graduate Research Fields are described below. ~~1. Graduate Research Field in Aging and Health~~ ~~o Students must successfully complete 2 required courses and 2 elective courses. An assessment of whether or not the student's thesis warrants the Aging and Health Graduate Research Field designation will be completed by the SPHS.~~ ~~* Required courses:~~ ~~* HLTH 701~~ ~~Interdisciplinary Seminar in Public Health and Health Systems~~ ~~* HLTH 750~~ ~~Fundamentals of Aging, Health and Well Being (over two terms, parts A and B)~~ ~~* Elective courses:~~ ~~* Select 1 from the following list:~~ ~~* HLTH 704~~ ~~Advanced Qualitative~~	courses are those that are on a list of courses designated as electives for a given Graduate Research Field. - o Students who have completed the MSc in Public Health and Health Systems and obtained a Graduate Research Field can obtain the same or another Field or (by taking the applicable required/elective courses) as part of their PhD program. - o For any of the Graduate Research Fields below, a directed studies course (HLTH 620 or HLTH 720) focused on the Graduate Research Field or an appropriate alternate course may replace a required or elective course, with the approval of the Associate Director, Graduate Studies, School of Public Health Sciences. - o The course requirements for the Graduate Research Fields are described below. 1. Graduate Research Field in Epidemiology and Biostatistics - o Students must successfully complete 3 required courses and 1 elective course. An assessment of whether or not the student's thesis warrants the Epidemiology and Biostatistics Graduate Research Field designation will be completed by the SPHS. ▪ Required courses: ▪ HLTH 701 Interdisciplinary Seminar in Public Health and Health Systems ▪ HLTH 705 Advanced Statistical Methods for Analyzing Public Health and Health Systems Data ▪ HLTH 706 Advanced Epidemiological Methods ▪ Elective course: ▪ Select 1 from the following list: ▪ HLTH 634 Environmental Epidemiology for Public Health ▪ HLTH 672 Epidemiological

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Methods for Health Research *— HLTH 705 Advanced Statistical Methods for Analyzing Public Health and Health Systems Data *— HLTH 706 Advanced Epidemiological Methods *— Select 1 from the following list: *— HLTH 626 Analysis and Management of Health Information in Aging Populations *— HLTH 627 Advanced Dementia Care *— HLTH 630 Advanced Geriatric Medicine and Healthcare *— HLTH 642 Interdisciplinary Perspectives on Aging *— HLTH 672 Epidemiological Methods in Aging Research 2. Graduate Research Field in Epidemiology and Biostatistics - o Students must successfully complete 3 required courses and 1 elective course. An assessment of whether or not the student's thesis warrants the Epidemiology and Biostatistics Graduate Research Field designation will be completed by the SPHS. ▪ Required courses: ▪ HLTH 701 Interdisciplinary Seminar in Public Health and Health Systems	Methods in Aging Research 2. Graduate Research Field in Global Health - o Students must successfully complete 2 required courses and 2 elective courses. An assessment of whether or not the student's thesis warrants the Global Health Graduate Research Field designation will be completed by the SPHS. ▪ Required courses: ▪ HLTH 662 Global Health (or equivalent) ▪ HLTH 701 Interdisciplinary Seminar in Public Health and Health Systems ▪ Elective courses: ▪ Select 1 from the following list: ▪ HLTH 704 Advanced Qualitative Methods for Health Research ▪ HLTH 705 Advanced Statistical Methods for Analyzing Public Health and Health Systems Data ▪ HLTH 706 Advanced Epidemiological Methods ▪ HLTH 719 Advanced Research Methods in Health Informatics ▪ Select 1 from the following list (these courses are global-health focused in all examples and assignments): ▪ HLTH 632 Health Economics and Public Health

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
▪ HLTH 705 Advanced Statistical Methods for Analyzing Public Health and Health Systems Data ▪ HLTH 706 Advanced Epidemiological Methods ▪ Elective course: ▪ Select 1 from the following list: ▪ HLTH 634 Environmental Epidemiology for Public Health ▪ HLTH 672 Epidemiological Methods in Aging Research 3. Graduate Research Field in Global Health - o Students must successfully complete 2 required courses and 2 elective courses. An assessment of whether or not the student's thesis warrants the Global Health Graduate Research Field designation will be completed by the SPHS. ▪ Required courses: ▪ HLTH 662 Global Health (or equivalent) ▪ HLTH 701 Interdisciplinary Seminar in Public Health and Health Systems ▪ Elective courses: ▪ Select 1 from the following list: ▪ HLTH 704 Advanced Qualitative Methods for Health Research ▪ HLTH 705 Advanced Statistical Methods for Analyzing Public Health and Health Systems Data ▪ HLTH 706 Advanced	▪ HLTH 654 Systems Thinking and Analysis in Health Program Planning and Evaluation 3. Graduate Research Field in Health and Environment - o Students must successfully complete 2 required courses and 2 elective courses. An assessment of whether or not the student's thesis warrants the Health and Environment Graduate Research Field designation will be completed by the SPHS. ▪ Required courses: ▪ HLTH 604 Public Health and the Environment (or equivalent) ▪ HLTH 701 Interdisciplinary Seminar in Public Health and Health Systems ▪ Elective courses: ▪ Select 1 from the following list: ▪ HLTH 704 Advanced Qualitative Methods for Health Research ▪ HLTH 705 Advanced Statistical Methods for Analyzing Public Health and Health Systems Data ▪ HLTH 706 Advanced Epidemiological Methods ▪ Select 1 from the following list: ▪ HLTH 623 Risk and Exposure Assessment in Public Health ▪ HLTH 624 Environmental

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Epidemiological Methods ▪ HLTH 719 Advanced Research Methods in Health Informatics ▪ Select 1 from the following list (these courses are global-health focused in all examples and assignments): ▪ HLTH 632 Health Economics and Public Health ▪ HLTH 654 Systems Thinking and Analysis in Health Program Planning and Evaluation 4. Graduate Research Field in Health and Environment - o Students must successfully complete 2 required courses and 2 elective courses. An assessment of whether or not the student's thesis warrants the Health and Environment Graduate Research Field designation will be completed by the SPHS. ▪ Required courses: ▪ HLTH 604 Public Health and the Environment (or equivalent) ▪ HLTH 701 Interdisciplinary Seminar in Public Health and Health Systems ▪ Elective courses: ▪ Select 1 from the following list: ▪ HLTH 704 Advanced Qualitative Methods for Health Research ▪ HLTH 705 Advanced Statistical Methods for	Toxicology in Public Health ▪ HLTH 631 Public Health Surveillance ▪ HLTH 634 Environmental Epidemiology for Public Health ▪ HLTH 661 Geographic Information Systems and Public Health ▪ HLTH 662 Global Health 4. Graduate Research Field in Health Evaluation - o Students must successfully complete 1 required course and 3 elective courses. An assessment of whether or not the student's thesis warrants the Health Evaluation Graduate Research Field designation will be completed by the SPHS. ▪ Required course: ▪ HLTH 701 Interdisciplinary Seminar in Public Health and Health Systems ▪ Elective courses: ▪ Select 1 from the following list: ▪ HLTH 655 Health Measurement and Survey Methods ▪ HLTH 704 Advanced Qualitative Methods for Health Research ▪ HLTH 705 Advanced Statistical Methods for Analyzing Public Health and Health Systems Data ▪ Select 1 or 2 from the following list:

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Analyzing Public Health and Health Systems Data ▪ HLTH 706 Advanced Epidemiological Methods ▪ Select 1 from the following list: ▪ HLTH 623 Risk and Exposure Assessment in Public Health ▪ HLTH 624 Environmental Toxicology in Public Health ▪ HLTH 631 Public Health Surveillance ▪ HLTH 634 Environmental Epidemiology for Public Health ▪ HLTH 661 Geographic Information Systems and Public Health ▪ HLTH 662 Global Health 5. Graduate Research Field in Health Evaluation - o Students must successfully complete 1 required course and 3 elective courses. An assessment of whether or not the student's thesis warrants the Health Evaluation Graduate Research Field designation will be completed by the SPHS. ▪ Required course: ▪ HLTH 701 Interdisciplinary Seminar in Public Health and Health Systems ▪ Elective courses: ▪ Select 1 from the following list: ▪ HLTH 655 Health Measurement and Survey Methods	▪ HLTH 614 Foundations of Program Evaluation ▪ HLTH 651 Theory and Applications in Program Evaluation ▪ HLTH 653 Evaluation Practice and Management ▪ HLTH 654 Systems Thinking and Analysis in Health Program Planning and Evaluation ▪ Select 1 from the following list if only 1 course was selected above: ▪ HLTH 603 Health Systems and Policy ▪ HLTH 626 Analysis and Management of Health Information in Aging Populations ▪ HLTH 639 Experiential Learning in Evaluation 5. Graduate Research Field in Health Informatics - o Students must successfully complete 2 required courses and 2 elective courses. An assessment of whether or not the student's thesis warrants the Health Informatics Graduate Research Field designation will be completed by the SPHS. ▪ Required courses: ▪ HLTH 701 Interdisciplinary Seminar in Public Health and Health Systems

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
▪ HLTH 704 Advanced Qualitative Methods for Health Research ▪ HLTH 705 Advanced Statistical Methods for Analyzing Public Health and Health Systems Data ▪ Select 1 or 2 from the following list: ▪ HLTH 614 Foundations of Program Evaluation ▪ HLTH 651 Theory and Applications in Program Evaluation ▪ HLTH 653 Evaluation Practice and Management ▪ HLTH 654 Systems Thinking and Analysis in Health Program Planning and Evaluation ▪ Select 1 from the following list if only 1 course was selected above: ▪ HLTH 603 Health Systems and Policy ▪ HLTH 626 Analysis and Management of Health Information in Aging Populations ▪ HLTH 639 Experiential Learning in Evaluation	▪ HLTH 719 Advanced Research Methods in Health Informatics OR Equivalent ▪ Elective courses: ▪ Select 1 from the following list: ▪ HLTH 615 Requirements Specification and Analysis in Health Systems ▪ HLTH 616 Decision Making and Systems Thinking in Health Informatics ▪ HLTH 626 Analysis and Management of Health Information in Aging Populations ▪ HLTH 629 Information Visualization ▪ HLTH 633 Digital Health ▪ HLTH 637 Public Health Informatics ▪ Select 1 from the following list: ▪ COGSCI 600 Seminar in Cognitive Science ▪ CS 634 Security and Privacy for Health Systems ▪ CS 792 Data Structures and Standards in Health Informatics ▪ CS 846 Advanced Topics in Software Engineering: Topic 30 Software Engineering for Big Data

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
6. Graduate Research Field in Health Informatics - o Students must successfully complete 2 required courses and 2 elective courses. An assessment of whether or not the student's thesis warrants the Health Informatics Graduate Research Field designation will be completed by the SPHS. ▪ Required courses: ▪ HLTH 701 Interdisciplinary Seminar in Public Health and Health Systems ▪ HLTH 719 Advanced Research Methods in Health Informatics OR Equivalent ▪ Elective courses: ▪ Select 1 from the following list: ▪ HLTH 615 Requirements Specification and Analysis in Health Systems ▪ HLTH 616 Decision Making and Systems Thinking in Health Informatics ▪ HLTH 626 Analysis and Management of Health Information in Aging Populations ▪ HLTH 629 Information Visualization ▪ HLTH 633 Digital Health ▪ HLTH 637 Public Health Informatics ▪ Select 1 from the following list: ▪ COGSCI 600 Seminar in Cognitive Science	▪ SYDE 642 Cognitive Engineering Methods ▪ SYDE 644 Human Factors Testing 6. Graduate Research Field in Work and Health - o Students must successfully complete 2 required courses and 2 elective courses. An assessment of whether or not the student's thesis warrants the Work and Health Graduate Research Field designation will be completed by the SPHS. ▪ Required courses: ▪ HLTH 701 Interdisciplinary Seminar in Public Health and Health Systems ▪ HLTH 728 What is Fair? International Perspectives On Equity In Work and Health ▪ Elective courses: ▪ Select 1 from the following list: ▪ HLTH 704 Advanced Qualitative Methods for Health Research ▪ HLTH 705 Advanced Statistical Methods for Analyzing Public Health and Health Systems Data ▪ HLTH 706 Advanced Epidemiological Methods ▪ HLTH 719 Advanced Research Methods in Health Informatics ▪ Select 1 from the following list:

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
▪ CS 634 Security and Privacy for Health Systems ▪ CS 792 Data Structures and Standards in Health Informatics ▪ CS 846 Advanced Topics in Software Engineering: Topic 30 Software Engineering for Big Data ▪ SYDE 642 Cognitive Engineering Methods ▪ SYDE 644 Human Factors Testing 7. Graduate Research Field in Work and Health - o Students must successfully complete 2 required courses and 2 elective courses. An assessment of whether or not the student's thesis warrants the Work and Health Graduate Research Field designation will be completed by the SPHS. ▪ Required courses: ▪ HLTH 701 Interdisciplinary Seminar in Public Health and Health Systems ▪ HLTH 728 What is Fair? International Perspectives On Equity In Work and Health ▪ Elective courses: ▪ Select 1 from the following list: ▪ HLTH 704 Advanced Qualitative Methods for Health Research ▪ HLTH 705 Advanced Statistical Methods for	▪ HLTH 614 Foundations of Program Evaluation ▪ HLTH 623 Risk and Exposure Assessment in Public Health ▪ HLTH 639 Experiential Learning in Evaluation ▪ HLTH 654 Systems Thinking and Analysis In Health Program Planning and Evaluation ▪ HLTH 731 Approaches to Research in Work and Health

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Analyzing Public Health and Health Systems Data ▪ HLTH 706 Advanced Epidemiological Methods ▪ HLTH 719 Advanced Research Methods in Health Informatics ▪ Select 1 from the following list: ▪ HLTH 614 Foundations of Program Evaluation ▪ HLTH 623 Risk and Exposure Assessment in Public Health ▪ HLTH 639 Experiential Learning in Evaluation ▪ HLTH 654 Systems Thinking and Analysis In Health Program Planning and Evaluation ▪ HLTH 731 Approaches to Research in Work and Health	

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

We currently do not have any PhD students registered in the Aging and Health field.

Department/School approval date (03/18/24):

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 07/28/22

Faculty approval date (mm/dd/yy): 10/25/24

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: Health

Program: Master of Health Informatics (MHI)

Program contact name(s): Jennifer Yessis, Michelle Fluit

Form completed by: Jennifer Yessis, Michelle Fluit

Description of proposed changes:

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

- 1) *Changing the name of the “Master of Health Informatics (MHI)” program to “Master of Health Informatics and Analytics (MHIA)”.*
- 2) *Updating the degree requirements to include two new Graduate Specializations.*
- 3) *Updating the list of required and elective courses.*
- 4) *Updating the type of references required for admission.*

Is this a [major modification](#) to the program? Yes

Rationale for change(s):

- 1) *The program name is being updated to “Master of Health Informatics and Analytics” to reflect the evolving industry demands for expertise in analytics, data science, machine learning, and artificial intelligence. Consultations with faculty, students, and an External Advisory Committee confirmed the importance of including both “Health Informatics” and “Analytics” in the name to accurately represent the program’s curriculum, meet the continuing need for health informatics specialists in Canada, and enhance students’ skills in analytics. The program learning outcomes remain unchanged.*
- 2) *The introduction of two specializations—Health Informatics and Advanced Analytics—addresses the need for targeted expertise in these areas. This structure allows students to gain a solid foundation in both areas while specializing in one, enhancing their skills and employability. Feedback from faculty, students, and external advisors highlighted the importance of these specializations to meet industry standards and student interests.*
- 3) *We are cleaning up the elective courses because some of them were never offered online and need to be removed from the online program. Given the new specializations, some of the core courses from the original MHI program are now electives.*
- 4) *Modifying the referee language for the Admissions Requirements to make it clearer for students that they need one academic and one professional reference for a complete application to the MHIA program.*

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#/programs/rJMTx1CAin>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Master of Health Informatics (MHI) Admission requirements: References • Number of references: 2 • Type of references: ~~at least one of which must be from an academic source~~, unless more than 5 years have elapsed since the applicant last registered in a university course, in which case both references can be from professional sources. ~~In the latter case~~, at least one of the professional referees must be asked to comment specifically on the applicant's academic abilities. Degree requirements • Students must complete the course requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM). Course requirements • ~~Required courses~~ ◦ The MHI program requires the completion of 10 graduate-level courses. 8 (including the practicum course) of the 10 courses are required core courses. The remaining 2 courses are electives: ▪ CS 634 Security and Privacy in Health Systems ▪ CS 638 Principles of Data Management and Use or ~~HLTH 605B Quantitative Methods and Analysis~~ ▪ ~~HLTH 611 The Health Care System~~ ▪ HLTH 612/CS 792 Data Structures and Standards in Health Informatics ▪ HTLH 613 Information Technology for the Health Professional	Master of Health Informatics <u>and Analytics</u> (MHIA) Admission requirements: References • Number of references: 2 • Type of references: • <u>1 from an academic source</u>, unless more than 5 years have elapsed since the applicant last registered in a university course, in which case both references can be from professional sources. At least one of the professional referees must be asked to comment specifically on the applicant's academic abilities. • <u>1 professional from a relevant paid or volunteer work experience.</u> <u>Graduate specializations</u> • <u>Health Informatics</u> • <u>Advanced Analytics</u> Degree requirements • Students must complete the course requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM). Course requirements • The MHIA program requires the <u>successful</u> completion of 10 graduate-level courses (<u>6.0 units of courses in total</u>) (note: <u>full credit courses are worth 0.5 units. Half credit modular courses are worth 0.25 units</u>). 8 (including the practicum course) of the 10 courses are required core courses. The remaining 2 courses are electives. <u>Alternatively, students may choose to pursue one of the Graduate Specializations outlined below.</u> • <u>Students are required to complete the following core courses in List A:</u> ◦ <u>HLTH 605B Quantitative Methods and Analysis (0.5 unit weight)</u>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
▪ HLTH 615 Requirements Specification and Analysis in Health Systems ▪ ~~HLTH 637 Public Health Informatics (offered online)~~ ▪ HLTH 640 Professional Experience Practicum ▪ ~~In situations where a student has previously taken a course with learning objectives similar to that of a required MHI course, a higher level graduate course in the same domain area will be substituted.~~ • Elective courses - o ~~2 of the required 10 courses are electives. The following online courses are currently offered and can be chosen as electives:~~ ▪ ~~CS 636 Introduction to Computer Networks and Distributed Computer Systems~~ ▪ CS 638 Principles of Data Management and Use or HLTH 605B Quantitative Methods and Analysis (note: courses taken from the list of required courses cannot be taken to satisfy the elective course requirements) ▪ HLTH 603 Health Policy in Public Health ▪ HLTH 608 Health and Risk Communication in Public Health ▪ HLTH 609 Management and Administration of Public Health Services ▪ HLTH 614 Evaluation of Public Health Programs ▪ ~~HTLH 616 Decision Making and Systems Thinking in Health Informatics~~ ▪ HLTH 631 Public Health Surveillance ▪ HLTH 632 Health Economics and Public Health ▪ ~~HLTH 649 Ethics and Privacy Considerations for Digital Technology and AI in Health~~ ▪ ~~HLTH 650A Application of Artificial Intelligence in Health~~ ▪ ~~HLTH 650B Machine Learning Techniques in Health~~ ▪ HLTH 654 Systems Thinking and Analysis	- o HLTH 612/CS 792 Data Structures and Standards in Health Informatics (<u>0.5 unit weight</u>) - o HTLH 613 Information Technology for the Health Professional (<u>0.5 unit weight</u>) - o HLTH 640 Professional Experience Practicum (<u>1.5 unit weight</u>) - o <u>HLTH 649A Privacy and Ethics (0.25 unit weight) and HLTH 649B Leadership in Digital Transformation (0.25 unit weight)</u> • <u>Students are required to complete 3 core courses (1.50 units total) from List B:</u> - o CS 634 Security and Privacy in Health Systems (<u>0.5 unit weight</u>) - o CS 638 Principles of Data Management (<u>0.5 unit weight</u>) - o HLTH 615 Requirements Specification and Analysis in Health Systems (<u>0.5 unit weight</u>) - o <u>HLTH 619 Fundamental Research Methods in Health Informatics (0.5 unit weight)</u> - o <u>HLTH 650A Application of Artificial Intelligence in Health (0.25 unit weight) and HLTH 650B Machine Learning Techniques in Health (0.25 unit weight)</u> - o <u>HLTH 718A Advanced Artificial Intelligence in Health I (0.5 unit weight)</u> - o <u>HLTH 718B Natural Language Processing Algorithm and Application in Health (0.5 unit weight)</u> • Elective courses (<u>choose 2 from List C</u>): - o HLTH 603 Health Policy in Public Health (<u>0.5 unit weight</u>) - o HLTH 608 Health and Risk Communication in Public Health (<u>0.5 unit weight</u>) - o HLTH 609 Management and Administration of Public Health Services (<u>0.5 unit weight</u>) - o <u>HLTH 611 Health Care System (0.5 unit weight)</u> - o HLTH 614 Evaluation of Public Health Programs (<u>0.5 unit weight</u>) - o <u>HLTH 620 Pandemic Preparedness (0.5 unit weight)</u> - o HLTH 631 Public Health Surveillance (<u>0.5 unit weight</u>) - o HLTH 632 Health Economics and Public Health (<u>0.5 unit weight</u>) - o <u>HLTH 633 Digital Health (0.5 unit weight)</u>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
▪ HLTH 661 Geographic Information Systems and Public Health ▪ HLTH 662 Global Health ▪ ~~HLTH 718A Advanced Artificial Intelligence in Health I~~ ▪ ~~HLTH 718B Natural Language Processing Algorithm and Application in Health~~ ▪ STAT 631 Introduction to Statistical Methods in Health Informatics ▪ Students can also choose from online and on-campus courses offered by both Computer Science and the School of Public Health Sciences with the permission of the program leader. • At a minimum, students must obtain an average of 75% or higher in aggregate on the courses presented in fulfilment of the degree requirements. Grades on all courses presented to fulfill the degree requirements must be 70% or higher. A grade below 70% in any course or failing to maintain an average of 75% will necessitate a review of the student's status by the School and may result in a student being required to complete additional coursework or being required to withdraw from the program. The School reserves the right to stipulate additional coursework if it is necessary for the student's preparation.	- o <u>HLTH 637 Public Health Informatics (0.5 unit weight)</u> - o <u>HLTH 661 Geographic Information Systems and Public Health (0.5 unit weight)</u> - o <u>HLTH 662 Global Health (0.5 unit weight)</u> - o <u>STAT 631 Introduction to Statistical Methods in Health Informatics (0.5 unit weight)</u> - o Students can also choose from online and on-campus courses offered by both Computer Science and the School of Public Health Sciences with the permission of the program leader. • <u>Students may choose to pursue one of the following Graduate Specializations:</u> <u>1. Health Informatics</u> <u>2. Advanced Analytics</u> • <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 Graduate Specialization.</u> • <u>All MHIA Graduate Specializations consist of a set of at least 4 (0.50 weight) graduate 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.</u> <u>1. Graduate Specialization in Health Informatics</u> • <u>To receive the Graduate Specialization in Health Informatics students must successfully complete the following compulsory courses (0.50 unit weight) and 2 (0.50 unit weight) elective courses:</u> - o <u>Compulsory courses (0.50 unit weight):</u> ▪ <u>CS 634 Security and Privacy for Health System (0.5 unit weight)</u> ▪ <u>CS 638 Principles of Database Management and Use (0.5 unit weight)</u>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
	▪ <u>HLTH 612/CS 792 Health Data Standards</u> ▪ <u>HLTH 613A IT Infrastructure for Health Professionals (0.25 unit weight) and HLTH 613B IT Applications for Health Professionals (0.25 unit weight)</u> ▪ <u>HLTH 615 Requirements Specification and Analysis in Health Systems (0.5 unit weight)</u> ▪ <u>HLTH 640 Professional Experience Practicum (1.5 unit weight)</u> ▪ <u>HLTH 649A Privacy and Ethics (0.25 unit weight) and HLTH 649B Leadership in Digital Transformation (0.25 unit weight)</u> ▪ <u>HLTH 605B Quantitative Methods (0.5 unit weight)</u> o <u>Elective courses (choose 2 (0.50 unit weight) from the following list):</u> ▪ <u>HLTH 650A Application of Artificial Intelligence in Health (0.25 unit weight) and HLTH 650B Machine Learning Techniques in Health (0.25 unit weight)</u> ▪ <u>HLTH 619 Fundamental Research Methods in Health Informatics (0.5 unit weight)</u> ▪ <u>HLTH 606B Principles of Epi (0.5 unit weight)</u> ▪ <u>HLTH 611 The Healthcare System (0.5 unit weight)</u> ▪ <u>HLTH 620 Pandemic Preparedness (0.5 unit weight)</u> ▪ <u>HLTH 631 Public Health Surveillance (0.5 unit weight)</u> ▪ <u>HLTH 633 Digital Health (0.5 unit weight)</u> ▪ <u>HLTH 637 Public Health Informatics (0.5 unit weight)</u> ▪ <u>HLTH 661 Geographic Information Systems and Public Health (0.5 unit weight)</u> <u>2. Graduate Specialization in Advanced Analytics</u> • <u>To receive the Graduate Specialization in Advanced Analytics, students must successfully complete the following compulsory courses (0.50 unit weight) and 2</u>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
	<u>(0.50 unit weight) elective courses:</u> - o <u>Compulsory courses (0.50 unit weight)</u> ▪ <u>HLTH 605B Quantitative Methods (0.5 unit weight)</u> ▪ <u>HLTH 612/CS 792 Health Data Standards (0.5 unit weight)</u> ▪ <u>HLTH 613A IT Infrastructure for Health Professionals (0.25 unit weight) and HLTH 613B IT Applications for Health Professionals (0.25 unit weight)</u> ▪ <u>HLTH 619 Fundamental Research Methods in Health Informatics (0.5 unit weight)</u> ▪ <u>HLTH 640 Professional Experience Practicum (1.5 unit weight)</u> ▪ <u>HLTH 649A Privacy and Ethics (0.25 unit weight) and HLTH 649B Leadership in Digital Transformation (0.25 unit weight)</u> ▪ <u>HLTH 650A Application of Artificial Intelligence in Health (0.25 unit weight) and HLTH 650B Machine Learning Techniques in Health (0.25 unit weight)</u> ▪ <u>HLTH 718A Advanced AI in Health I: Deep Learning (0.25 units weight) and HLTH 718B Advanced AI in Health II: NLP (0.25 unit weight)</u> - o <u>Elective courses (choose 2 (0.50 unit weight) from the following list):</u> ▪ <u>CS 634 Security and Privacy for Health System) (0.5 unit weight)</u> ▪ <u>CS 638 Principles of Database Management and Use (0.5 unit weight)</u> ▪ <u>HLTH 606B Principles of Epi (0.5 unit weight)</u> ▪ <u>HLTH 611 The Healthcare System (0.5 unit weight)</u> ▪ <u>HLTH 637 Public Health Informatics (0.5 unit weight)</u> ▪ <u>HLTH 620 Pandemic Preparedness (0.5 unit weight)</u> ▪ <u>HLTH 631 Public Health Surveillance (0.5 unit weight)</u> ▪ <u>HLTH 633 Digital Health (0.5 unit weight)</u>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
	▪ <u>HLTH 661 Geographic Information Systems and Public Health (0.5 unit weight)</u> • At a minimum, students must obtain an average of 75% or higher in aggregate on the courses presented in fulfilment of the degree requirements. Grades on all courses presented to fulfill the degree requirements must be 70% or higher. A grade below 70% in any course or failing to maintain an average of 75% will necessitate a review of the student's status by the School and may result in a student being required to complete additional coursework or being required to withdraw from the program. The School reserves the right to stipulate additional coursework if it is necessary for the student's preparation.

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

- 1) *All currently registered students in the MHI program 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 School, via email. By default, students will retain the original program name. Students who wish to change to the revised program name will need to indicate this to the Graduate Officer/Graduate Coordinator, and have the required courses for the name change.*
- 2) *Students will have the option to select a specialization and take courses towards that goal to gain greater depth in the specialization areas or stay in the general MHIA degree requirements*
- 3) *Because of the new program, we are cleaning up the electives so that students are able to take the electives listed. This will not influence students in the program because they can still take any health electives. The removed courses were never offered or available to online students. Students can take a specialization if they can complete all the courses in the specialization.*
- 4) *No impact to current students. This admission language will make it clearer to applicants that they need one professional and one academic reference.*

Department/School approval date (09/22/24):

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 11/05/24

Faculty approval date (mm/dd/yy): 11/21/24

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

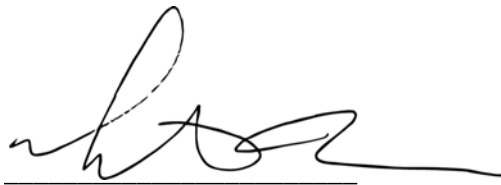
Date: January 07, 2025

Re: Science Graduate and Research Council Agenda

I would ask that the motion below be placed on the agenda of the **January 27, 2025, SGRC meeting**. The motion was approved by the Science Faculty Council (Nov. 25, 2024).

Motions from Biology

1. Revise the PhD and MSc in Biology Graduate Research Fields.

A handwritten signature in black ink, appearing to be 'Martin Ross', written over a horizontal line.

Martin Ross, PhD

Associate Dean Graduate Studies - Science

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 Biology

2) Master of Science (MSc) in Biology

Program contact name(s): Kirsten Müller, Paul Craig, April Wettig

Form completed by: Kirsten Müller

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 PhD and MSc in Biology Graduate Research Fields.

Is this a [major modification](#) to the program? Yes

Rationale for change(s):

The Graduate Research Fields do not reflect the current department following numerous retirements over the past 15 years and the changing names of disciplines. These new fields were discussed at a departmental retreat in Fall 2022 and voted on in a departmental meeting in January 2023. These new Graduate Research Fields were also included in our Self Study Report for Augmented Academic Program Review (2016-2022).

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#/programs/H1bIWJCCjn>

<https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/programs/rk4qbyAAi2>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Graduate research fields • ~~Bioinformatics, Systematics and Evolution~~ • ~~Ecology and Environmental Biology~~ • Microbiology • ~~Molecular Genetics~~ • ~~Physiology, Cell and Developmental Biology~~	Graduate research fields • <u>Biochemistry</u> • <u>Computational Biology</u> • <u>Ecology and Evolution</u> • Microbiology • Physiology <u>and</u> Cell Biology

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

Currently there are 132 students enrolled within Biology graduate programs, these students will be informed of the updates to the fields but they will not be impacted by the changes.

Department/School approval date (01/31/2023):

Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 09/20/24

Faculty approval date (11/25/2024):

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

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