

**UNIVERSITY OF WATERLOO
SENATE GRADUATE & RESEARCH COUNCIL
NOTICE OF MEETING**

DATE: Monday 12 June 2023
TIME: 10:30 a.m. – 12:00 noon
PLACE: NH 3318/3308

Chair – J. Casello

AGENDA

<u>Item</u>	<u>Action</u>
Declarations of Conflict of Interest	
a. Excerpt from Bylaw 1, section 8*	Information
 <u>CONSENT AGENDA</u>	
Motion: To approve or receive for information by consent, items 1-4 below	
1. Minutes of 8 May 2023*	Decision (SGRC)
2. Research Ethics* (Joza)	
a. Research Ethics Board – membership extensions	Decision (SGRC)
3. Graduate Awards* (Simm)	
a. Faculty of Environment Graduate Student Research Dissemination Award (operating)	Decision (SGRC) Decision (SGRC)
b. Professor Safieddin (Ali) Safavi-Naeini Graduate Scholarship (endowment)	Decision (SGRC)
c. Department of Philosophy Congress Graduate Award (trust)	Information
d. Science Graduate Award (operating)	Information
e. Buitrago Opportunity Graduate Scholarship in Engineering (trust)	
4. Curricular Submissions	
a. Environment* (Peter Deadman)	Decision (SGRC)
 <u>REGULAR AGENDA</u>	
5. Business Arising from the Minutes	Information
6. Co-chairs' Remarks	Information
7. Extensions for Centres and Institutes* (Charmaine Dean)	Decision (SGRC)
8. Curricular Submissions	
a. Arts* (Anna Esselment)	Item D, SEN-regular
b. Engineering* (Siva Sivoththaman)	Items 2a+b, SEN-regular
	Rest of items under 8a+b Decision (SGRC)
9. Graduate Studies & Postdoctoral Affairs – Class Delivery Modes* (Marianne Simm)	SEN-Regular
10. Graduate Studies Academic Calendar (GSAC) changes* (Marianne Simm)	SEN-Regular

- | | |
|---|-------------|
| 11. CREATEs (Bernie Duncker and Leslie Copp) | Information |
| 12. SGRC Facilitated Discussions – follow up (Guest: Melanie Will, 11:30 a.m.)
- additional material to be distributed to members ahead of the meeting | Information |
| 13. Other Business | Information |
| 14. Next Meeting: 18 September 2023 from 10:30 a.m. - 12 noon; NH3318 | Information |

*material attached
** to be distributed separately
“SGRC” to be approved on behalf of Senate
“SEN” to be recommended to Senate for approval

6 June 2023

Mike Grivicic
Associate University Secretary

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 8 May 2023 Meeting
[in agenda order]
Needles Hall 3318

Present: Ramona Bobocel, Jeff Casello, Charmaine Dean, Rob de Loe, Peter Deadman, Bernie Duncker, Anna Esselment, Bertrand Guenin, Neela Hasan, Brian Laird, William McIlroy, Joseph Meleshko, Ian Milligan, Liz Nilsen, Martin Ross, Marianne Simm, Mike Szarka, Tim Weber-Kraljevski (Secretary), Richard Wikkerink

Resources: Angela Christelis, Trevor Clews, Carrie MacKinnon-Molson

Guests: Leslie Copp

Regrets: Amelia Clarke, Aiman Fatima, Ana Ferrer, Alison Hitchens*, Reyan Johnson, Zerihun Kinate, Anita Layton*, Ryan Johnson, Julie Joza*, Manoj Sachdev*, Siva Sivoththaman*, Shirley Tang*, Shawn Wetting

Organization of Meeting: Jeff Casello, co-chair of the council, took the chair, and Tim Weber-Kraljevski acted as secretary. The secretary advised that due notice of the meeting had been given, a quorum was present, and the meeting was properly constituted.

DECLARATIONS OF 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. Deadman and Bobocel. Carried.

1. MINUTES OF 10 April 2023

Council approved the minutes of the meeting as distributed.

2. GRADUATE AWARDS

Council approved items a to d as presented.

3. CURRICULAR SUBMISSIONS

Council approved items a to c as presented.

REGULAR AGENDA

4. BUSINESS ARISING FROM THE MINUTES

There was no business arising.

5. CO-CHAIRS' REMARKS

Casello provided a brief update on the following: (a) the recent increase in media attention concerning research security, the needed for more due diligence prior to making new partnerships and bringing visitors to campus, and the resources available through the Office of Research; (b) the continued challenge of low number NSERC Doctoral Scholarship recipients at Waterloo and possible strategies for increasing applications; and (c) that the Policy 70 Policy Drafting Committee has created an initial draft of the revised Policy and will be consulting various stakeholders, including the Senate Graduate & Research Council. Members discussed: research security, areas of concern and the request that those with dissenting voices within the university community, to be directed to Casello, Dean, and Milligan to voice their concern internal before voicing them externally; and exploring Tri-Agency quotas further to investigate if there are any avenues for raising them.

7. CREATEs

Leslie Copp presented on the NSERC Collaborative Research and Training Experience (CREATE), providing an overview of the program, the low success rate for Waterloo, challenges with the program, and particular areas

Waterloo has fallen short, including: providing a defined training program; providing justification for the need of the CREATE program; providing evidence of EDI planning for the team and the program; demonstrating feasibility, program management, and plans for sustainability; and shortfall with internal processes. Members discussed: challenges with the program resulting in insufficient motivation for faculty members; consequence for Waterloo underperforming on CREATE applications; the characteristics of successful applications; strategies for encourage and supporting applications; and strategies for a top-down approach to identify gaps that could be filled using the CREATE program. Duncker informed members that this presentation was meant as an introduction to the topic and that a more fulsome discussion on how the university can reach its full potential with the CREATE program will take place at the June 12, 2023 meeting.

8. OTHER BUSINESS

There was no other business.

9. NEXT MEETING

The next meeting will be held Monday 12 June 2023 from 10:30 a.m. to 12 noon in NH 3318.

9 May 2023

Tim Weber-Kraljevski
Governance Officer

Memorandum

To: Members
Senate Graduate and Research Council (SGRC)

From: Julie Joza
Director, Research Ethics

Date: May 29, 2023

Subject: Membership on the Research Ethics Boards

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

Member Extensions

[Brendan Pinto](#), PhD student, Kinesiology and Health Sciences, currently serves as a student member on the Clinical Research Ethics Board (CREB). Brendan's first term on CREB began in September 2021, and was scheduled to end on August 31, 2023. Brendan would like to continue service on CREB until December 31, 2023.

[Aiman Fatima](#), MSc student, Kinesiology and Health Sciences, currently serves as a student member on the Human Research Ethics Board (HREB). Aiman's first term on HREB began in January 2022 and was scheduled to end on August 31, 2023. Aiman would like to continue service on HREB until April 30, 2024.

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.



May 30, 2023

TO: Mike Grivicic, Associate University, Senate Graduate and Research Council

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

RE: Agenda items for Senate Graduate & Research Council – June 2023

Items for Approval

a) Faculty of Environment Graduate Student Research Dissemination Award - operating

Through a commitment of financial support from the Faculty of Environment, awards are available to encourage full-time and part-time research-based graduate students in the Faculty of Environment to present their own research (oral, poster, paper) at an academic conference and engage in academic dialogue within their field of study and research. Recipients will receive an award valued at \$150 for in-person conferences. Interested students must submit an application that is available on the Faculty of Environment website prior to the conference as soon as they have confirmed that they will be presenting at a conference. Applicants will be notified of the decision within 2 weeks of submitting their application. Upon approval, the award will be applied to the term in which the conference occurs. The award will be coded to the student's Quest account and first applied to any outstanding tuition and incidental fees. Any credit balance will be released as a refund via direct deposit.

b) Professor Safieddin (Ali) Safavi-Naeini Graduate Scholarship – endowment

A scholarship, valued at \$1,500, will be provided annually to a full-time graduate student enrolled in a research-based master's or doctoral program in the Electrical and Computer Engineering department. Selection will be based on academic excellence (minimum 80% cumulative average in their current program or over the last two full-time academic years). Applicants must also demonstrate interest in conducting research in electromagnetics, ranging from radio to microwave to terahertz and optics, and applied to a variety of topics including, but not limited to, communications, imaging, superconductivity, and biomedical sensing. Interested students should submit an application by January 31 to the Engineering Graduate Office. A recipient will be selected annually by the Faculty of Engineering. This scholarship was established by the family and friends to create a legacy for Safieddin (Ali) Safavi-Naeini who strived to be a research mentor and a friend through his compassionate and caring spirit. Prof. Ali. was a Professor in the Department of Electrical and Computer Engineering and the director of the Centre for Intelligent Antenna and Radio Systems.

Total gift = \$50k

c) Department of Philosophy Congress Graduate Award – trust

The Department of Philosophy Congress Graduate Award has been established to provide funding to master's and doctoral students who present their research at the Canadian Congress of Humanities and Social Sciences. Recipients will receive an award valued at up to \$1,500 to assist with the cost of in-person travel to the conference. Interested students must submit an application that is available on the Department of Philosophy website by April 15th. The Graduate Committee in the Department of Philosophy will select recipients and determine the value based on budget available. Applicants will be notified of the decision within two

weeks of submitting their application. Upon approval, the award will be applied to the term in which the conference occurs. The award will be coded to the student's Quest account and first applied to any outstanding tuition and incidental fees. Any credit balance will be released as a refund to the student via direct deposit.

Items for Information

d) Science Graduate Award - operating

Originally established in April 2019, the Faculty of Science is amending the terms of reference by updating the values associated with the award. The changes are as below:

Student Type	Current	New
Domestic MSc students	\$5,000/year for max of 2 years	\$3,750/year for max of 2 years
Int'l MSc students	\$4,500/year for max of 2 years	\$3,375/year for max of 2 years
Domestic PhD students	\$8,000/year for max of 4 years	\$6,000/year for max of 4 years
Int'l PhD students	\$4,500/year for max of 4 years	\$3,375/year for max of 4 years

The new award description will be as follows:

Awards, valued at a minimum of \$3,375 per year, are available to support eligible graduate students registered full time in a research-based master's or doctoral program in the Faculty of Science. Students are automatically considered for this award throughout their eligibility period and may be nominated, without the need for an application, by their programs to the Associate Dean of Science, Graduate Studies.

e) Buitrago Opportunity Graduate Scholarship in Engineering – trust

Originally established in 2020, one of the eligibility criteria is being broadened to increase the number of students within the potential applicant pool. Instead of being restricted to research-based master's programs in the Faculty of Engineering, students registered in course-based master's programs in Engineering will now be eligible. The rest of the criteria remains the same.

The updated award description will now read as follows:

Scholarships, valued at \$50,000 will be provided to graduate students who will be registered full time in a research-based master's program in the Faculty of Engineering. The award will be spread equally over six academic terms. Selection will be based on academic achievement (minimum cumulative average of 75% or equivalent in their current or most recently completed program). Preference will be given to a student who received a degree in Mechanical Engineering from the Industrial University of Santander, Colombia then to a student who received any degree in Engineering from the Industrial University of Santander, Colombia, then to a student who received any degree in Engineering from any university in Colombia. A recipient will be selected in the winter term based on the student's application for admission to the program. This fund is made possible by a donation from Jorge Buitrago.

FACULTY OF ENVIRONMENT - GRADUATE STUDIES COMMITTEE

REPORT TO FACULTY COUNCIL

June 12 2023

1. Courses Changes for Approval

- a. Revision - GEMCC 690 – Added GEOG 452 as an anti-requisite
- b. New – GEOG 662 - Currently held with an undergraduate course but expected to be offered regularly in the coming years.

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: Winter Year: 2024

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*):

Requisites – adding GEOG 452 as an additional anti-requisite.

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

Course subject code: GEMCC

Course number: 690

Course ID: 016192

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

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

In this problem-based learning course, concepts, knowledge and skills developed throughout the program are integrated and applied to research projects. The focus of this highly interactive course is the development, implementation and communication of applied research to contribute knowledge and solutions to climate change

challenges specified by government, business or civil society. Students work in small collaborative teams in an interdisciplinary, professional practice environment.

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

Primary meet type: Seminar

Delivery mode: On-campus

Anti-requisites: GEMCC 675 Topic 1 and GEOG 452

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 add GEOG 452 as an anti-requisite as GEOG 452 covers some of the same material as GEMCC 690.

Form completed by:

Department/School approval date (03/31/23):

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 03/22/23

Faculty approval date (mm/dd/yy): 05/09/23

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: Fall Year: 2024

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: 662

Course ID:

Course title (max. 100 characters including spaces): Transforming Canadian Resource Management

Course short title (max. 30 characters including spaces): Transforming CND Resource Mgmt

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: This course builds on thematic areas of climate change, resource management, and sustainability. The evolution of Canadian resource management is traced from subsistence, utilitarian, and intrinsic value perspectives. The current state of resource management is critically evaluated, and alternative ways of thinking about conservation programming will be considered. (Note: This course involves a combination of lecture, class discussion and activities, student presentations, and a required multi-day field trip to Ottawa; field trip fee normally \$300+HST; will not exceed \$600+HST. Field trip dates will be determined no later than the end

of the first week of lectures. Held with GEOG 456.

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

Primary meet type: Lecture

Delivery mode: On-campus

Requisites: Antireq: GEOG 456, ERS 456, GEOG 474 Topic 004, GEOG 694 Topic 003

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 456

Rationale for request:

This course is currently offered/held-with with an undergraduate course (GEOG 456) under the GEOG 694 Environmental Management Special Topics Course number (topic 3) but is expected to be offered regularly in coming years. Creating a course in the Calendar will allow the inclusion of an anti-requisite to the undergraduate course.

Form completed by: Maria Strack

Department/School approval date (mm/dd/yy): 03/31/23

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 04/18/23

Faculty approval date (mm/dd/yy): 05/09/23

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



MEMORANDUM

To: Senate Graduate & Research Council

CC: Bernard P. Duncker, Associate Vice-President, Research and International
Sheila Ager, Dean of Arts
Mary Wells, Dean of Engineering
Bob Lemieux, Dean of Science
Mark Giesbrecht, Dean of Mathematics
Lili Liu, Dean of Health
Bruce Frayne, Dean of Environment
Tim Weber-Kraljevski, Governance Officer, Secretariat

From: Charmaine B. Dean, Vice-President, Research and International

Date: June 02, 2023

Subject: Extensions for Centres and Institutes

- For decision -

Following consultations to prepare for the upcoming review of Interdisciplinary Supports and Structures, all renewals of Waterloo Research Centres and Institutes will be temporarily paused. With the support of all six Deans, an extension is being proposed to the end date of those Centres and Institutes that will soon be or are currently up for renewal such that their new end date is December 31st, 2024 (indicated in the table below).

The recommendations of the review of Interdisciplinary Supports and Structures will guide the future of interdisciplinary activities at Waterloo. Once the review has been completed, its recommendations will be brought forward to SGRC, and their potential implications for renewal processes will be communicated to Centre and Institute Executive Directors.

Motion: That the Waterloo Centres and Institutes listed below be given revised mandate end dates of December 31, 2024.

Centre	Current Term End Date	Revised Renewal Date
Centre for Bioengineering and Biotechnology	31-Dec-23	31-Dec-24
Waterloo Climate Institute	End date has passed	31-Dec-24
Water Institute	31-May-24	31-Dec-24
Waterloo Institute for Nanotechnology	30-Apr-24	31-Dec-24
Waterloo Institute for Sustainable Energy	31-May-24	31-Dec-24
Institute for Quantum Computing	End date has passed	31-Dec-24
Global Health Policy and Innovation Research Centre	31-Jul-23	31-Dec-24
Waterloo Centre for German Studies	31-Mar-24	31-Dec-24
Centre for Theoretical Neuroscience	30-Nov-23	31-Dec-24

Centre	Current Term End Date	Revised Renewal Date
Centre for Accounting Research and Education	30-Sep-23	31-Dec-24
Centre for Advanced Materials Joining	30-Oct-23	31-Dec-24
Waterloo Centre for Electrochemical Energy	End date has passed	31-Dec-24
Centre for Ocular Research & Education	28-Feb-24	31-Dec-24
Waterloo Centre for Astrophysics	30-Sep-23	31-Dec-24
Waterloo Centre for Microbial Research	End date has passed	31-Dec-24

ARTS GRADUATE STUDIES

May 19, 2023

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 May 16, 2023 and are now being submitted for approval by the Senate Graduate and Research Council on June 12, 2023.

Maha Eid

Maha Eid

Attach.

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

CURRICULAR ITEMS for approval [bottom right pagination]

A) Political Science

- a. Revise the following course:
 - i. PSCI 621 (update course title from Political Theory 1 to Contemporary Political Theory and update course description) [2-3]
- b. Create the following courses:
 - i. PSCI 637 (Introduction to Machine Learning for Public Policy) [4-5]

B) Sociology

- a. Inactivate the following course:
 - i. SOC 730 (cross listed with RS 730) [6-7]

C) Religious Studies

- a. Inactivate the following course:
 - i. RS 730 (cross listed with SOC 730) [8-9]

D) Psychology

- a. PhD in Psychology
 - ii. Articulate the criteria for students to obtain a graduate research field designation on their transcript [10-11]
- b. MA in Psychology
 - iii. Adding the MA degree requirements to include a Developmental Psychology graduate research field. Adding this MA will provide students who wish to complete a PhD in Developmental Psychology with the opportunity to enroll in a more research focused Master's degree. Articulate the criteria for students to obtain a graduate research field designation on their transcript. [12-15]

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: Arts

Effective date: Term: Fall Year: 2023

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: PSCI

Course number: 621

Course ID: 002420

Course title (max. 100 characters including spaces):

Current title: Political Theory I

Revised title: Contemporary Political Theory

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

Current description: Problems in classical and contemporary political theory.

Revised description: An examination of normative understandings of freedom and equality and the ways different theorists measure them. An analysis of the impact that different framings of major concepts have on structures of justice and their implications for institutional design.

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 make the course description and title more specific and reflective of course content.

Form completed by: Maysah Eid

Department/School approval date (mm/dd/yy): 02/15/23

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 03/13/23

Faculty approval date (mm/dd/yy): 05/16/23

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: Arts

Effective date: Term: Fall Year: 2023

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: PSCI

Course number: 637

Course ID:

Course title (max. 100 characters including spaces): Introduction to Machine Learning for Public Policy

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: This course is an introduction to machine learning and other complex statistical methods that can be used to analyze a wide array of policy issues based on the use of open data. Learners must have knowledge of multivariate regression methods and be trained in the basic use of python or R to take this course.

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 course is needed for MPS students pursuing the GDip in CDASH. The course cannot be a PS course as MPS students need to take a course from another department/school for the GDip breadth requirement. Therefore, the Department decided to offer it under PSCI and it would typically be offered by a sessional instructor (out of the MPS budget).

Form completed by: Maysah Eid

Department/School approval date (mm/dd/yy): 02/15/23

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 03/13/23

Faculty approval date (mm/dd/yy): 05/16/23

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: Arts

Effective date: Term: Fall Year: 2023

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: SOC

Course number: 730

Course ID: 003051

Course title (max. 100 characters including spaces): Sociology of Religion

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 key substantive, theoretical and methodological issues of the sociology of religion through the detailed study of important classical and contemporary works in the field. Representative issues addressed are: the social and psychological nature and function of religious experience, the character of conversion processes, the social and political implications of religious ideologies and organizations, the status of religious beliefs and practices in an age of seeming secularization. Attention will be given to both western and non-western religious traditions as well as to both established and newer forms of religious life.

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: RS 730 - *inactive request for RS 730 also submitted*

Sections combined/held with:

Rationale for request:

The course has not been offered since Winter 2016 and is unlikely to be offered again in the near future.

Form completed by:

Department/School approval date (mm/dd/yy): 01/26/23

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 03/09/23

Faculty approval date (mm/dd/yy): 05/16/23

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: Arts

Effective date: Term: Fall Year: 2023

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: RS

Course number: 730

Course ID: 003051

Course title (max. 100 characters including spaces): Sociology of Religion

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 key substantive, theoretical and methodological issues of the sociology of religion through the detailed study of important classical and contemporary works in the field. Representative issues addressed are: the social and psychological nature and function of religious experience, the character of conversion processes, the social and political implications of religious ideologies and organizations, the status of religious beliefs and practices in an age of seeming secularization. Attention will be given to both western and non-western religious traditions as well as to both established and newer forms of religious life.

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: SOC 730 - *inactive request for SOC 730 also submitted*

Sections combined/held with:

Rationale for request:

The course has not been offered since Winter 2016 and is unlikely to be offered again in the near future.

Form completed by: Jeff Wilson, Acting Religious Studies Associate Chair, Graduate

Department/School approval date (mm/dd/yy): 02/17/23

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 02/09/23 (this is the date that SOC 730 was reviewed)

Faculty approval date (mm/dd/yy): 05/16/23

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

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: Arts

Program: Doctor of Philosophy (PhD) in Psychology

Program contact name(s): Jonathan Fugelsang

Form completed by: Jonathan Fugelsang

Description of proposed changes:

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

Articulating the criteria for students to obtain a graduate research field designation on their transcript.

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

Rationale for change(s):

It can be advantageous for students to have their graduate research field area noted on their transcripts. We are adding clarity to the Calendar in order for the graduate field designation to be added to the transcript.

Proposed effective date: Term: Fall Year: 2023

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

<https://uwaterloo.ca/graduate-studies-academic-calendar/arts/departement-psychology/doctor-philosophy-phd-psychology>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>Graduate research fields</p> <ul style="list-style-type: none"> • Clinical Psychology • Cognitive Neuroscience • Cognitive Psychology • Developmental Psychology • Industrial/Organizational Psychology • Social Psychology <p>Degree requirements</p> <ul style="list-style-type: none"> • PhD Thesis 	<p>Graduate research fields</p> <ul style="list-style-type: none"> • Clinical Psychology • Cognitive Neuroscience • Cognitive Psychology • Developmental Psychology • Industrial/Organizational Psychology • Social Psychology <p>Degree requirements</p> <ul style="list-style-type: none"> • PhD Thesis

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> ○ The Department requires a successful defense of the PhD Thesis. 	<ul style="list-style-type: none"> ○ The Department requires a successful defense of the PhD Thesis. ○ <u>Students must be admitted to one of the following Graduate Research Fields:</u> <ul style="list-style-type: none"> ▪ <u>Clinical Psychology</u> ▪ <u>Cognitive Neuroscience</u> ▪ <u>Cognitive Psychology</u> ▪ <u>Developmental Psychology</u> ▪ <u>Industrial/Organizational Psychology</u> ▪ <u>Social Psychology</u> ○ <u>A Graduate Research Field is a University credential that is recognized on the student's transcript and is intended to reflect that a student has successfully completed research concentrated in the area of the Graduate Research Field. The Department, represented by the student's supervisor and examining committee, must assess whether a student's completed research warrants the field designation at the time of degree completion. To obtain the Graduate Research Field designation, students must also complete the required courses associated with their chosen Graduate Research Field outlined in the above course requirements section.</u>

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

Articulating the criteria for students to obtain a graduate research field designation on their transcript will permit students currently enrolled in the program to receive that designation on their transcript when they graduate.

Department/School approval date (mm/dd/yy): 04/11/23

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 04/13/23

Faculty approval date (mm/dd/yy): 05/16/23

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

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

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: Arts

Program: Master of Arts (MA) in Psychology

Program contact name(s): Jonathan Fugelsang

Form completed by: Jonathan Fugelsang

Description of proposed changes:

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

- 1) *Updating the MA degree requirements to include a “Developmental Psychology” graduate research field.*
- 2) *Articulating the criteria for students to obtain a graduate research field designation on their transcript.*

Is this a [major modification](#) to the program? Yes

Rationale for change(s):

- 1) *Currently, students who wish to do a Master’s degree in Developmental Psychology only have the MASC in Psychology - Developmental & Communication Science option. This MASC program was originally designed for students with more applied interests, or who are unsure about continuing to a PhD. It is a fast-tracked 1-year (3-term) program that has a reduced research requirement, requiring a Masters Research Paper (rather than a thesis), as well as a community internship. For students who intend to continue on to a PhD, having a 2-year research-focused MA degree with a thesis would be advantageous. We have recently needed to transfer some students in the MASC program to a non-specialized research field MA in order to accommodate their research goals, and current graduate students who have been consulted with have expressed that having a research focused Developmental Psychology MA option to apply to and enroll into would be advantageous. Essentially, adding the Developmental Psychology graduate research field to the MA program will provide more flexibility for students, and also align the requirements of the Developmental Psychology program with those of the other research fields. Furthermore, the PhD program already has the Developmental Psychology graduate research field, so adding this field at the MA level will provide continuity for students.*
- 2) *It can be advantageous for students to have their graduate research field area noted on their transcripts. We are adding clarity to the Calendar in order for the graduate research field designation to be added to the transcript.*

Proposed effective date: Term: Winter Year: 2024

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/arts/departments-psychology/master-arts-ma-psychology>

Current Graduate Studies Academic Calendar content:

Proposed Graduate Studies Academic Calendar content:

Graduate research fields

- Clinical Psychology
- Cognitive Neuroscience
- Cognitive Psychology
- Social Psychology

Degree requirements

Thesis option:

- **Courses**
 - Students must complete 2 two-term or 4 one-term courses accepted for graduate credit by the Department. Specific course offerings in each Area will differ from year to year. The statistics requirement may be met by satisfactory performance in at least 1 of 2 core statistics courses: PSYCH 630 Advanced Analysis of Variance and PSYCH 632 Multiple Regression.
- **Master’s Thesis**

Master's Research Paper option:

Note: students must receive special permission from the Department to enter the Master’s Research Paper option.

- **Courses**
 - Students must complete 4 two-term or 8 one-term courses, accepted for graduate credit by the Department. The statistics requirement may be met by satisfactory performance in at least 1 of 2 core statistics courses: PSYCH 630 Advanced Analysis of Variance and PSYCH 632 Multiple Regression.
- **Master’s Research Paper**

Graduate research fields

- Clinical Psychology
- Cognitive Neuroscience
- Cognitive Psychology
- Developmental Psychology
- Social Psychology

Degree requirements

Thesis option:

- **Courses**
 - Students must complete 2 two-term or 4 one-term courses accepted for graduate credit by the Department. Specific course offerings in each Area will differ from year to year. The statistics requirement may be met by satisfactory performance in at least 1 of 2 core statistics courses: PSYCH 630 Advanced Analysis of Variance and PSYCH 632 Multiple Regression.
- **Master’s Thesis**

- Students must be admitted to one of the following Graduate Research Fields:

- Clinical Psychology
- Cognitive Neuroscience
- Cognitive Psychology
- Developmental Psychology
- Social Psychology

- A Graduate Research Field is a University credential that is recognized on the student’s transcript and is intended to reflect that a student has successfully completed research concentrated in the area of the Graduate Research Field. The Department, represented by the student’s supervisor and reading committee must assess whether a student’s completed research warrants the field designation at the time of degree completion. To obtain the Graduate Research Field designation, a student must also complete the

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
	<p><u>requirements associated with the MA degree.</u></p> <p>Master's Research Paper option:</p> <p>Note: students must receive special permission from the Department to enter the Master's Research Paper option.</p> <ul style="list-style-type: none"> • Courses <ul style="list-style-type: none"> ○ Students must complete 4 two-term or 8 one-term courses, accepted for graduate credit by the Department. The statistics requirement may be met by satisfactory performance in at least 1 of 2 core statistics courses: PSYCH 630 Advanced Analysis of Variance and PSYCH 632 Multiple Regression. • Master's Research Paper <ul style="list-style-type: none"> ○ <u>Students must be admitted to one of the following Graduate Research Fields:</u> <ul style="list-style-type: none"> ▪ <u>Clinical Psychology</u> ▪ <u>Cognitive Neuroscience</u> ▪ <u>Cognitive Psychology</u> ▪ <u>Developmental Psychology</u> ▪ <u>Social Psychology</u> ○ <u>A Graduate Research Field is a University credential that is recognized on the student's transcript and is intended to reflect that a student has successfully completed research concentrated in the area of the Graduate Research Field. The Department, represented by the student's supervisor and one additional reader must assess whether a student's completed research warrants the field designation at the time of degree completion. To obtain the Graduate Research Field designation, a student must also complete the requirements associated with the MA degree.</u>

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

Adding the MA graduate research field will not affect students already registered in the program.

Articulating the criteria for students to obtain a graduate research field designation on their transcript will permit students currently enrolled in the program to receive that designation on their transcript when they graduate.

Department/School approval date (mm/dd/yy): 04/11/23

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 04/13/23

Faculty approval date (mm/dd/yy): 05/16/23

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

Senate approval date (mm/dd/yy) (if appl

M E M O

TO: Tim Weber- Kraljirveski, Governance Officer Secretariat

FROM: S. Sivoththaman, Associate Dean, Graduate Studies, Faculty of Engineering

RE: Senate Graduate and Research Council

DATE: May 23, 2023

Please place the following motions forward for approval at the next meeting of the SGRC. These changes were approved by the EFC on May 16, 2023.

Items for Approval:

1. The department of **Management Sciences** would like to make the following calendar changes
 - a. Changing the entry method of the MSc- Co-operative Program from transfer to direct entry.

Rationale for Request:

The Department of Management Sciences currently offers a transfer entry co-op program where MSc students can apply for the co-op program after their first term in the program. To better support the MSc co-op students and to grow the graduate programs, the Department decided to offer a direct co-op program.

2. The department of **Electrical and Computer Engineering** would like to make the following calendar changes
 - a. Adding a Doctor of Philosophy (PhD) in Electrical and Computer Engineering - Aeronautics program.
 - b. Adding a Master of Applied Science (MASc) in Electrical and Computer Engineering - Aeronautics program
 - c. Adding BE 660 Negotiations to the list of electives for the Graduate Specialization in Business Leadership for MEng and MEng Co-op students.

Rationale for Request:

- a. The Department of Electrical and Computer Engineering is joining the CAP as research is already being conducted by faculty and graduate students in this research areas.
- b. The Department of Electrical and Computer Engineering is joining the CAP as research is already being conducted by faculty and graduate students in this research areas.

c. The Graduate Specialization in Business Leadership has been designed to introduce students to the processes and best practices for leading technical teams, processes, and organizations in a North American business context. The key purpose of leadership is creating a framework for action. Doing this well requires an understanding of people, familiarity with the “language” of business which is finance, and disciplinary expertise. The Graduate Specialization supplements the expertise students develop in the ECE MEng program with the core skills needed to lead a business venture. Adding BE660 as an elective will allow our graduate students an opportunity to strengthen their negotiation skills which may lead to favorable outcomes for our students in many real world situations.

3. The department of **Chemical Engineering** would like to make the following calendar changes
- a. Inactivation of CHE 610 Theory and Application of Transport Phenomena

Rationale for Request:

a. This course has been re-numbered as CHE 601. CHE 610 was retained in the Calendar pending degree completion by students who took it towards degree requirements. Students have completed.

SS/em

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 Sciences (MMSc) - Co-operative Program

Program contact name(s): Hossein Abouee Mehrizi, Kim Dunne

Form completed by:

Description of proposed changes:

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

Changing the entry method of the MMSc - Co-operative Program from transfer entry to direct entry.

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

Rationale for change(s):

The Department of Management Sciences currently offers a transfer entry co-op program where MMSc students can apply for the co-op program after their first term in the program. To better support the MMSc co-op students and to grow the graduate programs, the Department decided to offer a direct co-op program.

Proposed effective date: Term: Fall Year: 2023

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

<https://uwaterloo.ca/graduate-studies-academic-calendar/engineering/department-management-sciences/master-management-sciences-mmsc-co-operative-program>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>Program information</p> <ul style="list-style-type: none"> • Admit term(s) <ul style="list-style-type: none"> ○ Winter • Delivery mode <ul style="list-style-type: none"> ○ On-campus • Length of program <ul style="list-style-type: none"> ○ 5 terms (20 months) • Program type 	<p>Program information</p> <ul style="list-style-type: none"> • Admit term(s) <ul style="list-style-type: none"> ○ <u>Fall</u> • Delivery mode <ul style="list-style-type: none"> ○ On-campus • Length of program <ul style="list-style-type: none"> ○ 5 terms (20 months) • Program type

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> ○ Co-operative ○ Master's ○ Professional <ul style="list-style-type: none"> • Registration option(s) <ul style="list-style-type: none"> ○ Full-time • Study option(s) <ul style="list-style-type: none"> ○ Coursework <p>Admission requirements</p> <ul style="list-style-type: none"> • Minimum requirements <ul style="list-style-type: none"> ○ Students in the MMSc program can apply to transfer into the MMSc Co-operative Program after completing at least one academic term. Admission will be decided based on the student's progress to date, and is subject to approval by the Department Associate Chair for Graduate Studies. <p>Degree requirements</p> <ul style="list-style-type: none"> • Graduate Academic Integrity Module (Graduate AIM) • Courses <ul style="list-style-type: none"> ○ Students must successfully complete the following 4 General Requirement courses (0.50 unit weight per course/4 units): <ul style="list-style-type: none"> ▪ MSCI 603 Principles of Operations Research [this course may be replaced with MSCI 634 if a student has a strong background in Operations Research] ▪ MSCI 605 Organizational Theory & Behaviour ▪ MSCI 607 Economic Concepts for Management ▪ MSCI 609 Quantitative Data Analysis for Management Sciences ○ In addition to the 4 General Requirement courses (MSCI 603, MSCI 605, MSCI 607, MSCI 609), students must take at least 4 additional courses, totaling a minimum requirement of 8 courses overall (0.50 unit weight per course/4 units). These courses may 	<ul style="list-style-type: none"> ○ Co-operative ○ Master's ○ Professional <ul style="list-style-type: none"> • Registration option(s) <ul style="list-style-type: none"> ○ Full-time • Study option(s) <ul style="list-style-type: none"> ○ Coursework <p>Admission requirements</p> <ul style="list-style-type: none"> • Minimum requirements <ul style="list-style-type: none"> ○ <u>The Department of Management Sciences requires either (i) a 75% overall standing in the last two years, or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent; or (ii) a 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent, as the minimum requirement for admission to a Master's program for applicants educated at a Canadian institution. A 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent is the minimum requirement for admission to a Master's program for applicants educated outside of Canada.</u> ○ <u>Background in quantitative methods (e.g., Calculus, Linear Algebra, Probability and Statistics).</u> ○ <u>All applicants must submit a "Statement of Purpose" - a one page statement addressing their academic background and future goals.</u> ○ <u>Applicants who fall slightly below the minimum academic requirements may be considered for admission as transitional or probationary students.</u> • <u>Application materials</u> <ul style="list-style-type: none"> ○ <u>Résumé/Curriculum vitae</u> ○ <u>Supplementary information form</u> ○ <u>Transcript(s)</u> • <u>References</u> <ul style="list-style-type: none"> ○ <u>Number of references: 2</u> ○ <u>Type of references: academic (preferred) or professional</u>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>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.</p> <ul style="list-style-type: none"> ○ No more than 1 course (0.50 unit weight per course) may be taken outside of the Management Sciences Department. This course will require the approval of the Associate Chair for Graduate Studies. ○ Students who have completed their BAsC degree in Management Engineering at the University of Waterloo are required to choose their courses in consultation with the Associate Chair for Graduate Studies <ul style="list-style-type: none"> • Graduate Studies Work Report I and Graduate Studies Work Report II <ul style="list-style-type: none"> ○ Students in the program, who qualify, may choose a co-operative program of study. For a co-operative program of study a student must complete two work-terms and must complete the program during an academic term. The co-operative placements must relate to the program of study. Enrolment in the co-operative program must be approved by the student's supervisor and the Associate Chair Graduate Studies. ○ Co-operative students are responsible for following the regulations and procedures of Co-operative and Experiential Education (CEE). 	<ul style="list-style-type: none"> • <u>English language proficiency (ELP) (if applicable)</u> <p>Degree requirements</p> <p><u>The MSc – Co-operative Program will enable students to combine graduate studies with work experience.</u></p> <p><u>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 COOP 601 Career Success Strategies in the academic term prior to the first work term.</u></p> <ul style="list-style-type: none"> • Graduate Academic Integrity Module (Graduate AIM) • Courses <ul style="list-style-type: none"> ○ Students must successfully complete the following 4 General Requirement courses (0.50 unit weight per course/4 units): <ul style="list-style-type: none"> ▪ MSCI 603 Principles of Operations Research [this course may be replaced with MSCI 634 if a student has a strong background in Operations Research] ▪ MSCI 605 Organizational Theory & Behaviour ▪ MSCI 607 Economic Concepts for Management ▪ MSCI 609 Quantitative Data Analysis for Management Sciences ○ In addition to the 4 General Requirement courses (MSCI 603, MSCI 605, MSCI 607, MSCI 609), students must take at least 4 additional courses, totaling a minimum requirement of 8 courses overall (0.50 unit weight per course/4 units). These courses may include at most 2 500-level courses approved by the Associate Chair for Graduate Studies. All other courses must be at the 600 and 700 level.

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
	<p>Students must maintain an overall average of at least 73% at the end of each term, with no more than 2 failed courses overall.</p> <ul style="list-style-type: none"> ○ No more than 1 course (0.50 unit weight per course) may be taken outside of the Management Sciences Department. This course will require the approval of the Associate Chair for Graduate Studies. ○ Students who have completed their BAsC degree in Management Engineering at the University of Waterloo are required to choose their courses in consultation with the Associate Chair for Graduate Studies <ul style="list-style-type: none"> • Graduate Studies Work Report I and Graduate Studies Work Report II <ul style="list-style-type: none"> ○ Students must complete two work-term <u>experiences</u>. The co-operative <u>work-term experiences</u> must relate to the program of study. <u>For each work experience, a work report must be submitted to the Department for review to earn credit for the work report.</u> ○ Students are responsible for following the <u>roles</u> and <u>responsibilities</u> of Co-operative and Experiential Education (CEE).

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

The change will not impact the students currently registered since it will be offered as of Fall 2024.

Department/School approval date (mm/dd/yy): 03/06/23

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 05/02/23

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: Engineering

Program: Doctor of Philosophy (PhD) in Electrical and Computer Engineering - Aeronautics

Program contact name(s): Christopher Nielsen, Jared Rank

Form completed by: Christopher Nielsen, Jared Rank

Description of proposed changes:

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

The Department of Electrical and Computer Engineering is joining the Collaborative Aeronautics Program (CAP) and is thus adding a Doctor of Philosophy (PhD) in Electrical and Computer Engineering - Aeronautics program.

Is this a [major modification](#) to the program? Yes

Rationale for change(s):

After consultation with the ECE Graduate Studies Committee, which consists of Faculty and Graduate Student representatives, the department of Electrical and Computer Engineering is joining the Collaborative Aeronautics Program. Joining the CAP aligns with research that is already being conducted by faculty and graduate students in this area.

Proposed effective date: Term: Winter Year: 2024

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/engineering/department-electrical-and-computer-engineering>

<p>Current PhD in Electrical and Computer Graduate Studies Academic Calendar content:</p>	<p>Proposed PhD in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:</p>
<p>DOCTOR OF PHILOSOPHY (PHD) IN ELECTRICAL AND COMPUTER ENGINEERING</p> <p>Graduate research fields</p> <ul style="list-style-type: none"> • Antennas, Microwaves and Wave Optics • Biomedical 	<p>DOCTOR OF PHILOSOPHY (PHD) IN ELECTRICAL AND COMPUTER ENGINEERING - <u>AERONAUTICS</u></p> <p>Graduate research fields</p> <ul style="list-style-type: none"> • Antennas, Microwaves and Wave Optics • Biomedical

Current PhD in Electrical and Computer Graduate Studies Academic Calendar content:	Proposed PhD in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> • Circuits and Systems Including Computer - Aided Design • Communications and Information Systems • Computer Hardware • Computer Software • Nanotechnology • Pattern Analysis and Machine Intelligence (PAMI) • Power and Energy Systems • Quantum Information • Silicon Devices and Integrated Circuits • Systems and Control • Very Large Scale Integration (VLSI) • Wireless Communication 	<ul style="list-style-type: none"> • Circuits and Systems Including Computer - Aided Design • Communications and Information Systems • Computer Hardware • Computer Software • Nanotechnology • Pattern Analysis and Machine Intelligence (PAMI) • Power and Energy Systems • Quantum Information • Silicon Devices and Integrated Circuits • Systems and Control • Very Large Scale Integration (VLSI) • Wireless Communication
<p>Program information</p>	<p>Program information</p>
<ul style="list-style-type: none"> • Admit term(s) <ul style="list-style-type: none"> ○ Fall ○ Winter ○ Spring • Delivery mode <ul style="list-style-type: none"> ○ On-campus • Length of program <ul style="list-style-type: none"> ○ The minimum period of registration for the Doctoral degree is four terms after a Master's degree or equivalent and six terms after an Honours Bachelor's degree or equivalent. The maximum time limit is twelve terms after a Master's degree or equivalent and eighteen terms after an Honours Bachelor's degree or equivalent. Extensions beyond twelve terms must be approved by the Faculty Graduate Studies Office. • Program type <ul style="list-style-type: none"> ○ Doctoral ○ Research • Registration option(s) <ul style="list-style-type: none"> ○ Full-time ○ Part-time • Study option(s) <ul style="list-style-type: none"> ○ Thesis 	<ul style="list-style-type: none"> ○ Admit term(s) <ul style="list-style-type: none"> ○ Fall ○ Winter ○ Spring ○ Delivery mode <ul style="list-style-type: none"> ○ On-campus ○ Length of program <ul style="list-style-type: none"> ○ The minimum period of registration for the Doctoral degree is four terms after a Master's degree or equivalent and six terms after an Honours Bachelor's degree or equivalent. The maximum time limit is twelve terms after a Master's degree or equivalent and eighteen terms after an Honours Bachelor's degree or equivalent. Extensions beyond twelve terms must be approved by the Faculty Graduate Studies Office. ○ Program type <ul style="list-style-type: none"> ○ <u>Collaborative</u> ○ Doctoral ○ Research ○ Registration option(s) <ul style="list-style-type: none"> ○ Full-time ○ Part-time ○ Study option(s) <ul style="list-style-type: none"> ○ Thesis
<p>Admission requirements</p>	<p>Admission requirements</p>
<ul style="list-style-type: none"> • Minimum requirements 	

Current PhD in Electrical and Computer Graduate Studies Academic Calendar content:	Proposed PhD in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> ○ Admission to the program is based upon the student's academic record and evidence of ability to pursue independent research. ○ Normally an overall standing equivalent to 80% in either a relevant thesis-based Master's degree or a University of Waterloo Master of Engineering (MEng) degree that includes a completed ECE 699 Master of Engineering Project course. ○ At the time of admission, each student must have a faculty supervisor who has endorsed the recommendation for admission. <ul style="list-style-type: none"> ● Application materials <ul style="list-style-type: none"> ○ Résumé ○ Supplementary information form ○ Transcript(s) ● References <ul style="list-style-type: none"> ○ Number of references: 3 ○ Type of references: at least 2 academic ● English language proficiency (ELP) (if applicable) <p>Degree requirements</p> <ul style="list-style-type: none"> ○ Graduate Academic Integrity Module (Graduate AIM) ○ Courses <ul style="list-style-type: none"> ○ The coursework associated with the program is intended to provide a foundation for advanced learning in the chosen field of research. A minimum of 4 courses (0.50 unit weight per course) is required for a PhD student holding a MSc degree or equivalent (7 0.50 unit weight courses from a Bachelor program). At least 2 of the courses must be from the list of approved core courses (updated by the Department annually) in one of the approved areas of specialization as specified in the student's letter of admission, unless this course requirement has already been achieved during a University of Waterloo Electrical and Computer Engineering MSc program. The 	<ul style="list-style-type: none"> ○ Minimum requirements <ul style="list-style-type: none"> ○ Admission to the program is based upon the student's academic record and evidence of ability to pursue independent research. ○ Normally an overall standing equivalent to 80% in either a relevant thesis-based Master's degree or a University of Waterloo Master of Engineering (MEng) degree that includes a completed ECE 699 Master of Engineering Project course. ○ At the time of admission, each student must have a faculty supervisor who has endorsed the recommendation for admission. ○ Application materials <ul style="list-style-type: none"> ○ Résumé ○ Supplementary information form ○ Transcript(s) ○ References <ul style="list-style-type: none"> ○ Number of references: 3 ○ Type of references: at least 2 academic ○ English language proficiency (ELP) (if applicable) <p>Degree requirements</p> <ul style="list-style-type: none"> ○ Graduate Academic Integrity Module (Graduate AIM) ○ Courses <ul style="list-style-type: none"> ○ <u>Students admitted to the program with a non-Aeronautics MSc degree must obtain at least 5 courses (0.50 unit weight per course) of graduate credit including 2 Aeronautics core courses.</u> The coursework associated with the program is intended to provide a foundation for advanced learning in the chosen field of research. A minimum of 4 courses (0.50 unit weight per course) is required for a PhD student holding a MSc degree or equivalent (7 0.50 unit weight courses from a Bachelor program). At least 2 courses must be from the list of approved core courses (updated by the Department annually)

Current PhD in Electrical and Computer Graduate Studies Academic Calendar content:	Proposed PhD in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
<p>remaining 2 courses may be taken from outside of the Department but must be from the faculties of Engineering, Math, and/or Science (unless otherwise approved). All PhD students are required to take a minimum of 2 ECE courses toward their degree requirements. Core courses may count towards this 2 course minimum. The choice of courses must meet with the approval of the supervisor. The faculty supervisor will consider the level and adequacy of each student's preparation in drawing up the candidate's program. It is expected that candidates will maintain a 78% minimum cumulative average in their course work. To obtain credit, an individual course must be passed with at least 75%.</p> <ul style="list-style-type: none"> ○ Core courses: <ul style="list-style-type: none"> ▪ Antennas, Microwaves, and Wave Optics <ul style="list-style-type: none"> ▪ ECE 642 Radio Frequency Integrated Circuit Design ▪ ECE 671 Microwave and RF Engineering ▪ ECE 672 Optoelectronic Devices ▪ ECE 675 Radiation and Propagation of Electromagnetic Fields ▪ Biomedical <ul style="list-style-type: none"> ▪ ECE 601 Foundations of Biology in Engineering ▪ ECE 607 Fundamentals of Ultrasonics ▪ ECE 608 Quantitative Methods in Biomedical Engineering ▪ ECE 609 Engineering Analysis of Living Cells ▪ Circuits and Systems <ul style="list-style-type: none"> ▪ ECE 636 Advanced Analog Integrated Circuits ▪ ECE 637 Digital Integrated Circuits ▪ ECE 642 Radio Frequency Integrated Circuit Design ▪ ECE 671 Microwave and RF Engineering 	<p>in one of the approved areas of specialization as specified in the student's letter of admission unless this course requirement has already been achieved during a University of Waterloo Electrical and Computer Engineering MAsc program. The remaining 2 courses may be taken from outside of the Department but must be from the faculties of Engineering, Math, and/or Science (unless otherwise approved). All PhD Students are required to take a minimum of 2 ECE courses toward their degree requirements. Core courses may count towards this 2 course minimum. The choice of courses must meet with the approval of the supervisor. The faculty supervisor will consider the level and adequacy of each student's preparation in drawing up the candidate's program. It is expected that candidates will maintain a 78% minimum cumulative average in their course work. To obtain credit, an individual course must be passed with at least 75%.</p> <ul style="list-style-type: none"> ▪ <u>Aeronautics core courses:</u> <ul style="list-style-type: none"> ▪ <u>AVIA 601 Interdisciplinary Aeronautics</u> ▪ <u>AVIA 802 Interdisciplinary Aeronautics Project - PhD Level</u> ○ <u>Students admitted to the program with a MAsc in Electrical and Computer Engineering - Aeronautics degree from the University of Waterloo must obtain at least 5 courses (0.50 unit weight per course) of graduate credit including 1 Aeronautics core courses. Students are required to take a minimum of 2 ECE courses toward their degree requirements. The choice of courses must meet with the approval of the supervisor.</u> <ul style="list-style-type: none"> ▪ <u>Aeronautics core course:</u> <ul style="list-style-type: none"> ▪ <u>AVIA 802 Interdisciplinary Aeronautics Project - PhD Level.</u> ○ <u>Students admitted to the program with an incomplete Master's or Honours Bachelor's degree must obtain at least</u>

Current PhD in Electrical and Computer Graduate Studies Academic Calendar content:	Proposed PhD in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> ▪ Communications and Information Systems <ul style="list-style-type: none"> ▪ ECE 602 Introduction to Optimization or CO 602 Fundamentals of Optimization (cross-listed with CM 740 and CS 795) ▪ ECE 603 Statistical Signal Processing ▪ ECE 604 Stochastic Processes ▪ ECE 610 Broadband Communication Networks ▪ ECE 611 Digital Communications ▪ ECE 612 Information Theory ▪ ECE 613 Image Processing and Visual Communication ▪ Computer Hardware <ul style="list-style-type: none"> ▪ ECE 606 Algorithm Design ▪ ECE 621 Computer Organization ▪ ECE 627 Register-transfer-level Digital Systems ▪ ECE 637 Digital Integrated Circuits ▪ Computer Software <ul style="list-style-type: none"> ▪ ECE 606 Algorithm Design and Analysis or CO 602 Fundamentals of Optimization (cross-listed with CM 740 and CS 795) or CS 666 Algorithm Design and Analysis ▪ ECE 652 Methods and Principles of Safety-critical Embedded Software ▪ ECE 653 Software Testing, Quality Assurance and Maintenance or CS 647 Software Testing, Quality Assurance, and Maintenance ▪ ECE 654 Software Reliability Engineering 	<p><u>8 courses (0.50 unit weight per course) of graduate credit including 2 Aeronautics core courses. Students are required to take a minimum of 3 ECE courses toward their degree requirements. The choice of courses must meet with the approval of the supervisor.</u></p> <ul style="list-style-type: none"> ▪ <u>Aeronautics core courses:</u> <ul style="list-style-type: none"> ▪ <u>AVIA 601 Interdisciplinary Aeronautics</u> ▪ <u>AVIA 802 Interdisciplinary Aeronautics Project - PhD Level</u> ○ <u>Aside from AVIA 601 & AVIA 802, only courses from the Faculties of Science, Math and Engineering are permitted.</u> ○ <u>This degree is offered through the Collaborative Aeronautics Program. This program, jointly offered by a range of departments/schools across several academic faculties, promotes the development of interdisciplinary perspectives on aeronautics. Collaborative Aeronautics Program students complete their specialist training in their respective home departments/schools, while working with colleagues from a variety of other departments/schools in core interdisciplinary courses (AVIA 601 and AVIA 602/802).</u> ○ <u>To obtain credit, an individual course must be passed with at least a 75% average.</u> ○ <u>Students may be required to withdraw from the program at any time if they fail to maintain a minimum cumulative average of 78% in their course work or if they fail to receive satisfactory progress reports regarding their research activities.</u> ○ <u>ECE core courses:</u> <ul style="list-style-type: none"> ▪ <u>Antennas, Microwaves, and Wave Optics</u> <ul style="list-style-type: none"> ▪ <u>ECE 642 Radio Frequency Integrated Circuit Design</u> ▪ <u>ECE 671 Microwave and RF Engineering</u>

Current PhD in Electrical and Computer Graduate Studies Academic Calendar content:	Proposed PhD in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> ▪ ECE 656 Database Systems ▪ ECE 657A Data and Knowledge Modelling and Analysis or CS 680 Introduction to Machine Learning or CS 686 Introduction to Artificial Intelligence ▪ CO 685 The Mathematics of Public-Key Cryptography or CS 658 Computer Security and Privacy or CO 687 Applied Cryptography ▪ Nanotechnology <ul style="list-style-type: none"> ▪ ECE 630 Physics and Models of Semiconductor Devices ▪ ECE 633 Nanoelectronics ▪ ECE 634 Organic Electronics ▪ ECE 635 Fabrication in the Nanoscale: Principles, Technology and Applications ▪ ECE 672 Optoelectronic Devices ▪ PAMI - Pattern Analysis and Machine Intelligence <ul style="list-style-type: none"> ▪ ECE 606 Algorithm Design and Analysis ▪ ECE 613 Image Processing and Visual Communication ▪ ECE 657 Tools of Intelligent Systems Design ▪ ECE 657A Data and Knowledge Modelling and Analysis ▪ ECE 659 Intelligent Sensors and Sensor Networks ▪ Power and Energy Systems <ul style="list-style-type: none"> ▪ ECE 662 Power Systems Analysis and Control ▪ ECE 663 Energy Processing ▪ ECE 665 High Voltage Engineering Applications 	<ul style="list-style-type: none"> ▪ ECE 672 Optoelectronic Devices ▪ ECE 675 Radiation and Propagation of Electromagnetic Fields ▪ Biomedical <ul style="list-style-type: none"> ▪ ECE 601 Foundations of Biology in Engineering ▪ ECE 607 Fundamentals of Ultrasonics ▪ ECE 608 Quantitative Methods in Biomedical Engineering ▪ ECE 609 Engineering Analysis of Living Cells ▪ Circuits and Systems <ul style="list-style-type: none"> ▪ ECE 636 Advanced Analog Integrated Circuits ▪ ECE 637 Digital Integrated Circuits ▪ ECE 642 Radio Frequency Integrated Circuit Design ▪ ECE 671 Microwave and RF Engineering ▪ Communications and Information Systems <ul style="list-style-type: none"> ▪ ECE 602 Introduction to Optimization or CO 602 Fundamentals of Optimization (cross-listed with CM 740 and CS 795) ▪ ECE 603 Statistical Signal Processing ▪ ECE 604 Stochastic Processes ▪ ECE 610 Broadband Communication Networks ▪ ECE 611 Digital Communications ▪ ECE 612 Information Theory ▪ ECE 613 Image Processing and Visual Communication ▪ Computer Hardware <ul style="list-style-type: none"> ▪ ECE 606 Algorithm Design ▪ ECE 621 Computer Organization

Current PhD in Electrical and Computer Graduate Studies Academic Calendar content:	Proposed PhD in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> ▪ ECE 666 Power Systems Operation ▪ ECE 668 Distribution System Engineering ▪ ECE 760 Special Topics in Power Systems and High Voltage Engineering (topic 11 Power System Protection and Relaying) or ECE 765 Power System Protection and Relaying ▪ Quantum Information <ul style="list-style-type: none"> ▪ ECE 676 Quantum Information Processing Devices (cross-listed with QIC 750) ▪ ECE 677 Quantum Electronics and Photonics (cross-listed with QIC 885) ▪ QIC 710 Quantum Information Processing ▪ Silicon Devices and Integrated Circuits <ul style="list-style-type: none"> ▪ ECE 630 Physics and Models of Semiconductor Devices ▪ ECE 631 Microelectronic Processing Technology ▪ ECE 634 Organic Electronics ▪ ECE 636 Advanced Analog Integrated Circuits ▪ ECE 642 Radio Frequency Integrated Circuit Design ▪ ECE 672 Optoelectronic Devices ▪ Systems and Controls <ul style="list-style-type: none"> ▪ ECE 602 Introduction to Optimization or CO 602 Fundamentals of Optimization (cross-listed with CM 740 and CS 795) ▪ ECE 604 Stochastic Processes ▪ ECE 682 Multivariable Control Systems 	<ul style="list-style-type: none"> ▪ ECE 627 Register-transfer level Digital Systems ▪ ECE 637 Digital Integrated Circuits ▪ Computer Software <ul style="list-style-type: none"> ▪ ECE 606 Algorithm Design and Analysis or CO 602 Fundamentals of Optimization (cross-listed with CM 740 and CS 795) or CS 666 Algorithm Design and Analysis ▪ ECE 652 Methods and Principles of Safety-critical Embedded Software ▪ ECE 653 Software Testing, Quality Assurance and Maintenance or CS 647 Software Testing, Quality Assurance, and Maintenance ▪ ECE 654 Software Reliability Engineering ▪ ECE 656 Database Systems ▪ ECE 657A Data and Knowledge Modelling and Analysis or CS 680 Introduction to Machine Learning or CS 686 Introduction to Artificial Intelligence ▪ CO 685 The Mathematics of Public-Key Cryptography or CS 658 Computer Security and Privacy or CO 687 Applied Cryptography ▪ Nanotechnology <ul style="list-style-type: none"> ▪ ECE 630 Physics and Models of Semiconductor Devices ▪ ECE 633 Nanoelectronics ▪ ECE 634 Organic Electronics ▪ ECE 635 Fabrication in the Nanoscale: Principles, Technology and Applications

Current PhD in Electrical and Computer Graduate Studies Academic Calendar content:	Proposed PhD in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> ▪ ECE 686 Filtering and Control of Stochastic Linear Systems ▪ ECE 688 Nonlinear Systems ▪ VLSI - Very Large Scale Integration <ul style="list-style-type: none"> ▪ ECE 636 Advanced Analog Integrated Circuits ▪ ECE 637 Digital Integrated Circuits ▪ ECE 642 Radio Frequency Integrated Circuit Design ▪ ECE 671 Microwave and RF Engineering ▪ Wireless Communication <ul style="list-style-type: none"> ▪ ECE 602 Introduction to Optimization or CO 602 Fundamentals of Optimization (cross-listed with CM 740 and CS 795) ▪ ECE 603 Statistical Signal Processing ▪ ECE 604 Stochastic Processes ▪ ECE 610 Broadband Communication Networks ▪ ECE 611 Digital Communications ▪ ECE 612 Information Theory ▪ ECE 613 Image Processing and Visual Communication <p>○ PhD Comprehensive Examination I and PhD Comprehensive Examination II</p> <ul style="list-style-type: none"> ○ Students are required to meet the University-level PhD Comprehensive Examination minimum requirements outlined in the “Minimum requirements for the PhD degree” section of the Graduate Studies Academic Calendar (GSAC), with certain noted differences that are specific to the Faculty of Engineering Comprehensive Examination minimum requirements: <ul style="list-style-type: none"> ▪ Comprehensive examination purpose: Consistent with 	<ul style="list-style-type: none"> ▪ ECE 672 Optoelectronic Devices ▪ PAMI Pattern Analysis and Machine Intelligence <ul style="list-style-type: none"> ▪ ECE 606 Algorithm Design and Analysis ▪ ECE 613 Image Processing and Visual Communication ▪ ECE 657 Tools of Intelligent Systems Design ▪ ECE 657A Data and Knowledge Modelling and Analysis ▪ ECE 659 Intelligent Sensors and Sensor Networks ▪ Power and Energy Systems <ul style="list-style-type: none"> ▪ ECE 662 Power Systems Analysis and Control ▪ ECE 663 Energy Processing ▪ ECE 665 High Voltage Engineering Applications ▪ ECE 666 Power Systems Operation ▪ ECE 668 Distribution System Engineering ▪ ECE 760 Special Topics in Power Systems and High Voltage Engineering (topic 11 Power System Protection and Relaying) or ECE 765 Power System Protection and Relaying ▪ Quantum Information <ul style="list-style-type: none"> ▪ ECE 676 Quantum Information Processing Devices (cross-listed with QIC 750) ▪ ECE 677 Quantum Electronics and Photonics (cross-listed with QIC 885) ▪ QIC 710 Quantum Information Processing ▪ Silicon Devices and Integrated Circuits

Current PhD in Electrical and Computer Graduate Studies Academic Calendar content:	Proposed PhD in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
<p>University-level minimum requirements.</p> <ul style="list-style-type: none"> ▪ Who Chairs an examination: Students must follow the Faculty of Engineering Chair guidelines whereby the Chair is normally selected from outside of the student's home department. ▪ Format / Content: Consistent with University-level minimum requirements but with additional information provided in the Faculty of Engineering Comprehensive Examination minimum requirements. ▪ Academic integrity: Consistent with University-level minimum requirements. <p>○ In addition to the University-level and Faculty-level PhD Comprehensive Examination minimum requirements, students in the PhD in Electrical and Computer Engineering program are also required to meet the following requirements:</p> <ul style="list-style-type: none"> ▪ Students must complete the Background Comprehensive Examination and the Comprehensive Proposal Examination which are conducted by the Department for each candidate. ▪ The first exam, the Background Comprehensive Examination, will be held before the end of the third term (fourth term if from an incomplete MAsc). The main objective of this examination is to satisfy the Department that the candidate has a broad knowledge of their field and a thorough technical background to pursue their research; the candidate will be questioned on their background preparation. ▪ The second exam, the Comprehensive Proposal Examination, will be held no later than the student's sixth term and only after the Background Comprehensive Examination has been 	<ul style="list-style-type: none"> ▪ ECE 630 Physics and Models of Semiconductor Devices ▪ ECE 631 Microelectronic Processing Technology ▪ ECE 634 Organic Electronics ▪ ECE 636 Advanced Analog Integrated Circuits ▪ ECE 642 Radio Frequency Integrated Circuit Design ▪ ECE 672 Optoelectronic Devices ▪ Systems and Controls <ul style="list-style-type: none"> ▪ ECE 602 Introduction to Optimization or CO 602 Fundamentals of Optimization (cross-listed with CM 740 and GS 795) ▪ ECE 604 Stochastic Processes ▪ ECE 682 Multivariable Control Systems ▪ ECE 686 Filtering and Control of Stochastic Linear Systems ▪ ECE 688 Nonlinear Systems ▪ VLSI Very Large Scale Integration <ul style="list-style-type: none"> ▪ ECE 636 Advanced Analog Integrated Circuits ▪ ECE 637 Digital Integrated Circuits ▪ ECE 642 Radio Frequency Integrated Circuit Design ▪ ECE 671 Microwave and RF Engineering ▪ Wireless Communication <ul style="list-style-type: none"> ▪ ECE 602 Introduction to Optimization or CO 602 Fundamentals of Optimization (cross-listed with CM 740 and GS 795) ▪ ECE 603 Statistical Signal Processing ▪ ECE 604 Stochastic Processes

Current PhD in Electrical and Computer Graduate Studies Academic Calendar content:	Proposed PhD in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
<p>successfully completed. The main objective of this examination is to examine and approve the thesis proposal.</p> <ul style="list-style-type: none"> ▪ The result of these examinations is the identification of an Advisory Committee which has examined and approved the candidate's background and thesis proposal and is willing to assist the supervisor with the subsequent research program. The validity of the comprehensive examination expires after three years. ▪ Students who do not complete either Comprehensive Examination by the stated deadline, or fail either exam on their second attempt, will be required to withdraw from the program. ▪ The Background Comprehensive Examination Committee does not include the supervisor(s) and must consist of three members of the University, one of whom must be from ECE and two of whom can be internal or external to ECE (but within the University of Waterloo). The Proposal Comprehensive Examination Committee must consist of the supervisor(s) plus three members of the University, two of whom must be from ECE and one of whom must be external to ECE (but within the University of Waterloo). It is the supervisor's responsibility to form each of these committees. <ul style="list-style-type: none"> ○ Detailed procedures are available in the "PhD comprehensive examination process" section of the Electrical and Computer Engineering website. <ul style="list-style-type: none"> ○ PhD Seminar <ul style="list-style-type: none"> ○ The aim of the seminar is to allow students to gain experience in preparing and presenting their work. The seminar is to be held no later than the end of the third year (ninth term) 	<ul style="list-style-type: none"> ▪ ECE 610 Broadband Communication Networks ▪ ECE 611 Digital Communications ▪ ECE 612 Information Theory ▪ ECE 613 Image Processing and Visual Communication <ul style="list-style-type: none"> ○ PhD Comprehensive Examination I and PhD Comprehensive Examination II <ul style="list-style-type: none"> ○ Students are required to meet the University-level PhD Comprehensive Examination minimum requirements outlined in the "Minimum requirements for the PhD degree" section of the Graduate Studies Academic Calendar (GSAC), with certain noted differences that are specific to the Faculty of Engineering Comprehensive Examination minimum requirements: <ul style="list-style-type: none"> ▪ Comprehensive examination purpose: Consistent with University-level minimum requirements. ▪ Who Chairs an examination: Students must follow the Faculty of Engineering Chair guidelines whereby the Chair is normally selected from outside of the student's home department. ▪ Format / Content: Consistent with University-level minimum requirements but with additional information provided in the Faculty of Engineering Comprehensive Examination minimum requirements. ▪ Academic integrity: Consistent with University-level minimum requirements. ○ In addition to the University-level and Faculty-level PhD Comprehensive Examination minimum requirements, students in the PhD in Electrical and Computer Engineering - <u>Aeronautics</u> program are also required to meet the following requirements: <ul style="list-style-type: none"> ▪ Students must complete the Background Comprehensive Examination and the

Current PhD in Electrical and Computer Graduate Studies Academic Calendar content:	Proposed PhD in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
<p>after the initial registration in the program. The seminar must be attended by the student's supervisor and their Advisory Committee. Other Faculty members and PhD and MASc students may also be in attendance. Since this is not intended to be an examination, the seminar presentation and the feedback communication, would be regarded as satisfying the seminar credit requirements.</p> <ul style="list-style-type: none"> ○ Students who do not complete the PhD Seminar by the stated deadline will be required to withdraw from the program. <ul style="list-style-type: none"> ○ PhD Thesis <ul style="list-style-type: none"> ○ The primary objective of the program is the accomplishment of independent and original research work and reporting thereon in a research thesis. ○ The requirements for the PhD degree are completed when the student successfully defends their thesis before an Examination Committee. This committee should consist of the supervisor, three other members of the University (at least one of whom should be from outside the Department) and an external examiner. Faculty from other Departments who hold cross appointments in the Department are counted as departmental members in defining examining committees. 	<p>Comprehensive Proposal Examination which are conducted by the Department for each candidate.</p> <ul style="list-style-type: none"> ▪ The first exam, the Background Comprehensive Examination, will be held before the end of the third term (fourth term if from an incomplete MASc). The main objective of this examination is to satisfy the Department that the candidate has a broad knowledge of their field and a thorough technical background to pursue their research; the candidate will be questioned on their background preparation. ▪ The second exam, the Comprehensive Proposal Examination, will be held no later than the student's sixth term and only after the Background Comprehensive Examination has been successfully completed. The main objective of this examination is to examine and approve the thesis proposal. ▪ The result of these examinations is the identification of an Advisory Committee which has examined and approved the candidate's background and thesis proposal and is willing to assist the supervisor with the subsequent research program. The validity of the comprehensive examination expires after three years. ▪ Students who do not complete either Comprehensive Examination by the stated deadline, or fail either exam on their second attempt, will be required to withdraw from the program. ▪ The Background Comprehensive Examination Committee does not include the supervisor(s) and must consist of three members of the University, one of whom must

Current PhD in Electrical and Computer Graduate Studies Academic Calendar content:	Proposed PhD in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
	<p>be from ECE and two of whom can be internal or external to ECE (but within the University of Waterloo). The Proposal Comprehensive Examination Committee must consist of the supervisor(s) plus three members of the University, two of whom must be from ECE and one of whom must be external to ECE (but within the University of Waterloo). It is the supervisor's responsibility to form each of these committees.</p> <ul style="list-style-type: none"> ○ Detailed procedures are available in the "PhD comprehensive examination process" section of the Electrical and Computer Engineering website. ○ PhD Seminar <ul style="list-style-type: none"> ○ The aim of the seminar is to allow students to gain experience in preparing and presenting their work. The seminar is to be held no later than the end of the third year (ninth term) after the initial registration in the program. The seminar must be attended by the student's supervisor and their Advisory Committee. Other Faculty members and PhD and MASc students may also be in attendance. Since this is not intended to be an examination, the seminar presentation and the feedback communication, would be regarded as satisfying the seminar credit requirements. ○ Students who do not complete the PhD Seminar by the stated deadline will be required to withdraw from the program. ○ PhD Thesis <ul style="list-style-type: none"> ○ The primary objective of the program is the accomplishment of independent and original research work and reporting thereon in a research thesis. ○ The requirements for the PhD degree are completed when the student successfully defends their thesis before an Examination Committee. This committee should consist of the supervisor, three other members of the University (at least one of whom should be from outside the Department) and an external examiner. Faculty from

Current PhD in Electrical and Computer Graduate Studies Academic Calendar content:	Proposed PhD in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
	other Departments who hold cross appointments in the Department are counted as departmental members in defining examining committees.

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

Current students will be permitted to change program to the Collaborative Aeronautics Program.

Department/School approval date (mm/dd/yy): 02/16/2023

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 05/08/23

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: Engineering

Program: Master of Applied Science (MASc) in Electrical and Computer Engineering - Aeronautics

Program contact name(s): Christopher Nielsen, Jared Rank

Form completed by: Christopher Nielsen, Jared Rank

Description of proposed changes:

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

The Department of Electrical and Computer Engineering is joining the Collaborative Aeronautics Program (CAP) and is thus adding a Master of Applied Science (MASc) in Electrical and Computer Engineering - Aeronautics program.

Is this a [major modification](#) to the program? Yes

Rationale for change(s):

After consultation with the ECE Graduate Studies Committee, which consists of Faculty and Graduate Student representatives, the Department of Electrical and Computer Engineering is joining the Collaborative Aeronautics Program. Joining the CAP aligns with research that is already being conducted by faculty and graduate students in this area.

Proposed effective date: Term: Winter Year: 2024

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/engineering/department-electrical-and-computer-engineering>

<p>Current MASc in Electrical and Computer Engineering Graduate Studies Academic Calendar content:</p>	<p>Proposed MASc in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:</p>
<p>MASTER OF APPLIED SCIENCE (MASC) IN ELECTRICAL AND COMPUTER ENGINEERING</p> <p>Graduate research fields</p> <ul style="list-style-type: none"> • Antennas, Microwaves and Wave Optics • Biomedical 	<p>MASTER OF APPLIED SCIENCE (MASC) IN ELECTRICAL AND COMPUTER ENGINEERING - <u>AERONAUTICS</u></p> <p>Graduate research fields</p> <ul style="list-style-type: none"> • Antennas, Microwaves and Wave Optics • Biomedical

Current MASc in Electrical and Computer Engineering Graduate Studies Academic Calendar content:	Proposed MASc in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> • Circuits and Systems Including Computer - Aided Design • Communications and Information Systems • Computer Hardware • Computer Software • Nanotechnology • Pattern Analysis and Machine Intelligence (PAMI) • Power and Energy Systems • Quantum Information • Silicon Devices and Integrated Circuits • Systems and Control • Very Large Scale Integration (VLSI) • Wireless Communication 	<ul style="list-style-type: none"> • Circuits and Systems Including Computer - Aided Design • Communications and Information Systems • Computer Hardware • Computer Software • Nanotechnology • Pattern Analysis and Machine Intelligence (PAMI) • Power and Energy Systems • Quantum Information • Silicon Devices and Integrated Circuits • Systems and Control • Very Large Scale Integration (VLSI) • Wireless Communication
<p>Program information</p> <ul style="list-style-type: none"> • Admit term(s) <ul style="list-style-type: none"> ○ Fall ○ Winter ○ Spring • Delivery mode <ul style="list-style-type: none"> ○ On-campus • Length of program <ul style="list-style-type: none"> ○ The minimum period of registration for the Master's degree is two terms after an Honours Bachelor's degree or equivalent. The maximum time limit is six terms for the regular program and fifteen terms for the part-time program. Extensions beyond six terms must be approved by the Faculty Graduate Studies Office. • Program type <ul style="list-style-type: none"> ○ Master's ○ Research • Registration option(s) <ul style="list-style-type: none"> ○ Full-time ○ Part-time • Study option(s) <ul style="list-style-type: none"> ○ Thesis 	<p>Program information</p> <ul style="list-style-type: none"> • Admit term(s) <ul style="list-style-type: none"> ○ Fall ○ Winter ○ Spring • Delivery mode <ul style="list-style-type: none"> ○ On-campus • Length of program <ul style="list-style-type: none"> ○ The minimum period of registration for the Master's degree is two terms after an Honours Bachelor's degree or equivalent. The maximum time limit is six terms for the regular program and fifteen terms for the part-time program. Extensions beyond six terms must be approved by the Faculty Graduate Studies Office. • Program type <ul style="list-style-type: none"> ○ <u>Collaborative</u> ○ Master's ○ Research • Registration option(s) <ul style="list-style-type: none"> ○ Full-time ○ Part-time • Study option(s) <ul style="list-style-type: none"> ○ Thesis
<p>Admission requirements</p> <ul style="list-style-type: none"> • Minimum requirements <ul style="list-style-type: none"> ○ The Department of Electrical and Computer Engineering requires either (i) a 75% overall standing in the last 	<p>Admission requirements</p> <ul style="list-style-type: none"> • Minimum requirements <ul style="list-style-type: none"> ○ The Department of Electrical and Computer Engineering requires either

Current MASc in Electrical and Computer Engineering Graduate Studies Academic Calendar content:	Proposed MASc in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
<p>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.</p> <ul style="list-style-type: none"> ○ At the time of admission, each student must have a faculty supervisor who has endorsed the recommendation for admission. <ul style="list-style-type: none"> • Application materials <ul style="list-style-type: none"> ○ Résumé ○ Supplementary information form ○ Transcript(s) • References <ul style="list-style-type: none"> ○ Number of references: 2 ○ Type of references: at least 1 academic • English language proficiency (ELP) (if applicable) <p>Degree requirements</p> <ul style="list-style-type: none"> • Graduate Academic Integrity Module (Graduate AIM) • Courses <ul style="list-style-type: none"> ○ The requirements for the program consist of at least 5 courses (0.50 unit weight per course) of graduate credit. A minimum of 3 courses must be taken from within the Faculty of Engineering. A maximum of 2 courses may be taken from outside the Faculty but must be from the Faculties of Math and/or Science. At least 2 of the courses must be from the list of approved core courses (updated by the Department annually) in one of the approved areas of specialization as specified in the student's letter of admission. All MASc students are required to take a 	<p>(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.</p> <ul style="list-style-type: none"> ○ At the time of admission, each student must have a faculty supervisor who has endorsed the recommendation for admission. <ul style="list-style-type: none"> • Application materials <ul style="list-style-type: none"> ○ Résumé ○ Supplementary information form ○ Transcript(s) • References <ul style="list-style-type: none"> ○ Number of references: 2 ○ Type of references: at least 1 academic • English language proficiency (ELP) (if applicable) <p>Degree requirements</p> <ul style="list-style-type: none"> • Graduate Academic Integrity Module (Graduate AIM) • Courses <ul style="list-style-type: none"> ○ <u>Students must obtain</u> The requirements for the program consist of at least 6 courses (0.50 unit weight per course) of graduate credit <u>including 2 Aeronautics core courses.</u> A minimum of 3 courses must be taken from within the Faculty of Engineering. A maximum of 2 courses may be taken from outside the Faculty but must be from the Faculties of Math and/or Science. At least 2 courses must be from the list of approved core courses (updated by the Department annually) in one of the approved areas of specialization as

Current MASc in Electrical and Computer Engineering Graduate Studies Academic Calendar content:	Proposed MASc in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
<p>minimum of 2 ECE courses toward their degree requirements. Core courses may count towards this 2 course minimum. The choice of courses must meet with the approval of the supervisor.</p> <ul style="list-style-type: none"> ○ Core courses: <ul style="list-style-type: none"> ▪ Antennas, Microwaves, and Wave Optics <ul style="list-style-type: none"> ▪ ECE 642 Radio Frequency Integrated Circuit Design ▪ ECE 671 Microwave and RF Engineering ▪ ECE 672 Optoelectronic Devices ▪ ECE 675 Radiation and Propagation of Electromagnetic Fields ▪ Biomedical <ul style="list-style-type: none"> ▪ ECE 601 Foundations of Biology in Engineering ▪ ECE 607 Fundamentals of Ultrasonics ▪ ECE 608 Quantitative Methods in Biomedical Engineering ▪ ECE 609 Engineering Analysis of Living Cells ▪ Circuits and Systems <ul style="list-style-type: none"> ▪ ECE 636 Advanced Analog Integrated Circuits ▪ ECE 637 Digital Integrated Circuits ▪ ECE 642 Radio Frequency Integrated Circuit Design ▪ ECE 671 Microwave and RF Engineering ▪ Communications and Information Systems <ul style="list-style-type: none"> ▪ ECE 602 Introduction to Optimization or CO 602 Fundamentals of Optimization (cross-listed with CM 740 and CS 795) ▪ ECE 603 Statistical Signal Processing ▪ ECE 604 Stochastic Processes 	<p>specified in the student's letter of admission. All MASc Students are required to take a minimum of 2 ECE courses toward their degree requirements. Core courses may count towards this 2 course minimum. The choice of courses must meet with the approval of the supervisor.</p> <ul style="list-style-type: none"> ○ <u>Aeronautics core courses:</u> <ul style="list-style-type: none"> ▪ <u>AVIA 601 Interdisciplinary Aeronautics</u> ▪ <u>AVIA 602 Interdisciplinary Aeronautics Project</u> ○ <u>Aside from AVIA 601 & AVIA 602, only courses from the Faculties of Science, Math and Engineering are permitted.</u> ○ ECE core courses: <ul style="list-style-type: none"> ▪ Antennas, Microwaves, and Wave Optics <ul style="list-style-type: none"> ▪ ECE 642 Radio Frequency Integrated Circuit Design ▪ ECE 671 Microwave and RF Engineering ▪ ECE 672 Optoelectronic Devices ▪ ECE 675 Radiation and Propagation of Electromagnetic Fields ▪ Biomedical <ul style="list-style-type: none"> ▪ ECE 601 Foundations of Biology in Engineering ▪ ECE 607 Fundamentals of Ultrasonics ▪ ECE 608 Quantitative Methods in Biomedical Engineering ▪ ECE 609 Engineering Analysis of Living Cells ▪ Circuits and Systems <ul style="list-style-type: none"> ▪ ECE 636 Advanced Analog Integrated Circuits ▪ ECE 637 Digital Integrated Circuits ▪ ECE 642 Radio Frequency Integrated Circuit Design ▪ ECE 671 Microwave and RF Engineering ▪ Communications and Information Systems <ul style="list-style-type: none"> ▪ ECE 602 Introduction to Optimization or CO 602

Current MASc in Electrical and Computer Engineering Graduate Studies Academic Calendar content:	Proposed MASc in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> ▪ ECE 610 Broadband Communication Networks ▪ ECE 611 Digital Communications ▪ ECE 612 Information Theory ▪ ECE 613 Image Processing and Visual Communication ▪ Computer Hardware <ul style="list-style-type: none"> ▪ ECE 606 Algorithm Design ▪ ECE 621 Computer Organization ▪ ECE 627 Register-transfer-level Digital Systems ▪ ECE 637 Digital Integrated Circuits ▪ Computer Software <ul style="list-style-type: none"> ▪ ECE 606 Algorithm Design and Analysis or CO 602 Fundamentals of Optimization (cross-listed with CM 740 and CS 795) or CS 666 Algorithm Design and Analysis ▪ ECE 652 Methods and Principles of Safety-critical Embedded Software ▪ ECE 653 Software Testing, Quality Assurance and Maintenance or CS 647 Software Testing, Quality Assurance, and Maintenance ▪ ECE 654 Software Reliability Engineering ▪ ECE 656 Database Systems ▪ ECE 657A Data and Knowledge Modelling and Analysis or CS 680 Introduction to Machine Learning or CS 686 Introduction to Artificial Intelligence ▪ CO 685 The Mathematics of Public-Key Cryptography or CS 	<ul style="list-style-type: none"> Fundamentals of Optimization (cross-listed with CM 740 and CS 795) ▪ ECE 603 Statistical Signal Processing ▪ ECE 604 Stochastic Processes ▪ ECE 610 Broadband Communication Networks ▪ ECE 611 Digital Communications ▪ ECE 612 Information Theory ▪ ECE 613 Image Processing and Visual Communication ▪ Computer Hardware <ul style="list-style-type: none"> ▪ ECE 606 Algorithm Design ▪ ECE 621 Computer Organization ▪ ECE 627 Register-transfer-level Digital Systems ▪ ECE 637 Digital Integrated Circuits ▪ Computer Software <ul style="list-style-type: none"> ▪ ECE 606 Algorithm Design and Analysis or CO 602 Fundamentals of Optimization (cross-listed with CM 740 and CS 795) or CS 666 Algorithm Design and Analysis ▪ ECE 652 Methods and Principles of Safety-critical Embedded Software ▪ ECE 653 Software Testing, Quality Assurance and Maintenance or CS 647 Software Testing, Quality Assurance, and Maintenance ▪ ECE 654 Software Reliability Engineering ▪ ECE 656 Database Systems ▪ ECE 657A Data and Knowledge Modelling

Current MASc in Electrical and Computer Engineering Graduate Studies Academic Calendar content:	Proposed MASc in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
<p>658 Computer Security and Privacy or CO 687 Applied Cryptography</p> <ul style="list-style-type: none"> ▪ Nanotechnology <ul style="list-style-type: none"> ▪ ECE 630 Physics and Models of Semiconductor Devices ▪ ECE 633 Nanoelectronics ▪ ECE 634 Organic Electronics ▪ ECE 635 Fabrication in the Nanoscale: Principles, Technology and Applications ▪ ECE 672 Optoelectronic Devices ▪ PAMI - Pattern Analysis and Machine Intelligence <ul style="list-style-type: none"> ▪ ECE 606 Algorithm Design and Analysis ▪ ECE 613 Image Processing and Visual Communication ▪ ECE 657 Tools of Intelligent Systems Design ▪ ECE 657A Data and Knowledge Modelling and Analysis ▪ ECE 659 Intelligent Sensors and Sensor Networks ▪ Power and Energy Systems <ul style="list-style-type: none"> ▪ ECE 662 Power Systems Analysis and Control ▪ ECE 663 Energy Processing ▪ ECE 665 High Voltage Engineering Applications ▪ ECE 666 Power Systems Operation ▪ ECE 668 Distribution System Engineering ▪ ECE 760 Special Topics in Power Systems and High Voltage Engineering (topic 11 Power System Protection and Relaying) or ECE 765 Power System Protection and Relaying 	<p>and Analysis or CS 680 Introduction to Machine Learning or CS 686 Introduction to Artificial Intelligence</p> <ul style="list-style-type: none"> ▪ CO 685 The Mathematics of Public-Key Cryptography or CS 658 Computer Security and Privacy or CO 687 Applied Cryptography ▪ Nanotechnology <ul style="list-style-type: none"> ▪ ECE 630 Physics and Models of Semiconductor Devices ▪ ECE 633 Nanoelectronics ▪ ECE 634 Organic Electronics ▪ ECE 635 Fabrication in the Nanoscale: Principles, Technology and Applications ▪ ECE 672 Optoelectronic Devices ▪ PAMI - Pattern Analysis and Machine Intelligence <ul style="list-style-type: none"> ▪ ECE 606 Algorithm Design and Analysis ▪ ECE 613 Image Processing and Visual Communication ▪ ECE 657 Tools of Intelligent Systems Design ▪ ECE 657A Data and Knowledge Modelling and Analysis ▪ ECE 659 Intelligent Sensors and Sensor Networks ▪ Power and Energy Systems <ul style="list-style-type: none"> ▪ ECE 662 Power Systems Analysis and Control ▪ ECE 663 Energy Processing ▪ ECE 665 High Voltage Engineering Applications ▪ ECE 666 Power Systems Operation ▪ ECE 668 Distribution System Engineering

Current MASc in Electrical and Computer Engineering Graduate Studies Academic Calendar content:	Proposed MASc in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> ▪ Quantum Information <ul style="list-style-type: none"> ▪ ECE 676 Quantum Information Processing Devices (cross-listed with QIC 750) ▪ ECE 677 Quantum Electronics and Photonics (cross-listed with QIC 885) ▪ QIC 710 Quantum Information Processing ▪ Silicon Devices and Integrated Circuits <ul style="list-style-type: none"> ▪ ECE 630 Physics and Models of Semiconductor Devices ▪ ECE 631 Microelectronic Processing Technology ▪ ECE 634 Organic Electronics ▪ ECE 636 Advanced Analog Integrated Circuits ▪ ECE 642 Radio Frequency Integrated Circuit Design ▪ ECE 672 Optoelectronic Devices ▪ Systems and Controls <ul style="list-style-type: none"> ▪ ECE 602 Introduction to Optimization or CO 602 Fundamentals of Optimization (cross-listed with CM 740 and CS 795) ▪ ECE 604 Stochastic Processes ▪ ECE 682 Multivariable Control Systems ▪ ECE 686 Filtering and Control of Stochastic Linear Systems ▪ ECE 688 Nonlinear Systems ▪ VLSI - Very Large Scale Integration <ul style="list-style-type: none"> ▪ ECE 636 Advanced Analog Integrated Circuits ▪ ECE 637 Digital Integrated Circuits ▪ ECE 642 Radio Frequency Integrated Circuit Design 	<ul style="list-style-type: none"> ▪ ECE 760 Special Topics in Power Systems and High Voltage Engineering (topic 11 Power System Protection and Relaying) or ECE 765 Power System Protection and Relaying ▪ Quantum Information <ul style="list-style-type: none"> ▪ ECE 676 Quantum Information Processing Devices (cross-listed with QIC 750) ▪ ECE 677 Quantum Electronics and Photonics (cross-listed with QIC 885) ▪ QIC 710 Quantum Information Processing ▪ Silicon Devices and Integrated Circuits <ul style="list-style-type: none"> ▪ ECE 630 Physics and Models of Semiconductor Devices ▪ ECE 631 Microelectronic Processing Technology ▪ ECE 634 Organic Electronics ▪ ECE 636 Advanced Analog Integrated Circuits ▪ ECE 642 Radio Frequency Integrated Circuit Design ▪ ECE 672 Optoelectronic Devices ▪ Systems and Controls <ul style="list-style-type: none"> ▪ ECE 602 Introduction to Optimization or CO 602 Fundamentals of Optimization (cross-listed with CM 740 and CS 795) ▪ ECE 604 Stochastic Processes ▪ ECE 682 Multivariable Control Systems ▪ ECE 686 Filtering and Control of Stochastic Linear Systems ▪ ECE 688 Nonlinear Systems

Current MASc in Electrical and Computer Engineering Graduate Studies Academic Calendar content:	Proposed MASc in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> ▪ ECE 671 Microwave and RF Engineering ▪ Wireless Communication <ul style="list-style-type: none"> ▪ ECE 602 Introduction to Optimization or CO 602 Fundamentals of Optimization (cross-listed with CM 740 and CS 795) ▪ ECE 603 Statistical Signal Processing ▪ ECE 604 Stochastic Processes ▪ ECE 610 Broadband Communication Networks ▪ ECE 611 Digital Communications ▪ ECE 612 Information Theory ▪ ECE 613 Image Processing and Visual Communication ○ Students are normally expected to take graduate courses at the 600 or 700 level. 1 advanced undergraduate (400 level) Electrical or Computer Engineering course may be allowed for graduate credit. It is expected that both the student and supervisor should provide adequate justification and complete the required paperwork before any undergraduate course is approved for credit. ○ The advanced undergraduate courses must be at the 400 or 500 level as given in the Undergraduate Studies Academic Calendar and must be approved for graduate credit and confirmed in writing by the Department Associate Chair for Graduate Studies at the time of registration. ○ Students may be required at any time to withdraw from the program if they fail to maintain a minimum grade of 65% in each of the 5 courses and a cumulative average of at least 70% in the coursework portion of their approved study program or if they fail to receive satisfactory progress reports regarding their research activities. ○ The Department may recommend that credit be allowed for courses taken at other institutions. In special cases, 2 	<ul style="list-style-type: none"> ▪ VLSI – Very Large Scale Integration <ul style="list-style-type: none"> ▪ ECE 636 Advanced Analog Integrated Circuits ▪ ECE 637 Digital Integrated Circuits ▪ ECE 642 Radio Frequency Integrated Circuit Design ▪ ECE 671 Microwave and RF Engineering ▪ Wireless Communication <ul style="list-style-type: none"> ▪ ECE 602 Introduction to Optimization or CO 602 Fundamentals of Optimization (cross-listed with CM 740 and CS 795) ▪ ECE 603 Statistical Signal Processing ▪ ECE 604 Stochastic Processes ▪ ECE 610 Broadband Communication Networks ▪ ECE 611 Digital Communications ▪ ECE 612 Information Theory ▪ ECE 613 Image Processing and Visual Communication ○ Students are normally expected to take graduate courses at the 600 or 700 level <u>or higher as per the Graduate Studies Academic Calendar.</u> ○ <u>One (1) advanced undergraduate (at the 400 or 500 level as per the Undergraduate Studies Academic Calendar)</u> Electrical or Computer Engineering course may be <u>permitted</u> for graduate credit. It is expected that <u>Both</u> the student and supervisor <u>should must</u> provide adequate justification and complete the required paperwork before any undergraduate course is approved for credit. ○ The advanced undergraduate courses must be at the 400 or 500 level as given in the Undergraduate Studies Academic Calendar and must be approved for graduate credit and confirmed in writing by the Department

Current MSc in Electrical and Computer Engineering Graduate Studies Academic Calendar content:	Proposed MSc in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
<p>courses (0.50 unit weight) may be approved.</p> <ul style="list-style-type: none"> • Master's Seminar <ul style="list-style-type: none"> ○ Students are required to present a seminar on their thesis topic as part of the degree requirements. The purpose of this seminar is to develop the student's ability to communicate the results of a research work in an organized and informative manner. The seminar is not an oral examination of the thesis. The seminar should be held during the term the thesis is submitted to the readers. The supervisor(s), plus one other Faculty member must be in attendance at the seminar in order for the student to receive credit. • Master's Thesis <ul style="list-style-type: none"> ○ The topic of the thesis and the choice of the required 5 courses of graduate coursework are arranged by students and their faculty supervisor. Each student's program is subject to approval by the Graduate Studies Committee of the Department. Students must maintain continuous active registration until the thesis requirements are completed. The research work leading to the thesis must be performed under the direction of the faculty supervisor(s) and is finally approved and accepted by at least three readers. The readers will consist of the supervisor(s) plus a minimum of two other faculty members. 	<p>Associate Chair for Graduate Studies at the time of registration.</p> <ul style="list-style-type: none"> ○ <u>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).</u> ○ <u>To obtain credit, an individual course must be passed with at least a 65% average.</u> ○ <u>Students may be required at any time to withdraw from the program at any time if they fail to maintain a minimum grade of 65% in each of the 5 courses and a cumulative average of at least 70% in their coursework portion of their approved study program or if they fail to receive satisfactory progress reports regarding their research activities.</u> ○ The Department may recommend that credit be allowed for courses taken at other institutions. In special cases, <u>a maximum of 2 courses (0.50 unit weight)</u> may be approved. <ul style="list-style-type: none"> • Master's Seminar <ul style="list-style-type: none"> ○ Students are required to present a seminar on their thesis topic as part of the degree requirements. The purpose of this seminar is to develop the student's ability to communicate the results of a research work in an organized and informative manner. The seminar is not an oral examination of the thesis. The seminar should be held during the term the thesis is submitted to the readers. The supervisor(s), plus one other Faculty member must be in attendance at the seminar in order for the student to receive credit. • Master's Thesis <ul style="list-style-type: none"> ○ The topic of the thesis and the choice of the required 5 courses of graduate

Current MASC in Electrical and Computer Engineering Graduate Studies Academic Calendar content:	Proposed MASC in Electrical and Computer Engineering - Aeronautics Graduate Studies Academic Calendar content:
	<p>coursework are is arranged by students and their faculty supervisor. Each student's program is subject to approval by the Graduate Studies Committee of the Department. Students must maintain continuous active registration until the thesis requirements are completed. The research work leading to the thesis must be performed under the direction of the faculty supervisor(s) and is finally approved and accepted by at least three readers. The readers will consist of the supervisor(s) plus a minimum of two other faculty members.</p>

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

Current students will be able to submit a program change to the Collaborative Aeronautics Program.

Department/School approval date (mm/dd/yy): 02/16/2023

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 05/08/23

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.

Faculty: Engineering

Programs: 1) Master of Engineering (MEng) in Electrical and Computer Engineering

2) Master of Engineering (MEng) in Electrical and Computer Engineering – Co-operative Program

Program contact name(s): Jared Rank

Form completed by: Jared Rank

Description of proposed changes:

Note: changes to courses and milestones also require the completion/submission of the SGRC Course/Milestone-New/Revision/Inactivation form ([PC docx version](#) or [MAC docx version](#)).

Adding BE 660 Negotiations to the list of electives for the Graduate Specialization in Business Leadership.

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

Rationale for change(s):

The Graduate Specialization in Business Leadership has been designed to introduce students to the processes and best practices for leading technical teams, processes, and organizations in a North American business context. The key purpose of leadership is creating a framework for action. Doing this well requires an understanding of people, familiarity with the “language” of business which is finance, and disciplinary expertise. The Graduate Specialization supplements the expertise students develop in the ECE MEng program with the core skills needed to lead a business venture.

Adding BE660 as an elective will allow our graduate students an opportunity to strengthen their negotiation skills which may lead to favorable outcomes for our students in many real world situations.

Proposed effective date: Term: Fall Year: 2023

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

<https://uwaterloo.ca/graduate-studies-academic-calendar/engineering/department-electrical-and-computer-engineering/master-engineering-meng-electrical-and-computer-engineering>

<https://uwaterloo.ca/graduate-studies-academic-calendar/engineering/department-electrical-and-computer-engineering/master-engineering-meng-electrical-and-computer-engineering-co-operative-program-direct-entry>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Degree requirements <ul style="list-style-type: none"> • Courses 	Degree requirements <ul style="list-style-type: none"> • Courses

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<ul style="list-style-type: none"> ○ Students must successfully complete 8 one-term courses (0.50 unit weight) acceptable for credit by the Department. ○ Students may register for any ECE course at the 600 or 700 levels. ○ A minimum of 5 courses must be taken from within the ECE Department. A maximum of 3 courses may be taken from outside the Department but must be from the faculties of Engineering, Mathematics and Science. Students opting for the Graduate Specialization in Business Leadership are allowed to take a maximum of 4 courses from outside ECE, but from the specified list of BE/BET courses, detailed below. ○ A minimum grade of 65% in each of the 8 courses and a minimum cumulative average of 70% are required to remain in the program. Students who receive a grade of less than 65% may be permitted to take a maximum of 2 additional courses to meet the minimum averages for the degree requirements (outlined above). ○ Students wishing to complete a Graduate Specialization as part of their MEng program should consult the list of required courses for each Graduate Specialization before selecting courses, as the number of minimum required courses may differ. ○ Students in the MEng in Electrical and Computer Engineering program may choose to pursue one of the following Graduate Specializations: <ul style="list-style-type: none"> 1. Artificial Intelligence and Machine Learning 2. Biomedical Engineering 3. Business Leadership 4. Computer Networking and Security 5. Nanoelectronic Circuits and Systems 6. Nanoelectronic Devices and Materials 7. Software 8. Sustainable Energy ○ A Graduate Specialization is a University credential that is recognized on the student's transcript but not on the diploma and is intended to reflect that a student has successfully completed a set of courses that 	<ul style="list-style-type: none"> ○ Students must successfully complete 8 one-term courses (0.50 unit weight) acceptable for credit by the Department. ○ Students may register for any ECE course at the 600 or 700 levels. ○ A minimum of 5 courses must be taken from within the ECE Department. A maximum of 3 courses may be taken from outside the Department but must be from the faculties of Engineering, Mathematics and Science. Students opting for the Graduate Specialization in Business Leadership are allowed to take a maximum of 4 courses from outside ECE, but from the specified list of BE/BET courses, detailed below. ○ A minimum grade of 65% in each of the 8 courses and a minimum cumulative average of 70% are required to remain in the program. Students who receive a grade of less than 65% may be permitted to take a maximum of 2 additional courses to meet the minimum averages for the degree requirements (outlined above). ○ Students wishing to complete a Graduate Specialization as part of their MEng program should consult the list of required courses for each Graduate Specialization before selecting courses, as the number of minimum required courses may differ. ○ Students in the MEng in Electrical and Computer Engineering program may choose to pursue one of the following Graduate Specializations: <ul style="list-style-type: none"> 1. Artificial Intelligence and Machine Learning 2. Biomedical Engineering 3. Business Leadership 4. Computer Networking and Security 5. Nanoelectronic Circuits and Systems 6. Nanoelectronic Devices and Materials 7. Software 8. Sustainable Energy ○ A Graduate Specialization is a University credential that is recognized on the student's transcript but not on the diploma and is intended to reflect that a student has successfully completed a set of courses that

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>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.</p> <ul style="list-style-type: none"> ○ All MEng Graduate Specializations in Electrical and Computer Engineering consist of a set of at least 4 graduate (0.50 weight) level courses and this set is comprised of a mix of compulsory and elective courses. Compulsory courses are those that are prescribed as part of the Graduate Specialization. Elective courses are those that are on a list of courses designated as electives for a given Graduate Specialization. The requirements for each of the Graduate Specializations are described below. ○ Note: Not all elective courses for any given Graduate Specialization are guaranteed to be offered each year. Students are encouraged to take elective courses when they are offered and should plan accordingly. ○ Students will be able to complete the Business Leadership Graduate Specialization along with 1 other ECE Graduate Specialization, noting the following: <ul style="list-style-type: none"> ▪ Each course will only be counted towards one Graduate Specialization and the MEng degree. ▪ The number of required courses for the MEng degree will increase from 8 to 9 or 10 depending on the requirements associated with the Graduate Specializations. ○ Students must consult with the ECE Masters Coordinator to finalize their plan of study and to ensure that they are able to meet the degree and Graduate Specialization requirements within the program time limits. <p>3. Graduate Specialization in Business Leadership</p> <ul style="list-style-type: none"> ○ To receive the Graduate Specialization in Business Leadership, students must 	<p>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.</p> <ul style="list-style-type: none"> ○ All MEng Graduate Specializations in Electrical and Computer Engineering consist of a set of at least 4 graduate (0.50 weight) level courses and this set is comprised of a mix of compulsory and elective courses. Compulsory courses are those that are prescribed as part of the Graduate Specialization. Elective courses are those that are on a list of courses designated as electives for a given Graduate Specialization. The requirements for each of the Graduate Specializations are described below. ○ Note: Not all elective courses for any given Graduate Specialization are guaranteed to be offered each year. Students are encouraged to take elective courses when they are offered and should plan accordingly. ○ Students will be able to complete the Business Leadership Graduate Specialization along with 1 other ECE Graduate Specialization, noting the following: <ul style="list-style-type: none"> ▪ Each course will only be counted towards one Graduate Specialization and the MEng degree. ▪ The number of required courses for the MEng degree will increase from 8 to 9 or 10 depending on the requirements associated with the Graduate Specializations. ○ Students must consult with the ECE Masters Coordinator to finalize their plan of study and to ensure that they are able to meet the degree and Graduate Specialization requirements within the program time limits. <p>3. Graduate Specialization in Business Leadership</p> <ul style="list-style-type: none"> ○ To receive the Graduate Specialization in Business Leadership, students must

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>successfully complete 2 compulsory courses and 2 elective courses:</p> <ul style="list-style-type: none"> ▪ Compulsory courses: <ul style="list-style-type: none"> ▪ BE 600 Management and Leadership ▪ BE 601 Introduction to Financial and Managerial Accounting ▪ Elective courses (choose 2 from the following list): Note: not all elective courses may be offered each year. <ul style="list-style-type: none"> ▪ BE 602 Data Analysis and Management ▪ BE 603 Operations and Supply Chain Management ▪ BE 604 Marketing Management ▪ BE 605 Project Management ▪ BE 606 Entrepreneurship and Innovation ▪ BE 610 Special Topics in Business and Entrepreneurship ▪ BE 680 Consulting ▪ ECE 657A Data & Knowledge Modelling & Analysis ▪ ECE 699 Master of Engineering Project ▪ Note: A maximum of 4 courses from outside the Department of ECE is permitted to satisfy both the MEng in ECE and Graduate Specialization in Business Leadership requirements. 	<p>successfully complete 2 compulsory courses and 2 elective courses:</p> <ul style="list-style-type: none"> ▪ Compulsory courses: <ul style="list-style-type: none"> ▪ BE 600 Management and Leadership ▪ BE 601 Introduction to Financial and Managerial Accounting ▪ Elective courses (choose 2 from the following list): Note: not all elective courses may be offered each year. <ul style="list-style-type: none"> ▪ BE 602 Data Analysis and Management ▪ BE 603 Operations and Supply Chain Management ▪ BE 604 Marketing Management ▪ BE 605 Project Management ▪ BE 606 Entrepreneurship and Innovation ▪ BE 610 Special Topics in Business and Entrepreneurship ▪ <u>BE 660 Negotiations</u> ▪ BE 680 Consulting ▪ ECE 657A Data & Knowledge Modelling & Analysis ▪ ECE 699 Master of Engineering Project ▪ Note: A maximum of 4 courses from outside the Department of ECE is permitted to satisfy both the MEng in ECE and Graduate Specialization in Business Leadership requirements.

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

Students currently enrolled in the MEng programs will be able to enroll in BE 660 as an elective.

Departmental approval date (mm/dd/yy): 03/16/2023

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy):05/04/23

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](#). For questions about the form submission, contact [Trevor Clews](#), Graduate Studies and Postdoctoral Affairs (GSPA).

Faculty: Engineering

Effective date: Term: Winter Year: 2024

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:
CHE, 610, 000333, Theory and Application of Transport Phenomena
- 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: CHE

Course number: 610

Course ID: 000333

Course title (max. 100 characters including spaces): Theory and Application of Transport Phenomena

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: Mathematical analysis of momentum, heat and mass transport in systems of chemical engineering interest: development of the differential equations of change (continuity, motion and energy) for forced convection in isothermal, non-isothermal and multi-component systems; description of velocity, temperature and concentration profiles and computation of momentum, energy and mass fluxes at surfaces under

conditions of laminar flow; description of transport in turbulent flow by time-smoothing of the equations of change; turbulent velocity, temperature and concentration profiles.

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

Primary meet type: Lecture

Delivery mode: On-campus

Requisites:

Special topics course: Yes No

Cross-listed course: Yes No

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

Sections combined/held with:

Rationale for request:

- CHE 610 has been re-numbered as CHE 601, and CHE 601 is the new code being used.
- CHE 610 was retained in the Calendar pending degree completion by students who took it towards degree requirements.

Form completed by:

Department/School approval date (mm/dd/yy): 03/24/23

Reviewed by GSPA (for GSPA use only) date (mm/dd/yy): 04/17/23

Faculty approval date (mm/dd/yy):

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

For Recommendation

Public

Open Session

To: Graduate & Research Council

Sponsor: Jeff Casello, Associate Vice-President Graduate Studies and Postdoctoral Affairs

Contact Information: jcasello@uwaterloo.ca

Presenter: Marianne Simm, Director Graduate Studies and Postdoctoral Affairs
Contact Info: msimm@uwaterloo.ca

Date of Meeting: June 12, 2023

Item Identification:

Class Delivery Modes

Summary:

This document (appendix A) provides proposed definitions for class delivery modes that were developed by the Registrar's Office through the members of Keep Learning Team and led by the Associate Registrar to improve clarity for instructors and students when scheduling and selecting courses each term. The intent is to include and adopt these definitions in the Graduate Studies Academic Calendar 'Glossary of terms'. The increased interest in and adoption of blended learning courses has amplified the importance of this project at this time.

Recommendation/Motion:

Adoption of the submitted definitions for the graduate calendar (Glossary of terms), in alignment with the same additions to the undergraduate calendar.

The University should adopt the delivery mode definitions for In-Person, Blended, and Online in this document.

Jurisdictional Information:

Undergraduate Council and Graduate and Research Council plan to submit these definitions jointly to Senate for approval.

Governance Path:

Review by Graduate Operations Committee, approval by Graduate and Research Council, approval by Senate.

Previous Action Taken:

1. October 18, 2022; review by Graduate Operations Council

Graduate & Research Council

2. February 13, 2023; review and sent back for further consultation by Graduate and Research Council
3. March 21, 2023; review by Graduate Operations Committee and edits shared with the Keep Learning Team via the Associate Registrar.

Highlights:

Addition of definitions for delivery modes of instruction to the Graduate Studies Academic Calendar Glossary of Terms, and the Quest Glossary of Terms, as presented in detail (Appendix A), to include;

IN-PERSON: a class with scheduled instruction or activity occurring in person.

BLENDED: a class in which instruction or activity is distributed between scheduled in-person and required online activities, resulting in fewer scheduled in-class hours.

ONLINE: a class scheduled to be fully online that requires no in-person instruction or activity (may require in-person exam(s)); may be exclusively asynchronous (no scheduled meets), synchronous (scheduled meets), or a combination of the two.

Next Steps:

To be included in the Fall 2023 Graduate Academic Calendar.

Documentation Provided:

Appendix A

APPENDIX A
SENATE GRADUATE AND RESEARCH COUNCIL
June 2023

Class Delivery Modes

Definitions for Modes

Current definition in the glossary of terms in the GSAC .	Proposed definition (to be added to the glossary of terms in the GSAC and Quest site)
N/A	<u>In-person</u> : a class with scheduled instruction or activity occurring in person.
N/A	<u>Blended</u> : a class in which instruction or activity is distributed between scheduled in-person and required online activities, resulting in fewer scheduled in-class hours.
N/A	<u>Online</u> : a class scheduled to be fully online that requires no in-person instruction or activity (may require in-person exam(s)); may be exclusively asynchronous (no scheduled meets), synchronous (scheduled meets), or a combination of the two.

Additional background information on definitions

NOTE (not for inclusion in the calendar): Hyflex classes have recently been delivered in a held-with format, where 2 delivery modes are held simultaneously. Hyflex is an emerging combined mode that will need definition and system development in order to evolve further. Hyflex = a class that is scheduled both in-person and is simultaneously delivered remotely. Students have the choice to attend in-person or remotely on a class-by-class basis. Future considerations of hyflex should also address the possibility of an asynchronous option for those engaging in the course online.

CLASS DELIVERY MODES	DEFINITION	NOTES/EXAMPLES	SCHEDULING TERMS ASSOCIATED WITH EACH DELIVERY MODE		
			THE “CAMPUS” CODES INDICATE WHICH INSTITUTION	THE “LOCATION” OF WHERE A COURSE IS TAUGHT IS ALSO IDENTIFIED	EXAMPLES

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			OFFERS THE COURSE		
IN- PERSON	A class with scheduled instruction or activity occurring in person	Scheduled meet only on campus/in-person	UW: University of Waterloo (Main) CGC: Conrad Grebel University College REN: Renison University College STJ: St. Jerome's University UTD: United College WLU: Wilfrid Laurier University	U: Main campus G: Conrad Grebel University College J: St. Jerome's University UTD: United College R: Renison University College L: Wilfrid Laurier University STRATFORD: Stratford campus KITCHENER: Kitchener campus CAMBRIDGE: Cambridge campus	UW U = Taught by the University of Waterloo at the University of Waterloo's Main Campus UW STRATFORD = Taught by the University of Waterloo at the University of Waterloo's Stratford Campus
BLENDED	A class in which instruction or activity is distributed between scheduled in-person and required online activities, resulting in fewer scheduled in-class hours.	Scheduled on-campus meet + asynchronous online meet/activity (e.g., flipped classroom) Scheduled on-campus meet + synchronous online meet/activity	BLND: Blended course (Main) BLNDG: Blended course (Conrad Grebel University College) BLNDJ: Blended	U: Main campus G: Conrad Grebel University College J: St. Jerome's University UTD: United College	BLND U = Taught by the University of Waterloo; on-campus meet is at the University of Waterloo's Main Campus and includes online element

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		Both types of meets must appear in the schedule of classes, including the online piece whether asynchronous or synchronous To reduce class time, seek approval from department chair	course (St. Jerome's University) BLNDT: Blended course (United College) BLNDR: Blended course (Renison University College)	R: Renison University College L: Wilfrid Laurier University STRATFORD: Stratford campus + ONLINE: Online course	BLND UTD = Taught by the University of Waterloo; the on-campus meet is at United College and includes online element
ONLINE	A class scheduled to be fully online that requires no in-person instruction or activity (may require in-person exam(s)); may be exclusively asynchronous, synchronous, or a combination of the two.	Fully online CEL course Instructor-developed online course Fully synchronous course with regularly scheduled meets via web conferencing Asynchronous course with some scheduled meets (seminars, tutorials, office hours) Synchronous course with online asynchronous	ONLN: Online course (Main) ONLNG: Online course (Conrad Grebel University College) ONLNJ: Online course (St. Jerome's University) ONLNT: Online course (United College) ONLNR: Online course	ONLINE: Online course	ONLN ONLINE = Taught by the University of Waterloo and occurs online ONLNR ONLINE = Taught by Renison University College and occurs online

Graduate & Research Council

		discussion or other activities	(Renison University College)		
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May 30, 2023

TO: Tim Weber-Kraljevski, Governance Officer, Senate Graduate and Research Council

FROM: Jeff Casello, Associate Vice-President, Graduate Studies and Postdoctoral Affairs (GSPA)
Liz Nilsen, Assistant Vice-President, GSPA
Marianne Simm, Director, GSPA

RE: Graduate Studies Academic Calendar (GSAC) changes

Items for approval:

Updating and expanding the co-operative education section to include Graduate Work-integrated Learning definitions and content. Adding a new Community and Industry Research Projects (CIR) course component to the GSAC and Quest glossary of terms.

Description and rationale for proposed changes:

The University's [strategic commitment](#) towards developing talent for a complex future includes expanding Work Integrated Learning (WIL) opportunities at the graduate level. This is a signature objective towards the goal of enhancing graduate studies. Within this "GradWIL" initiative, an identified challenge is in tracking where and how graduate WIL activities takes place. That is, currently, there is inconsistency in terminology as well as how similar activities are recorded across graduate programs. The purpose of this Calendar language is to provide structure and consistency for how programs label/record their WIL offerings such that this information can be tracked institutionally (or by individual programs). The proposed Calendar language also identifies other forms of WIL beyond the current description, which only identifies co-operative education. Consultations, which included this proposed structure, have been ongoing (involving Faculty graduate groups, graduate students, CEE leaders, GSPA, RO, individual graduate programs, etc.).

Proposed effective date: Term: Fall Year: 2023

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

<https://uwaterloo.ca/graduate-studies-academic-calendar/general-information-and-regulations/co-operative-education>

<https://uwaterloo.ca/graduate-studies-academic-calendar/general-information-and-regulations/glossary-terms>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>Co-operative education</p> <p>Some departments within the University make provision for co-operative work terms at the Master's or the PhD level. Normally, two terms of co-op work terms are required for this option. Students admitted to co-operative degree</p>	<p><u>Graduate Work-integrated Learning</u></p> <p><u>Work-integrated learning (WIL) opportunities are provided to students across numerous graduate programs at the University of Waterloo. Adopting the Co-operative and Work-Integrated Learning Canada (CEWIL) definition,</u></p>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
<p>programs register part-time for their work terms. Check with your department/school to see whether the co-op option is available.</p>	<p><u>WIL “is a form of curricular experiential education that formally integrates a student’s academic studies with quality experiences within a workplace or practice setting. WIL experiences include an engaged partnership of at least: an academic institution, a host organization, and a student. WIL can occur at the course or program level and includes the development of student learning objectives and outcomes related to: employability, agency, knowledge and skill mobility and life-long learning.”</u></p> <p><u>WIL allows for theoretical learning to be integrated with practice, promoting deeper understanding of theory through practical application. Graduate programs offering WIL opportunities should follow best-practices through the inclusion of the following key WIL components: pedagogy (curricular elements that include when the activity occurs, duration/intensity, and training); experience (ensuring meaningful activities and alignment with the WIL definition); assessment (of activities based on identified learning outcomes); and reflection (on what constitutes purposeful work for each student). Regardless of how WIL is structured, activities should align with Graduate WIL (GradWIL) learning development process. (See below for GradWIL learning development process text, included for reference).</u></p> <p><u>At the University of Waterloo, there are different WIL models that provide consistency in how WIL experiences are offered and recorded across academic programs. While there may be some WIL activities that do not fall within one of the models (as well as accreditation requirements for professional programs), academic units should use one of the following WIL models to facilitate standardization and institutional tracking of experiences.</u></p> <ol style="list-style-type: none"> <u>1. Course-level WIL is delivered in the context of a course (either required or elective) and activities are typically facilitated through a course instructor. Students receive course credit for the activity, with the unit weight being determined by the intensity/duration of</u>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
	<p><u>activities. Course-level WIL comes in the form of the following models: a) Community and Industry Research Projects (CIR) or b) Practicums:¹</u></p> <p>a) <u>Community and Industry Research Projects (CIR):</u> <u>Supporting the course objectives, CIR consist of a project or assignment within the course wherein students engage with a partner organization either individually or in teams. The course project/assignment would occur in or with external organizations, with examples being consulting projects, design projects, program evaluations. When a course involves CIR, the activity would be identified with a secondary (or tertiary) component using the course component CIR.</u></p> <p>b) <u>Practicums (PRA):</u> <u>Practicums are a work-integrated learning experience that form the basis of the course and provide students with intensive, hands-on experience in a setting relevant to their subject of study (paid or unpaid). Practicums are typically supervised within the external setting by identified person(s) who are approved by the program (based on their professional and other competencies). Practicum hour requirements are established by the program, vary across different programs and courses. Practicums are denoted as a primary component using the course component PRA. Practicums are usually graded as credit/no-credit.</u></p> <p>2. <u>Program-level WIL</u> <u>is delivered as a required component of the program with associated WIL activities typically facilitated through the academic unit, often in partnership with Co-operative and Experiential Education (CEE).</u></p>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
	<p><u>Program-level WIL comes in the form of the following models: a) Co-operative Education or b) Internship. Program-level WIL would be identified through the program name, plan code, and corresponding milestone(s). In both models, the WIL activity provides experience in a practice/workplace setting related to the student's field of study. Typically the WIL activity would occur at a time in the student's academic program to allow for an integration of learning between the WIL experience and academic/research activities. As program-level WIL typically involves full-time activity, students would be required to have a change of enrollment status during their experience(s).</u></p> <p>a) <u>Co-operative Education (Co-op):</u> <u>Co-op is full-time, paid work experience in a workplace setting that is related to the student's area of study and career interest. Co-op programs typically include completion of a professional development course prior to a work term (COOP 601²), work term(s), and reflective and/or work reports as required by the graduate program. In masters-level programs with co-op designations, students are required to successfully complete a minimum of one standard work-term and, if specified by their program, one additional work term (standard or flexible work-terms). Co-op doctoral programs require a minimum of three standard work-terms and, if specified by their program, additional work terms (standard or flexible work-terms).</u></p> <p>b) <u>Internships:</u> <u>Internships are supervised work-integrated learning experiences that are discipline-specific and directly align with the graduate program's learning</u></p>

<p>Current Graduate Studies Academic Calendar content:</p>	<p>Proposed Graduate Studies Academic Calendar content:</p>
	<p><u>outcomes. Internships require approval by the graduate program. Internships vary in length and intensity, but are typically between 4 months to 12 months of full-time work experience (that is paid or unpaid), and supervised within the external setting by identified persons who are approved by the graduate program (based on their professional and other competencies).</u></p> <p><u>Separate from course or program-level offerings, many graduate students are involved in discipline-specific research activities that constitute WIL either as part of degree requirements (e.g., thesis or Master’s Research Paper) or as additional research projects during their graduate training (i.e., during a time when they have active enrollment status). Such research would involve an industry or community partner and an identified faculty collaborator (in most cases, the research supervisor). For research activities to be considered WIL, there must be co-creation of the research objectives by the external partner and the student/faculty member, active engagement and interaction between the student and external partner, and the external partner should have a role in providing feedback to and/or assessment of the student activity.</u></p> <p>¹ <u>There are other types of experiential learning courses that take place in a setting outside the classroom [e.g., Labs (LAB), Field Studies (FLD), Studio (STU)]. The key distinction between these types of courses and those that denote WIL is that, for the former, a meaningful partnership with an external/host organization is not required. If criteria for WIL is met, courses should be identified as CIR or PRA.</u></p> <p>² <u>COOP 601 does not count towards home program degree course requirements.</u></p>

<p>Current Graduate Studies Academic Calendar content:</p>	<p>Proposed Graduate Studies Academic Calendar content:</p>
<p><u>Glossary of terms</u></p> <p>N/A</p>	<p><u>Glossary of terms</u></p> <p><u>Community and Industry Research Projects (CIR):</u> This is a secondary or tertiary component</p>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
	<u>that involves student engagement in research that occurs primarily in or with external organizations (including consulting projects, design projects, program evaluations). This component is only used at the graduate-level.</u>

GradOps review date: 04/18/23

GradWIL Steering Committee review date: 05/08/23

Additional information

NOTE: The content below will *not* be added to the GSAC but will be included on a separate GradWIL resource page. It is included here because it is referenced within the proposed calendar text.

GradWIL Learning Development Process

GradWIL Learning Development Process has been designed to help guide how WIL is offered at the University of Waterloo, such that learning outcomes (i.e., based on program-specific [graduate degree level expectations](#) and/or [future ready talent framework](#)) can be supported. This learning development process is provided to help shape decision-making, and, as a collective, create the conditions for purposeful work.

Prior to their experience students will have had the opportunity to:

- **Evaluate** the level of their current knowledge, skills, and abilities
- **Reflect** on their values, needs and the strengths/gaps in their current knowledge, skills, and abilities
- **Plan** how to utilize strengths and improve upon gaps in knowledge, skills, and abilities while on an experience

While on experience students will have had the opportunity to:

- **Develop** and/or **implement** research, evidence-informed solutions and/or other work reflecting their depth and breadth of discipline and context specific knowledge
- **Collaborate** and **build** professional relationships with industry and/or community partners
- **Reflect** on their current work experience, demonstrating evolution in their knowledge, skills, and abilities, a deeper understanding of their values and needs, and an appreciation for differences in workplace cultures

Following their experience students will have had the opportunity to:

- **Illustrate** how their values, knowledge, skills and abilities are connected to their career identity (i.e. overall career goals, interests, and motivations)
- **Reflect** on how their career identity can contribute to academia, government, and/or private and public sectors to impact people, teams, organizations, and communities
- **Integrate** their career identity, experiences, and competencies into a post-graduation action plan