UNIVERSITY OF WATERLOO | Senate

SENATE GRADUATE & RESEARCH COUNCIL
MONDAY, June 17, 2024
10:30 A.M. EST
NH 3318 / Zoom
Governing Documents and Resources

Chair – J. Casello

TIMING	AGENDA ITEM	PAGE	ACTION
	OPEN SESSION		
	1. Conflict of Interest	3	Declaration
10:30 a.m. (5 mins)	**Consent Agenda** *Motion: To approve or receive for information the items on the consent agenda, listed as items 2-5 below.*		
	2. Minutes of May 6, 2024 Meeting	4	Decision (SGRC)
	3. Research Ethics (Julie Joza)	6	
	a. Human Research Ethics Board (HREB) [Membership update]	6	Decision (SGRC)
	4. Graduate Awards (Marianne Simm)		
	a. Lemay Change Maker Award [trust]	7	Decision (SGRC)
	b. Awards being formally sunsetted:	7	Information
	i. Manulife Indonesia READI Awd		
	ii. Statistics and Actuarial Science Best Research Presentation Prize		
	iii. Statistics & Actuarial Science Doctoral Entrance Award		
	iv. Statistics, Actuarial Science & Finance Conference Presentation Award		
	v. Statistics & Actuarial Science MMath Entrance Scholarship		
	vi. Statistics and Actuarial Science Graduate Outstanding Performance Award		
	vii. Risk Management, Economic Sustainability & Actuarial Science Dev in Indonesia		
	c. MSS Architects Graduate Scholarship for Locally Focused Architecture [trust]	8	Information
	d. KEEN Graduate Entrance Scholarship [trust]	8	Information
	e. DiMarco Graduate Scholarship in Computational Rhetoric [trust]	8	Information
	5. Curricular Submissions		
	a. Faculty of Engineering (Siva Sivoththaman)	9	Decision (SGRC)
	b. Faculty of Environment (Phil Bigelow)	78	Decision (SGRC)
	c. Faculty of Health (Peter Deadman)	96	Decision (SGRC)
	d. Faculty of Science (Martin Ross)	119	Decision (SGRC)

TIMING	AGENDA ITEM	PAGE	ACTION
	Regular Agenda		
	6. Business Arising from the Minutes	Oral	Input
10:35 a.m. (15 mins)	7. Co-chairs' Remarks	Oral	Information
10:50 a.m. (15 mins)	8. SGRC Agenda Subcommittee and SGRC Curriculum Subcommittee Proposal	124	Input/Decision
11:05 a.m. (40 mins)	9. Health Futures and Care Next Coalition (Catherine Burns)	128	Information
	10. Other Business	Oral	Input
	CONFIDENTIAL SESSION		
11:45 a.m. (5 mins)	11. Confidential Minutes of May 6, 2024 Meeting	144	Decision (SGRC)
	12. Other Business	Oral	Input
	13. Adjournment	Oral	Input

"Decision (SGRC)" to be approved on behalf of Senate
"Decision (SEN-C)" to be recommended to Senate for approval (consent agenda)
"Decision (SEN-R)" to be recommended to Senate for approval (regular agenda)

June 10, 2024

Tim Weber-Kraljevski
Associate University Secretary
Secretary to SGRC

Important Dates

September 16, 2024	SGRC Meeting
September 23, 2024	Senate Meeting

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 May 6, 2024 Meeting
[in agenda order]

Present: Steven Bednarski, Phil Bigelow, Sue Ann Campbell, Jeff Casello (co-chair), Robert de Loe, Peter Deadman, Charmaine Dean (co-chair), Mrittika Dreesha, Bernard Duncker, Anna Esselment, Aiman Fatima, Bertrand Guenin, Alison Hitchens, Abhishesh Homagain, Julie Joza, Ian Milligan, Nicholas Pellegrino, Martin Ross, Marianne Simm, Siva Sivoththaman, Mike Szarka, Shirley Tang, Tim Weber-Kraljevski (secretary), Kevin White, Clarence Woudsma.

Resources/Guests: Angela Christelis, Carrie MacKinnon, Justin Wan.

Absent: David Clausi*, Ana Ferrer*, Neela Hassan, Marina Mourtzakis, Joseph Meleshko.
*regrets

Organization of Meeting: Charmaine Dean took the chair, and Tim Weber-Kraljevski acted as secretary. The secretary advised that a quorum was present. The agenda was approved without formal motion.

1. CONFLICT OF INTEREST

No conflicts of interest were declared.

CONSENT AGENDA

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

2. MINUTES OF THE APRIL 8, 2024 MEETING

Council approved the minutes of the meeting as distributed.

3. RESEARCH ETHICS

Council approved the Terms of Reference updates for the Human Research Ethics Board (HREB) and the Clinical Research Ethic Board (CERB), as distributed.

4. GRADUATE AWARDS'

Council approved items a.-d. and received item e. for information.

5. CURRICULAR SUBMISSIONS

Council approved item 5.a.2 on behalf of Senate and recommended to Senate to approve item 5.b.1., as distributed.

REGULAR AGENDA

6. BUSINESS ARISING FROM THE MINUTES

There was no business arising.

7. CO-CHAIR'S REMARKS

Casello spoke to the following: the results of the Tri-Agency Doctoral Scholarships and the impact of Waterloo's recent process improvements; and the increase in scholarship funding in the Federal budget. Members discussed the

scholarship increase and allocations by agency, if those currently holding scholarships will also see an increase in their scholarships; and the increase in funding for student stipends.

8. RESEARCH DATA MANAGEMENT

Milligan and Hitchens presented on the Research Data Management, speaking to the Tri-Agency Research Data Management Policy (DMP), Waterloo's institutional strategy, DMP Requirements, and work being done on campus and supports available from the Office of Research and the Library. Members discussed: the diversity of needs on campus; coordinating with other institutions; data management needs for inter-institution partnerships; and possible national solutions.

Members divided into breakout groups and discussed how Waterloo can build a culture of RDM excellence on campus. Following breakout groups, a summary of each of the groups' discussions were presented.

9. GRADUATE STUDIES ACADEMIC CALENDAR (GSAC) CHANGES

Casello provided an overview of the proposal to change the Approved Doctoral Dissertation Supervisor (ADDS) to the Sole-supervisory privilege status (SSPS) and highlighted the changes made to the proposal since previously being approved by Council, following the item being removed from the Senate Agenda due to concerns raised by Teaching Stream faculty and with the consultation process. A motion was heard to recommend Senate approve the proposed changes to the GSAC, as presented. Woudsma and Esselment. Carried. Members discussed: operationally how advisory committees will provide any concerns about supervisory performance; and the various supervisory roles different members of the University community can have. Members committed to a mid-year assessment of these changes.

10. OTHER BUSINESS

New members student members Mrittika Dreesha and Abhishesh Homagain introduced themselves and were welcomed to Council.

With no further business in the open session, Council moved into confidential session.

May 28, 2024

Tim Weber-Kraljevski
Governance Officer

Memorandum

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

From: **Julie Joza, Director, Research Ethics**

Date: **June 3, 2024**

Subject: **Membership on Waterloo's Research Ethics Boards**

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

Human Research Ethics Board (HREB)

New Member

Dr. Catherine Tong will be joining HREB as a physician member. Dr. Tong's term will begin on June 1, 2024, and continue through to May 31, 2027. Dr. Tong has practiced as both an emergency and family physician in Kitchener Waterloo and holds an appointment with McMaster University's Department of Family Medicine. Dr. Tong leads the faculty development portfolio for the Enhanced Skills Program in the Department of Family Medicine and is the Program Director of the Royal College Clinician Educator Area for the Focused Competence Diploma program at McMaster University. Dr. Tong has led a team of educators in presenting several workshops in local and international conferences on faculty development programming addressing equity, diversity, inclusivity, and Indigenous reconciliation learning needs. Dr. Tong has also participated in and led various research projects in the clinical and academic domains.

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.

UNIVERSITY OF WATERLOO | Graduate Studies and Postdoctoral Affairs

June 3, 2024

TO: Tim Weber-Kraljevski, Governance Officer

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

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

Items for Approval

a) Lemay Change Maker Award – trust

An award, valued at $5,000, will be presented annually to a full-time undergraduate or graduate student enrolled in any year of the undergraduate or master's program in the School of Architecture in the Faculty of Engineering. Selection is based on excellence in design and/or design initiative with distinctively actionable potential to positively impact Canadian communities with architecture that is thought-provoking, collaborative, and sustainable. Selection will consider all or some of the following categories: sustainability; transdisciplinary thinking; social value; and design excellence. Students interested in applying must submit an application form that can be found on the School of Architecture website, by the deadline advertised, normally each spring. This fund is made possible by a donation from Lemay Architects.

The period of this defined term award will be from 2024 to 2026; the first selection will be made in spring 2024 and the last in spring 2026.

Total gift = $15,000

Items for Information

b) As part of simplification of overall administration of operating scholarships within the department Statistics and Actuarial Science and the Faculty of Mathematics, the following awards are being formally sunset effective May 1, 2024:

i) Manulife Indonesia READI Awd
ii) Statistics and Actuarial Science Best Research Presentation Prize
iii) Statistics & Actuarial Science Doctoral Entrance Award
iv) Statistics, Actuarial Science & Finance Conference Presentation Award
v) Statistics & Actuarial Science MMath Entrance Scholarship
vi) Statistics and Actuarial Science Graduate Outstanding Performance Award
vii) Risk Management, Economic Sustainability & Actuarial Science Dev in Indonesia

c) MSS Architects Graduate Scholarship for Locally Focused Architecture – trust

This scholarship was originally created in 2020 with a gift of $20,000, under the name of MartinSimmons Graduate Scholarship for Locally Focused Architecture. In 2022, MartinSimmons Architects Inc. rebranded and is now known as MSS Architects Inc.
This scholarship is being renewed with a gift of $24,000 with selection of the final award to be made in spring 2028. The updated award description is as follows:

A scholarship, valued at $6,000, will be awarded annually to a graduate student registered full time in the first term of thesis work in their master's program in the School of Architecture in the Faculty of Engineering. Interested students must submit an application found on the School of Architecture website along with an 800-word abstract describing how their research focuses on a local project in Waterloo Region or Wellington County. Students interested in being considered for this award must submit an award application that can be found on the School of Architecture website. The School of Architecture will select recipients normally each Spring. This scholarship is supported by both MSS Architects Inc. and the Amy Hallman Snyder Award Fund at Kitchener Waterloo Community Foundation in honour of both their deep roots in Waterloo Region and commitment to growing local architecture.

d) KEEN Graduate Entrance Scholarship – trust

This scholarship was originally created in 2018 with a gift of $50,000 with selections being made from 2019 to 2023. This scholarship is being renewed with a gift of $50,000 with a defined term from 2025 to 2029. The award description remains the same as the original:

Two entrance scholarships, valued at $5,000 each, will be awarded annually to graduate students registered full time in the first term of either the Master of Climate Change (MCC), Master of Development Practice (MDP) or the Master of Economic Development and Innovation (MEDI) programs, in the Faculty of Environment. Selection will be based on scholastic excellence (minimum cumulative average of 80% or equivalent). Preference will be given to students who demonstrate leadership and community engagement. The Associate Dean of Graduate Studies along with recommendations from the Department of Geography and School of Environment, Enterprise and Development, in the Faculty of Environment will select a recipient by March. This fund is made possible by donations from KEEN.

e) DiMarco Graduate Scholarship in Computational Rhetoric – trust

Originally created in 2018, the terms of this award are being amended to expand the selection criteria to address the difficulty in selecting an appropriate candidate who fits the current criteria. The scholarship is now open to any discipline in Math (as opposed to Computer Science alone) and Arts; applicants will submit their application to the graduate studies office in the Faculty of Mathematics as opposed to the School of Computer Science.

The updated award description is as follows:

A scholarship valued at $2,500, will be awarded annually to a graduate student registered full time in the Faculty of Mathematics or the Faculty of Arts at the University of Waterloo with a demonstrated area of interest in computational rhetoric, computational analysis and/or generation of rhetoric and persuasive text. Interested students must submit an application to the Graduate Studies Office in the Faculty of Mathematics by October 15th in order to be considered. The application form can be found on the Faculty of Mathematics website. Selection will be based on academic achievement (minimum A- cumulative average in their current program) and interest in computational rhetoric as demonstrated in the application. Computational Rhetoric is a twenty-first century offshoot of Natural Language Processing (NLP) that Professor Chrysanne DiMarco helped to pioneer. Applicants are advised to read some of her foundational papers to see how their projects fit into that research. This fund is made possible by a donation from Sam Pasupalak in honour of Professor DiMarco's excellent teaching and mentorship.

UNIVERSITY OF WATERLOO
FACULTY OF ENGINEERING

M E M O

TO: Tim Weber-Kraljevski, Committee Secretary

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

RE: Senate Graduate and Research Council

DATE: April 30, 2024

Please place the following motions forward for approval at the next meeting of the SGRC. These changes were approved by the EFC on April 16, 2024.

Items for Approval:

1. The department of **Chemical Engineering** would like to make the following calendar changes:
   a. The current degree requirements state that both CHE 601 and CHE 602 are required courses. The Department has voted in favor of changing this to either CHE 601 or CHE 602 as required courses.

   Rationale for Request:

   a. By requiring MEng students to take both of these courses the program was too restrictive. Being able to choose which of these 2 courses to take provides students more flexibility in tailoring their MEng degree to meet their own career objectives.

2. The department of **Mechanical and Mechatronics Engineering** would like to make the following calendar changes:
   a. Creation of a new course – ME 655: Advanced Building Energy Analysis
   b. Creation of a new course – ME 656: Advanced HVAC Systems, Equipment, and Energy Efficiency
   c. Inactivate course – ME 755: Advanced Differential Equations and Special Functions
   d. Inactivate course – ME 756: Combustion 2
   e. Inactivate course – ME 758: Thermal Contact

   Rationale for Request:

   a. This graduate course is currently listed as a special topics graduate course in thermal engineering (ME 760 – Topic 35). It is one of the technical electives for the Green Energy specialization. It is held with a 500-level undergraduate version, with extra requirements for students enrolled in the graduate course. Enrolment has been good over twelve years, with typically 8-15 graduate students per offering (and typically 40-60 students overall per offering). It is offered each Spring and Fall term. It is time to change this to a regular course number rather than a special topic. A unique course number will help the visibility for students wishing to enrol. Further, the course content has evolved over time and the title has evolved to reflect these changes. Similar changes have already been approved and included in the Undergraduate Calendar a few years ago.
   b. This graduate course is currently listed as a special topics graduate course in thermal engineering (ME 760 - Topic 40). It is one of the technical electives for the Green Energy specialization. It is held with a 500-level undergraduate version, with extra requirements for students enrolled in the graduate course. Enrolment has been good over thirteen years, with typically 15-20 graduate students per offering (and typically 90-100 students overall per offering). It is offered each Winter term. It is time to change this to a regular course number rather than a special topic. A unique course number will help the visibility for students wishing to enrol. Further, the course content has evolved over time and the title has evolved to reflect these changes. Similar changes have already been approved and included in the Undergraduate Calendar a few years ago.
   c. No longer offered. No plans to offer in future and has not been offered in more than 10 years.
   d. No longer offered. No plans to offer in future and has not been offered in more than 10 years.
   e. No longer offered. No plans to offer in future and has not been offered in more than 10 years.

3. The department of **Electrical and Computer Engineering** would like to make the following calendar changes:
    a. Addition of Master's thesis defence
    b. Revision of course description of ECE 627
    c. Revision of course description and course name of ECE 677/IQC 885

    Rationale for Request:
    a. The introduction of an MASc thesis examination will improve the student degree completion experience and improve thesis quality. Currently, MASc students often receive little feedback on their thesis and must chase their readers via email to get their approval signature. Moving to a thesis examination will give students a well-defined degree end process. It will communicate to students that the Department takes the research component of their degree seriously and will help prepare students for a possible PhD.
    b. The new description gives the instructors of ECE 627 more flexibility to choose which hardware description language they use. The old description was based solely on the VHDL hardware description language. The new description allows the instructor to use either VHDL or the Verilog as the description language for the course.
    c. Better reflects the original intent of how the course fits into the ECE-QIC program, in which it is a core course. The old name was similar to those of other graduate courses; the new name helps distinguish this course.

4. The department of **Systems Design Engineering** would like to make the following calendar changes
    a. Update the course descriptions for SYDE 660, SYDE 660A, SYDE 660B, SYDE 660C, SYDE 660D, and SYDE 660E
    b. Creation of a new course - SYDE 620: Fundamentals of Continuous System Models
    c. Creation of a new course - SYDE 640: Experimental Design
    d. Revise course description and title for SYDE 631: Time Series Modelling
    e. Require all research-based graduate students to complete at least 1 core methods course as part of the degree requirements.
    f. Require all research-based graduate students to submit a graphical abstract to the department at the time of their thesis submission.
    g. Language clean up for degree course requirements for the MASc-Aeronautics, MASc-NANO, PhD, PhD-Aeronautics, and PhD-Nanotechnology programs.

    Rationale for Request:
    a. The course description is being updated to remove the option of individual projects. The SYDE MEng program is steadily increasing in size; SYDE 660 and its combined sections are a required course for all SYDE MEng students, so enrollment in the course increases in line with increases in program enrollment. With the current enrollment numbers in the course and future projected enrollment increases, it is no longer feasible to offer the individual project option, as this would severely limit the resources (eg. instructor attention) available to each project group.
    b. SYDE 620 will provide graduate level engineering math fundamentals to SYDE students. There is currently no equivalent course at the graduate level. It will also become one of the core methods courses that all SYDE MASc and PhD students will be required to choose one from.
    c. SYDE 640 will provide graduate level experimental design and statistical analysis fundamentals and techniques to SYDE students. There is currently no equivalent course at the graduate level in SYDE. It will also become one of the core methods courses that all SYDE MASc and PhD students will be required to choose one from.
    d. SYDE 631 course title and description are being updated to include modern theories and applications.
    e. The introduction of a core course will provide students with foundational knowledge about methods used for modeling and analysis of a wide spectrum of systems within the

department's remit. It is meant to guarantee that the students are equipped to undertake their research.

f. The graphical abstract provides the students with an opportunity to present the results of their research in an approachable (visual) manner, demonstrating their communication skills. It will also allow the department to communicate the value and significance of the research it undertakes.
g. Housekeeping items to further clarify course requirements for research-based students.

SS/rac

Graduate Studies
Program Revision Template

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

Faculty: Engineering

Programs: 1. Master of Engineering (MEng) in Chemical Engineering
2. Master of Engineering (MEng) in Chemical Engineering - Co-operative Program

Program contact name(s): Jeff Gostick

Form completed by: Jeff Gostick

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Graduate Studies Course/Milestone Form.

The current degree requirements state that both CHE 601 and CHE 602 are required courses. The Department has voted in favor of changing this to either CHE 601 or CHE 602 as required courses.

Is this a major modification to the program? No

Rationale for change(s):

By requiring MEng students to take both of these courses the program was too restrictive. Being able to choose which of these 2 courses to take provides students more flexibility in tailoring their MEng degree to meet their own career objectives.

Proposed effective date: Term: Fall 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-chemical-engineering/master-engineering-meng-chemical-engineering

https://uwaterloo.ca/graduate-studies-academic-calendar/engineering/department-chemical-engineering/master-engineering-meng-chemical-engineering-co-operative-program-direct-entry

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:

Degree requirements
 	
• **Courses**
  ○ Students must complete CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 credit weight) and 8 graduate courses (0.50 unit weight per course) as follows:
	Degree requirements
	
	• **Courses**
	  ○ Students must complete CHE 600 Engineering and Research Methods, Ethics, Practice, and Law (0.25 credit weight) and 8 graduate courses (0.50 unit weight per course) as follows:

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
▪ CHE 601 Theory and Application of Transport Phenomena ▪ CHE 602 Chemical Reactor Analysis ▪ ~~6~~ graduate level electives of which ~~3~~ must be CHE courses o No more than 2 may be 500 level courses. o No more than 1 may be a reading course. o Graduate courses offered by the Faculty of Engineering are numbered as 600 or 700 series courses and are assigned a unit weight of 0.50, which means that they are one-term courses as defined in the Graduate Studies Academic Calendar. o Only courses taken within five years prior to the completion of the MEng degree may be counted for credit towards a degree, unless a request for revalidation is granted. o Students must achieve a: ▪ Minimum cumulative average of 70%. ▪ Minimum grade of 65% in each individual course. ▪ Note: Probationary students may have specific grade requirements, which will be specified in their admission letter. o Each student is responsible for monitoring their own academic records and must immediately notify the Graduate Coordinator of any inadequate grade or average.	▪ <u>Either</u> CHE 601 Theory and Application of Transport Phenomena <u>or</u> CHE 602 Chemical Reactor Analysis ▪ <u>7</u> graduate level electives of which <u>4</u> must be CHE courses o No more than 2 may be 500 level courses. o No more than 1 may be a reading course. o Graduate courses offered by the Faculty of Engineering are numbered as 600 or 700 series courses and are assigned a unit weight of 0.50, which means that they are one-term courses as defined in the Graduate Studies Academic Calendar. o Only courses taken within five years prior to the completion of the MEng degree may be counted for credit towards a degree, unless a request for revalidation is granted. o Students must achieve a: ▪ Minimum cumulative average of 70%. ▪ Minimum grade of 65% in each individual course. ▪ Note: Probationary students may have specific grade requirements, which will be specified in their admission letter. o Each student is responsible for monitoring their own academic records and must immediately notify the Graduate Coordinator of any inadequate grade or average.

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

Current students will be allowed to choose between 601 and 602 if they wish, so that all of our MEng students can avail themselves of the new flexibility this offers. Note however that both courses will be offered with the same regularity so students wishing to follow the previous requirements can do so without any issue.

Department/School approval date (mm/dd/yy): 03/18/24
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 03/19/24
Faculty approval date (mm/dd/yy): 04/16/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):

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

Faculty: Engineering

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: **ME**

Course number: **655**

Course ID: TBD

Course title (max. 100 characters including spaces): **Advanced Building Energy Analysis**

Course short title (max. 30 characters including spaces): Adv. Building Energy Analysis

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: Aspects of whole-building energy analysis, including energy auditing, benchmarking, and simulation. Review of relevant concepts in heat transfer and thermodynamics. Interactive effects of building elements, systems, and occupant behaviour. Economic and environmental impacts of building energy use.

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

Primary meet type: Lecture

Delivery mode: On-campus

Requisites: Anti-Requisites: AE 572, ME 572, CIVE 700 – Topic 21, ME 760 – Topic 35

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:
CIVE 630 (cross-list request for CIVE 630 also submitted and pending approval)

Sections combined/held with: May be held with AE 572/ME 572/CIVE 630

Rationale for request:

This graduate course is currently listed as a special topics graduate course in thermal engineering (ME 760 – Topic 35). It is one of the technical electives for the Green Energy specialization. It is held with a 500-level undergraduate version, with extra requirements for students enrolled in the graduate course. Enrolment has been good over twelve years, with typically 8-15 graduate students per offering (and typically 40-60 students overall per offering). It is offered each Spring and Fall term. It is time to change this to a regular course number rather than a special topic. A unique course number will help the visibility for students wishing to enrol. Further, the course content has evolved over time and the title has evolved to reflect these changes. Similar changes have already been approved and included in the Undergraduate Calendar a few years ago.

Form completed by: Profs. David Mather and Cecile Devaud
Department/School approval date (mm/dd/yy): 12/11/23
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 02/01/24
Faculty approval date (mm/dd/yy): 04/16/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

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

Faculty: Engineering

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: CIVE

Course number: 630

Course ID: TBD

Course title (max. 100 characters including spaces): Advanced Building Energy Analysis

Course short title (max. 30 characters including spaces): Adv. Building Energy Analysis

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: Aspects of whole-building energy analysis, including energy auditing, benchmarking, and simulation. Review of relevant concepts in heat transfer and thermodynamics. Interactive effects of building elements, systems, and occupant behaviour. Economic and environmental impacts of building energy use.

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

Primary meet type: Lecture

Delivery mode: On-campus

Requisites: Anti-Requisites: AE 572, ME 572, ME 655, CIVE 700 – Topic 21

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: **ME 655** (cross-list request for ME 665 also submitted and pending approval)

Sections combined/held with: May be held with AE 572/ME 572/ME 655

Rationale for request:

This is an interdisciplinary engineering course, jointly offered/cross-listed by CEE and MME.

This graduate course is currently offered as a special topics graduate course in structural engineering (CIVE 700). It is held with a 500-level undergraduate version, with enhanced requirements for students enrolled in the graduate course. The course content has been offered for twelve years (with several different course/topic numbers). Offering it as CIVE 700 is more recent. It has been offered six times as CIVE 700, with an average of 8 graduate students per offering (and an average of 60 students overall for these offerings). A unique course number will help the visibility for students wishing to enroll.

Form completed by:
Department/School approval date (mm/dd/yy): 12/14/23
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 12/13/23
Faculty approval date (mm/dd/yy):
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

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

Faculty: Engineering

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: **ME**

Course number: **656**

Course ID: TBD

Course title (max. 100 characters including spaces): **Advanced HVAC Systems, Equipment, and Energy Efficiency**

Course short title (max. 30 characters including spaces): Adv HVAC Sys, Eqpt, Energy Eff

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: Selected topics in HVAC systems design, with focus on energy-efficiency and environmental-sustainability: heating and cooling distribution using air-, water-, and refrigerant-based systems; constant- and

variable-flow systems; heat- and energy-recovery systems; vapor-compression heat-pump systems, including air- and geothermal-source heat pumps. May be held with ME 573, but with enhancements for the ME 656 students.

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

Primary meet type: Lecture

Delivery mode: On-campus

Requisites: Anti-Requisites: AE 573, ME 573, ME 760 – Topic 40

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: May be held with AE 573/ME 573

Rationale for request:

This graduate course is currently listed as a special topics graduate course in thermal engineering (ME 760 - Topic 40). It is one of the technical electives for the Green Energy specialization. It is held with a 500-level undergraduate version, with extra requirements for students enrolled in the graduate course. Enrolment has been good over thirteen years, with typically 15-20 graduate students per offering (and typically 90-100 students overall per offering). It is offered each Winter term. It is time to change this to a regular course number rather than a special topic. A unique course number will help the visibility for students wishing to enrol. Further, the course content has evolved over time and the title has evolved to reflect these changes. Similar changes have already been approved and included in the Undergraduate Calendar a few years ago.

Form completed by: Profs. David Mather and Cecile Devaud
Department/School approval date (mm/dd/yy): 12/11/23
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 02/01/24
Faculty approval date (mm/dd/yy): 04/16/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

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

Faculty: Engineering

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: **ME**

Course number: **755**

Course ID: 001906

Course title (max. 100 characters including spaces): **Advanced Differential Equations and Special Functions**

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

Grading basis: Choose an item.

Course credit weight: Choose an item.

Course consent required: Choose an item.

Course description:

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

Primary meet type: Choose an item.

Delivery mode: Choose an item.

Requisites:

Special topics course: Yes ☐ No ☐

Cross-listed course: Yes ☐ No ☐

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

Sections combined/held with:

Rationale for request: *No longer offered.*
No plans to offer in future and has not been offered in more than 10 years.

Form completed by: Prof. Cecile Devaud
Department/School approval date (mm/dd/yy): 12/11/23
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 02/01/24
Faculty approval date (mm/dd/yy): 04/16/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

UNIVERSITY OF WATERLOO

Senate Graduate & Research Council
Graduate Studies Course/Milestone Form

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

Faculty: Engineering

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: **ME**

Course number: **756**

Course ID: 009374

Course title (max. 100 characters including spaces): **Combustion 2**

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

Grading basis: Choose an item.

Course credit weight: Choose an item.

Course consent required: Choose an item.

Course description:

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

Primary meet type: Choose an item.

Delivery mode: Choose an item.

Requisites:

Special topics course: Yes ☐ No ☐

Cross-listed course: Yes ☐ No ☐

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

Sections combined/held with:

Rationale for request: *No longer offered.*
No plans to offer in future and has not been offered in more than 10 years.

Form completed by: Prof. Cecile Devaud
Department/School approval date (mm/dd/yy): 12/11/23
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 02/01/24
Faculty approval date (mm/dd/yy): 04/16/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

UNIVERSITY OF WATERLOO

Senate Graduate & Research Council
Graduate Studies Course/Milestone Form

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

Faculty: Engineering

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: **ME**

Course number: **758**

Course ID: 001907

Course title (max. 100 characters including spaces): **Thermal Contact Resistance**

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

Grading basis: Choose an item.

Course credit weight: Choose an item.

Course consent required: Choose an item.

Course description:

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

Primary meet type: Choose an item.

Delivery mode: Choose an item.

Requisites:

Special topics course: Yes ☐ No ☐

Cross-listed course: Yes ☐ No ☐

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

Sections combined/held with:

Rationale for request: *No longer offered.*
No plans to offer in future and has not been offered in more than 10 years.

Form completed by: Prof. Cecile Devaud
Department/School approval date (mm/dd/yy): 12/11/23
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 02/01/24
Faculty approval date (mm/dd/yy): 04/16/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Graduate Studies
Program Revision Template

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

Faculty: Engineering

Program: 1) Master of Applied Science (MASc) in Electrical and Computer Engineering

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

3) Master of Applied Science (MASc) in Electrical and Computer Engineering - Nanotechnology

4) Master of Applied Science (MASc) in Electrical and Computer Engineering - Quantum Information

Program contact name(s): Christopher Nielsen and Emilie Mechler

Form completed by: Emilie Mechler

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Graduate Studies Course/Milestone Form.

Remove the Master's Seminar milestone and introduce a thesis examination as a component of the Master's Thesis milestone.

Is this a major modification to the program? No

Rationale for change(s):

The introduction of an MASc thesis examination will improve the student degree completion experience and improve thesis quality. Currently, MASc students often receive little feedback on their thesis and must chase their readers via email to get their approval signature. Moving to a thesis examination will give students a well-defined degree end process. It will communicate to students that the Department takes the research component of their degree seriously and will help prepare students for a possible PhD.

Proposed effective date: Term: Fall 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/master-applied-science-masc-electrical-and-computer-engineering

https://uwaterloo.ca/graduate-studies-academic-calendar/engineering/department-electrical-and-computer-engineering/master-applied-science-masc-electrical-and-computer-engineering-aeronautics

https://uwaterloo.ca/graduate-studies-academic-calendar/engineering/department-electrical-and-computer-engineering/master-applied-science-masc-electrical-and-computer-engineering-nanotechnology

https://uwaterloo.ca/graduate-studies-academic-calendar/engineering/department-electrical-and-computer-engineering/master-applied-science-masc-electrical-and-computer-engineering-quantum-information

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
Degree requirements • ~~**Master's Seminar**~~ ○ ~~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**~~ ○ ~~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~~.	**Degree requirements** • **Master's Thesis** ○ The primary objective of the program is the completion of research work and reporting thereon in a master's thesis. ○ The topic of the thesis is arranged by students and their faculty supervisor(s). The research work leading to the thesis must be performed under the direction of the faculty supervisor(s). ○ Students must orally defend their thesis before a thesis examination committee for their thesis to be accepted. Candidates first present their research work orally in an organized and informative manner. The presentation is followed by questioning from the examination committee. ○ The thesis examination committee consists of the supervisor(s) as well as a regular faculty member from the Department of Electrical and Computer Engineering and an additional examiner whose expertise can support the evaluation of the master's thesis. ○ The role of the examining committee is to read the thesis and asses its quality in terms of the student's ability to (i) define a research problem, (ii) provide sufficient understanding of the relevant literature and (iii) critically evaluate and analyse the research outcomes.

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

Current students will not be impacted as they will be evaluated under the existing milestones.

Department/School approval date (mm/dd/yy): January 18, 2024
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 03/01/24
Faculty approval date (mm/dd/yy): 04/16/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):

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

Faculty: Engineering

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*):

Updating the Course description.

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

Course subject code: ECE

Course number: 627

Course ID: 014410

Course title (max. 100 characters including spaces): Register-transfer-level Digital Systems

Course short title (max. 30 characters including spaces): Regstr-trnsfr-lvl Digtl Systms

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

Current description: Syntax, semantics, and usage of the VHDL hardware description language. Modeling concurrency in VHDL, in other hardware description languages, and using other simulation techniques.

Modeling, design, and implementation at the register-transfer level. Functional verification techniques. Timing analysis. Introduction to power analysis and optimization. Introduction to faults and testing.

Revised description: Syntax, semantics, and usage of hardware description languages like VHDL, Verilog, etc. Modeling concurrency and using other simulation techniques. Modeling, design, and implementation at the register-transfer level. Functional verification techniques. Timing analysis. Introduction to power analysis and optimization. Introduction to faults and testing.

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

Primary meet type: Lecture

Delivery mode: On-campus

Requisites:

Special topics course: Yes ☐ No ☒

Cross-listed course: Yes ☐ No ☒

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

Sections combined/held with:

Rationale for request:

The new description gives the instructors of ECE 627 more flexibility to choose which hardware description language they use. The old description was based solely on the VHDL hardware description language. The new description allows the instructor to use either VHDL or the Verilog as the description language for the course.

Form completed by: Emilie Mechler
Department/School approval date (mm/dd/yy):
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 02/28/24
Faculty approval date (mm/dd/yy): 04/16/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

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

Faculty: Engineering

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*):

Updating the Course description and Course title.

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

Course subject code: ECE

Course number: 677

Course ID: 015282

Course title (max. 100 characters including spaces):

Current title: Quantum Electronics and Photonics
Revised title: Applied Quantum Mechanics

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

Current short tile: Quantum Elctrncs and Photonics
Revised short title: Applied Quantum Mechanics

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

Current description: The course is introductory and emphasizes the fundamental concepts and engineering applications without a previous exposure to quantum mechanics. Examples and problems are designed to address the applications of the course contents to real problems in electronic, optoelectronic, photonic and superconductive devices.

Revised description: This course covers a spectrum of topics in quantum electronics and quantum optics, making it accessible to a broad audience engaged in areas such as solid-state electronics, quantum photonics, and quantum information processing. The curriculum places emphasis on both fundamental concepts and engineering applications in each subject. Examples and problem-solving scenarios illustrate the practical relevance of the course content to challenges in electronic, optoelectronic, photonic, and superconductive devices

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

Primary meet type: Lecture

Delivery mode: On-campus

Requisites: Antireq: ECE 770 Topic 14

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: QIC 885 (approved by QI graduate steering committee on January 29, 2024)

Sections combined/held with:

Rationale for request:

Better reflects the original intent of how the course fits into the ECE-QIC program, in which it is a core course. The old name was similar to those of other graduate courses; the new name helps distinguish this course.

The ECE 677/QIC 885 course title should also be updated on the following program pages in the GSAC:
Doctor of Philosophy (PhD) in Electrical and Computer Engineering
Doctor of Philosophy (PhD) in Electrical and Computer Engineering - Quantum Information
Master of Applied Science (MASc) in Electrical and Computer Engineering
Master of Applied Science (MASc) in Electrical and Computer Engineering - Quantum Information

Form completed by: Emilie Mechler
Department/School approval date (mm/dd/yy):
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 02/28/24
Faculty approval date (mm/dd/yy): 04/16/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

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

Faculty: Engineering

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*):

Updating the Course description and Course title.

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

Course subject code: QIC

Course number: 885

Course ID: 015282

Course title (max. 100 characters including spaces):

Current title: Quantum Electronics and Photonics
Revised title: Applied Quantum Mechanics

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

Current short tile: Quantum Elctrncs and Photonics
Revised short title: Applied Quantum Mechanics

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

Current description: The course is introductory and emphasizes the fundamental concepts and engineering applications without a previous exposure to quantum mechanics. Examples and problems are designed to address the applications of the course contents to real problems in electronic, optoelectronic, photonic and superconductive devices.

Revised description: This course covers a spectrum of topics in quantum electronics and quantum optics, making it accessible to a broad audience engaged in areas such as solid-state electronics, quantum photonics, and quantum information processing. The curriculum places emphasis on both fundamental concepts and engineering applications in each subject. Examples and problem-solving scenarios illustrate the practical relevance of the course content to challenges in electronic, optoelectronic, photonic, and superconductive devices

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: ECE 677 (course revision form to be submitted by ECE)

Sections combined/held with:

Rationale for request:

Better reflects the original intent of how the course fits into the ECE-QIC program, in which it is a core course. The old name was similar to those of other graduate courses; the new name helps distinguish this course.

Form completed by: Emilie Mechler
Department/School approval date (mm/dd/yy):
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 02/28/24
Faculty approval date (mm/dd/yy): 04/16/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

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

Faculty: Engineering

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*):

Updating the Course description.

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

Course subject code: SYDE

Course number: 660

Course ID: 015742

Course title (max. 100 characters including spaces): Systems Design Graduate Workshop 1

Course short title (max. 30 characters including spaces): SYDE Workshop 1

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

Current description: Engineering design project course where students work in small groups or individually applying the principles of engineering problem solving, research methods, systems analysis including

modelling, simulation, optimization and design. There is a strong focus on a major design project with regular mentorship, project update reports and presentations, project reviews, and design embodiment demonstrations.

Revised description: Engineering design project course where students work in small groups applying the principles of engineering problem solving, research methods, systems analysis including modelling, simulation, optimization and design. There is a strong focus on a major design project with regular mentorship, project update reports and presentations, project reviews, and design embodiment demonstrations.

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

Primary meet type: Lecture

Delivery mode: On-campus

Requisites: Prerequisite: SYDE 600. Antirequisites: SYDE 660A, SYDE 660B, SYDE 660C, SYDE 660D, SYDE 660E

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: SYDE 660A, SYDE 660B, SYDE 660C, SYDE 660D, SYDE 660E

Rationale for request:

The course description is being updated to remove the option of individual projects. The SYDE MEng program is steadily increasing in size; SYDE 660 and its combined sections are a required course for all SYDE MEng students, so enrollment in the course increases in line with increases in program enrollment. With the current enrollment numbers in the course and future projected enrollment increases, it is no longer feasible to offer the individual project option, as this would severely limit the resources (eg. instructor attention) available to each project group.

Form completed by: J. Sparry / S. Landy
Department/School approval date (mm/dd/yy): 09/07/23
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/19/2023
Faculty approval date (mm/dd/yy): 12/13/23
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: Engineering

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*):

Updating the Course description and Meet type/course components.

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

Course subject code: SYDE

Course number: 660A

Course ID: 015958

Course title (max. 100 characters including spaces): Systems Design Graduate Workshop 1 – AI and Machine Learning

Course short title (max. 30 characters including spaces): SYDE Workshop 1 – AI & ML

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

Current description: Engineering Design Project course where students work individually or in small groups applying the principles of engineering problem solving, research methods, systems analysis including

modelling, simulation, optimization and design. There is a strong focus on a major AI and Machine Learning design project with regular mentorship, project update reports & presentations, project reviews, and design embodiment demonstrations.

Revised description: Engineering design project course where students work in small groups applying the principles of engineering problem solving, research methods, systems analysis including modelling, simulation, optimization and design. There is a strong focus on a major AI and Machine Learning design project with regular mentorship, project update reports and presentations, project reviews, and design embodiment demonstrations.

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

Primary meet type: Lecture

Delivery mode: On-campus

Requisites: Prerequisite: SYDE 600. Antirequisites: SYDE 660, SYDE 660B, SYDE 660C, SYDE 660D, SYDE 660E

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: SYDE 660, SYDE 660B, SYDE 660C, SYDE 660D, SYDE 660E

Rationale for request:

1. The course description is being updated to remove the option of individual projects. The SYDE MEng program is steadily increasing in size; SYDE 660 and its combined sections are a required course for all SYDE MEng students, so enrollment in the course increases in line with increases in program enrollment. With the current enrollment numbers in the course and future projected enrollment increases, it is no longer feasible to offer the individual project option, as this would severely limit the resources (eg. instructor attention) available to each project group.
2. This course is provided as a weekly two-hour offering, in line with the Lecture meet type. It does not meet the definition of a Studio meet type, so the Studio meet type is being removed from the calendar description.

Form completed by: J. Sparry / S. Landy
Department/School approval date (mm/dd/yy): 09/07/23
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/19/23
Faculty approval date (mm/dd/yy): 12/13/23
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: Engineering

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*):

Updating the Course description and Meet type/course components.

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

Course subject code: SYDE

Course number: 660B

Course ID: 015959

Course title (max. 100 characters including spaces): Systems Design Graduate Workshop 1 – Biomedical Systems

Course short title (max. 30 characters including spaces): SYDE Workshop 1 - Biomedical

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

Current description: Engineering Design Project course where students work individually or in small groups applying the principles of engineering problem solving, research methods, systems analysis including modelling,

simulation, optimization and design. There is a strong focus on a major Biomedical Systems design project with regular mentorship, project update reports & presentations, project reviews, and design embodiment demonstrations.

Revised description: Engineering design project course where students work in small groups applying the principles of engineering problem solving, research methods, systems analysis including modelling, simulation, optimization and design. There is a strong focus on a major Biomedical Systems design project with regular mentorship, project update reports and presentations, project reviews, and design embodiment demonstrations.

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

Primary meet type: Lecture

Delivery mode: On-campus

Requisites: Prerequisite: SYDE 600. Antirequisites: SYDE 660, SYDE 660A, SYDE 660C, SYDE 660D, SYDE 660E

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: SYDE 660, SYDE 660A, SYDE 660C, SYDE 660D, SYDE 660E

Rationale for request:

1. The course description is being updated to remove the option of individual projects. The SYDE MEng program is steadily increasing in size; SYDE 660 and its combined sections are a required course for all SYDE MEng students, so enrollment in the course increases in line with increases in program enrollment. With the current enrollment numbers in the course and future projected enrollment increases, it is no longer feasible to offer the individual project option, as this would severely limit the resources (eg. instructor attention) available to each project group.
2. This course is provided as a weekly two-hour offering, in line with the Lecture meet type. It does not meet the definition of a Studio meet type, so the Studio meet type is being removed from the calendar description.

Form completed by: J. Sparry / S. Landy
Department/School approval date (mm/dd/yy): 09/07/23
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/19/23
Faculty approval date (mm/dd/yy): 12/13/23
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: Engineering

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*):

Updating the Course description and Meet type/course components.

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

Course subject code: SYDE

Course number: 660C

Course ID: 015960

Course title (max. 100 characters including spaces): Systems Design Graduate Workshop 1 – Human Factors

Course short title (max. 30 characters including spaces): SYDE Workshop 1 – Human Factrs

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

Current description: Engineering Design Project course where students work individually or in small groups applying the principles of engineering problem solving, research methods, systems analysis including

modelling, simulation, optimization and design. There is a strong focus on a major Human Factors design project with regular mentorship, project update reports & presentations, project reviews, and design embodiment demonstrations.

Revised description: Engineering design project course where students work in small groups applying the principles of engineering problem solving, research methods, systems analysis including modelling, simulation, optimization and design. There is a strong focus on a major Human Factors design project with regular mentorship, project update reports and presentations, project reviews, and design embodiment demonstrations.

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

Primary meet type: Lecture

Delivery mode: On-campus

Requisites: Prerequisite: SYDE 600. Antirequisites: SYDE 660, SYDE 660A, SYDE 660B, SYDE 660D, SYDE 660E

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: SYDE 660, SYDE 660A, SYDE 660B, SYDE 660D, SYDE 660E

Rationale for request:

1. The course description is being updated to remove the option of individual projects. The SYDE MEng program is steadily increasing in size; SYDE 660 and its combined sections are a required course for all SYDE MEng students, so enrollment in the course increases in line with increases in program enrollment. With the current enrollment numbers in the course and future projected enrollment increases, it is no longer feasible to offer the individual project option, as this would severely limit the resources (eg. instructor attention) available to each project group.
2. This course is provided as a weekly two-hour offering, in line with the Lecture meet type. It does not meet the definition of a Studio meet type, so the Studio meet type is being removed from the calendar description.

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Department/School approval date (mm/dd/yy): 09/07/23
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/19/23
Faculty approval date (mm/dd/yy): 12/13/23
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: Engineering

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*):

Updating the Course description and Meet type/course components.

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

Course subject code: SYDE

Course number: 660D

Course ID: 015961

Course title (max. 100 characters including spaces): Systems Design Graduate Workshop 1 – Mechatronic & Physical Systems

Course short title (max. 30 characters including spaces): SYDE Workshop 1 - Mech&PhysSys

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

Current description: Engineering Design Project course where students work individually or in small groups applying the principles of engineering problem solving, research methods, systems analysis including modelling, simulation, optimization and design. There is a strong focus on a major Mechatronic & Physical Systems design project with regular mentorship, project update reports & presentations, project reviews, and design embodiment demonstrations.

Revised description: Engineering design project course where students work in small groups applying the principles of engineering problem solving, research methods, systems analysis including modelling, simulation, optimization and design. There is a strong focus on a major mechatronic and physical systems design project with regular mentorship, project update reports and presentations, project reviews, and design embodiment demonstrations.

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

Primary meet type: Lecture

Delivery mode: On-campus

Requisites: Prerequisite: SYDE 600. Antirequisites: SYDE 660, SYDE 660A, SYDE 660B, SYDE 660C, SYDE 660E

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: SYDE 660, SYDE 660A, SYDE 660B, SYDE 660C, SYDE 660E

Rationale for request:

1. The course description is being updated to remove the option of individual projects. The SYDE MEng program is steadily increasing in size; SYDE 660 and its combined sections are a required course for all SYDE MEng students, so enrollment in the course increases in line with increases in program enrollment. With the current enrollment numbers in the course and future projected enrollment increases, it is no longer feasible to offer the individual project option, as this would severely limit the resources (eg. instructor attention) available to each project group.
2. This course is provided as a weekly two-hour offering, in line with the Lecture meet type. It does not meet the definition of a Studio meet type, so the Studio meet type is being removed from the calendar description.

Form completed by: J. Sparry / S. Landy
Department/School approval date (mm/dd/yy): 09/07/23
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/19/2023
Faculty approval date (mm/dd/yy): 12/13/23
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: Engineering

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*):

Updating the Course description and Meet type/course components.

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

Course subject code: SYDE

Course number: 660E

Course ID: 015962

Course title (max. 100 characters including spaces): Systems Design Graduate Workshop 1 – Vision, Image & Signal Processing

Course short title (max. 30 characters including spaces): SYDE Workshop 1 – VIS Proc

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

Current description: Engineering Design Project course where students work individually or in small groups applying the principles of engineering problem solving, research methods, systems analysis including

modelling, simulation, optimization and design. There is a strong focus on a major Vision, Image & Signal Processing design project with regular mentorship, project update reports & presentations, project reviews, and design embodiment demonstrations.

Revised description: Engineering design project course where students work in small groups applying the principles of engineering problem solving, research methods, systems analysis including modelling, simulation, optimization and design. There is a strong focus on a major vision, image and signal processing design project with regular mentorship, project update reports and presentations, project reviews, and design embodiment demonstrations.

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

Primary meet type: Lecture

Delivery mode: On-campus

Requisites: Prerequisite: SYDE 600. Antirequisites: SYDE 660, SYDE 660A, SYDE 660B, SYDE 660C, SYDE 660D

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: SYDE 660, SYDE 660A, SYDE 660B, SYDE 660C, SYDE 660D

Rationale for request:

1. The course description is being updated to remove the option of individual projects. The SYDE MEng program is steadily increasing in size; SYDE 660 and its combined sections are a required course for all SYDE MEng students, so enrollment in the course increases in line with increases in program enrollment. With the current enrollment numbers in the course and future projected enrollment increases, it is no longer feasible to offer the individual project option, as this would severely limit the resources (eg. instructor attention) available to each project group.
2. This course is provided as a weekly two-hour offering, in line with the Lecture meet type. It does not meet the definition of a Studio meet type, so the Studio meet type is being removed from the calendar description.

Form completed by: J. Sparry / S. Landy
Department/School approval date (mm/dd/yy): 09/07/23
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/19/23
Faculty approval date (mm/dd/yy): 12/13/23
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: Engineering

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: SYDE

Course number: 620

Course ID:

Course title (max. 100 characters including spaces): Fundamentals of Continuous System Models

Course short title (max. 30 characters including spaces): Funds of Cont Sys Models

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: Solution of systems of ordinary differential equations (ODEs), nonlinear systems, qualitative analysis, phase plane, stability, and nonhomogeneous systems. Series solutions of ODEs; Legendre polynomials, and Bessel functions. Fourier expansions and integral, orthogonal functions, and Sturm-Liouville systems. Partial differential equations: parabolic, hyperbolic and elliptic equations and their solution techniques.

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:

SYDE 620 will provide graduate level engineering math fundamentals to SYDE students. There is currently no equivalent course at the graduate level. It will also become one of the core methods courses that all SYDE MASc and PhD students will be required to choose one from.

Form completed by: J. Sparry / S. Landy
Department/School approval date (mm/dd/yy): 09/07/23
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/19/23
Faculty approval date (mm/dd/yy): 12/13/23
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: Engineering

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: SYDE

Course number: 640

Course ID:

Course title (max. 100 characters including spaces): Experimental Design

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: This course introduces fundamentals and important techniques for experimental design and statistical analysis used in systems design engineering. Topics include measurements, variables, main and interaction effects, sources of errors, experimental control, T-test, ANOVA, regression, factorial and fractional factorial designs, response surface methods, and robust parameter design. Techniques frequently used in experiments both with and without human participants will be introduced. Examples will be selected from research publications. Students will learn the importance and proper methods of experimental design through studying

examples in the field of systems design engineering and practice with different software tools.

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:

SYDE 640 will provide graduate level experimental design and statistical analysis fundamentals and techniques to SYDE students. There is currently no equivalent course at the graduate level in SYDE. It will also become one of the core methods courses that all SYDE MASc and PhD students will be required to choose one from.

Form completed by: J. Sparry / S. Landy
Department/School approval date (mm/dd/yy): 09/07/23
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/19/23
Faculty approval date (mm/dd/yy): 12/13/23
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: Engineering

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*):

Updating the Course description.

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

Course subject code: SYDE

Course number: 631

Course ID: 003147

Course title (max. 100 characters including spaces): Time Series Modelling

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

Current description: The theory and application of time-series modelling are presented for describing phenomena measured at discrete points in time. The types of time-series models include stationary auto

regressive moving average (ARMA), nonstationary, special families of seasonal, transfer function-noise (multiple inputs-single output), intervention, and multivariate (multiple inputs-multiple output) models. Applications are used for explaining how the foregoing models are fitted to both natural and socio-economic time series by following the identification, estimation and diagnostic check stages of model construction. Other topics include simulation in engineering design, forecasting in the operation of large-scale projects, and environmental impact assessment.

Revised description: The theories and applications of time-series modelling are presented for describing phenomena measured at discrete points in time. The types of time-series models include stationary auto regressive moving average (ARMA), nonstationary, special families of seasonal, transfer function-noise (multiple inputs-single output), intervention, multivariate (multiple inputs-multiple output) models and machine learning methods for time series. Applications are used for explaining how the foregoing models are fitted to both natural and socio-economic time series by following the identification, estimation and diagnostic check stages of model construction. Other topics include simulation in engineering design, forecasting in the operation of large-scale projects, and environmental impact assessment.

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

Primary meet type: Lecture

Delivery mode: On-campus

Requisites:

Special topics course: Yes ☐ No ☒

Cross-listed course: Yes ☐ No ☒

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

Sections combined/held with:

Rationale for request:

The course description is being updated to include modern theories and applications.

Form completed by: J. Sparry / S. Landy
Department/School approval date (mm/dd/yy): 09/07/23
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/19/23
Faculty approval date (mm/dd/yy): 12/13/23
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Graduate Studies
Program Revision Template

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

Faculty: Engineering

Program: Master of Applied Science (MASc) in Systems Design Engineering

Program contact name(s): Eihab Abdel-Rahman & Anna Cunningham

Form completed by: J. Sparry / S. Landy

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Graduate Studies Course/Milestone Form.

1. *Addition of a core methods course requirement (choose min. 1 from a list of 5) towards course degree requirements for research-based students.*
2. *Addition of a requirement for all research-based students to submit a graphical abstract as part of thesis submission process.*

Is this a major modification to the program? No

Rationale for change(s):

1. *The introduction of a core course will provide students with foundational knowledge about methods used for modeling and analysis of a wide spectrum of systems within the Department's remit. It is meant to guarantee that the students are equipped to undertake their research.*
2. *The graphical abstract provides the students with an opportunity to present the results of their research in an approachable (visual) manner. This will help the students improve and demonstrate their communication skills. It will also assist the Department in communicating the value and significance of the research it undertakes.*

Proposed effective date: Term: Fall 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-systems-design-engineering/master-applied-science-masc-systems-design-engineering#degree_requirements

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
Degree requirements **Courses** • Students must successfully complete 4 graduate courses (0.50 unit weight per course) counting towards degree credit from the	**Degree requirements** **Courses** • Students must successfully complete 4 graduate courses (0.50 unit weight per course) counting towards degree credit from the

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
University of Waterloo satisfying the following criteria: ○ At least 2 courses from Systems Design Engineering at the 500, 600 or 700 level. ○ A maximum of 2 courses may be taken from outside the Faculty of Engineering but must be from the Faculties of Mathematics, Health, Environment and/or Science. ○ At most 1 course at the 500 level. ~~○ At least 1 course at the 600 level.~~ • All course selections are arranged by the supervisor(s) in consultation with the student and are subject to the approval of the Associate Chair for Graduate Studies. Students pursuing one the program's Graduate Research Fields, should inform their supervisor(s) of their chosen field(s) to ensure appropriate course selection. • Note: these requirements are in addition to satisfactory completion of any transitional courses that may be specified at the time of admission. • Note: the Faculty of Engineering requires that no more than one-half of the courses used for credit toward a graduate degree may be taught by a candidate's supervisor(s). In the case of co-supervision in small research groups, it may be necessary to relax this rule; however, the student's file must contain a statement of formal approval from the Department and endorsement from the Associate Dean for Graduate Studies and Research in the Faculty of Engineering. **Master's Thesis** • Students must submit a thesis embodying the results of independent research work to the satisfaction of an Examining Committee. The topic of the thesis is arranged by the supervisor(s) and the student. The composition of the Examining Committee must be as follows: ○ The student's supervisor(s). ○ At least one faculty member from within the Department of Systems Design Engineering. ○ At least one faculty member from outside the Department of Systems Design Engineering. ○ No more than one adjunct faculty member (including Professors Emeriti) may serve on the Examining	University of Waterloo satisfying the following criteria: ○ At least 2 courses from Systems Design Engineering at the 500, 600 or 700 level. ○ <u>At least 1 course from the Systems Design Engineering core methods courses list.</u> ○ A maximum of 2 courses may be taken from outside the Faculty of Engineering but must be from the Faculties of Mathematics, Health, Environment and/or Science. ○ At most 1 course at the 500 level. • <u>Systems Design Engineering core methods courses:</u> ○ <u>SYDE 600 Systems Theory, Models, Research & Design</u> ○ <u>SYDE 620 Fundamentals of Continuous System Models</u> ○ <u>SYDE 631 Time Series Modelling</u> ○ <u>SYDE 640 Experimental Design</u> ○ <u>SYDE 675 Pattern Recognition</u> • All course selections are arranged by the supervisor(s) in consultation with the student and are subject to the approval of the Associate Chair for Graduate Studies. Students pursuing one the program's Graduate Research Fields, should inform their supervisor(s) of their chosen field(s) to ensure appropriate course selection. • Note: these requirements are in addition to satisfactory completion of any transitional courses that may be specified at the time of admission. • Note: the Faculty of Engineering requires that no more than one-half of the courses used for credit toward a graduate degree may be taught by a candidate's supervisor(s). In the case of co-supervision in small research groups, it may be necessary to relax this rule; however, the student's file must contain a statement of formal approval from the Department and endorsement from the Associate Dean for Graduate Studies and Research in the Faculty of Engineering. **Master's Thesis** • Students must submit a thesis embodying the results of independent research work to the satisfaction of an Examining Committee. The topic of the thesis is arranged by the supervisor(s) and the student. The composition

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

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

Currently registered students will not be impacted by this change. Only students admitted in Fall 2024 forward will be required to follow these changes.

Department/School approval date (mm/dd/yy): 09/07/23
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/19/23
Faculty approval date (mm/dd/yy): 12/13/23
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):

Graduate Studies
Program Revision Template

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

Faculty: Engineering

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

Program contact name(s): Eihab Abdel-Rahman & Anna Cunningham

Form completed by: J. Sparry / S. Landy

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Graduate Studies Course/Milestone Form.

1. *Addition of a core methods course requirement (choose min. 1 from a list of 5) towards course degree requirements for research-based students.*
2. *Addition of a requirement for all research-based students to submit a graphical abstract as part of thesis submission process.*

Is this a major modification to the program? No

Rationale for change(s):

1. *The introduction of a core course will provide students with foundational knowledge about methods used for modeling and analysis of a wide spectrum of systems within the Department's remit. It is meant to guarantee that the students are equipped to undertake their research.*
2. *The graphical abstract provides the students with an opportunity to present the results of their research in an approachable (visual) manner. This will help the students improve and demonstrate their communication skills. It will also assist the Department in communicating the value and significance of the research it undertakes.*

Proposed effective date: Term: Fall 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-systems-design-engineering/master-applied-science-masc-systems-design-engineering-aeronautics#degree_requirements

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
Degree requirements **Courses** • Students must successfully complete AVIA 601 Interdisciplinary Aeronautics, AVIA 602 Interdisciplinary Aeronautics Project, and 3	**Degree requirements** **Courses** • Students must successfully complete AVIA 601 Interdisciplinary Aeronautics, AVIA 602 Interdisciplinary Aeronautics Project, and 3

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

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

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

Currently registered students will not be impacted by this change. Only students admitted in Fall 2024 forward will be required to follow these changes.

Department/School approval date (mm/dd/yy): 09/07/23
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/19/2023
Faculty approval date (mm/dd/yy): 12/13/23
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):

Graduate Studies
Program Revision Template

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

Faculty: Engineering

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

Program contact name(s): Eihab Abdel-Rahman & Anna Cunningham

Form completed by: J. Sparry / S. Landy

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Graduate Studies Course/Milestone Form.

1. *General clarification of course degree requirements.*
2. *Addition of a core methods course requirement (choose min. 1 from a list of 5) towards course degree requirements for research-based students.*
3. *Addition of a requirement for all research-based students to submit a graphical abstract as part of thesis submission process.*

Is this a major modification to the program? No

Rationale for change(s):

1. *These changes will bring the MASc-NANO program course requirements in line with the other SYDE research-based MASc programs.*
2. *The introduction of a core course will provide students with foundational knowledge about methods used for modeling and analysis of a wide spectrum of systems within the Department's remit. It is meant to guarantee that the students are equipped to undertake their research*
3. *The graphical abstract provides the students with an opportunity to present the results of their research in an approachable (visual) manner. This will help the students improve and demonstrate their communication skills. It will also assist the Department in communicating the value and significance of the research it undertakes.*

Proposed effective date: Term: Fall 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-systems-design-engineering/master-applied-science-masc-systems-design-engineering-nanotechnology#degree_requirements

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
Degree requirements **Courses**	**Degree requirements** **Courses**

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
~~• Students must successfully complete 4 half credit courses (0.50 unit weight) including NANO 600 Introduction to Nanotechnology, 1 nanotechnology core course, and 2 elective courses.~~ • Note: it is possible that some students may need to take additional courses to meet the specific course requirements of the collaborative program. • Nanotechnology core courses: o NANO 601 Characterization of Nanomaterials o NANO 602 Structure and Spectroscopy of Nanoscale Materials o NANO 603 Nanocomposites o NANO 604 Nanomechanics and Molecular Dynamics Simulations o NANO 605/SYDE 683 Design of MEMS & NEMS o NANO 606/SYDE 682 Advanced MicroElectroMechanical Systems: Physics, Design & Fabrication • Core courses are designed to provide the base knowledge and skill set required to prepare students for more specialized courses and to conduct interdisciplinary nanoscale research. • Students holding a Bachelor of Applied Science (BASc) degree in Nanotechnology Engineering or Master's degree in Nanotechnology at the University of Waterloo can not take NANO 600. Instead, they can choose 1 course from the list of nanotechnology core courses. • All course selections are arranged by the supervisor(s) in consultation with the student and are subject to the approval of the Associate Chair for Graduate Studies. • Note: these requirements are in addition to satisfactory completion of any transitional courses that may be specified at the time of admission. • Note: the Faculty of Engineering requires that no more than one-half of the courses used for credit toward a graduate degree may be taught by a candidate's supervisor(s). In the case of co-supervision in small research groups, it may be necessary to relax this rule; however, the student's file must contain a statement of formal approval from the Department and endorsement from the Associate Dean for Graduate Studies and Research in the Faculty of Engineering. □ **Master's Thesis**	• Students must successfully complete NANO 600 Introduction to Nanotechnology, and 3 graduate courses (0.50 unit weight per course) counting towards degree credit from the University of Waterloo satisfying the following criteria: o At least 2 courses from Systems Design Engineering at the 500, 600 or 700 level o At least 1 course from the Nanotechnology core course list o At least 1 course from the Systems Design Engineering core methods courses list o A maximum of 2 courses may be taken from outside the Faculty of Engineering but must be from the Faculties of Mathematics, Health, Environment and/or Science. o At most 1 course at the 500 level. • Note: it is possible that some students may need to take additional courses to meet the specific course requirements of the collaborative program. • Nanotechnology core courses: o NANO 601 Characterization of Nanomaterials o NANO 602 Structure and Spectroscopy of Nanoscale Materials o NANO 603 Nanocomposites o NANO 604 Nanomechanics and Molecular Dynamics Simulations o NANO 605/SYDE 683 Design of MEMS & NEMS o NANO 606/SYDE 682 Advanced MicroElectroMechanical Systems: Physics, Design & Fabrication • Systems Design Engineering core methods courses: o SYDE 600 Systems Theory, Models, Research & Design o SYDE 620 Fundamentals of Continuous System Models o SYDE 631 Time Series Modelling o SYDE 640 Experimental Design o SYDE 675 Pattern Recognition • Core courses are designed to provide the base knowledge and skill set required to prepare students for more specialized courses and to conduct interdisciplinary nanoscale research. • Students holding a Bachelor of Applied Science (BASc) degree in Nanotechnology Engineering or Master's degree in Nanotechnology at the University of Waterloo

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
• Students must submit a thesis embodying the results of independent research work to the satisfaction of an Examining Committee. The topic of the thesis is arranged by the supervisor(s) and the student. The composition of the Examining Committee must be as follows: o The student's supervisor(s). o At least one faculty member from within the Department of Systems Design Engineering. o At least one faculty member from outside the Department of Systems Design Engineering. o No more than one adjunct faculty member (including Professors Emeriti) may serve on the Examining Committee. Adjunct appointments require the approval of the Associate Dean, Graduate from the student's home Faculty. o At least two of the faculty members on the committee must be tenure or tenure-track.	can not take NANO 600. Instead, they can choose 1 course from the list of nanotechnology core courses. • All course selections are arranged by the supervisor(s) in consultation with the student and are subject to the approval of the Associate Chair for Graduate Studies. • Note: these requirements are in addition to satisfactory completion of any transitional courses that may be specified at the time of admission. • Note: the Faculty of Engineering requires that no more than one-half of the courses used for credit toward a graduate degree may be taught by a candidate's supervisor(s). In the case of co-supervision in small research groups, it may be necessary to relax this rule; however, the student's file must contain a statement of formal approval from the Department and endorsement from the Associate Dean for Graduate Studies and Research in the Faculty of Engineering. **Master's Thesis** • Students must submit a thesis embodying the results of independent research work to the satisfaction of an Examining Committee. The topic of the thesis is arranged by the supervisor(s) and the student. The composition of the Examining Committee must be as follows: o The student's supervisor(s). o At least one faculty member from within the Department of Systems Design Engineering. o At least one faculty member from outside the Department of Systems Design Engineering. o No more than one adjunct faculty member (including Professors Emeriti) may serve on the Examining Committee. Adjunct appointments require the approval of the Associate Dean, Graduate from the student's home Faculty. o At least two of the faculty members on the committee must be tenure or tenure-track. • Before submitting their thesis for display, students must submit a graphical abstract for their thesis to the Department. Guidelines for

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
	the graphical abstract are available from the Department.

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

Currently registered students will not be impacted by this change. Only students admitted in Fall 2024 forward will be required to follow these changes.

Department/School approval date (mm/dd/yy): 09/07/23
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/19/23
Faculty approval date (mm/dd/yy): 12/13/23
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):

Graduate Studies
Program Revision Template

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

Faculty: Engineering

Program: Doctor of Philosophy (PhD) in Systems Design Engineering

Program contact name(s): Eihab Abdel-Rahman & Anna Cunningham

Form completed by: J. Sparry / S. Landy

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Graduate Studies Course/Milestone Form.

1. *General clarification of course degree requirements (formatting changes only, no content changes).*
2. *Addition of a core methods course requirement (choose min. 1 from a list of 5) towards course degree requirements for research-based students.*
3. *Addition of a requirement for all research-based students to submit a graphical abstract as part of thesis submission process.*

Is this a major modification to the program? No

Rationale for change(s):

1. *These changes will bring the PhD program course requirements in line with the other SYDE research-based programs.*
2. *The introduction of a core course will provide students with foundational knowledge about methods used for modeling and analysis of a wide spectrum of systems within the Department's remit. It is meant to guarantee that the students are equipped to undertake their research*
3. *The graphical abstract provides the students with an opportunity to present the results of their research in an approachable (visual) manner. This will help the students improve and demonstrate their communication skills. It will also assist the Department in communicating the value and significance of the research it undertakes*.

Proposed effective date: Term: Fall 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-systems-design-engineering/doctor-philosophy-phd-systems-design-engineering .

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
Degree requirements □ **Courses**	**Degree requirements** □ **Courses**

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

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
○ Modelling, Simulation and Systems Theory ○ Optimization and Decision Making ○ Societal and Environmental Systems ○ Vision, Image and Signal Processing • A Graduate Research Field is a University credential that is recognized on the student's transcript and is intended to reflect that a student has successfully completed research concentrated in the area of the Graduate Research Field. The Department, represented by the student's supervisor and examining committee, must assess whether a student's completed research warrants the field designation at the time of degree completion. To obtain the Graduate Research Field designation, a student must also complete the requirements associated with the PhD degree. Students can choose to pursue a maximum of 2 Graduate Research Field designations (1 methodology field and 1 application field) for their degree. • Candidates are expected to maintain continuous registration until the thesis is submitted to Graduate Studies and Postdoctoral Affairs. Under exceptional circumstances, inactive terms or a leave of absence may be requested for a prior specified period with departmental approval. The role of a supervisor is to assist a candidate in establishing a research problem with an appropriate scope, to suggest alternative general approaches to the solution of a problem and to provide general advice on the structure and content of a thesis. It is imperative that the engineering code of ethics be strictly observed in the supervisor-candidate relationship. • The PhD degree in the Faculty of Engineering is awarded to a candidate who has successfully completed a program of advanced study and conducted original research. The program of research and its findings must be presented in the form of a thesis and submitted to the University for public examination prior to its oral defence. • The writer of a thesis must demonstrate a critical awareness and understanding of the literature in the research field, exhibit a capability of defining original and useful research problems and a capability of independent thought in solving a research problem. An ability to communicate research results verbally and in writing must be shown. The University of Waterloo allows students to	• <u>Candidates holding a Master's degree in Systems Design Engineering at the University of Waterloo do not need to take a course from the Systems Design Engineering core methods course list. Instead they can take any graduate course from Systems Design Engineering.</u> • The Faculty of Engineering requires that no more than one-half of the courses used for credit towards a graduate degree may be taught by the candidate's supervisor(s). In the case of co-supervision in small research groups, it may be necessary to relax this rule, but the student's file must contain a statement of formal approval from the Department and endorsement from the Associate Dean for Graduate Studies and Research in the Faculty of Engineering. • **PhD Thesis** • Students may choose to pursue up to 2 of the following Graduate Research Fields: ○ Biomedical Engineering ○ Human Factors and Ergonomics ○ Machine Learning and Intelligence ○ Mechatronic and Physical Systems ○ Modelling, Simulation and Systems Theory ○ Optimization and Decision Making ○ Societal and Environmental Systems ○ Vision, Image and Signal Processing • A Graduate Research Field is a University credential that is recognized on the student's transcript and is intended to reflect that a student has successfully completed research concentrated in the area of the Graduate Research Field. The Department, represented by the student's supervisor and examining committee, must assess whether a student's completed research warrants the field designation at the time of degree completion. To obtain the Graduate Research Field designation, a student must also complete the requirements associated with the PhD degree. Students can choose to pursue a maximum of 2 Graduate Research Field designations (1 methodology field and 1 application field) for their degree. • Candidates are expected to maintain continuous registration until the thesis is submitted to Graduate Studies and Postdoctoral Affairs. Under exceptional circumstances, inactive terms or a leave of absence may be requested for a prior specified

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

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
	candidate's contribution is to consider the extent to which parts of the thesis might be published in peer-reviewed technical journals with an international stature or as a monograph by an acceptable publisher. The ultimate test of the acceptability of a thesis is the ability of a candidate to satisfy, through an oral examination, to a University-appointed committee of research specialists in the general field of study, that a significant research contribution has been made and communicated adequately.

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

Currently registered students will not be impacted by this change. Only students admitted in Fall 2024 forward will be required to follow these changes.

Department/School approval date (mm/dd/yy): 09/07/23
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/19/2023
Faculty approval date (mm/dd/yy): 12/13/23
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):

Graduate Studies
Program Revision Template

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

Faculty: Engineering

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

Program contact name(s): Eihab Abdel-Rahman & Anna Cunningham

Form completed by: J. Sparry / S. Landy

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Graduate Studies Course/Milestone Form.

1. *General clarification of course degree requirements (formatting changes only, no content changes).*
2. *Addition of a core methods course requirement (choose min. 1 from a list of 5) towards course degree requirements for research-based students.*
3. *Addition of a requirement for all research-based students to submit a graphical abstract as part of thesis submission process.*

Is this a major modification to the program? No

Rationale for change(s):

1. *These changes will bring the PhD-Aeronautics program course requirements in line with the other SYDE research-based programs.*
2. *The introduction of a core course will provide students with foundational knowledge about methods used for modeling and analysis of a wide spectrum of systems within the Department's remit. It is meant to guarantee that the students are equipped to undertake their research.*
3. *The graphical abstract provides the students with an opportunity to present the results of their research in an approachable (visual) manner. This will help the students improve and demonstrate their communication skills. It will also assist the Department in communicating the value and significance of the research it undertakes.*

Proposed effective date: Term: Fall 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-systems-design-engineering/doctor-philosophy-phd-systems-design-engineering-aeronautics

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
Degree requirements **Courses**	**Degree requirements** • **Courses**

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
• PhD candidates possessing a ~~recent~~ Master's degree in an appropriate discipline are required to successfully complete AVIA 601 Interdisciplinary Aeronautics, AVIA 802 Interdisciplinary Aeronautics Project – PhD Level, and 2 additional ~~courses – at least 1 Engineering course at the 600 or 700 level and at most 1 course from outside of the Faculty of Engineering but must be from the Faculties of Mathematics, Health or Science (with unit weights of 0.50 each). The Department may require individual candidates to take more than 4 courses. In every case, a graduate course program is established by the supervisor(s) in consultation with the student, and is subject to the approval of the Associate Chair for Graduate Studies. Candidates may also be required to take additional courses as a result of a comprehensive examination.~~ • Candidates admitted to the PhD program who do not possess a ~~recent and~~ relevant Master's degree, or have transferred directly to the PhD program without a Master's degree, are required to complete ~~a minimum of 8 courses (with a unit weight of 0.50 each) including AVIA 601 and AVIA 802. At least 6 of the 8 courses must be at the 600 or 700 levels, at least 4 of those 8 courses must be from Engineering, and at most 2 courses may be taken from outside the Faculty of Engineering but must be from the Faculties of Mathematics, Health, Environment, and/or Science.~~ • This degree is offered through the Collaborative Aeronautics Program. This program, jointly offered by a range of departments/schools across several academic faculties, promotes the development of interdisciplinary perspectives on aeronautics. Collaborative Aeronautics Program students complete their specialist training in their respective home departments/schools, while working with colleagues from a variety of other departments/schools in core interdisciplinary courses (AVIA 601 and AVIA 602/802). • Students who have already completed AVIA 601 and AVIA 602 as part of their Master's Aeronautics degree, must complete the following course requirements: o AVIA 802 Interdisciplinary Aeronautics Project - PhD Level o 1 elective graduate course that is applicable to aeronautics (approved by their supervisor with support from the	• PhD candidates possessing a Master's degree in an appropriate discipline are required to successfully complete AVIA 601 Interdisciplinary Aeronautics, AVIA 802 Interdisciplinary Aeronautics Project – PhD Level, and 2 additional <u>graduate courses (0.50 unit weight per course) at the 600 or 700 level satisfying the following criteria:</u> o <u>At least 1 course from the Systems Design Engineering core methods course list</u> o <u>A maximum of 1 course may be taken from outside the Faculty of Engineering but must be from the Faculties of Mathematics, Health, or Science</u> • <u>Systems Design Engineering core methods courses:</u> o <u>SYDE 600 Systems Theory, Models, Research & Design</u> o <u>SYDE 620 Fundamentals of Continuous System Models</u> o <u>SYDE 631 Time Series Modelling</u> o <u>SYDE 640 Experimental Design</u> o <u>SYDE 675 Pattern Recognition</u> • Candidates admitted to the PhD program who do not possess a relevant Master's degree, or have transferred directly to the PhD program without a Master's degree, are required to complete <u>AVIA 601 and AVIA 802, and 6 additional graduate courses (0.50 unit weight per course) satisfying the following criteria:</u> o <u>At least 4 courses from the Faculty of Engineering at the 600 or 700 levels</u> o <u>At least 2 courses from Systems Design Engineering</u> o <u>At least 1 course from the Systems Design Engineering core methods course list</u> o <u>A maximum of 2 courses may be taken from outside the Faculty of Engineering but must be from the Faculties of Mathematics, Health, Environment and/or Science</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

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
Director of the Collaborative Aeronautics Program) ○ 2 Engineering courses at the 600 or 700 level (with unit weights of 0.50 each) • The Faculty of Engineering requires that no more than one-half of the courses used for credit towards a graduate degree may be taught by the candidate's supervisor(s). In the case of co-supervision in small research groups, it may be necessary to relax this rule, but the student's file must contain a statement of formal approval from the Department and endorsement from the Associate Dean for Graduate Studies and Research in the Faculty of Engineering. **PhD Thesis** • Candidates are expected to maintain continuous registration until the thesis is submitted to Graduate Studies and Postdoctoral Affairs. Under exceptional circumstances, inactive terms or a leave of absence may be requested for a prior specified period with departmental approval. The role of a supervisor is to assist a candidate in establishing a research problem with an appropriate scope, to suggest alternative general approaches to the solution of a problem and to provide general advice on the structure and content of a thesis. It is imperative that the engineering code of ethics be strictly observed in the supervisor-candidate relationship. • The PhD degree in the Faculty of Engineering is awarded to a candidate who has successfully completed a program of advanced study and conducted original research. The program of research must be applicable to Systems Design Engineering and Aeronautics and its findings must be presented in the form of a thesis and submitted to the University for public examination prior to its oral defence. • The writer of a thesis must demonstrate a critical awareness and understanding of the literature in the research field, exhibit a capability of defining original and useful research problems and a capability of independent thought in solving a research problem. An ability to communicate research results verbally and in writing must be shown. The University of Waterloo allows students to submit theses in English or in French, the latter being governed by certain important	departments/schools in core interdisciplinary courses (AVIA 601 and AVIA 602/802). • Students who have already completed AVIA 601 and AVIA 602 as part of their Master's Aeronautics degree, must complete the following course requirements: ○ AVIA 802 Interdisciplinary Aeronautics Project - PhD Level ○ 1 elective graduate course that is applicable to aeronautics (approved by their supervisor with support from the Director of the Collaborative Aeronautics Program) ○ <u>At least 1 course from the Systems Design Engineering core methods course list</u> ○ <u>1 additional course from the Faculties of Engineering, Mathematics, Health, or Science</u> • <u>Candidates holding a Master's degree in Systems Design Engineering at the University of Waterloo do not need to take a course from the Systems Design Engineering core methods course list. Instead they can take any graduate course from Systems Design Engineering.</u> • The Faculty of Engineering requires that no more than one-half of the courses used for credit towards a graduate degree may be taught by the candidate's supervisor(s). In the case of co-supervision in small research groups, it may be necessary to relax this rule, but the student's file must contain a statement of formal approval from the Department and endorsement from the Associate Dean for Graduate Studies and Research in the Faculty of Engineering. • **PhD Thesis** • Candidates are expected to maintain continuous registration until the thesis is submitted to Graduate Studies and Postdoctoral Affairs. Under exceptional circumstances, inactive terms or a leave of absence may be requested for a prior specified period with departmental approval. The role of a supervisor is to assist a candidate in establishing a research problem with an appropriate scope, to suggest alternative general approaches to the solution of a problem and to provide general advice on the structure and content of a thesis. It is imperative that the engineering code of ethics be strictly observed in the supervisor-candidate relationship.

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

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
	general field of study, that a significant research contribution has been made and communicated adequately.

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

Currently registered students will not be impacted by this change. Only students admitted in Fall 2024 forward will be required to follow these changes.

Department/School approval date (mm/dd/yy): 09/07/23
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/19/23
Faculty approval date (mm/dd/yy): 12/13/23
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):

Graduate Studies
Program Revision Template

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

Faculty: Engineering

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

Program contact name(s): Eihab Abdel-Rahman & Anna Cunningham

Form completed by: J. Sparry / S. Landy

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Graduate Studies Course/Milestone Form.

1. *General clarification of course degree requirements (formatting changes only, no content changes).*
2. *Addition of a core methods course requirement (choose min. 1 from a list of 5) towards course degree requirements for research-based students.*
3. *Addition of a requirement for all research-based students to submit a graphical abstract as part of thesis submission process.*

Is this a major modification to the program? No

Rationale for change(s):

1. *These changes will bring the PhD-Nano program course requirements in line with the other SYDE research-based programs.*
2. *The introduction of a core course will provide students with foundational knowledge about methods used for modeling and analysis of a wide spectrum of systems within the Department's remit. It is meant to guarantee that the students are equipped to undertake their research.*
3. *The graphical abstract provides the students with an opportunity to present the results of their research in an approachable (visual) manner. This will help the students improve and demonstrate their communication skills. It will also assist the Department in communicating the value and significance of the research it undertakes.*

Proposed effective date: Term: Fall 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-systems-design-engineering/doctor-philosophy-phd-systems-design-engineering-nanotechnology

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
Degree requirements **Courses**	**Degree requirements** **Courses**

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:

~~• For the PhD program, students who are admitted with an appropriate masters degree must successfully complete 3 half credit courses (0.50 unit weight) at the 600 or 700 level including NANO 600 Introduction to Nanotechnology, 1 nanotechnology core course, and 1 elective course.~~
• ~~Students admitted with an appropriate honours bachelor's degree or who transfer directly from a masters program to the PhD program must successfully complete 7 half credit courses (0.50 unit weight) including NANO 600 Introduction to Nanotechnology, 1 nanotechnology core course, and 5 elective courses.~~
• Note: it is possible that some students may need to take additional courses to meet the specific course requirements of the collaborative program.
• Nanotechnology core courses:
  ○ NANO 601 Characterization of Nanomaterials
  ○ NANO 602 Structure and Spectroscopy of Nanoscale Materials
  ○ NANO 603 Nanocomposites
  ○ NANO 604 Nanomechanics and Molecular Dynamics Simulations
  ○ NANO 605/SYDE 683 Design of MEMS & NEMS
  ○ NANO 606/SYDE 682 Advanced MicroElectroMechanical Systems: Physics, Design & Fabrication
• Core courses are designed to provide the base knowledge and skill set required to prepare students for more specialized courses and to conduct interdisciplinary nanoscale research.
• Students holding a Bachelor of Applied Science (BASc) degree in Nanotechnology Engineering or Master's degree in Nanotechnology at the University of Waterloo can not take NANO 600. Instead, they can choose 1 course from the list of nanotechnology core courses.
• A graduate course program is established by the supervisor(s) in consultation with the student, and is subject to the approval of the Associate Chair for Graduate Studies. Candidates may also be required to take additional courses as a result of a comprehensive examination.
• ~~Candidates admitted to the PhD program who do not possess a recent and relevant Master's degree, or have transferred directly to the PhD program without a Master's degree, are~~
	• <u>PhD candidates possessing a Master's degree in an appropriate discipline are required to successfully complete NANO 600 Introduction to Nanotechnology, 1 nanotechnology core course, and 1 Systems Design Engineering core methods course.</u>
	• Note: it is possible that some students may need to take additional courses to meet the specific course requirements of the collaborative program.
	• Nanotechnology core courses:
	  ○ NANO 601 Characterization of Nanomaterials
	  ○ NANO 602 Structure and Spectroscopy of Nanoscale Materials
	  ○ NANO 603 Nanocomposites
	  ○ NANO 604 Nanomechanics and Molecular Dynamics Simulations
	  ○ NANO 605/SYDE 683 Design of MEMS & NEMS
	  ○ NANO 606/SYDE 682 Advanced MicroElectroMechanical Systems: Physics, Design & Fabrication
	• <u>Systems Design Engineering core methods courses:</u>
	  ○ <u>SYDE 600 Systems Theory, Models, Research & Design</u>
	  ○ <u>SYDE 620 Fundamentals of Continuous System Models</u>
	  ○ <u>SYDE 631 Time Series Modelling</u>
	  ○ <u>SYDE 640 Experimental Design</u>
	  ○ <u>SYDE 675 Pattern Recognition</u>
	• Core courses are designed to provide the base knowledge and skill set required to prepare students for more specialized courses and to conduct interdisciplinary nanoscale research.
	• <u>Candidates admitted to the PhD program who do not possess a relevant Master's degree, or have transferred directly to the PhD program without a Master's degree, are required to successfully complete NANO 600 and 6 additional graduate courses (0.50 unit weight per course) satisfying the following criteria:</u>
	  ○ <u>At least 2 courses from Systems Design Engineering</u>
	  ○ <u>At least 1 course from the Nanotechnology core course list</u>
	  ○ <u>At least 1 course from the Systems Design Engineering core methods course list</u>
	  ○ <u>A maximum of 2 courses may be taken from outside the Faculty of Engineering but must be from the Faculties of</u>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
~~required to successfully complete a minimum of 7 courses (with a credit weight of 0.50 each) at least 5 of which must be at the 600 or 700 levels.~~ • The Faculty of Engineering requires that no more than one-half of the courses used for credit towards a graduate degree may be taught by the candidate's supervisor(s). In the case of co-supervision in small research groups, it may be necessary to relax this rule, but the student's file must contain a statement of formal approval from the Department and endorsement from the Associate Dean for Graduate Studies and Research in the Faculty of Engineering. **PhD Thesis** • Candidates are expected to maintain continuous registration until the thesis is submitted to Graduate Studies and Postdoctoral Affairs. Under exceptional circumstances, inactive terms or a leave of absence may be requested for a prior specified period with departmental approval. The role of a supervisor is to assist a candidate in establishing a research problem with an appropriate scope, to suggest alternative general approaches to the solution of a problem and to provide general advice on the structure and content of a thesis. It is imperative that the engineering code of ethics be strictly observed in the supervisor-candidate relationship. • The PhD degree in the Faculty of Engineering is awarded to a candidate who has successfully completed a program of advanced study and conducted original research. The program of research and its findings must be presented in the form of a thesis and submitted to the University for public examination prior to its oral defence. • The writer of a thesis must demonstrate a critical awareness and understanding of the literature in the research field, exhibit a capability of defining original and useful research problems and a capability of independent thought in solving a research problem. An ability to communicate research results verbally and in writing must be shown. The University of Waterloo allows students to submit theses in English or in French, the latter being governed by certain important constraints. The principles governing the submission of theses in French are specified in	Mathematics, Health, Environment and/or Science. o At most 2 courses at the 500 level. • Students holding a Bachelor of Applied Science (BASc) degree in Nanotechnology Engineering or Master's degree in Nanotechnology at the University of Waterloo can not take NANO 600. Instead, they can choose 1 course from the list of nanotechnology core courses. • Candidates holding a Master's degree in Systems Design Engineering at the University of Waterloo do not need to take a course from the Systems Design Engineering core methods course list. Instead they can take any graduate course from Systems Design Engineering. • A graduate course program is established by the supervisor(s) in consultation with the student, and is subject to the approval of the Associate Chair for Graduate Studies. Candidates may also be required to take additional courses as a result of a comprehensive examination. • The Faculty of Engineering requires that no more than one-half of the courses used for credit towards a graduate degree may be taught by the candidate's supervisor(s). In the case of co-supervision in small research groups, it may be necessary to relax this rule, but the student's file must contain a statement of formal approval from the Department and endorsement from the Associate Dean for Graduate Studies and Research in the Faculty of Engineering. **PhD Thesis** • Candidates are expected to maintain continuous registration until the thesis is submitted to Graduate Studies and Postdoctoral Affairs. Under exceptional circumstances, inactive terms or a leave of absence may be requested for a prior specified period with departmental approval. The role of a supervisor is to assist a candidate in establishing a research problem with an appropriate scope, to suggest alternative general approaches to the solution of a problem and to provide general advice on the structure and content of a thesis. It is imperative that the engineering code of ethics be strictly observed in the supervisor-candidate relationship. • The PhD degree in the Faculty of Engineering is awarded to a candidate who has

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Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
	research contribution has been made and communicated adequately.

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

Currently registered students will not be impacted by this change. Only students admitted in Fall 2024 forward will be required to follow these changes.

Department/School approval date (mm/dd/yy): 09/07/23
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Senate approval date (mm/dd/yy) (if applicable):

FACULTY OF ENVIRONMENT - GRADUATE STUDIES COMMITTEE REPORT

TO SENATE GRADUATE & RESEARCH COUNCIL

June 2024

1. Program/Course Changes for approval

a. SERS
   i. ERS 625 – Creating to cross list with GEOG 625
   ii. MES – Allowing 2 course options for methods training
   iii. MES Accelerated - Allowing 2 course options for methods training
   iv. PhD – Allowing 2 course options for methods training, deleted reference to ERS 670 and updated language around comp. Exam outcomes.

b. GEOG
   i. GEMCC 614 – New course, had been offered as special topics before. Adding a permanent code.
   ii. GEOG 625 – Adding ERS 625 as cross-list.
   iii. MCC – Updating the listing of climate change elective options.

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*):

Creating ERS 625 to cross-list with GEOG 625.

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

Course subject code: ERS

Course number: 625

Course ID: 001369

Course title (max. 100 characters including spaces): Qualitative Methods in Geography

Course short title (max. 30 characters including spaces): Qualitative Methods in Geog

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: This course is designed to investigate the range of qualitative research methods (research tools) employed by human geographers and explore the methodological justifications (philosophical or theoretical underpinnings) for using this type of research approach. Qualitative methods attempt to interpret meaning as opposed to purely measuring phenomena. The focus of qualitative research is not descriptive measurement and

prediction of phenomena, as offered by statistical description/analysis, but is more attuned to examining subjective understandings and the interpretation of meaning (hermeneutics). This course will examine and evaluate the range of research tools comprising qualitative methods including: various interviewing methods, participant observation, ethnography, case study methods and discourse analysis. It will also engage with the theoretical debates and philosophical approaches that underpin qualitative research.

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: *GEOG 625 (cross-list request for GEOG 625 also submitted)*

Sections combined/held with:

Rationale for request:

GEOG 625 has been identified as a relevant cross-listing for ERS graduate students seeking their required methods training. This new cross-listed course is a response to recommendations in the SERS seven-year review to provide graduate students in ERS with more focused methods training. Formally cross-listing this course expands options for ERS students' required methods training and removes the administrative step of applying for approval. Geography and Environmental Management benefits from the arrangement with additional students in their graduate courses. The new ERS 625 course will be cross-listed with the existing GEOG 625 course.

Form completed by: Andrea Collins
Department/School approval date (mm/dd/yy): 02/06/24
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 03/20/24
Faculty approval date (mm/dd/yy): 04/30/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Graduate Studies
Program Revision Template

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

Faculty: Environment

Programs: 1) Master of Environmental Studies (MES) in Social and Ecological Sustainability

2) Master of Environmental Studies (MES) in Social and Ecological Sustainability - Water

3) Master of Environmental Studies (MES) in Social and Ecological Sustainability - Internship

Program contact name(s): Andrea M. Collins, Associate Director, Graduate Studies

Form completed by: Andrea M. Collins, Associate Director, Graduate Studies

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Graduate Studies Course/Milestone Form.

We are changing the required courses for the Thesis and MRP options so that students may choose one of two methods courses instead of just one required course. We are also cross-listing ERS 625 with GEOG 625. These proposed program changes have also been submitted for approval in coordination with GEM.

Is this a major modification to the program? No

Rationale for change(s):

- *We are offering a new option for SERS MES students to receive methods training: students will be able to choose one of two courses to meet this requirement and may also take both courses if they prefer. The option to have two courses will allow students to have more in-depth training in the methods that will best suit them in their future research.*

Proposed effective date: Term: Fall 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/environment/school-environment-resources-and-sustainability/master-environmental-studies-mes-social-and-ecological-sustainability

https://uwaterloo.ca/graduate-studies-academic-calendar/environment/school-environment-resources-and-sustainability/master-environmental-studies-mes-social-and-ecological-sustainability-water

https://uwaterloo.ca/graduate-studies-academic-calendar/environment/school-environment-resources-and-sustainability/master-environmental-studies-mes-social-and-ecological-sustainability-internship

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
MES in Social and Ecological Sustainability	**MES in Social and Ecological Sustainability**

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
MES in Social and Ecological Sustainability - Water **Degree Requirements:** **Thesis Option:** Courses o Required courses ▪ ERS 680 Sustainability Foundations (Fall) ▪ ERS 681 Sustainability Applications (Winter) ▪ ERS 669 Applied Statistics in Ecology and Environment (Winter) **Master's Research Paper option:** Courses o Required courses ▪ ERS 669 Applied Statistics in Ecology and Environment (Winter) ▪ ERS 680 Sustainability Foundations (Fall) ▪ ERS 681 Sustainability Applications (Winter)	**MES in Social and Ecological Sustainability - Water** **Degree Requirements:** **Thesis Option:** Courses o Required courses ▪ ERS 680 Sustainability Foundations (Fall) ▪ ERS 681 Sustainability Applications (Winter) ▪ One of: ERS 669 Applied Statistics in Ecology and Environment OR ERS 625/GEOG 625 Qualitative Methods in Geography (Winter) **Master's Research Paper option:** Courses o Required courses ▪ ERS 680 Sustainability Foundations (Fall) ▪ ERS 681 Sustainability Applications (Winter) ▪ One of: ERS 669 Applied Statistics in Ecology and Environment OR ERS 625/GEOG 625 Qualitative Methods in Geography (Winter)
MES in Social and Ecological Sustainability – Internship **Degree Requirements:** **Master's Research Paper option:** Courses o Required courses ▪ ERS 620 Skills Identification and Career Development ▪ ERS 669 Applied Statistics in Ecology and Environment (Winter) ▪ ERS 680 Sustainability Foundations (Fall) ▪ ERS 681 Sustainability Applications (Winter)	**MES in Social and Ecological Sustainability – Internship** **Degree Requirements:** **Master's Research Paper option:** Courses o Required courses ▪ ERS 620 Skills Identification and Career Development ▪ ERS 680 Sustainability Foundations (Fall) ▪ ERS 681 Sustainability Applications (Winter) ▪ One of: ERS 669 Applied Statistics in Ecology and Environment OR ERS 625/GEOG 625 Qualitative Methods in Geography (Winter)

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

Students already registered in the program have already been permitted to take either course in the 2023/2024 school year. Students that have not yet completed their required courses may take either course to fulfil their requirement.

Department/School approval date (mm/dd/yy): 02/06/24
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 03/20/24
Faculty approval date (mm/dd/yy): 04/30/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):

Graduate Studies
Program Revision Template

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

Faculty: Environment

Program: Accelerated Master's Program in Environment, Resources and Sustainability

Program contact name(s): Andrea M. Collins, Associate Director, Graduate Studies

Form completed by: Andrea M. Collins, Associate Director, Graduate Studies

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Graduate Studies Course/Milestone Form.

We are changing the required courses for the Thesis and MRP options so that students may choose one of two methods courses instead of just one required course. This change to the Accelerated Master's option is to be consistent with the other Master's program offerings. We are also cross-listing ERS 625 with GEOG 625. These proposed program changes have also been submitted for approval in coordination with GEM.

Is this a major modification to the program? No

Rationale for change(s):

- *We are offering a new option for SERS MES students to receive methods training: students will be able to choose one of two courses to meet this requirement and may also take both courses if they prefer. The option to have two courses will allow students to have more in-depth training in the methods that will best suit them in their future research.*

Proposed effective date: Term: Fall 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/environment/school-environment-resources-and-sustainability/accelerated-masters-program-environment-resources-and-sustainability

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
Continuing to Graduate School • Obtain credit according to graduate course requirements for one graduate level (6xx) elective course normally taken in term 4A, ~~and ERS 669~~, normally taken in term 4B. Students who fail to complete these courses during their undergraduate degree may have their offer of admission to the relevant Master's program revoked. Continuation in the Master's program is subject to the conditions that apply to the	**Continuing to Graduate School** • Obtain credit according to graduate course requirements for one graduate level (6xx) elective course normally taken in term 4A, and one of ERS 669 or ERS 625/GEOG 625, normally taken in term 4B. Students who fail to complete these courses during their undergraduate degree may have their offer of admission to the relevant Master's program revoked. Continuation in the Master's program

<table>
<tr><th>Current Graduate Studies Academic Calendar content:</th><th>Proposed Graduate Studies Academic Calendar content:</th></tr>
<tr><td>relevant Master's program in the School of Environment, Resources and Sustainability.

Typical Plan of Study for the Accelerated Master's Program
<table><tr><td>4 B</td><td>• Undergraduate courses
• ERS 669</td><td>• Undergraduate courses
• ERS 669</td><td>• Undergraduate courses
• ERS 669
• WATER 601</td><td>• Undergraduate courses
• ERS 669
• WATER 601</td></tr></table></td><td>is subject to the conditions that apply to the relevant Master's program in the School of Environment, Resources and Sustainability.

Typical Plan of Study for the Accelerated Master's Program
<table><tr><td>4 B</td><td>• Undergraduate courses
• ERS 669 or ERS 625/ GEOG 625</td><td>• Undergraduate courses
• ERS 669 or ERS 625/ GEOG 625</td><td>• Undergraduate courses
• ERS 669 or ERS 625/GEOG 625
• WATER 601</td><td>• Undergraduate courses
• ERS 669 or ERS 625/ GEOG 625
• WATER 601</td></tr></table></td></tr>
</table>

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

Students already registered in the program have already been permitted to take either course in the 2023/2024 school year. Students that have not yet completed their required courses may take either course to fulfil their requirement.

Department/School approval date (mm/dd/yy): 02/06/24
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 03/20/24
Faculty approval date (mm/dd/yy): 04/30/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):

Graduate Studies
Program Revision Template

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

Faculty: Environment

Programs: 1) Doctor of Philosophy (PhD) in Social and Ecological Sustainability

2) Doctor of Philosophy (PhD) in Social and Ecological Sustainability - Water

Program contact name(s): Andrea M. Collins, Associate Director, Graduate Studies

Form completed by: Andrea M. Collins, Associate Director, Graduate Studies

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Graduate Studies Course/Milestone Form.

Our graduate methods course options have recently been revised, and these changes are reflected here in this revision. This includes cross-listing ERS 625 with GEOG 625. These proposed program changes have also been submitted for approval in coordination with GEM.

Minor changes have also been made to remove reference to a course that is no longer offered (ERS 670).

Is this a major modification to the program? No

Rationale for change(s):

- *We are offering a new option for SERS graduate students to receive methods training. The option to have two courses will allow students to have more in-depth training in the methods that will best suit them in their future research.*
- *Deleted reference to ERS 670.*
- *Updating language around comprehensive exam outcomes.*

Proposed effective date: Term: Fall 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/environment/school-environment-resources-and-sustainability/doctor-philosophy-phd-social-and-ecological-sustainability

https://uwaterloo.ca/graduate-studies-academic-calendar/environment/school-environment-resources-and-sustainability/doctor-philosophy-phd-social-and-ecological-sustainability-water

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
Degree Requirements **Courses**	**Degree Requirements** **Courses**

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
- Students may be required to take additional courses to ensure they have the requisite research skills in their field, particularly related to methodology and statistics. The Master of Environmental Studies (MES) curriculum includes ~~both~~ a methods course (ERS 669 Applied Statistics in Ecology and Environment) and ~~a proposal development course (ERS 670 MES Research Development),~~ but it is assumed that, normally, students coming into the PhD program will have equivalent training and experience. Students may also choose to take supplemental courses later in their program based on discussions with their advisory committee. ~~They will also need to do so if they fail their comprehensive examination~~.	- Students may be required to take additional courses to ensure they have the requisite research skills in their field, particularly related to methodology and statistics. The Master of Environmental Studies (MES) curriculum includes a methods course (<u>either</u> ERS 669 Applied Statistics in Ecology and Environment <u>or ERS 625/GEOG 625 Qualitative Methods in Geography)</u> and <u>research skills training to develop a research proposal</u>, but it is assumed that, normally, students coming into the PhD program will have equivalent training and experience. Students may also choose to take supplemental courses later in their program based on discussions with their advisory committee. <u>They may also need to do so as a condition of a comprehensive examination outcome.</u>

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

Students already registered in the program have already been permitted to take either course in the 2023/2024 school year. Students that have not yet completed their required courses may take either course to fulfil their requirement.

Department/School approval date (mm/dd/yy): 02/06/24
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 03/20/24
Faculty approval date (mm/dd/yy): 04/30/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):

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

Faculty: 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: GEMCC

Course number: 614

Course ID:

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

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description:

This course provides an overview of the key concepts related to climate services (i.e., useful, timely, and robust information about climatic trends that can support decision-making) and the development of the United Nations' Global Framework for Climate Services. The value of climate-informed decision-making across diverse sectors of the economy are examined, both for climate variability and extremes today and in an era of accelerating climate

change. The scientific and practical challenges of utilizing climate information for decision-making in government policy, community planning, business operations, and international development, as well as the technical standards and professional ethics associated with providing climate services, are examined. Students gain practical experience in the development and application of climate services through climate data assembly and interpretation.

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

Primary meet type: Seminar

Delivery mode: On-campus

Requisites: Antireq: GEOG 314 and GEMCC 694 Topic 2: Climate Services

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 314

Rationale for request:

This course been successfully offered as a Special Topics graduate course. It will be of interest to graduate students within and outside of the Faculty of Environment as it allows students to explore the ways in which climate data and science matters to their discipline/field. Having a permanent course code allows for it to appear in the catalogue and be more easily identified by graduate students as an available option.

Form completed by: Teresa Wilson
Department/School approval date (mm/dd/yy): 03/22/24
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 04/09/24
Faculty approval date (mm/dd/yy): 04/30/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

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

Faculty: Environment

Effective date: Term: 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*):

Cross-listing GEOG 625 with ERS 625.

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

Course subject code: GEOG

Course number: 625

Course ID: 001369

Course title (max. 100 characters including spaces): Qualitative Methods in Geography

Course short title (max. 30 characters including spaces): Qualitative Methods in Geog

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Not required

Course description: This course is designed to investigate the range of qualitative research methods (research tools) employed by human geographers and explore the methodological justifications (philosophical or theoretical underpinnings) for using this type of research approach. Qualitative methods attempt to interpret meaning as opposed to purely measuring phenomena. The focus of qualitative research is not descriptive measurement and

prediction of phenomena, as offered by statistical description/analysis, but is more attuned to examining subjective understandings and the interpretation of meaning (hermeneutics). This course will examine and evaluate the range of research tools comprising qualitative methods including: various interviewing methods, participant observation, ethnography, case study methods and discourse analysis. It will also engage with the theoretical debates and philosophical approaches that underpin qualitative research.

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: *ERS 625 (cross-list request for ERS 625 also submitted)*

Sections combined/held with:

Rationale for request:

GEOG 625 has been identified as a relevant cross-listing for ERS graduate students seeking their required methods training. This new cross-listed course is a response to recommendations in the SERS seven-year review to provide graduate students in ERS with more focused methods training. Formally cross-listing this course expands options for ERS students' required methods training and removes the administrative step of applying for approval. Geography and Environmental Management benefits from the arrangement with additional students in their graduate courses. The new ERS 625 course will be cross-listed with the existing GEOG 625 course.

Form completed by: Maria Strack
Department/School approval date (mm/dd/yy): 02/23/24
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 03/20/24
Faculty approval date (mm/dd/yy): 04/30/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Graduate Studies
Program Revision Template

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

Faculty: Environment

Program: Master of Climate Change (MCC)

Program contact name(s): Dan Scott

Form completed by: Teresa Wilson

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Graduate Studies Course/Milestone Form.

Updating the listing of climate change elective options.

Is this a major modification to the program? No

Rationale for change(s):

To add a new course – GEMCC 614 Climate Services – to the listing of climate change elective options.

Proposed effective date: Term: Fall 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/environment/department-geography-and-environmental-management/master-climate-change-mcc

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:

Master's Research Paper option:
 	
Courses
 	
• Students must successfully complete the following graduate level courses (0.50 unit weight per course):
• 3 required courses:
  ○ GEMCC 601 Climate Change: Physical Science Basis
  ○ GEMCC 602 Climate Change Vulnerability and Adaptation
  ○ GEMCC 603 Climate Change Mitigation
• 2 climate change electives:
	Master's Research Paper option:
	
	Courses
	
	• Students must successfully complete the following graduate level courses (0.50 unit weight per course):
	• 3 required courses:
	  ○ GEMCC 601 Climate Change: Physical Science Basis
	  ○ GEMCC 602 Climate Change Vulnerability and Adaptation
	  ○ GEMCC 603 Climate Change Mitigation
	• 2 climate change electives:

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
○ Students are able to tailor their program of study based on their individual interests by completing 2 climate change designated electives which can be chosen from, but are not limited to, the following list. The availability of climate change designated electives varies year-to-year, including newly approved courses. ▪ GEMCC 610/GEOG 652 Climate Prediction, Modeling and Scenarios ▪ GEMCC 620/GEOG 674 Climate Data and Analytics ▪ GEMCC 622/GEOG 677 Climate Change, Natural Hazards and Disaster Risk Reduction ▪ GEMCC 630/GEOG 653 Land Use and the Carbon Cycle ▪ GEMCC 640/GEOG 678 Climate Change Governance: From Global Treaties to Local Innovation ▪ GEMCC 644 Climate Resilient Canadians and Health Systems ▪ GEMCC 650/ENBUS 652 Business and Climate Change ▪ GEMCC 652/PLAN 627 Climate Change and Community Planning ▪ GEMCC 653/FCIT 606 Sustainability Transitions in Cities ▪ GEMCC 660 Carbon Accounting and Management ▪ GEMCC 690 Climate Change Projects • 2 open electives chosen from the climate change designated electives list, partnering programs within the Faculty of Environment (that are willing to allow the student to enroll in a course), and graduate programs offered by other Faculties (that are willing to allow the student to enroll in a course). • Failure to maintain a course average of at least 75% will result in an automatic review of the student's status in the program. The review committee will consist of the Program Director and the Graduate Officer. The review committee may require that the student withdraw from the program. **Coursework option:**	○ Students are able to tailor their program of study based on their individual interests by completing 2 climate change designated electives which can be chosen from, but are not limited to, the following list. The availability of climate change designated electives varies year-to-year, including newly approved courses. ▪ GEMCC 610/GEOG 652 Climate Prediction, Modeling and Scenarios ▪ <u>GEMCC 614 Climate Services</u> ▪ GEMCC 620/GEOG 674 Climate Data and Analytics ▪ GEMCC 622/GEOG 677 Climate Change, Natural Hazards and Disaster Risk Reduction ▪ GEMCC 630/GEOG 653 Land Use and the Carbon Cycle ▪ GEMCC 640/GEOG 678 Climate Change Governance: From Global Treaties to Local Innovation ▪ GEMCC 644 Climate Resilient Canadians and Health Systems ▪ GEMCC 650/ENBUS 652 Business and Climate Change ▪ GEMCC 652/PLAN 627 Climate Change and Community Planning ▪ GEMCC 653/FCIT 606 Sustainability Transitions in Cities ▪ GEMCC 660 Carbon Accounting and Management ▪ GEMCC 690 Climate Change Projects • 2 open electives chosen from the climate change designated electives list, partnering programs within the Faculty of Environment (that are willing to allow the student to enroll in a course), and graduate programs offered by other Faculties (that are willing to allow the student to enroll in a course). • Failure to maintain a course average of at least 75% will result in an automatic review of the student's status in the program. The review committee will consist of the Program Director and the Graduate Officer. The review committee may require that the student withdraw from the program.

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:

Courses
 	
• Students must successfully complete the following graduate level courses (0.50 unit weight per course):
• 3 required courses:
  ○ GEMCC 601 Climate Change: Physical Science Basis
  ○ GEMCC 602 Climate Change Vulnerability and Adaptation
  ○ GEMCC 603 Climate Change Mitigation
• 2 climate change electives:
  ○ Students are able to tailor their program of study based on their individual interests by completing 2 climate change designated electives which can be chosen from, but are not limited to, the following list. The availability of climate change designated electives varies year-to-year, including newly approved courses.
  ▪ GEMCC 610/GEOG 652 Climate Prediction, Modeling and Scenarios
  ▪ GEMCC 620/GEOG 674 Climate Data and Analytics
  ▪ GEMCC 622/GEOG 677 Climate Change, Natural Hazards and Disaster Risk Reduction
  ▪ GEMCC 630/GEOG 653 Land Use and the Carbon Cycle
  ▪ GEMCC 640/GEOG 678 Climate Change Governance: From Global Treaties to Local Innovation
  ▪ GEMCC 644 Climate Resilient Canadians and Health Systems
  ▪ GEMCC 650/ENBUS 652 Business and Climate Change
  ▪ GEMCC 652/PLAN 627 Climate Change and Community Planning
  ▪ GEMCC 653/FCIT 606 Sustainability Transitions in Cities
  ▪ GEMCC 660 Carbon Accounting and Management
  ▪ GEMCC 690 Climate Change Projects
• 2 open electives chosen from the climate change designated electives list, partnering programs within the Faculty of Environment (that are willing to allow the student to enroll in
	Coursework option:
	
	Courses
	
	• Students must successfully complete the following graduate level courses (0.50 unit weight per course):
	• 3 required courses:
	  ○ GEMCC 601 Climate Change: Physical Science Basis
	  ○ GEMCC 602 Climate Change Vulnerability and Adaptation
	  ○ GEMCC 603 Climate Change Mitigation
	• 2 climate change electives:
	  ○ Students are able to tailor their program of study based on their individual interests by completing 2 climate change designated electives which can be chosen from, but are not limited to, the following list. The availability of climate change designated electives varies year-to-year, including newly approved courses.
	  ▪ GEMCC 610/GEOG 652 Climate Prediction, Modeling and Scenarios
	  ▪ GEMCC 614 Climate Services
	  ▪ GEMCC 620/GEOG 674 Climate Data and Analytics
	  ▪ GEMCC 622/GEOG 677 Climate Change, Natural Hazards and Disaster Risk Reduction
	  ▪ GEMCC 630/GEOG 653 Land Use and the Carbon Cycle
	  ▪ GEMCC 640/GEOG 678 Climate Change Governance: From Global Treaties to Local Innovation
	  ▪ GEMCC 644 Climate Resilient Canadians and Health Systems
	  ▪ GEMCC 650/ENBUS 652 Business and Climate Change
	  ▪ GEMCC 652/PLAN 627 Climate Change and Community Planning
	  ▪ GEMCC 653/FCIT 606 Sustainability Transitions in Cities
	  ▪ GEMCC 660 Carbon Accounting and Management
	  ▪ GEMCC 690 Climate Change Projects

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
a course), and graduate programs offered by other Faculties (that are willing to allow the student to enroll in a course). • Failure to maintain a course average of 75% or better results in an automatic review of the student's status in the program. The review committee will consist of the Program Director and the Graduate Officer. The review committee may require that the student withdraw from the program.	• 2 open electives chosen from the climate change designated electives list, partnering programs within the Faculty of Environment (that are willing to allow the student to enroll in a course), and graduate programs offered by other Faculties (that are willing to allow the student to enroll in a course). • Failure to maintain a course average of 75% or better results in an automatic review of the student's status in the program. The review committee will consist of the Program Director and the Graduate Officer. The review committee may require that the student withdraw from the program.

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

There is no impact to current students.

Department/School approval date (mm/dd/yy): 03/22/24
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 04/09/24
Faculty approval date (mm/dd/yy): 04/30/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):

Summary of Grad Motions for SGRC – June 17, 2024

1) HLTH 600 NEW course

Course description: The aim of this course is to introduce e students to the scope of public health and the competencies that students will develop throughout the MPH program. This course consists of an institute of talks, activities, and workshops focused on active learning. Students who take this course will learn about the: 1) history and achievements of public health; 2) public health ethics; 3) functions of public health practice (assessment, prevention, protection, promotion and emergency response); 4) systems thinking; and 5) local, provincial, and national public health agencies. Students will also learn about working on interprofessional teams through group work throughout the course. This course serves as an introduction to the MPH program, the School of Public Health Sciences and the University of Waterloo.

Rationale for request: *This course is to be added as a required course for MPH students to serve as an in-person requirement for the MPH.*

2) MPH Program Revision – adding HLTH 600

Adding HLTH 600 as a new required introduction course.

Rationale for change(s): *HLTH 600 replaces a previous version of an in-person HLTH 602A course that is now offered as a full-term online course. The purpose of HLTH 600 is to introduce students to key public health competencies, to the public health field and the School of Public Health Sciences through interactive learning activities and guest speakers.*

3) HLTH 649 NEW course

Course description: This course will explore the legal, ethical, and policy implications of the use of digital technology, artificial intelligence and big data applications in healthcare and public health

Rationale for request:

This is a new modular course (6 weeks) proposed as a core module for the MHI program in light of recent developments in artificial intelligence and big data applications in healthcare and public health. This course is also a foundational component of AI literacy for all graduate programs in the School of Public Health, including MHI, MPH, MHE, MSc and PhD programs.

Students will be exposed to some of the most significant challenges that individuals and society are likely to face as a result of emerging digital technologies and AI applications. Students will develop the ability to spot and analyze ethical issues and articulate their values and opinions and respectfully address contrary values and opinions, both orally and in writing. This course will equip students to confidently advocate positions to those responsible for designing or developing the next generation of digital technologies and AI applications, those who will be analyzing the inputs and outputs of those technologies and applications, and/or those who will be creating the regulatory frameworks and public policies surrounding those technologies and applications.

Topics to be addressed in this course include, but are not limited to: (i) what current and proposed laws and regulations exist for the protection of privacy of patients and other persons in the area of digital health and AI; (ii) what ethical considerations AI and big data implicate and how we can best align new technologies with human values; (iii) what being an ethical data scientist means; (iv) what generative AI can be expected to do in the reasonably foreseeable future, and whether this poses existential or other risks; (v) the impact of bias and discrimination in data, algorithms, and developers; and (vi) whether privacy can co-exist in a data-driven world.

4) HLTH 650A Course Revision

Course description: This course focuses on the application of machine learning (ML) and artificial intelligence (AI) techniques in the field of in healthcare and public health settings. Big data sources available for population health studies will be introduced to students and challenges related to AI in health data will also be discussed. The learning activities consist of lectures, student-led journal club discussions and a term paper to propose the application of ML techniques to solve population health or public health problems.

Rationale for request:
To open the course to MHI, MPH, MSc in Public Health Sciences and PhD in Public Health Sciences students to understand the ongoing and new developments in the application of AI to health and public health. As AI is a rapidly developing field with multiple applications in health and public health, it is expected that the change in the title of the course, course description, and prerequisites will attract more students to take this course.

This 6-week modular course focused on domain knowledge of AI in the Health field, allowing students to select different technique modules (i.e. intro to ML or Advanced AI) based on their prior programming and machine learning skills.

5) HLTH 650B Course Revision

Course description: This course focuses on the techniques of machine learning (ML) commonly used to solve healthcare and public health problems. Various analytics techniques, including data wrangling, visualization, unsurprised and supervised learning, will be introduced to students. Challenges and strategies related to missing data, imbalanced data and model selections will also be discussed. The learning activities consist of lectures, labs, and a final project to demonstrate the proficiency of ML techniques to solve population health or public health problems.

Rationale for request:
To open the course to MHI, MPH, MSc in Public Health Sciences and PhD in Public Health Sciences students to learn machine learning techniques, with special attention to characteristics of health data and the application in health and public health. With the rapid increase of big data in the healthcare and public health domain, the demand for advanced data analytics techniques to reveal insights from these data has also increased. Machine learning is an important methodology in health research and solution design. The requested change in course title and description will attract health students to take this course to build their machine-learning skills.

This is a 6-week modular course focusing on basic ML techniques. The modular design of the course offering allows students to select different technique modules (i.e. intro to ML or Advanced AI) based on their prior programming and machine learning skills.

6) HLTH 718A NEW course

Course description: This course presents advanced applications of machine learning (ML) and artificial intelligence (AI) algorithms and their applications in solving challenges unique to health data. Common characteristics of big health data, such as multi-domain inputs, being observational, often unstructured, and potentially containing private information, are common barriers to the application of ML and AI in this field. This course will discuss some advanced ML solutions to those barriers and how AI advances are being applied to health. This is a modular seminar-style course. There will be a series of lectures from faculty members and researchers from the health and AI community.

Rationale for request:

This is a new modular course (6 weeks) proposed as an advanced quantitative methods course for students who would like to learn advanced machine learning skills, particularly deep learning techniques. This is the first module of the Advanced AI course. The topics include deep Learning, causal reasoning, causal AI, privacy-preserving AI.

This module is developed to meet the demands for skills that can derive insights from highly complex and large datasets, as well as develop AI applications in healthcare and public health. This course is a key component for the AI competency for graduate programs in the School of Public Health, including MSc and PhD programs with Health Informatics field specialization and Master of Health Informatics.

7) HLTH 718B NEW course

Course description: This course presents natural language processing techniques (NLP) and their optimization and applications in healthcare and public health. Classic NLP techniques and the state-of-the-art transformer-based language processing models will be introduced. Challenges and barriers of processing and understanding medical notes, reports and social data will be discussed. This course will present some advanced NLP solutions to those barriers and how NLP advances are being applied to health. This is a modular seminar-style course. There will be a series of lectures from faculty members and researchers from the health and NLP community.

Rationale for request:

This is a new modular course (6 weeks) proposed as an advanced quantitative methods course for students who would like to learn natural language process techniques, including large language models, and their applications in healthcare and public health. This is the second module of the Advanced AI course. The topics include basics of natural language processing, clinical NLP, large language models and their applications in social media data processing, clinical coding, and summarization tasks.

This new module is developed to meet the demands for skills that can derive insights from text data generated in social media, electronic medical records and public health reports. This course is a key component for the AI competency for students who would like to specialize in health data science who are enrolled in all graduate programs in the School of Public Health, including MHI, MPH, MHE, MSc and PhD programs.

8) MHI Program Revision

Changing courses to be more modular with current AI and machine learning content and for the courses to be more aligned to the MHI program outcomes.

Rationale for request:

Revisions to the MHI program are being made to better reflect the changes in the Health Informatics and Data Science research and communities.

Senate Graduate & Research Council
Graduate Studies Course/Milestone Form

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

Faculty: Health

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: HLTH

Course number: 600

Course ID:

Course title (max. 100 characters including spaces): MPH Introductory Institute

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

Grading basis: Credit/No Credit

Course credit weight: 0.25

Course consent required: Not required

Course description: The aim of this course is to introduce students to the scope of public health and the competencies that students will develop throughout the MPH program. This course consists of an institute of talks, activities, and workshops focused on active learning. Students who take this course will learn about the: 1) history and achievements of public health; 2) public health ethics; 3) functions of public health practice

(assessment, prevention, protection, promotion and emergency response); 4) systems thinking; and 5) local, provincial, and national public health agencies. Students will also learn about working on interprofessional teams through group work throughout the course. This course serves as an introduction to the MPH program, the School of Public Health Sciences and the University of Waterloo.

Meet type(s): Lecture Seminar 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: *This course is to be added as a required course for MPH students to serve as an in-person requirement for the MPH.*

Form completed by: Jennifer Yessis
Department/School approval date (mm/dd/yy): 03/18/24
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 02/28/24
Faculty approval date (mm/dd/yy): 05/31/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Graduate Studies
Program Revision Template

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

Faculty: Health

Program: Master of Public Health (MPH)

Program contact name(s): Narveen Jandu

Form completed by: Jennifer Yessis

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Graduate Studies Course/Milestone Form.

Adding HLTH 600 as a new required introduction course.

Is this a major modification to the program? No

Rationale for change(s):

HLTH 600 replaces a previous version of an in-person HLTH 602A course that is now offered as a full-term online course. The purpose of HLTH 600 is to introduce students to key public health competencies, to the public health field and the School of Public Health Sciences through interactive learning activities and guest speakers.

Proposed effective date: Term: Fall 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/applied-health-sciences/school-public-health-sciences/master-public-health-mph

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:

Program information
 	
• **Admit term(s)**
  ○ Fall
 	
• **Delivery mode**
  ○ On-campus
  ○ Online
 	
• **Delivery mode information**
  ○ All students must attend a ~~two-day~~ on-campus orientation ~~session~~ scheduled
	Program information
	
	• **Admit term(s)**
	  ○ Fall
	
	• **Delivery mode**
	  ○ On-campus
	  ○ Online
	
	• **Delivery mode information**
	  ○ All students must attend a one-week on-campus MPH Institute course

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
~~the~~ week prior to the start of classes in the Fall term. In addition, a one-week on-campus capstone course is required at the conclusion of the program. ~~Courses are available either on-campus, online, or in a blended/hybrid format.~~ Students should check the School's website for the latest information for format and timing of the courses for the most current mode of delivery and offering. • **Length of program** o Full-time: 6 terms (24 months) o Part-time: 12 terms (48 months) o Courses are offered in three terms of each academic year. For all, continuous registration for each term of the program is required. • **Program type** o Master's o Professional • **Registration option(s)** o Full-time o Part-time • **Study option(s)** o Coursework **Degree requirements** • **Graduate Academic Integrity Module (Graduate AIM)** • **Courses** o The minimum course requirements are 12 one-term (0.50 unit weight) graduate courses, 1 block course requiring one-week on campus (0.50 unit weight) and a practicum (1.50 unit weight). o Students will attend on-campus on ~~one~~ occasion for a 1~~-week block course~~. ~~This~~ course, HLTH 602B Capstone Integrative Seminar for Public Health, will bring students together at the end of the program after completion of all coursework and the practicum. HTLH 602B is a culminating integrated learning experience that provides a context for students to demonstrate their achievement of the foundational	scheduled two weeks prior to the start of classes in the Fall term. In addition, a one-week on-campus capstone course is required at the conclusion of the program. Asynchronous course work and group work is required during the pre/post in-person week on campus. Courses are available online with limited options for on-campus, or courses will be offered in a blended/hybrid format. Students should check the School's website for the latest information for format and timing of the courses for the most current mode of delivery and offering. • **Length of program** o Full-time: 6 terms (24 months) o Part-time: 12 terms (48 months) o Courses are offered in three terms of each academic year. For all, continuous registration for each term of the program is required. • **Program type** o Master's o Professional • **Registration option(s)** o Full-time o Part-time • **Study option(s)** o Coursework **Degree requirements** • **Graduate Academic Integrity Module (Graduate AIM)** • **Courses** o The minimum course requirements are 12 one-term (0.50 unit weight) graduate courses, 1 block course requiring one-week on campus at the beginning of the program (0.25 unit weight) and 1 asynchronous and in-person course in the final term of the program as the capstone course (0.50 unit weight) and a practicum (1.50 unit weight). o Students will attend on-campus on two occasions for a 1-week in-person program requirement. The first course,

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
knowledge and core competencies of public health. On-campus workshops and preparation and presentation of a capstone project are required for the completion of this course. ○ Additional required courses are as follows: ▪ HLTH 602A the Foundations of Public Health ▪ HLTH 603 Health Policy in Public Health ▪ HLTH 604 Public Health and the Environment ▪ One of: HLTH 605A Regression Models OR HLTH 605B Quantitative Methods and Analysis ▪ One of: HLTH 606A Epidemiological Methods OR HLTH 606B Principles of Epidemiology for Public Health ▪ HLTH 607 Social, Cultural and Behavioural Aspects of Public Health I ▪ HLTH 608 Health and Risk Communication in Public Health ▪ HLTH 609 Management and Administration of Public Health Services ▪ HLTH 617 Population Intervention for Disease Prevention and Health Promotion ▪ HLTH 618 Research Tools for Public Health Practice ▪ HLTH 640 Professional Experience Practicum ▪ Two elective HLTH courses. Note: Graduate courses from other departments/schools may be acceptable if approved by the SPHS Professional Graduate Programs Committee.	HLTH 600 MPH Introductory Institute consists of talks, activities, and workshops focused on active learning with an introduction to public health competencies. The final course, HLTH 602B Capstone Integrative Seminar for Public Health, will bring students together at the end of the program after completion of all coursework and the practicum. HTLH 602B is a culminating integrated learning experience that provides a context for students to demonstrate their achievement of the foundational knowledge and core competencies of public health. On-campus workshops and preparation and presentation of a capstone project are required for the completion of this course. ○ Additional required courses are as follows: ▪ HLTH 602A the Foundations of Public Health ▪ HLTH 603 Health Policy in Public Health ▪ HLTH 604 Public Health and the Environment ▪ One of: HLTH 605A Regression Models OR HLTH 605B Quantitative Methods and Analysis ▪ One of: HLTH 606A Epidemiological Methods OR HLTH 606B Principles of Epidemiology for Public Health ▪ HLTH 607 Social, Cultural and Behavioural Aspects of Public Health I ▪ HLTH 608 Health and Risk Communication in Public Health ▪ HLTH 609 Management and Administration of Public Health Services ▪ HLTH 617 Population Intervention for Disease Prevention and Health Promotion ▪ HLTH 618 Research Tools for Public Health Practice ▪ HLTH 640 Professional Experience Practicum ▪ Two elective HLTH courses. Note: Graduate courses from

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
	other departments/schools may be acceptable if approved by the SPHS Professional Graduate Programs Committee.

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

Incoming students will be required to attend one week in person for the MPH Introductory Institute. This was required pre-pandemic and was piloted for the first time in 2023. Current students will not be impacted by this change.

Department/School approval date (mm/dd/yy): 03/18/24
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 03/18/24
Faculty approval date (mm/dd/yy): 05/31/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):

UNIVERSITY OF WATERLOO

Senate Graduate & Research Council
Graduate Studies Course/Milestone Form

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

Faculty: Health

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: HLTH

Course number: 649

Course ID:

Course title (max. 100 characters including spaces): Ethics and Privacy Considerations for Digital Technology and AI in Health

Course short title (max. 30 characters including spaces): Ethics and Privacy in HI

Grading basis: Numerical

Course credit weight: 0.25

Course consent required: Not required

Course description: This course will explore the legal, ethical, and policy implications of the use of digital technology, artificial intelligence and big data applications in healthcare and public health

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

Primary meet type: Seminar

Delivery mode: On-campus and also offered online

Requisites:

Special topics course: Yes ☐ No ☒

Cross-listed course: Yes ☐ No ☒

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

Sections combined/held with:

Rationale for request:

This is a new modular course (6 weeks) proposed as a core module for the MHI program in light of recent developments in artificial intelligence and big data applications in healthcare and public health. This course is also a foundational component of AI literacy for all graduate programs in the School of Public Health, including MHI, MPH, MHE, MSc and PhD programs.

Students will be exposed to some of the most significant challenges that individuals and society are likely to face as a result of emerging digital technologies and AI applications. Students will develop the ability to spot and analyze ethical issues and articulate their values and opinions and respectfully address contrary values and opinions, both orally and in writing. This course will equip students to confidently advocate positions to those responsible for designing or developing the next generation of digital technologies and AI applications, those who will be analyzing the inputs and outputs of those technologies and applications, and/or those who will be creating the regulatory frameworks and public policies surrounding those technologies and applications.

Topics to be addressed in this course include, but are not limited to: (i) what current and proposed laws and regulations exist for the protection of privacy of patients and other persons in the area of digital health and AI; (ii) what ethical considerations AI and big data implicate and how we can best align new technologies with human values; (iii) what being an ethical data scientist means; (iv) what generative AI can be expected to do in the reasonably foreseeable future, and whether this poses existential or other risks; (v) the impact of bias and discrimination in data, algorithms, and developers; and (vi) whether privacy can co-exist in a data-driven world.

Form completed by: Maura R Grossman
Department/School approval date (mm/dd/yy): 03/18/24
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 04/05/24
Faculty approval date (mm/dd/yy): 05/31/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

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

Faculty: Health

Effective date: Term: 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*):

Updating the course number, title, description, and meet type/components. Changing the credit weight from 0.50 to 0.25 and removing the "HLTH 605A or HLTH 605B" prerequisites.

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

Course subject code: HLTH

Course number:

Current number: 650
Revised number: 650A

Course ID: 016369

Course title (max. 100 characters including spaces):

Current title: Applied Machine Learning and Artificial Intelligence in Public Health
Revised title: Application of Artificial Intelligence in Health

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

Grading basis: Numerical

Course credit weight: 0.25

Course consent required: Instructor

Course description:

Current description: This course introduces machine learning (ML) algorithms that are commonly used in artificial intelligence (AI) in healthcare and public health settings. Students will have hands-on experiences in making linkages across multiple datasets, developing ML algorithms to find patterns, and generating evidence and predictive models that help inform decision-making for policymakers and public health organizations. Challenges related to AI in health data will also be discussed, including data quality, explainability of artificial intelligence, unethical use of AI, and vulnerabilities in datasets that pose a threat to privacy and appropriate use of AI in the public health domain.

Revised description: This course focuses on the application of machine learning (ML) and artificial intelligence (AI) techniques in the field of in healthcare and public health settings. Big data sources available for population health studies will be introduced to students and challenges related to AI in health data will also be discussed. The learning activities consist of lectures, student-led journal club discussions and a term paper to propose the application of ML techniques to solve population health or public health problems.

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

Primary meet type: Lecture

Delivery mode: On-campus and also offered online (hybrid)

Requisites:

Special topics course: Yes ☐ No ☒

Cross-listed course: Yes ☐ No ☒

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

Sections combined/held with:

Rationale for request:

To open the course to MHI, MPH, MSc in Public Health Sciences and PhD in Public Health Sciences students to understand the ongoing and new developments in the application of AI to health and public health. As AI is a rapidly developing field with multiple applications in health and public health, it is expected that the change in the title of the course, course description, and prerequisites will attract more students to take this course.

This 6-week modular course focused on domain knowledge of AI in the Health field, allowing students to select different technique modules (i.e. intro to ML or Advanced AI) based on their prior programming and machine learning skills.

Form completed by: Zahid Butt
Department/School approval date (mm/dd/yy): 03/18/24
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 04/16/24
Faculty approval date (mm/dd/yy): 05/31/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

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

Faculty: Health

Effective date: Term: 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: HLTH

Course number: 650B

Course ID: TBD

Course title (max. 100 characters including spaces): Machine Learning Techniques in Health

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

Grading basis: Numerical

Course credit weight: 0.25

Course consent required: Instructor

Course description: This course focuses on the techniques of machine learning (ML) commonly used to solve healthcare and public health problems. Various analytics techniques, including data wrangling, visualization, unsurprised and supervised learning, will be introduced to students. Challenges and strategies related to missing data, imbalanced data and model selections will also be discussed. The learning activities consist of lectures, labs, and a final project to demonstrate the proficiency of ML techniques to solve population health or public health problems.

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

Primary meet type: Lecture

Delivery mode: On-campus and also offered online (hybrid)

Prerequisite: HLTH 650A

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 open the course to MHI, MPH, MSc in Public Health Sciences and PhD in Public Health Sciences students to learn machine learning techniques, with special attention to characteristics of health data and the application in health and public health. With the rapid increase of big data in the healthcare and public health domain, the demand for advanced data analytics techniques to reveal insights from these data has also increased. Machine learning is an important methodology in health research and solution design. The requested change in course title and description will attract health students to take this course to build their machine-learning skills.

This is a 6-week modular course focusing on basic ML techniques. The modular design of the course offering allows students to select different technique modules (i.e. intro to ML or Advanced AI) based on their prior programming and machine learning skills.

Form completed by: Helen Chen
Department/School approval date (mm/dd/yy): 03/18/24
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 04/16/24
Faculty approval date (mm/dd/yy): 05/31/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

UNIVERSITY OF WATERLOO

Senate Graduate & Research Council
Graduate Studies Course/Milestone Form

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

Faculty: Health

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: HLTH

Course number: 718A

Course ID:

Course title (max. 100 characters including spaces): Advanced Artificial Intelligence in Health I

Course short title (max. 30 characters including spaces): AI In Health I

Grading basis: Numerical

Course credit weight: 0.25

Course consent required: Instructor

Course description: This course presents advanced applications of machine learning (ML) and artificial intelligence (AI) algorithms and their applications in solving challenges unique to health data. Common characteristics of big health data, such as multi-domain inputs, being observational, often unstructured, and potentially containing private information, are common barriers to the application of ML and AI in this field. This

course will discuss some advanced ML solutions to those barriers and how AI advances are being applied to health. This is a modular seminar-style course. There will be a series of lectures from faculty members and researchers from the health and AI community.

Meet type(s): Seminar Tutorial Lab Reading

Primary meet type: Seminar

Delivery mode: On-campus and also offered online (hybrid)

Requisites: HLTH650B or HLTH619 as prerequisite

Special topics course: Yes ☐ No ☒

Cross-listed course: Yes ☐ No ☒

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

Sections combined/held with:

Rationale for request:

This is a new modular course (6 weeks) proposed as an advanced quantitative methods course for students who would like to learn advanced machine learning skills, particularly deep learning techniques. This is the first module of the Advanced AI course. The topics include deep Learning, causal reasoning, causal AI, privacy-preserving AI.

This module is developed to meet the demands for skills that can derive insights from highly complex and large datasets, as well as develop AI applications in healthcare and public health. This course is a key component for the AI competency for graduate programs in the School of Public Health, including MSc and PhD programs with Health Informatics field specialization and Master of Health Informatics.

Form completed by: Abel Torres Espin
Department/School approval date (mm/dd/yy): 03/18/24
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 04/05/24
Faculty approval date (mm/dd/yy): 05/31/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Senate Graduate & Research Council
Graduate Studies Course/Milestone Form

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

Faculty: Health

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: HLTH

Course number: 718B

Course ID:

Course title (max. 100 characters including spaces): Natural Language Processing Algorithm and Application in Health

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

Grading basis: Numerical

Course credit weight: 0.25

Course consent required: Instructor

Course description: This course presents natural language processing techniques (NLP) and their optimization and applications in healthcare and public health. Classic NLP techniques and the state-of-the-art transformer-based language processing models will be introduced. Challenges and barriers of processing and understanding

medical notes, reports and social data will be discussed. This course will present some advanced NLP solutions to those barriers and how NLP advances are being applied to health. This is a modular seminar-style course. There will be a series of lectures from faculty members and researchers from the health and NLP community.

Meet type(s): Lecture Tutorial Lab Reading Seminar

Primary meet type: Seminar

Delivery mode: On-campus and also offered online (hybrid)

Requisites: HLTH 650Bor HLTH619 as prerequisite

Special topics course: Yes ☐ No ☒

Cross-listed course: Yes ☐ No ☒

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

Sections combined/held with:

Rationale for request:

This is a new modular course (6 weeks) proposed as an advanced quantitative methods course for students who would like to learn natural language process techniques, including large language models, and their applications in healthcare and public health. This is the second module of the Advanced AI course. The topics include basics of natural language processing, clinical NLP, large language models and their applications in social media data processing, clinical coding, and summarization tasks.

This new module is developed to meet the demands for skills that can derive insights from text data generated in social media, electronic medical records and public health reports. This course is a key component for the AI competency for students who would like to specialize in health data science who are enrolled in all graduate programs in the School of Public Health, including MHI, MPH, MHE, MSc and PhD programs.

Form completed by: Abel Torres Espin
Department/School approval date (mm/dd/yy): 03/18/24
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 04/05/24
Faculty approval date (mm/dd/yy): 05/31/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

Graduate Studies
Program Revision Template

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

Faculty: Health

Program: Master of Health Informatics (MHI)

Program contact name(s): Narveen Jandu

Form completed by: Michelle Fluit

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Graduate Studies Course/Milestone Form.

Changing courses to be more modular with current AI and machine learning content and for the courses to be more aligned to the MHI program outcomes.

Is this a major modification to the program? No

Rationale for change(s):

Revisions to the MHI program are being made to better reflect the changes in the Health Informatics and Data Science research and communities.

Proposed effective date: Term: Fall 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/academic-calendar/graduate-studies/catalog#/programs/rJMTx1CAin

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
Coursework option: Course requirements	**Coursework option: Course requirements**
Required courses The MHI program requires the completion of 10 graduate-level courses. 8 (including the practicum course) of the 10 courses are required core courses. The remaining 2 courses are electives: CS 634 Security and Privacy in Health Systems	Required courses The MHI program requires the completion of 10 graduate-level courses. 8 (including the practicum course) of the 10 courses are required core courses. The remaining 2 courses are electives: CS 634 Security and Privacy in Health Systems

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
CS 638 Principles of Data Management and Use or HLTH 605B Quantitative Methods and Analysis	CS 638 Principles of Data Management and Use or HLTH 605B Quantitative Methods and Analysis
HLTH 611 The Health Care System	HLTH 611 The Health Care System
HLTH 612/CS 792 Data Structures and Standards in Health Informatics	HLTH 612/CS 792 Data Structures and Standards in Health Informatics
HTLH 613 Information Technology for the Health Professional	HTLH 613 Information Technology for the Health Professional
HLTH 615 Requirements Specification and Analysis in Health Systems	HLTH 615 Requirements Specification and Analysis in Health Systems
HLTH 637 Public Health Informatics (offered online)	HLTH 637 Public Health Informatics (offered online)
HLTH 640 Professional Experience Practicum	HLTH 640 Professional Experience Practicum
In situations where a student has previously taken a course with learning objectives similar to that of a required MHI course, a higher-level graduate course in the same domain area will be substituted.	In situations where a student has previously taken a course with learning objectives similar to that of a required MHI course, a higher-level graduate course in the same domain area will be substituted.
Elective courses	Elective courses
2 of the required 10 courses are electives. The following online courses are currently offered and can be chosen as electives:	2 of the required 10 courses are electives. The following online courses are currently offered and can be chosen as electives:
CS 636 Introduction to Computer Networks and Distributed Computer Systems	CS 636 Introduction to Computer Networks and Distributed Computer Systems
CS 638 Principles of Data Management and Use or HLTH 605B Quantitative Methods and Analysis (note: courses taken from the list of required courses cannot be taken to satisfy the elective course requirements)	CS 638 Principles of Data Management and Use or HLTH 605B Quantitative Methods and Analysis (note: courses taken from the list of required courses cannot be taken to satisfy the elective course requirements)
HLTH 603 Health Policy in Public Health	HLTH 603 Health Policy in Public Health
HLTH 608 Health and Risk Communication in Public Health	HLTH 608 Health and Risk Communication in Public Health
HLTH 609 Management and Administration of Public Health Services	HLTH 609 Management and Administration of Public Health Services
HLTH 614 Evaluation of Public Health Programs	HLTH 614 Evaluation of Public Health Programs
HTLH 616 Decision Making and Systems Thinking in Health Informatics	HTLH 616 Decision Making and Systems Thinking in Health Informatics
HLTH 631 Public Health Surveillance	HLTH 631 Public Health Surveillance

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
HLTH 632 Health Economics and Public Health HLTH 654 Systems Thinking and Analysis HLTH 661 Geographic Information Systems and Public Health HLTH 662 Global Health STAT 631 Introduction to Statistical Methods in Health Informatics Students can also choose from online and on-campus courses offered by both Computer Science and the School of Public Health Sciences with the permission of the program leader.	HLTH 632 Health Economics and Public Health HLTH 649 Ethics and Privacy Considerations for Digital Technology and AI in Health HLTH 650A Application of Artificial Intelligence in Health HLTH 650B Machine Learning Techniques in Health HLTH 654 Systems Thinking and Analysis HLTH 661 Geographic Information Systems and Public Health HLTH 662 Global Health HLTH 718A Advanced Artificial Intelligence in Health I HLTH 718B Natural Language Processing Algorithm and Application in Health STAT 631 Introduction to Statistical Methods in Health Informatics Students can also choose from online and on-campus courses offered by both Computer Science and the School of Public Health Sciences with the permission of the program leader.

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

Current students are required to complete the MHI program as indicated in the GSAC for their intake year and complete the degree requirements for graduation. Current students may choose the new courses as an elective option but these courses are not required.

Department/School approval date (mm/dd/yy):
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 04/16/24
Faculty approval date (mm/dd/yy):
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):

Faculty of Science

SGRC submission

MEMORANDUM

To: Tim Weber-Kraljevski

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

Date: June 3rd, 2024

Re: Science Graduate and Research Council Agenda

I would ask that the motions below be placed on the agenda for the upcoming SGRC meeting. The motions were all approved at the Science Faculty Council (May 31st. 2024).

Chemistry:

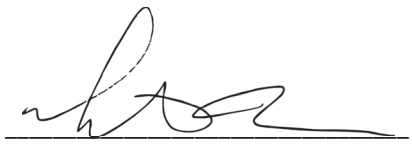
1. To approve updating the course requirements in Chemistry graduate programs to specify the required overall average and the required average for individual courses.

Pharmacy:

2. To approve the course revision, including updating the course description and delivery mode, for PHARM 657.

Forms, including the rationale for the modifications, are attached.

Thank you,



Martin Ross, PhD

Associate Dean Graduate Studies – Faculty of Science

Graduate Studies
Program Revision Template

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

Faculty: Science

Programs: 1) Doctor of Philosophy (PhD) in Chemistry

2) Doctor of Philosophy (PhD) in Chemistry - Co-operative Program (direct entry)

3) Doctor of Philosophy (PhD) in Chemistry - Nanotechnology

4) Doctor of Philosophy (PhD) in Chemistry - Quantum Information

5) Master of Science (MSc) in Chemistry

6) Master of Science (MSc) in Chemistry - Co-operative Program (direct entry)

7) Master of Science (MSc) in Chemistry - Nanotechnology

8) Master of Science (MSc) in Chemistry - Quantum Information

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

Form completed by: Thorsten Dieckmann, Kim Rawson

Description of proposed changes:
Note: changes to courses and milestones also require the completion/submission of the SGRC Graduate Studies Course/Milestone Form.

Updating the course requirements to specify the required overall average and the required average for individual courses.

Is this a major modification to the program? No

Rationale for change(s):

The required pass/fail grades have been GWC policy for many years on both campuses (Waterloo and Guelph), but not officially outlined in the GSAC.

Proposed effective date: Term: Fall 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/academic-calendar/graduate-studies/catalog#/programs?group=Chemistry

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
Course requirements	**Course requirements** • An average of at least 70% must be obtained in the required courses. A minimum grade of

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
• *Note: comparable content is not currently included in the Chemistry program pages in the GSAC.*	65% is required for a pass in each course. If a student does not meet these minimum grade requirements, or receives a failing grade in any course, the student may be required to withdraw from the program.

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

No impact to current students as the policy has been in place for many years, as listed on the GWC website.

Department/School approval date (mm/dd/yy): May 14, 2024
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 05/15/24
Faculty approval date (mm/dd/yy): 05/31/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):

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

Faculty: Science

Effective date: Term: Winter Year: 2025

Milestone

Note: milestone changes also require the completion/submission of the Graduate Studies Program Revision Template.

☐ New: Choose an item.

☐ Inactivate: Choose an item.

☐ Revise: from Choose an item. to Choose an item.

Course

Note: some course changes also require the completion/submission of the Graduate Studies Program Revision Template.

☐ New: Complete all course elements below

☐ Inactivate: Complete the following course elements:
Course subject code, Course number, Course ID, Course title

☒ Revise: Complete all course elements below to reflect the proposed change(s) and identify the course elements being revised (*e.g. Course description, Course title*):

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

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

Course subject code: PHARM

Course number: 657

Course ID: 016435

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

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

Grading basis: Numerical

Course credit weight: 0.50

Course consent required: Instructor

Course description:

Current description: In Pharmacy and other health care professions mental health and addictions work is often carried out in specialized settings and is focused on pathological substance use and use disorder.

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

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

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

Primary meet type: Online activities

Delivery mode: Online

Requisites: None

Special topics course: Yes ☐ No ☒

Cross-listed course: Yes ☐ No ☒

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

Sections combined/held with: N/A

Rationale for request:

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

Form completed by: Melinda Recchia
Department/School approval date (mm/dd/yy): 05/30/2024
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 04/24/24
Faculty approval date (mm/dd/yy): 05/31/24
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):

UNIVERSITY OF WATERLOO | Senate

Senate Graduate & Research Council

For Discussion

To:	**Senate Graduate & Research Council**
From:	Charmaine Dean Vice-President, Research & International Jeff Casello, Associate Vice-President, Graduate Studies and Postdoctoral Affairs
Date of Meeting:	June 17, 2024
Agenda Item Identification:	**SGRC Agenda Subcommittee and SGRC Curriculum Subcommittee Proposal**

Summary:

Following discussion at Senate Graduate & Research Council (SGRC) considering restructuring, and in consultation with President and Vice-Presidents (PVP), Dean's Council (DC), and the Secretariat, the co-chairs of SGRC are proposing the creation of a SGRC Agenda Subcommittee and a SGRC Curriculum Subcommittee for the consideration of SGRC.

Background:

Following a memo from the Associate Deans, Research (ADRs), and as part of the Senate Governance Review, SGRC has been discussing the restructuring of the Council over the last year and a half. SGRC also hosted separate facilitated consultations for Students, Support Staff, Associate Deans, Graduate Studies (ADGs), and ADRs.

The summary of this consultation is as follows:

- There is an acknowledgement that substantive portions of SGRC meetings are spent on curricular changes which may not be of particular relevance or interest to the ADRs;
- There is also a recognition that the ADRs portfolio tends to focus more on interactions with faculty members than with graduate students;
- Agenda items led by the ADRs – most notably Centre and Institute renewals – are of interest to the ADGs as these research activities are important sources of engagement for graduate students;
- There is a perceived common interest (among ADGs and ADRs) in postdoctoral scholars that is not regularly addressed at SGRC.

Generally, the ADGs find value in maintaining a common Graduate and Research Council of Senate, but changes should and have been considered to improve its efficacy. Changes that have already been made to SGRC include:

- A consent agenda has been introduced to ensure equitable time for both research and academic strategic matters.
- A quality enhancement committee of Senate has been approved that will receive and vet all cyclical program reviews under the University's IQAP.

Suggestions for improvement include:

- Providing greater clarity on the purpose of the curricular reviews such that their consideration can be streamlined. The observation was made that substantial time is spent on presenting what can be considered minor curricular changes – titles and descriptions of courses, program requirements, etc. – that are rarely contentious. If the Council were to develop a new operational model that still met the governance obligations, but expedited the review, more time may be available at SGRC meetings for other considerations.
- Including strategic discussions as part of the SGRC agenda such that there is a balance between the operational and strategic functions of SGRC, in keeping with proposed changes at Senate. To this end, motivating the introduction of strategic discussions from all stakeholders – co-chairs, ADGs, ADRs, Students and other members – may increase the value of SGRC meetings and may advance the common goals of the graduate studies and research communities. One avenue to this goal would be to offering more opportunities (or, perhaps, making clearer existing opportunities) for Council members to construct the meeting agendas.

As an outcome of the consultations, a new structure was proposed and presented to SGRC at its October 16, 2023 meeting. The proposal was generally not supported by SGRC members and instead a discussion was had on the prospect of splitting the council into separate research and graduate studies councils. The matter was taken to meetings of the PVP+ and DC+ for further consideration and feedback.

In discussion with both aforementioned groups, concerns were raised in regard to the splitting of the council and that such a move would be counter to the overarching goal of integrated planning, including strategic contemplation and governance of the combined research, graduate studies, and postdoctoral portfolios needed to foster the "One University" as outlined in the Provost's Advisory Committee on Building a Resilient University of Waterloo. Concerns were also raised as to whether the mandate of a Senate Research Council would be enough to substantiate a separate council of Senate, noting the UW Act does not explicitly empower Senate with authority over research, and in light of external regulations and oversight of research activity (e.g., through the tri-agencies).

Discussion also included consideration and affirmation of the relationship and intersections between graduate studies and research activity, as well as possible changes to the administrative structures within Faculties and in the Office of Research to better provide the venue and opportunities that the ADRs are seeking to discuss and influence research strategy issues. It was agreed that administrative challenges ought not be solved by changing governance structures as this would not address the root cause of concerns being raised. The Deans have committed to meeting with ADGSs and ADRs within their Facilities to discuss and facilitate the increased intersection of these portfolios. To date, the co-Chairs are not aware that these meetings have taken place or, if they have, what the outcomes of those conversations include.

The co-chairs of SGRC, with the support of the Secretariat, are committed to additional efforts to address members' concerns and have developed a two-fold proposal:

1. the establishment of an SGRC Agenda Subcommittee to review and assess agenda items and how they are best considered for SGRC meeting agendas; and,
2. the establishment of an SGRC Curriculum Subcommittee to review curriculum proposals and in some cases use delegated authority for routine approvals with a view to streamlining processes and meeting agendas. The curriculum subcommittee concept is adapted from that currently being piloted for the Senate Undergraduate Council (SUC).

SGRC Agenda Subcommittee:

It is proposed that a SGRC Agenda Subcommittee (SGRC-AS) be created with powers and duties as follows;

- To request special meetings of SGRC;
- To determine if an agenda warrants a meeting of SGRC;
- To prepare the agenda for all SGRC meetings;
- To receive and review reports and other materials ahead of their inclusion in the SGRC agenda; and
- To guide the strategic direction of SGRC.

Membership of the proposed SGRC-AS would include:

- The VPRI (co-chair);
- The AVPGSPA (co-chair);
- One ADG;
- One ADR; and
- One student member of SGRC.

Apart from the co-chairs, the members of SGRC-AS would be appointed by SGRC.

The SGRC-AS would be supported by the Secretariat. The main goal of the proposed SGRC-AS is to engage members in agenda setting, particularly in determining which items should be included within the consent agenda and in identifying strategic topics for discussion, to ensure that SGRC meetings are of relevance and interest to all membership.

The creation of the SGRC-AS would necessitate an amendment to Senate Bylaw 2.

SGRC Curriculum Subcommittee:

It is proposed that a SGRC Curriculum Subcommittee (SGRC-CS) be created with powers and duties as follows;

- To consider, study and review all proposals for new graduate programs, the deletion of graduate programs and major changes to existing graduate programs, and make recommendations to SGRC thereon.

- To consider, study and review all proposals for new regulations within the Graduate Studies Academic Calendar (GSAC), the deletion of regulations within the GSAC and major changes to regulations withing the GSAC and make recommendations to SGRC thereon.
- On behalf of SGRC, consider and approve all new graduate courses, the deletion of graduate courses, and proposed minor changes to existing graduate courses and programs, and provide SGRC with a brief summary of council's deliberations in this regard. Any matter of controversy that might arise may be referred to SGRC.

Membership of the proposed SGRC-SC would include:

- The AVPGSPA (chair);
- The six ADGs;
- One ADR;
- The AFIW member of SGRC; and
- Two student member of SGRC.

Apart from the chair and the ADGs, the members of SGRC-SC would be appointed by SGRC.

The SGRC-SC would also be supported by the Secretariat and as noted above, is modelled after the Curriculum Subcommittee that the Senate Undergraduate Council is currently piloting. The main goal of the proposed SGRC-SC is to delegate the powers and duties of SGRC for curriculum items, reducing the amount of time SGRC members spend reviewing these items. While the SGRC consent agenda has already reduced the amount of time SGRC spends discussing curriculum items at meetings, the SGRC-SC would significantly reduce the amount of material SGRC members would need to review to prepare for an SGRC meeting. New course, course changes, course deletions, and minor program modifications would be approved on behalf of SGRC and only a brief summary of the approvals would be submitted to SGRC for information. New programs, major program modifications, program deletions, new GSAC regulations, GSAC regulation changes, GSAC regulation deletion, and anything deemed controversial or of interest to SGRC, would still be presented to SGRC for approval, either within the consent or regular agenda.

It is anticipated the introduction of the SGRC-SC would also reduce the number of meetings necessary for SGRC from eight meetings a year to six, with SGRC meeting only twice a term.

The creation of the SGRC-SC would also necessitate an amendment to Senate Bylaw 2.

Next Steps

Should SGRC be supportive of this proposal, the terms of references for each subcommittee would be developed in consultation with the Secretariat and presented to SGRC for endorsement, before being brought to SEC to recommend to Senate for approval.

Further actions may be considered by SGRC, including the creation of a University Research Council pending further consultation with the Deans as they engage their ADGs and ADRs, and the co-chairs and the Secretariat engages DC+.

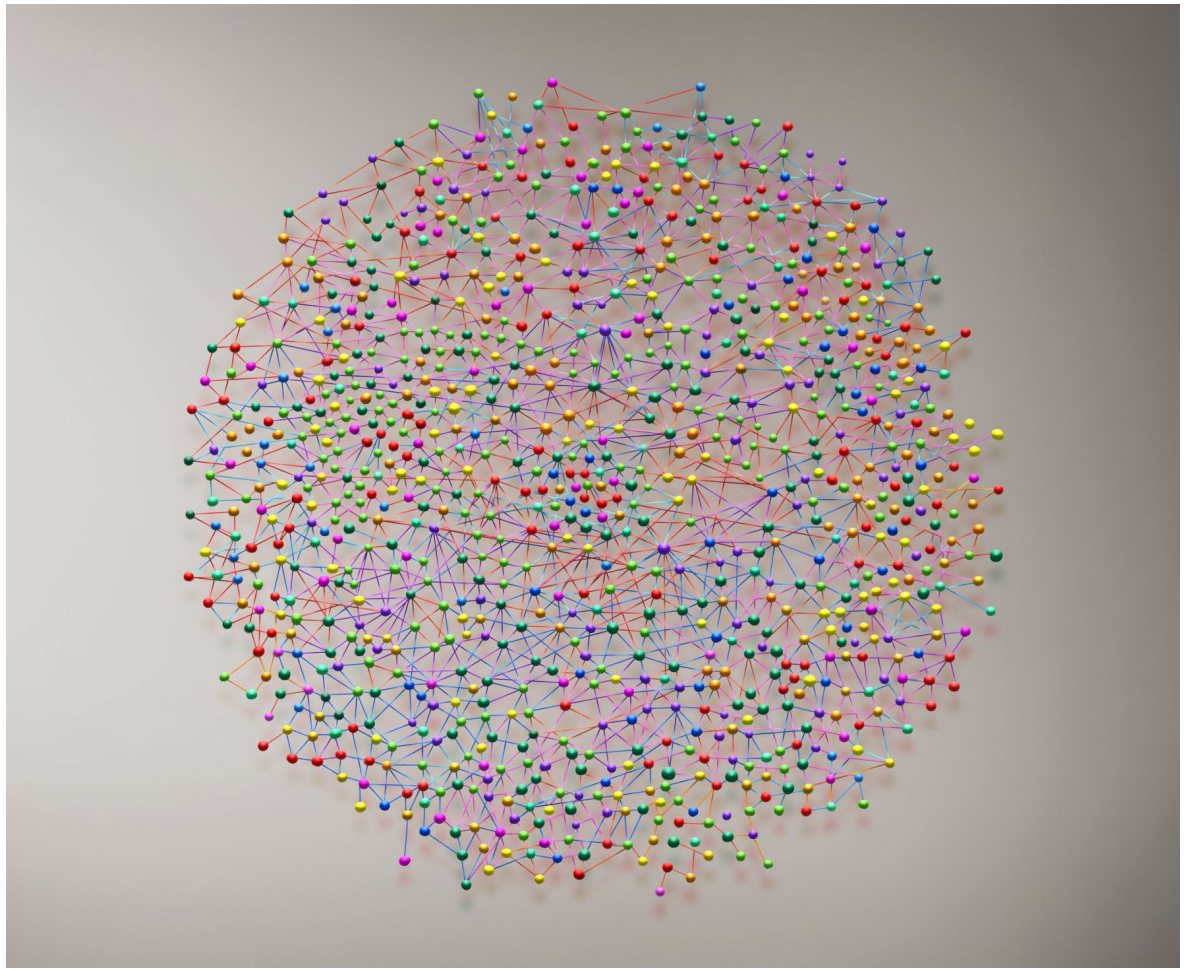
Health Futures Strategy

Catherine Burns
AVP, Health Initiatives

Overview for SGRC
2023-04-24

UNIVERSITY OF WATERLOO

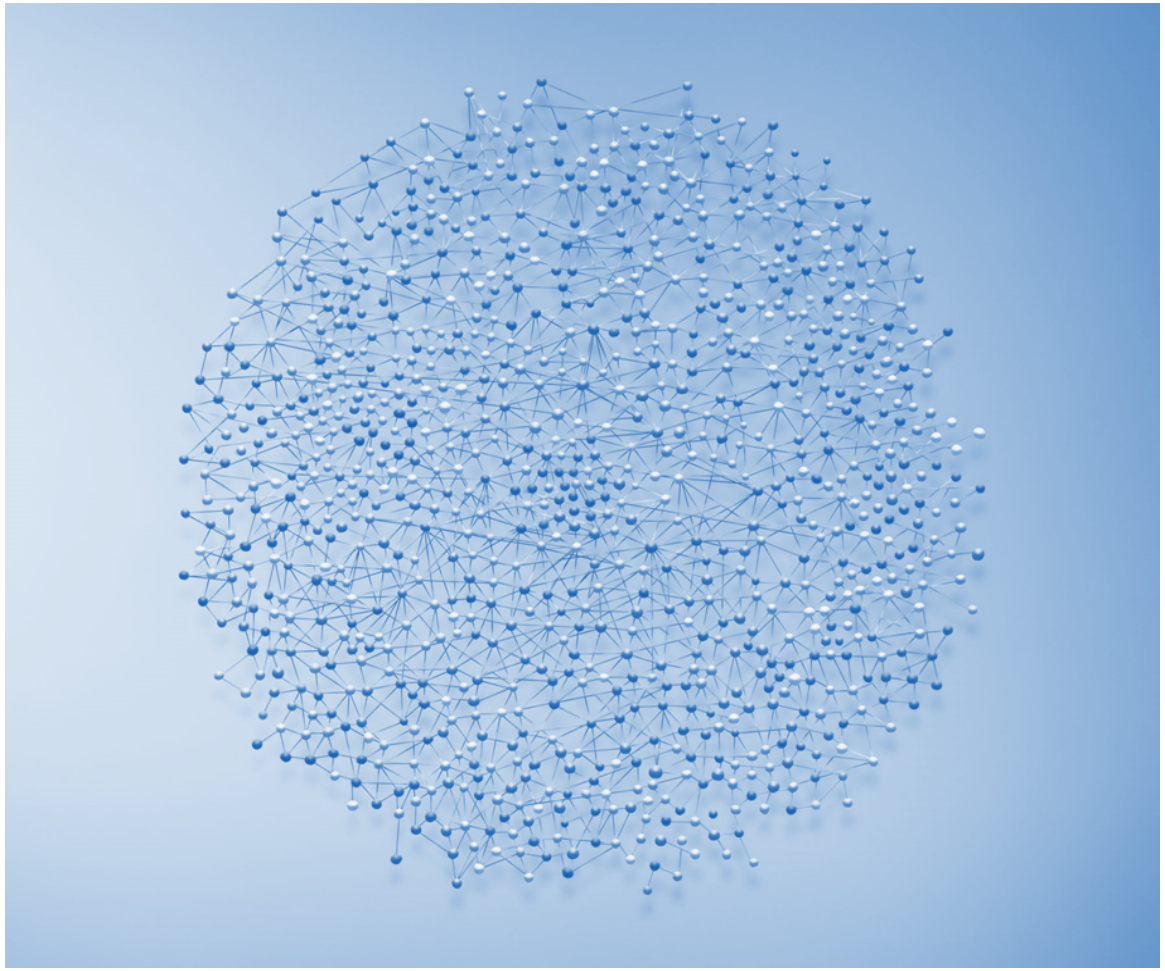
VISION



Through a problem-centric focus, the Global Futures Networks will enable innovation, collaboration, and the organization of activities across research, education, and service designed to help shape the future we imagine for humanity and our planet.

UNIVERSITY OF WATERLOO

Health Core Strategy



- Focus on **community** (problem-centeredness)
- Build sustainable high impact *co-designed* **collaborations** that promote collaboration within and with partners that are "platform" level collaborations that will be generative in $, education and training, innovation, policy, and impact – sustainability built in
- Improve internal **coordination** and knowledge sharing

Community

- Nurture, protect, and grow key relationships
- Engage with community directly in shared co-designed initiatives
- Community engages in the governance through advisory committees
- Focus on:
  - Education: clinical programs, interdisc undergraduate and graduate programs
  - Research: the Health Hub, NAR/NAS, the Clinician Council among others
  - Innovation: new ways of teaching, living, creating
  - Service: healthy campus, community impact, policy

Collaborations that are Sustainable and High Impact

Initiatives that are co-designed and co-invested between (at least) two units in some way:

- Min two party *co-design*: faculties, UW and the community, others
- Investment might mean $, access, time, and commitment
- *Executive Sponsor*: believes the project will make a difference and has the persuasive power to bring assets to the team. Works for sustainability.
- Initiative Director: direct responsibility for the project and management of the team
- **Scale must be at the level to initiate transformation**
- **ROI: new ways of working, impact, visibility***
  - *this ROI is acknowledged as hard to measure, but true to advancing change. Initiatives will have specific metrics that suit the initiative.

Co-ordination and Knowledge Sharing

- The Network must not just be a set of projects, but build community
- A set of supported Communities of Practice, that may change over time to stimulate needed
  - Share thoughts on interdisciplinary teaching, how to share facilities, how to improve student wellness,…
  - Generate initiatives informally
- Health Leaders Council
  - Formal knowledge sharing
  - Awareness of initiatives and key partnerships
  - Generate initiatives formally

Connection with the Global Futures Office

- Global futures office *convenes* the connections
  - Health leaders council, the Communities of Practice network
- Global futures office *connects* and encourages innovative codesign of initiatives
- Global futures office *supports* and stewards the Executive Sponsor and Initiative Director through the governance process to seek support for initiatives

DEVELOPMENTAL PATHWAY

GLOBAL FUTURES NETWORK

2023-2024

- Conclude consultations and proposal development

2024-2025

- Creation of the Global Futures Office (GFO) and staffing
- Work with existing initiatives to connect into the GFO
- Iterative review and development

2025-2026

- Initial call for proposals in two stages:

  GF pitch & Full GF submission

- Launch of 1st gen GF initiatives

HEALTH FUTURES

2023-2024

- Advance consultations to proposed network

2024-2025

- Reconsideration of mandate and purpose of CBB, Network for Aging and Society and Global health
- Begin the Health Leaders Council and 2 CoPs
- Iterative review and development

2025-2026

- Identify and prepare initiatives for the GF process

  GF pitch & Full GF submission

- Launch of 1st gen GF HF initiatives

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CareNext:

A co-invested and co-designed collaborative for innovative health care in Waterloo Region

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Why CareNext

Waterloo, in partnership with Grand River Hospital and St. Mary's Hospital, has a unique opportunity to develop an applied research and innovation platform that is unique in Canada to:

- Advance from a solid foundation of working together over many years
- Progress to a formal joint collaboration that can act strategically to:
  - Connect across organizations
  - Create the culture change to work together closely and innovatively
  - Develop smooth pathways for applied research and innovation to interact with the hospitals
  - Develop models for sustainability that bring success to all partners

What is “Care Next”

- Align the efforts of the two hospitals, the University of Waterloo, and key partners to be Innovation ready.
- Create a clear path for intersecting and working with the innovation, tech, and educational sectors to “move further, faster, together.”
- Apply innovation, with a focus on digital and tech at first, to current and future healthcare settings
- Portal of entry into the healthcare “sandbox” for innovators, driving the concept of clinician-led health science innovation in situ, as opposed to academic health sciences.
- Harness, align and leverage the current clinical and operational expertise at each hospital level to clarify the path to application for innovators and the tech sector.

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Phases of care next

Phase 1

- Early focus would be on "Fixing the Frustrations" of front-line workers in the hospital sector.
- Hiring of Chief Health Innovation Officer.

Phase II

- Identify and prepare to solve more complex regional health system issues
- Create educational programming and entrepreneurial ventures
- Create and enable integrated care systems that reach people where they are, when they need it.

Phase III

- Be a key partner and creator of the future of Canada's healthcare system
- Focus on modern technologies and innovations for economic benefits to Ontario and Canada.
- Identify what it means and set the stage to become Canada's healthiest community and set the stage
- Focus on innovation to enable individuals to be healthy at home, and if care is needed, for patients to get the right care, in the right place, so our hospitals can focus on specialized care.

*Phases will be running concurrently

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Waterloo's engagement in CareNext

- Founding partner
- Contribution of $1 million matching of contributions from both GRH and SMH
- UW's contribution – to be finalized - to come from repositioning of the Graham Seed Fund and OVPRI support, to seed CareNext projects
- Location of the Chief Health Innovation Officer (CHIO) at the Innovation Arena, joint reporting to all leads, at UW reporting to VPRI
- Guidance on the steering committee for the coalition
- Direct guidance and participation through support and direction to the CHIO.

Expected Benefits

- Growth of local hospitals in their readiness to support research and innovation for better patient care in the region
- Easier pathways for our researchers and innovators to access hospitals and clinicians
- A collaborative named entity that can attract visibility and further investment
- A team that can develop models that generate support for further innovation to benefit all 3 organizations
- Test driving ideas that will support the concept of an Innovation Hospital
- Clear advancement of the Waterloo @100 strategy, the Health Futures strategy, and the partnership goals identified by the Health Initiatives Task Force.

Questions

- What health initiatives are you working on that might advance goals in your Faculty strategic plans? Can they tie to the Health Futures vision?
- How can the CareNext collaboration be a vehicle to advance your initiatives in education, research or innovation?
- What CoPs are important to develop?


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