UNIVERSITY OF WATERLOO | Senate

Senate

Open and Confidential Sessions

April 7, 2025

3:30 - 6:00 p.m.

Needles Hall

NH 3407

Waterloo Campus

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2025 04 07 Senate Meeting Book

AGENDA

Governance Resources
https://uwaterloo.ca/secretariat/governing-bodies/senate

OPEN SESSION

3:30 p.m.	1. Territorial Acknowledgement [Reitsma]	
3:35 p.m.	2. Approval of the Agenda and Minutes [Goel]	
	2.1 Conflict of Interest	Declaration
	2.2 Approval of the Agenda and Consent Items	Decision
	2.3 Minutes of the March 3, 2025 Meeting - open and confidential	Decision
	2.4 Business Arising from the Minutes	Information
	Memo, item 2.1-2.4	
	Minutes of the March 3, 2025 Meeting	
3:40 p.m.	3. Report of the President [Goel]	
	3.1 General Update	Information
4:00 p.m.	4. Report of the Provost [Rush]	
	4.1 Report of the Vice-President, Academic and Provost on University Professor Designation	Information
4:05 p.m.	5. Report of the Senate Executive Committee [Goel]	
	5.1 2025-2026 Senate Nominations for the Board of Governors	Information
	5.2 Delegation of Authority for Approval of the Roster of Graduands	Decision
	5.3 Submission Received – Proposal to Amend Senate Bylaw 4	Information
4:15 p.m.	6. Report of the Senate Finance Committee [Rush]	
	6.1 2025-26 Operating Budget	Recommendation
5:00 p.m.	7. Report of the Senate Graduate & Research Council [Woudsma]	
	7.1 Faculty of Arts	Decision
	7.2 Faculty of Engineering	Decision
	7.3 Faculty of Environment	Decision
5:10 p.m.	8. Report of the Faculty of Environment [Frayne]	
	8.1 Faculty Organizational Change – Department of Knowledge Integration	Recommendation

	8.2 Amendments to the Faculty of Environment Constitution	Decision
5:20 p.m.	9. CONSENT AGENDA	
	9.1 Senate Work Plan	Information
	9.2 Senate Graduate & Research Council	Information
	9.3 Academic Quality Enhancement Committee	Information
	9.4 Report of the Provost, Faculty Appointments, Leaves	
	9.5 Report of the Vice President, Research and International	Information
	10. Items Removed from the Consent Agenda	
	11. Other Business	Input
	11.1 Annual Senate Survey	Information
5:35 p.m.	CONFIDENTIAL SESSION	Senators, Vice-Presidents, Secretariat and Technical Staff as required
	12. Approval of the Minutes [Goel]	
	12.1 Minutes of the March 3, 2025 Meeting (confidential session)	Decision
	12.2 Business Arising from the Minutes	Information
	13. Other Business	Input
	14. Adjournment	

Non-senators interested in attending a Senate meeting can find meeting dates, registration details, and guidelines for visitors through the link
https://uwaterloo.ca/secretariat/senate-meeting-dates

For Information **Open Session**

To:	**Senate**
From:	Gen Gauthier-Chalifour, University Secretary
Agenda Item Identification:	**2. Approval of the Agenda and Minutes**

2.1 Conflict of Interest

Senators are invited to declare any conflicts related to the open session agenda at this time. Should a conflict of interest arise during discussion, senators are asked to declare a conflict of interest as it arises.

The Secretariat can provide guidance regarding potential conflicts of interest in advance of or during the Senate meeting.

2.2 Approval of the Agenda, and Approval of the Consent Agenda

Motion: To approve the agenda as presented/amended, and to approve or receive for information the items on the consent agenda, listed as items 9.1-9.5 of the Senate agenda.

Senators wishing to have an item removed from consent to the regular agenda are asked to contact the University Secretary in advance of the meeting. Senators may also request to have items moved to the regular agenda immediately prior to the approval of the agenda.

2.3 Minutes of the March 3, 2025 Meeting – open and confidential

Motion: To approve the minutes of the March 3, 2025 meeting (open session), and to approve the minutes of the March 3, 2025 meeting (confidential session), as distributed/amended.

Documentation Provided:

- Minutes of the March 3, 2025 Meeting – Open Session
- Minutes of the March 3, 2025 Meeting – Confidential Session (see item 11.1 of the confidential agenda)

2.4 Business Arising from the Minutes

There are no items of business arising.

University of Waterloo
Senate
Minutes of the March 3, 2025 meeting
[in agenda order]

Present: John Abraham, Nasser Abukhdeir, Bilal Ahmed, Avery Akkerman, Marc Aucoin, Veronica Austen, Aubrey Basdeo, Jordan Bauman, Jean Becker, Andrew Chang, Martin Cooke, Cecilia Cotton, Kim Cuddington, Hans De Sterck, Laura Deakin, Charmaine Dean, David DeVidi, Mark Ferro, Paul Fieguth, Teresa Fortney, Bruce Frayne, Murray Gamble, Genevieve Gauthier-Chalifour (Secretary), Mark Giesbrecht, Vivek Goel (Chair), Rob Gorbet, Mike Grivicic (Associate Secretary), Vikas Gupta, David Ha, Peter Hall, Kevin Hare, Neela Hassan, Chris Houser, Nadine Ibrahim, Marc Jerry, Acey Kaspar, Achim Kempf, Veronica Kitchen, Scott Kline, Sachin Kotecha, Christiane Lemieux, Ondrej Lhotak, Lili Liu, Brad Lushman, Jennifer Lynes, Shana MacDonald, Ellen MacEachen, Blake Madill, Colleen Maxwell, Peter Meehan, Kristiina Montero, Kirsten Muller, Richard Myers, Cathy Newell Kelly, Christopher Nielsen, James Nugent, Troy Osborne, Nicholas Pfeifle, Nicholas Pfeifle, David Porreca, Neil Randall, Jacinda Reitsma, Mary Robinson, James Rush, John Saabas, Beth Sandore Namachchivaya, Rida Sayed, Asher Scaini, Mark Seasons, Marcus Shantz, Siva Sivoththaman, James Skidmore, Christopher Taylor, Alexie Tcheuyap, Sharon Tucker, Diana Vangelisti, Johanna Wandel, Mary Wells, Stanley Woo, Clarence Woudsma, Changbao Wu, En-Hui Yang

Regrets: Judy Castaneda, Catherine Dong, Natalie Hutchings, Stephanie Maaz, Carol Ann MacGregor, Nicholas Pellegrino, Jagdeep Singh Bachher, Katie Traynor

Guests: Graham Brown, Aldo Caputo, Randy Dauphin, Ashley Day, Nenone Donaldson, Bernard Duncker, Donna Ellis, Melanie Figueiredo, Jenny Flagler-George, Anne Galang, Jennifer Gillies, Diana Goncalves, Michelle Hollis, Trevor Holmes, Diane Johnston, Andrea Kelman, Jennifer Kieffer, Nick Manning, Jon Mason, Norah McRae, Christine McWebb, Ian Milligan, Bessma Momani, Carter Neal, Chris Read, Daniela Seskar-Hencic, Savannah Sloat, Allan Starr, Brandon Sweet, Jodi Szimanski, Caitlin Vaux, Tim Weber-Kraljevski, Roly Webster, Meghan Whitfield, Sarah Willey-Thomas, Katy Wong-Francq

OPEN SESSION

The chair offered condolences on the recent passing of senator and professor Sivabal (Siv) Sivaloganathan on March 2, 2025, and invited Mark Giesbrecht, Dean of the Faculty of Mathematics, to offer remarks. Giesbrecht spoke of Prof. Sivaloganathan's outstanding contributions to the academic life of his department, Faculty and the University while also reflecting on the personal connections and impacts he had with colleagues and students. Giesbrecht noted there would be an opportunity forthcoming for the community to come together and honour the memory of a beloved friend and colleague.

1. Territorial Acknowledgement
The territorial acknowledgement was provided jointly by Kirsten Muller, Savannah Sloat and Marina Mendonca through the reading of a poem, and reflection.

The chair offered thanks to Muller, Sloat and Mendonca, and invited other senators to consider offering the territorial acknowledgment at an upcoming Senate meeting.

2. Approval of the Agenda and Minutes
The chair noted the conclusion of recent elections to Senate and the subsequent report provided in the meeting book, and that nominations for student and faculty senators to sit on the Board of Governors would open later in the week. The upcoming call for honorary degree nominations was also noted.

2.1 Conflict of Interest.
No conflicts of interest were declared.

2.2 Approval of the Agenda, and Approval of the Consent Agenda.
A senator asked that an item be added to the agenda to discuss Senate considerations for the operating budget. The chair noted this matter would be raised as part of their report and could be raised at that time. The senator agreed.

A motion was heard to approve the agenda as presented, and to approve or receive for information the items on the consent agenda, listed as items 10.1-10.7 of the Senate agenda. Porreca and Abukhdeir. Carried.

2.3 Minutes of the January 27, 2025 Meeting – open and confidential.
A senator expressed their concern that instances where criticism is raised in Senate meetings do not appear to be reflected in the minutes, notwithstanding the understanding that the record isn't meant to be verbatim. University Secretary Gen Gauthier-Chalifour noted that potential guidelines for minutes are being developed and would provide clarity around minute-taking principles and what information is

captured for the record. A motion was heard to approve the minutes of the January 27, 2025 meeting (open session), and to approve the minutes of the January 27, 2025 meeting (confidential session), as distributed. Deakin and Porreca. Carried.

2.4 Business Arising from the Minutes.
The chair noted two items of information arising from the previous meeting, those being approvals by the Board of Governors of the amendments to Policy 33 as well as the reappointment of Mary Wells as Dean of Engineering for an additional three-year term.

A senator questioned whether the sole-sourcing of the contract with Nous Group for consulting services violated legislative requirements for procurement. Jacinda Reitsma, Vice-President, Administration and Finance, indicated that in the context of the urgency of the matter and having utilized the vendor of record list furnished by Supply Ontario in following the sole source guidelines, the procurement in question is compliant with legislative requirements. The senator urged that the University should exercise caution before acting on recommendations received from the consultant. The chair emphasized that any decisions will be made by the University, not by the consultant, and with due consideration.

A senator offered comment in follow-up to the chair's reference on recent elections to Senate, and those upcoming for the Board of Governors. The senator noted that approximately twenty-five percent of senators are women and encouraged fellow senators to help to foster participation from underrepresented groups. The chair noted that the recommendation in the President's Anti-Racism Task Force Report regarding the 50/30 challenge to have gender parity and significant representation of other equity deserving groups at governance tables has been difficult to meet for Senate given the large proportion of seats that are elected. This further presents a challenge for Board of Governors representation since faculty and student governors are drawn from elected Senators.

3. Report of the President
President and Vice-Chancellor Vivek Goel observed that Waterloo has entered the top 100 in the Times Higher Education (THE) reputational rankings for 2025, along with being recognized as Canada's top research university in the comprehensive category for the 17th consecutive year. Waterloo also recently received the STARS Gold rating for sustainability achievements. The appointment of Thomas Duever as interim provost was recently announced, and he will serve a two-year term. The report of the task forces on responsible investing and on institutional partnerships have been released, with implementation to be led by Sarah Hadley (Chief Financial Officer) and Ian Milligan (Associate Vice-President, Research Oversight & Analysis), respectively. As part of the announced functional review of specific academic support units, the expertise of the Nous Group will be engaged to obtain a variety of views in relatively short order. Internal expertise will be leveraged in the formation of working groups to foster innovation in both the academic and non-academic spheres of Waterloo's activities, and which may be supported by external expertise where appropriate. Waterloo is partnering with UniForum, a program of Nous Cubane which is a multi-year benchmarking initiative which brings a data-driven approach widely used by several U15 peer institutions as well as peers from Australia and the United Kingdom.

The president went on to highlight the recent provincial election and return of a PC majority government, noting the party's platform did speak to funding for STEM education. The federal Liberal leadership race will be completed on March 9, and a federal election is expected to be forthcoming. Funding and policy changes in the United States (US) are having impacts in Canada, with tariffs likely to affect both federal and provincial funding for the sector. The impact of US government policies targeting EDI initiatives was also noted, including the potential for similar policies to be adopted in Canada.

Finally, the president noted that with respect to Senate's forthcoming consideration of the operating budget, a more substantial package of information is being developed. It was noted that several requests for information to support budget discussions have been received from senators to various offices. Senators are encouraged to communicate with the Secretariat to relay requests for specific budget information ahead of the joint Board-Senate budget preview session on March 28. There is significant amount of information posted to the budget website. It was also noted that requests have been received for meeting agendas and minutes of governance bodies whose records have traditionally been treated as confidential. The Secretariat is actively exploring more transparent practices around such governance records.

Questions were invited.

Regarding THE rankings, a senator asked whether a shift in the academic offerings of Waterloo might jeopardize the university's status as a comprehensive university. The chair indicated that the category broadly includes those universities without a medical school and with a breadth of offerings and observed that other universities are reviewing their program and course offerings.

A senator noted that while most operating budget expenses relate to people and employment, a significant portion does not. It would be useful for Senate to understand the status of Waterloo's various reserve funds, salaries and benefits, and other major expenses including capital projects and deferred maintenance. Internal debt figures and information on ancillary operations would also be useful. The

timing of materials being released was also noted in that one week prior to the Senate meeting will not be sufficient time for senators to review in-depth material. The chair indicated that as part of a comprehensive budget package there will be a report on capital projects that will address much of what has been raised, and that expanded budget materials are under development. The budget documents will be released on or about March 24, as part of the material for the upcoming Senate Finance Committee meeting.

In response to a question about Senate discussion of the task force reports, the chair noted that Senate would likely have a role in implementation of the recommendations from the task force on institutional partnerships. Recommendations related to investments would appropriately go through the Board of Governors. The opportunity for exchange on shared topics as the University works through implementation was noted.

In response to a question about EDI/DEI policies in the US and supporting researchers in the community, the chair noted that conversations are happening with peer institutions and political leaders. Christopher Taylor, AVP EDI-R noted that certain terms related to EDI have become polarizing but that people largely support the core principles and so a revised approach to those issues is prudent.

On UniForum, a senator asked whether the value for money in joining the consortium was comparable for analysis that could potentially be conducted internally and noted that a key concern of utilizing that consultant is that data is not accessible and cannot be potentially scrutinized by experts on campus.

4. Annual Report – Co-operative and Experiential Education

4.1 CEE 2024 Annual Report

Norah McRae, Associate Provost, Co-operative and Experiential Education, provided a presentation to highlight elements of the report. McRae spoke to the focus on supporting students to become future-ready, and the multifaceted portfolio of CEE with many linkages to other parts of the campus community. Waterloo has global leadership in these portfolios, as evidenced by international awards and recognition. CEE undertakes advanced research in areas such as work-integrated learning and pioneering the use of AI tools. McRae highlighted key priorities for 2025 and beyond, to expand on existing strength and build out new capabilities. McRae noted that co-op employment is currently seeing headwinds and that any leads related to employment are encouraged.

Questions were invited.

A senator recommended against utilizing AI for advising as this seems to disrupt existing models while introducing new risks. Students are focused on the quality of co-op job opportunities, and if job quality is a concern, then perhaps the University could examine reducing the number of placements to steer more toward higher-quality opportunities. Unrelated to the report, it was suggested that there be discussions on the use of the Tatham Centre as a facility funded by the student levy. McRae noted that the AI project saw Waterloo develop its own large language model and is entirely optional for students.

5. Association Annual Updates – Report of the Presidents of FAUW, WUSA, GSA

David Porreca, President of the Faculty Association of the University of Waterloo (FAUW) provided a presentation. Porreca noted that FAUW is now fully staffed and is embarking on work around strategic planning for the association, a governance review is underway, and offered highlights of new initiatives and activities for members engagement. Other comments included the naming of FAUW Equity Fellows, advocacy work on behalf of members including the March 2024 salary settlement, a childcare working group to identify needs towards supporting recruitment and retention and engaging in a variety of University policy processes.

Nicholas Pfeifle, President of the Waterloo Undergraduate Student Association (WUSA) provided a presentation. Pfeifle noted WUSA investments in the Student Life Centre and other student spaces, along with detail on WUSA's commercial operations. Other comments included support for orientation activities, advocacy related to transit and housing, supporting student life through events and clubs, and support for the establishment of the Ombuds Office.

Neela Hassan, President of the Graduate Student Association (GSA) provided a presentation. Hassan noted the GSA's role and wide range of services, positions taken towards advocacy for students, and events to promote wellbeing within the graduate student community. Other comments included achievements in 2024-25 toward a multi-year strategic plan, standardization of department-level associations, renovations of the Grad House, and other student-focused programming.

6. Report - Senate Graduate & Research Council
- **6.1 Faculty of Engineering – New graduate program proposals**
- **6.2 Faculty of Environment – Major modifications**
- **6.3 Faculty of Health – Major modification**
- **6.4 Faculty of Science – Major modifications**

Woudsma provided an overview of item 6.1, noting engagement with Arts and Co-op. A senator questioned the rationale for only having a co-op option for the program, given that there are instances in current programs where graduate students cannot find placements. Mary Wells, Dean of the Faculty of Engineering, indicated that Engineering aims to capitalize on co-op offerings and can examine co-op equivalents for situations where students don't have co-op placements.

The following motion was heard:

> That Senate approve the proposed new graduate academic programs of MEng in Chemical Engineering - Health Technologies (Co-op); MEng in Mechanical and Mechatronics Engineering - Health Technologies (Co-op); MMSc - Health Technologies (Co-op) as presented; and, that the effective date be either May 1, 2025 or September 1, 2025.

Woudsma and Wells. Carried.

Senate agreed to take items 6.2-6.4 together, and the following motions were heard.

> That Senate approve the major modifications to the Doctor of Philosophy (PhD) in Planning – Water, MA in Geography, MES in Geography, MSc in Geography, PhD in Geography, MES in Sustainability Management effective 1 May 2025, as presented.
>
> That Senate approve the major modifications to the PhD in Public Health Sciences and Master of Health Informatics (MHI), effective 1 May 2025, as presented.
>
> That Senate approve the major modifications to the PhD and MSc in Biology Graduate research fields, effective 1 May 2025, as presented.

Woudsma and Frayne. Carried.

7. Report - Senate Undergraduate Council
- **7.1 Faculty of Arts – Major modifications**
- **7.2 Faculty of Engineering – Major modifications**
- **7.3 Faculty of Environment – Major modification**
- **7.4 Faculty of Math – Major modifications**
- **7.5 Faculty of Science – Major modifications**
- **7.6 Course Outline Working Group Report**

Senate agreed to take items 7.1-7.5 together. The motions of those five items were heard together– DeVidi and Frayne. DeVidi noted that the reports of this council and that of the previous item demonstrates the routine but very important business of the Senate and the University in reviewing and renewing curricular offerings.

Senators discussed the fifth motion under item 7.1, specifically on regulation changes for Bachelor of Arts degree requirements and assessments, which provide the option for weekend midterm examinations. Some senators expressed concerns about the impact on students, noting other approaches could be taken to utilize classrooms outside of scheduling on weekends. It was emphasized that the regulation enunciates that midterms are to be primarily scheduled Monday-Friday with weekends only as a last resort.

Senate voted on the motion of item 7.1, motion 5, separately. The following motion was carried:

> 5. That Senate approve the regulation changes for the Bachelor of Arts Degree Requirements, Assessments: Scheduling Parameters, and Arts: Courses and Classes, effective September 1, 2025, as presented.

The chair asked the Alexie Tcheuyap, Dean of Arts, to convey the content of the discussion back to his Faculty and to the unit in question.

Senate voted on the remaining motions 7.1 to 7.5. The following motions carried:

[Item 7.1]

> 1. That Senate approve the major modifications for Conrad Grebel University College, including retiring two specializations and creating three new specializations, as part of a larger program revision, effective September 1, 2025, as presented.

2. That Senate approve the major modifications for the Department of Fine Arts: Three-Year General Visual Culture, Honours Visual Culture, and Visual Culture in a Global Context Minor, effective September 1, 2025, as presented.
3. That Senate approve the deletion of the Digital & Public History Specialization, and major plan modifications for the International Studies Minor, effective September 1, 2025, as presented.
4. That Senate approve the major plan modifications to the Financial Leadership Specialization, effective September 1, 2025, as presented.

[Item 7.2]

1. That Senate approve the new Diploma in Society, Technology and Values, effective September 1, 2025, as presented.
2. That Senate approve the two new specializations and major plan modifications within Environmental Engineering, effective September 1, 2025, as presented.
3. That Senate approve the regulation changes for Averages and Academic Standings, and Courses and Classes for the Faculty of Engineering, effective September 1, 2025, as presented.

[Item 7.3]

That Senate approve the new plans for the Knowledge Integration Diploma and Sustainable Finance Specialization, effective September 1, 2025, as presented.

[Item 7.4]

That Senate approve the major modifications to the Applied Mathematics with Scientific Computing and Scientific Machine Learning (Bachelor of Mathematics - Honours) and new CS-Game Design Specialization, effective September 1, 2025, as presented.

DeVidi provided an overview of item 7.6, noting that Senate has had requirements around course outlines since 2008 and that this report's recommendations would seek to amend those requirements. Also proposed are changes to boilerplate language that is otherwise dated.

Discussion followed. Senators discussed whether, instead of boilerplate language, course outlines could direct students to a website which can be updated. DeVidi noted there is a history of students successfully appealing issues where the information was not included in the course outline.

In response to a question, it was noted the element for inclusion in course outlines pertaining to "Any other element required by the program/department/faculty, including Administrative Policy (if applicable)" is there because some Faculties require specific elements related to their external accreditations, and those elements are approved by departments, schools or faculty councils.

A senator noted that some instructors utilize alternate grading schemes which may not detail certain elements at the outset such as allowing students to determine parameters for group work. DeVidi noted that not including any such detail on a course outline could lead to students appealing successfully on the basis of arbitrariness, and that the course outline can indicate that students will be consulted in determining elements as in the example to mitigate an appeal.

A motion was heard [item 7.6]:

1. That Senate approve the requirement of the inclusion of course materials costs directly into course outlines.

2. That Senate approve the list of required and recommended elements to be included in a course outline, as presented in this report.

3. That Senate approve an update to the boilerplate text below for Accessibility and Mental Health Supports.

DeVidi and Woudsma. Carried.

8. Report - Senate Executive Committee

8.1 Proposed Amendment to Senate Bylaws - Governance Year

Goel provided a short overview of the report, noting that this change would align with the Board's governance year and that with approval of the bylaw amendments the term of senators would be extended by four months, of which two are the summer months where Senate usually does not meet.

A motion was heard:

That Senate gives second reading to the amendments to Senate Bylaws 1, 2, and 3 as presented in this report.

> And, that Senate approve that the current year be extended to end on August 31, 2025 to facilitate a transition year, with provisions for the transition year as described in this report;
>
> And, that Senate approve the extension of the terms of elected senators and of members of Senate committees and councils to be congruent with the revised year, as appropriate.

Skidmore and Porreca. Carried.

8.2 Guidelines for Visitors to Senate Meetings

A motion was heard that Senate amend section 4.7 of the Guidelines for Visitors to Senate Meetings as follows:

> 4.7. An individual or group may request to bring a representation to Senate on a given subject normally once in a Senate year ~~meeting cycle (May 1 to April 30)~~.

Skidmore and Muller.

A motion was heard to amend the main motion, to strike section 4.7 entirely from the guidelines. Abukhdeir and Pfeifle. Senate discussed the amending motion, with some senators questioning the need for such an element in the guidelines. The secretary noted that the guidelines will be reviewed after one year's time to assess efficacy and whether any amendments are needed.

The question of the amending motion was called, and it was defeated.

The question of the main motion was called, and it was carried.

8.3 Delegation of Authority for Editorial Amendments to Senate Bylaws and Senate-Approved Guidelines

The secretary affirmed that the recommended delegation of authority would provide a tool to more efficiently revise bylaws and guidelines for changes to titles, revising pronouns, and ensure that governing documents interact well. The recommendation provides Senate with transparency on the use of the delegation, and Senate may override those editorial amendments if the body so decides. A motion was heard:

> That Senate delegate its authority to the Secretary of Senate for the execution and approval of editorial amendments to Senate bylaws and to Senate-approved guidelines for a fixed period from the date of approval to March 31, 2026 inclusive;
>
> And, that for all such amendments executed by the Secretary of Senate there shall be a report made to the next Senate meeting;
>
> And, that Senate reserves its authority to rescind amendments so executed through majority vote at a properly constituted meeting.

DeVidi and Frayne. Carried.

8.4 Appointment of the COU Academic Colleague 2025-28

A senator observed that, notwithstanding the suitability of the nominee, the process could benefit from a broader call for nominations. The chair agreed that a clear process for this and other similar nomination processes is needed and under consideration by the Secretariat. The chair called for nominations from the floor. None were received.

A motion was heard that Senate approve the reappointment of Dr. Scott Kline as the Council of Ontario Universities (COU) Academic Colleague for the University of Waterloo for a three-year term to June 30, 2028. Woudsma and Porreca. Carried.

9. Report of the University Secretary

9.1 2025-2026 Senate Election Results

The secretary noted that this item is for information and expressed thanks to Melanie Figueiredo, Governance Officer in the Secretariat, for her excellent work in guiding these elections. Communications to new senators on the revised Senate year will be forthcoming.

9.2 Update on Policy Activity
The secretary noted that this item is for information and acknowledged the effort of Graham Brown, Associate University Secretary, since joining on the Secretariat in 2024 and taking on the policy portfolio. She noted that the next phase of activity of Policy 33 will be forthcoming.

CONSENT AGENDA

The following items were received for approved / received for information.

10.1 Senate Work Plan

10.2 Report - Senate Graduate and Research Council

10.3 Senate Undergraduate Council

10.4 Senate Finance Committee

10.5 Academic Quality Enhancement Committee

10.6 Report - Vice President, Research and International: Awards, Distinctions, Grants, Waterloo International Engagements

10.7 Report of the Provost: Faculty Appointments, Leaves

11. Items Removed from the Consent Agenda
No items removed from the consent agenda.

12. Other Business
There was no other business.

With no other business, the committee convened in confidential session.

March 8, 2025

Mike Grivicic
Associate University Secretary

UNIVERSITY OF WATERLOO | Senate

For Information **Open Session**

To:	Senate
Presenter:	James W.E. Rush Vice-President, Academic and Provost
Date of Meeting:	April 7, 2025
Agenda Item:	**4.1 Report of the Vice-President, Academic and Provost on University Professor Designation**

Summary:
The 2025 University Professor designations are **Anita Layton** (Applied Mathematics), **Daniel Scott** (Geography and Environmental Management), and **Donna Strickland** (Physics and Astronomy).

Highlights:
The University of Waterloo owes much of its international reputation and stature to the quality of its eminent professors. UW recognizes exceptional scholarly achievement and international pre-eminence through the designation "University Professor". Once appointed, a faculty member retains the designation until retirement.

Not counting retirees, it is anticipated there will be one University Professor for approximately every 60 full-time regular faculty members, with at most two appointments each year.

The 2025 University Professor designations are Anita Layton (Applied Mathematics), Daniel Scott (Geography and Environmental Management), and Donna Strickland (Physics and Astronomy).

Jurisdictional Information:
University Professor designations are reported to Senate and the Board of Governors in April.

Governance Path:
1. Annually, nominations will be sought from Faculty deans, directors of schools and department chairs, as well as from the university community generally. A nominee shall have demonstrated exceptional scholarly achievement and international pre-eminence in a particular field or fields of knowledge. The individual who nominates a colleague is responsible for gathering the documentation and submitting it to the vice-president academic & provost before the December break. The University Tenure, Permanence & Promotion Committee will act as the selection committee; its decisions are final.
2. A nomination must be supported by at least six signatures from at least two UW departments/schools and must be accompanied by a curriculum vitae and a short, non-technical description of the nominee's contributions.
3. A nomination must also be accompanied by letters from the nominee's Dean, and from at least two and no more than five scholars of international standing in the nominee's field from outside the University. The scholars are to be chosen by the nominee's Chair/Director in consultation with the Dean and the nominator. The letter of nomination should explain why these particular scholars were chosen.

4. Letters soliciting comments from scholars shall be sent by the Chair/Director. Scholars shall be asked to comment on the impact and specific nature of the nominee's most influential contributions, addressing their responses directly to the Vice-President, Academic & Provost.
5. The dossiers of unsuccessful nominees remain in the pool for two additional years. The appropriate Dean should provide updated information each year.

Next Steps:
The 2025 University Professor designations will be reported to the Board of Governors on April 15, 2025.

UNIVERSITY OF WATERLOO | Senate

For Information **Open Session**

To:	**Senate**
Sponsor/ Presenter:	Gen Gauthier-Chalifour, University Secretary gen.gauthier-chalifour@uwaterloo.ca
Date of Meeting:	April 7, 2025
Agenda Item:	**5.1 2025-2026 Senate Nominations for the Board of Governors**

Summary

In accordance with sections 11.3 and 11.4 of the University of Waterloo Act, Faculty and Student Governors are to be selected from among Faculty and Student Senators. The Secretariat issued a call for nominations for Senators interested in a seat on the Board of Governors on March 7, with the nomination period closing on March 21. Candidates were asked to submit a 100-word statement to be shared with Senators prior to the voting period. This report provides a summary of nominations received.

Proposal/Rationale

This report is being provided to the Senate for information item.

Jurisdictional Information

As previously noted, the *University of Waterloo Act* states that faculty and student governors must be appointed from among the faculty and student senators.

Governance Path

Senate Executive Committee was advised of the submission of this nomination report at the meeting held March 24, 2025. This item is not subject to the terms of reference for any other council or committee of Senate.

Nominations Received by March 21, 2025

In the Call for Nominations, it was noted that Senator-Elects with terms beginning September 1, 2025, or current Senators with terms ending in 2026 or 2027 were eligible for nomination. Only current Senators are eligible to vote.

The following nominations have been received for the listed seats:

- 3 faculty senator seats
    1. Clausi, David (Professor, Systems Design Engineering, Engineering)
    2. De Sterck, Hans (Professor, Applied Mathematics, Mathematics)

3. Gorbet, Rob (Associate Professor, Knowledge Integration, Environment)
4. Ibrahim, Nadine (Associate Professor, Civil and Environmental Engineering, Engineering)
5. Jerry, Marc (President and Vice-Chancellor, Renison University College)
6. Nugent, James (Associate Professor Teaching Stream, School of Environment, Resources, and Sustainability, Environment)
7. Porreca, David* (Associate Professor, Classical Studies, Arts)
8. Tan, Su-Yin (Associate Professor Teaching Stream, School of Planning and Department of Geography and Environmental Management, Environment)
9. Woo, Stan (Director, School of Optometry & Vision Science, Science)

- 3 undergraduate student senator seats
    1. Bauman, Jordan (Psychology, Science)
    2. Mikhail, Damian (Statistics and Actuarial Science, Mathematics)
    3. Pawelko, Alex (Pure Mathematics, Mathematics)
    4. Razmjoo, Arya (Legal Studies, Arts)
    5. Sayed, Rida (Nanotechnology Engineering, Engineering)

- 1 graduate student senator seat
  (No nominations received)

**incumbent*

Nominations from the Floor

As is Senate's usual practice for Senate ballots and slates, Senators meeting the eligibility criteria may submit their nomination from the Senate floor at the meeting on April 7, 2025.

Results and Committee Assignments

Voting will take place via SimplyVoting from April 9 – April 16. Results will be shared via email, and reported to Senate at its meeting on May 5, 2025.

Senate committee and council assignments for the 2025-2026 governance year will be presented for approval at the Senate meeting of scheduled for June 9, 2025.

UNIVERSITY OF WATERLOO | Senate

For Approval **Open Session**

To:	Senate
From:	Senate Executive Committee
Presenter:	Vivek Goel President and Vice-Chancellor
Date of Meeting:	April 7, 2025
Agenda Item:	**5.2 Delegation of Authority for the Roster of Graduands**

Recommendation/Motion

That Senate delegate its authority for the approval of the roster of graduands jointly to the chair and vice-chair of Senate, for convocation ceremonies scheduled in June 2025 and October 2025;

And that Senate direct that a report on the complete roster of graduands be presented for information to the Senate meeting following the relevant convocation.

Proposal/Rationale

It is customary practice for Senate to delegate its authority to approve the roster of graduands, considering that timing constraints and incongruences with the Senate meeting schedule do not allow for timely approval in line with operational requirements. Further, the heavy volume of information contained in the roster of graduands makes its approval onerous upon Senators, and so it is reasonable for Senate to delegate it's approval in a prudent manner to meet operational requirements.

In previous years, this delegation had been made to the Senate Executive Committee following a report and recommendation from the vice-president, academic and provost; however in 2023, Senate commenced a practice where on an annual basis the Senate chair and vice-chair (the president and the provost, respectively) are entrusted to handle these approvals, which ensures that adequate time is given to the Registrar's Office and Community Relations and Events in planning convocation ceremonies.

The recommended delegation of authority maintains Senate's empowerments to "to confer degrees, diplomas and certificates or other awards in any and all branches of learning and in any subject taught in the University or its federated or affiliated colleges" as provided in section 22(g) of the *University of Waterloo Act.*

As a mechanism for accountability in approving the delegation of authority, Senate will require a report on the complete roster of graduands at the Senate meeting which follows the relevant convocation.

Jurisdictional Information

Excerpt from *University of Waterloo Act*, 1972:\

> Powers of The Senate
>
> 22. The Senate has the power to establish the educational policies of the University and to make recommendations to the Board of Governors with respect to any matter relative to the operation of the University and without restricting the generality of the foregoing, this includes the power,
>
> …
>
> (*g*) to confer degrees, diplomas and certificates or other awards in any and all branches of learning and in any subject taught in the University or its federated or affiliated colleges;

Governance Path

- Senate Executive Committee - March 24, 2025
- Senate - April 8, 2025

UNIVERSITY OF WATERLOO | Senate

For Information **Open Session**

To:	Senate
From:	Senate Executive Committee
Presenter:	Vivek Goel President and Vice-Chancellor
Date of Meeting:	April 7, 2025
Agenda Item:	**5.3 Submission Received – Proposal to Amend Senate Bylaw 4**

Background

On March, 21, 2025, the Secretariat received a submission from faculty senator James Nugent requesting that notice of motion for a proposed amendment to Senate Bylaw 4 be included as part of the April 7, 2025 Senate meeting agenda. The proposed amendment would have the President of the University of Waterloo Staff Association (UWSA) be added as an *ex officio* member of Senate. A copy of the submission is attached to this report.

The Senate Executive Committee (SEC) discussed the matter at its meeting March 24, 2025, as part of its preparation of the agenda for the April 7 Senate meeting.

The SEC acknowledged the merits of both the proposal and need to consider staff representation and participation on Senate. The following observations offered through SEC's discussion on this matter are provided below for the consideration of Senate:

- The UWSA does not represent all non-academic staff, and the proposed bylaw amendment may not fully address concerns around staff representation.
- The proposal may be viewed as paternalistic being presented by faculty and without having engaged with the various staff employee groups who will be impacted; it is unclear whether consultations with UWSA and staff unions took place to understand their perspectives and ascertain how they might wish to be represented on Senate. Evidence of engagement and consultation with staff employee groups on campus would better allow Senate to consider the proposal.
- An environmental scan of comparator institutions and various models for staff representation on Senate would be useful to provide context for Senate's consideration of the proposal.
- The impact on the *ex officio* and elected faculty ratio would need to be ascertained, as would current provisions in the *University of Waterloo Act* and whether the *Act* might provide the ability for staff to have elected seats on Senate as an alternative to *ex officio.*

The SEC affirmed the spirit and principle of the idea to improve representation of staff on Senate but was not prepared to support the proposal as presented. It was agreed that consultation with staff and background research would enable appropriate assessment of the matter, and a revised report and proposal from the Secretariat reflecting this rigour could be provided to support its consideration by Senate. The Secretariat was asked to undertake research on the questions raised and prepare a report for the committee's next meeting (April 21).

In keeping with the SEC's longstanding responsibility for reviewing and making recommendations to Senate on matters related to Senate governance including its governing documents, it is proposed that any revised report be brought forward through the committee for consideration and recommendation to Senate at an upcoming meeting.

Jurisdictional Information

Excerpt from *University of Waterloo Act*, 1972:

> *Powers of The Senate*
>
> *22. The Senate has the power to establish the educational policies of the University and to make recommendations to the Board of Governors with respect to any matter relative to the operation of the University and without restricting the generality of the foregoing, this includes the power,*
>
> *…*
>
> *(o) to enact by-laws and regulations for the conduct of its affairs.*

Excerpt from Senate Bylaw 1:

> *14. Bylaws – general*
>
> *14.01 The passage of a new bylaw or amendment(s) to an existing bylaw is accomplished in two readings by Senate. At the first reading, such discussion as is deemed appropriate by Senate shall take place. At the second reading, further discussion may take place and the vote on the document shall be taken. The two readings shall take place at different, but not necessarily consecutive, meetings of Senate.*
>
> *14.02 No proposed bylaw or amendment(s) will be given reading unless it has been bound into or accompanies the agenda portfolio distributed in advance of the meeting.*
>
> *14.03 Any proposed bylaw or amendment(s) shall include the proposed wording of the bylaw or amendment(s), and where appropriate, a summary of the reasons for such bylaw or amendment(s).*
>
> *14.04 In order to be approved by Senate, any new bylaw or amendment(s) to bylaws must receive the affirmative vote of at least two-thirds of the members of Senate present and voting at the meeting.*

Excerpt from Senate Bylaw 2:

> *1.04 The Executive Committee shall have the following powers and duties:*
>
> *…*
>
> *c. To prepare the agenda for all regular and special meetings of Senate.*
>
> *…*
>
> *g. To receive and review the reports and recommendations of all committees and councils, prior to their presentation to Senate and to make at its discretion recommendations to Senate thereon.*

Governance Path

- Senate Executive Committee – March 24, 2025
- Senate – April 7, 2025

Attachments

- Original submission: Senate Bylaw 4 (proposed amendment)

Senate Motion

Proposed Bylaw Amendment (First Reading)

Proposed Wording of Amendment:

Amend Senate Bylaw 4 section 1. *Ex officio* members to include "i. The president of Staff Association – University of Waterloo."

Background:

The University of Waterloo Act (18.a.9) empowers Senate to appoint *ex officio* members to Senate. Senate Bylaw 4 Bylaw 4 has been amended 11 times between 1981-2023. Adding an ex-officio member to senate would also mean adding another faculty member to senate to maintain the ratio of faculty representation in keeping with the University of Waterloo Act (9.b.2).

Summary of Reasons for Bylaw Amendment:

- The University of Waterloo Staff Association (UWSA) is not currently represented on Senate.
- UWSA represents approximately 3,000 employees on campus.
- UWSA members provide essential academic services directly relevant to educational policies and the operation of the university. Some examples include:
    - Librarians – teach students directly and assist students and faculty with research
    - Centre for Teaching Excellence – train faculty and graduate students in education and teaching
    - Centre for Extended Learning – develop online courses
    - Under/Graduate Advisors – advise students and committees on academic policies and procedures
    - Supervision of research and teaching labs
    - ITMS staff - provide technical services and facilities in support of the teaching and learning environments
- The Staff Association President can offer information and perspectives critical for Senate to make informed operations recommendations to the Board of Governors:
    - UWSA members "advise students, organize public events, schedule classes, manage grants and fundraise, train faculty and other staff, deliver mail, keep our information infrastructure running, make sure we get paid, run research programs and supervise labs, design online classes, and so much more."

    - The UWSA President can relay candid insights that individual staff may not otherwise feel comfortable raising to their supervisors due to their precarious employment position (approximately 18% of Staff are employed on temporary contracts).
- Many decisions made at senate directly impact staff (e.g., operating budget recommendations; faculty/program reorganizations; etc.) and so it is useful to hear from a staff representative when making these decisions to understand the stakes and avoid unintended consequences.
- Staff are our colleagues whose concerns and ideas are critical for helping Senate realize the academic mission of the university.

Governance Pathway:

Senate - First Reading: April 7, 2025

Senate Bylaw 4

A bylaw relating to the naming of additional *ex officio* members of Senate of the University of Waterloo.

BE IT ENACTED as a bylaw of Senate of the University of Waterloo, as follows:

1. *Ex officio* members

WHEREAS *The University of Waterloo Act, 1972* provides in section 18.a.9 that Senate of the university may add to its membership such other *ex officio* members as Senate by bylaw may, from time to time, designate; and

WHEREAS *The University of Waterloo Act, 1972* provides in section 18.b.2 that elected members of the faculty shall equal in number one more than the total number of all other members of Senate; and

WHEREAS *The University of Waterloo Act, 1972* provides in section 18.c. that upon the designation of and addition, from time to time, by Senate of any additional *ex officio* members, the number of elected members from the Board of Governors, the undergraduate students, the graduate students and the alumni shall be increased by whatever numbers are necessary to retain the ratios, in each case, of the number of such elected persons to the number of elected faculty.

BE IT THEREFORE enacted as a bylaw of Senate of the University of Waterloo as follows:

That the following be named as *ex officio* members of Senate:

a. The associate vice-president, equity, diversity, inclusion & anti-racism.
b. The associate vice-president, Indigenous relations.
c. The vice-president, research and international.
d. The associate vice-president, academic.
e. The associate vice-president, academic operations.
f. The president of the Faculty Association of the University of Waterloo.
g. The president of the Federation of Students, University of Waterloo.
h. The president of the Graduate Student Association - University of Waterloo.
i. The president of Staff Association – University of Waterloo

That the chief returning officer be empowered upon passage of this bylaw to take whatever steps are necessary to carry out such elections or by-elections as may be necessary to comply with the provisions of *The University of Waterloo Act, 1972*, cited above and arising from the designation of *ex officio* members of Senate by the passage or amendment of this bylaw.

Approved by Senate 20 May 1975.
Amended by Senate in two readings, December 1980 and January 1981.
Amended by Senate in two readings, December 1983 and January 1984.
Amended by Senate in two readings, May and June 1987.
Amended by Senate in two readings, May and June 1990.
Amended by Senate in two readings, October and November 2012.
Amended by Senate in two readings, November 2013 and January 2014.
Amended from Bylaw 11 by Senate in two readings, September and October 2014.
Amended by Senate in two readings, March and May 2015.
Amended by Senate in two readings, November 2017 and January 2018.
Amended by Senate in two readings, May 2019 and June 2019.
Amended by Senate in two readings, April 2023 and May 2023.

UNIVERSITY OF WATERLOO | Senate

For Decision **Open Session**

To:	Senate
From:	Senate Finance Committee
Presenters:	Vivek Goel President and Vice-Chancellor James W.E. Rush Vice-President, Academic and Provost Jacinda Reitsma Vice-President, Administration and Finance
Date of Meeting:	April 7, 2025
Agenda Item:	**6.1 2025-26 Operating Budget**

Recommendation/Motion:
That Senate recommend that the Board of Governors approve the operating budget revenues and expenses for 2025-26, as presented in Tables 4 and 8 of the University of Waterloo 2025-26 Budget Report.

Summary

The Senate Finance Committee received an update on the current year budget at its meeting October 15, 2024, and an in-depth review of the University's budget planning processes at its meeting January 23, 2025. A separate joint education session of the Board of Governors and Senate, which focused on the operating budget development process, was also held on January 23.

The committee endorsed the operating budget as presented in the University of Waterloo 2025-26 Budget Report at its meeting on March 31, 2025, and made its recommendation to Senate as is included with this report.

Additional context on the proposed operating budget has also been provided by the Office of the Vice-President, Academic and Provost:

> The recommended 2025-26 operating budget is presented for consideration within the context of a three-year plan to return to a balanced budget (see the 2025-26 operating budget package on the following pages).
>
> Eliminating the structural deficit by the 2027-28 year will require significant annual expense reductions through organizational transformation. To achieve this transformation successfully, the University will carefully manage a transition of our academic model to a sustainable future-oriented model, focusing our resources on institutional priorities, and carefully using and managing our one-time resources.

> The University will continue to consider the following objectives throughout the important work of organizational transformation to return to a balanced budget: financial sustainability, operational and priority plan impacts, quality in core academic and research operations, student experience, employee morale and engagement, a future orientation with 'Waterloo at 100' as the anchor, and risk management.

[NB: The Board's Finance & Investment Committee met on March 25, 2025 to consider the proposed budget, and at that meeting the committee passed a motion to recommend approval of the operating budget to the Board of Governors.]

Jurisdictional Information

In accordance with Senate Bylaw 2, section 2.04, the Senate Finance Committee has among its powers and duties:

> 2.04(c) To receive each year from the vice-president, academic & provost, for consideration, study, and review, on behalf of Senate, a detailed operating budget for the university and to make recommendations to Senate thereon.

Governance Path

i. Senate Finance Committee – March 31, 2025
ii. Senate – April 7, 2025
iii. Board of Governors [prospective] – April 15, 2025

Documentation Provided

- Attachment: 2025/26 Operating Budget Report

University of Waterloo

2025/26 Budget Report

Prepared for Senate Finance and the
Joint Board of Governors and Senate Budget Preview Session

As of March 24, 2025

Table of Contents

University of Waterloo

2025/26 Budget Report

Executive Summary

The University of Waterloo is a global research-intensive university, renowned for entrepreneurship and innovation, providing co-op and work-integrated learning at scale with impact. Our long-term vision is driven by our Waterloo at 100 goals and associated focus areas. The actual mechanism by which we will strive to reach these long-term goals is via university-wide integrated planning and budgeting, of which one of the outcomes is this budget report. As part of integrated planning we identify annual institutional priorities which, for 2025-2026, include

1. Waterloo's Values (*Think Differently, Act with Purpose, Work Together*) for a culture of collaboration.
2. Campus Wellness, through belonging, safety, engagement, enablement and thriving.
3. Global Futures Networks for interdisciplinary activity across research, education and service. To help us focus and co-ordinate our work across disciplines and organizational boundaries, we have identified five interconnected futures for humanity, aligned to our academic and research strengths: Societal Futures, Health Futures, Sustainable Futures, Technological Futures and Economic Futures
4. Integrated Planning & Budgeting, to drive coordination and collaboration.
5. Effectiveness, Efficiency, and Revenue Generation, to enable our mission and strengthen financial sustainability.

This Operating Budget package represents a major step forward in budgetary process transparency, improved integration in cross-unit planning, improved effectiveness in making budget plans, and improved efficiency in the budget approval process, building the framework for effective planning and institutional resilience.

2024 is the first year of an extensive new integrated planning and budgeting process, with a standardized approach for every unit, and with opportunities for repeated iteration and feedback. This process stands in contrast to our historical approach, in which we operated in a very decentralized manner, so that individual units had very limited insight or understanding of planning and budget-related decisions in other units.

As with most post-secondary institutions in Canada, this package will articulate major budget challenges due to revenue constraints. While it is important to recognize that many of these challenges have been developing over a period of years, it is also true that the challenges have recently intensified and that newly emerging factors with respect to tariffs and cross-border trade will likely have a significant impact on provincial government capacity and spending priorities. Our institutional movement towards a much more self-contained and comprehensive budget package, with the salient details and context all in one place, will greatly aid in providing a resource to track these influences in relation to our planning and budgeting decision making.

This integrated planning and budgeting process, and resulting budget package, are a substantial step forward, but clearly still work in progress. We acknowledge that Governors and Senators have been asking for more information for some time, and we have endeavoured to produce a much more comprehensive package than has traditionally been provided to support governance approval processes.

James Rush, Provost
March 2025

Long-Term Directions and Goals

The recommended 2025/26 Operating Budget, together with other strategic initiatives and plans, needs to be framed in the context of the long-term aspirations articulated by *Waterloo at 100*:

WATERLOO AT 100

In the 1950's, the University of Waterloo disrupted post-secondary education in Canada with an unconventional model for education. In today's rapidly changing world, now is the time to rediscover what makes us unconventional as we look towards humanity's future.

WHO WE ARE

We are a leading global research-intensive university, renowned for entrepreneurship and innovation, providing co-op and work-integrated learning at scale with impact.

OUR VISION

A community of curious, collaborative, innovative and entrepreneurial problem-solvers and leaders who seek to understand and identify equitable and sustainable solutions for the future of humanity and our planet.

OUR VALUES

Our values represent a commitment to build on our existing cultural strengths but also identify areas to evolve.

Think differently | *unconventional* | *bold* | *innovative* | Great ideas are born when we challenge the status quo and ask bold questions and embrace risks.

Act with purpose | *positive impact* | *responsible* | *get things done* | We make a positive impact in the Waterloo community and around the world.

Work together | *collaborative* | *community* | *"one Waterloo"* | We are at our best when we work together – which results in fresh thinking, inspiration, and innovative breakthroughs.

WATERLOO AT 100 GOALS

On our journey to our 100th anniversary in 2057, we will remain true to our core strengths and constantly evolve our differentiators in ways only Waterloo can.

Our Waterloo at 100 Goals provide a roadmap to 2057:

C: COMMUNITY, CAMPUS AND CULTURE

Create a decolonized, equitable University of Waterloo community that works together and supports health and well-being and contributes to the region's communities.

K: KNOWLEDGE, GRADUATES AND CO-OP

Develop graduates and alumni who constantly grow and act with purpose to advance solutions at the intersections of our Global Futures.

R: FUNDAMENTAL AND APPLIED RESEARCH

Be a world leader through the Global Futures in curiosity-based and impactful research that's connected, locally and globally.

I: INNOVATION AND ENTREPRENEURSHIP

Create the conditions that foster innovation and entrepreneurship across our five interconnected Futures for humanity and our planet, aligned to our academic and research strengths.

To 2057 and beyond, we will continue to ensure we lead at being unconventional, to define new futures for the University and humanity.

Overview and Context

The University of Waterloo segregates revenues and expenses into six separate funds, as shown in Figure 1, in accordance with their source and purpose. The six funds, within which revenues and expenses are tracked, are operating, research, capital, trust, endowment, and ancillary. Transfers between funds are limited and are subject to accounting rules. The audited financial statements of the University include all funds. The total actual revenues received for 2023/24 were $1366M, of which the operating fund is the largest of the six funds.

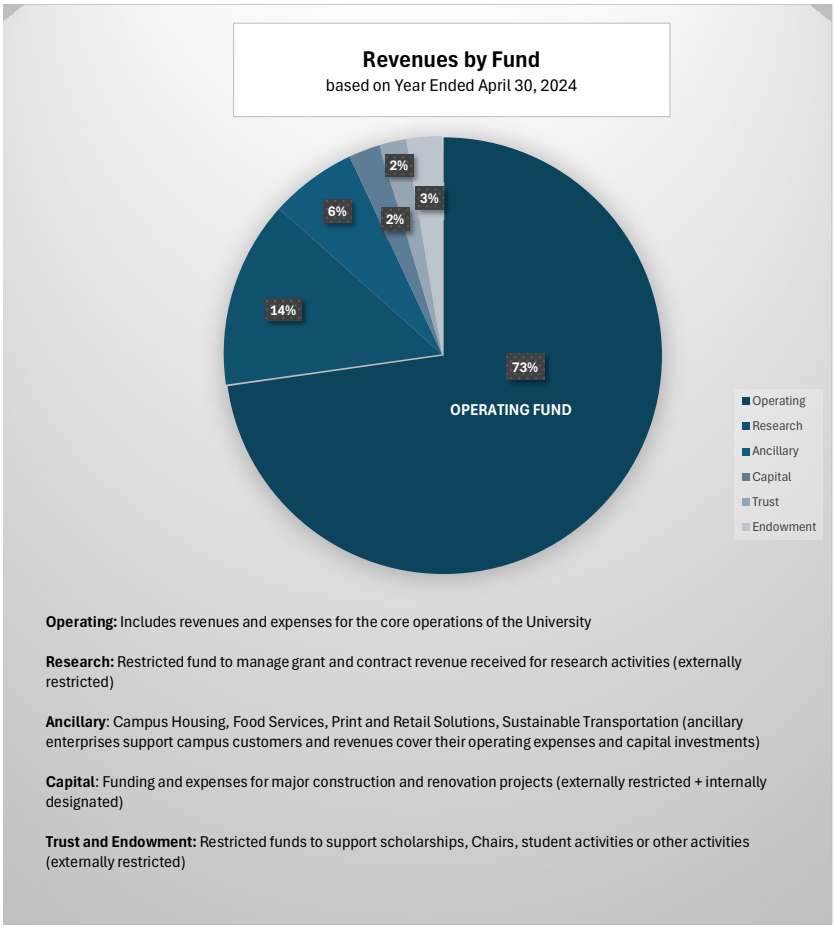


Figure 1: The University of Waterloo Operating Fund, in Context.

This Budget Package focuses on the operating fund, and on capital projects which can have an impact on the operating fund. Income in the operating fund includes operating grant support received through the provincial government, and tuition and other fees assessed to students. Expenditures in the operating fund include salaries and employee benefits for faculty and staff, student support, utilities, library acquisitions, and supplies. Figure 2 gives a broad, high-level overview of the changes in total operating budget revenues and expenses over the last 10 years, where recent challenges due to reductions in revenues are clearly visible.

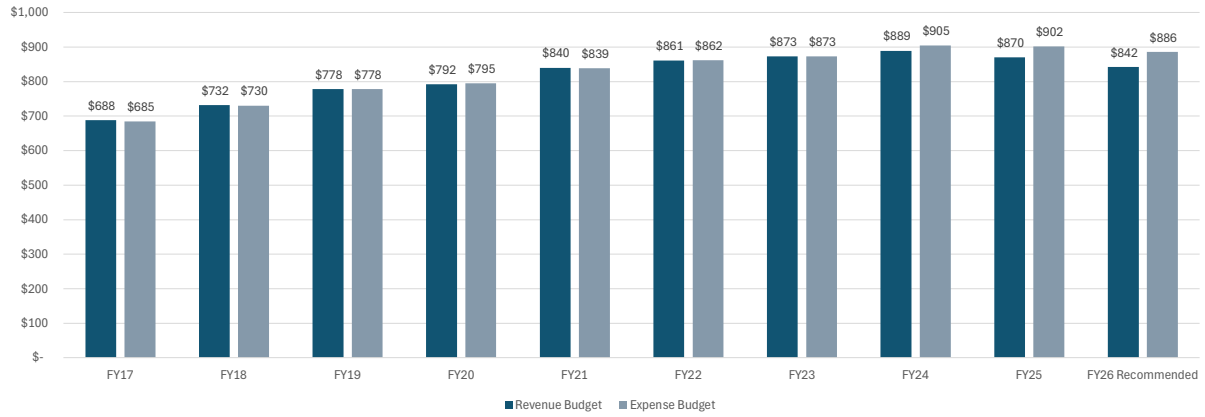


Figure 2: 10 Year Annual Operating Budget Revenues and Expenses, for Fiscal 2024/25 and prior; Recommended Budget for Fiscal 2025/26

The charts in Figure 3 offer a high-level breakdown of the proportional composition of operating revenues and expenses. Revenue is made up almost entirely of tuition fees and government grants, and by far the largest component of expenses is based on salaries, wages, and benefits.

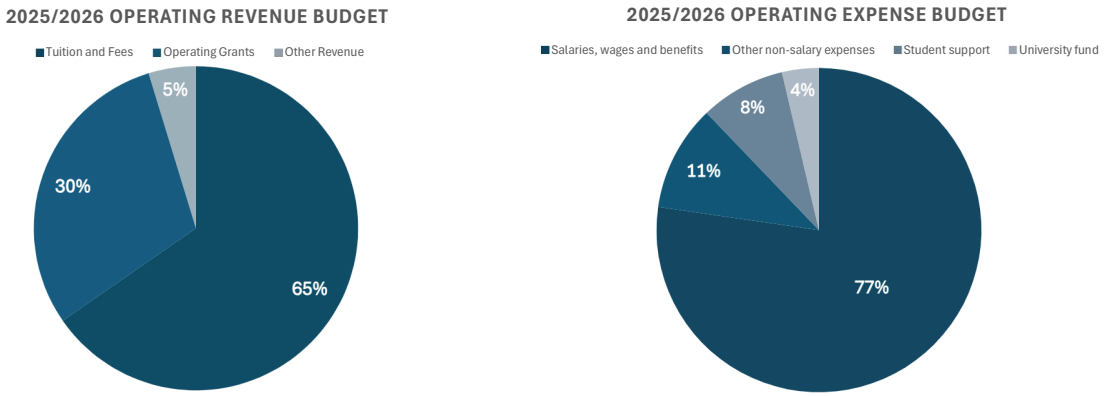


Figure 3: High-Level Breakdown of Operating Revenues and Expenses

There are many external factors, outside of the University's control, which are causing adverse impacts on the University's ability to achieve and maintain financial sustainability:

- 2019: Provincial mandatory 10% domestic tuition rate cut and 2-year tuition freeze
- 2020: COVID-19 epidemic and subsequent impacts
- 2020: Domestic tuition freeze (still ongoing, as of 2025)
- 2020: Domestic provincial government grant freeze (still ongoing, as of 2025)
- 2020: Province limits ongoing grant funding for graduate enrolment growth achieved in SMA2, leading to reduced financial recognition of eligible graduate enrolment growth
- 2023: Out-of-province domestic tuition rates increased by 5%, domestic in-province rates continue to be frozen
- 2023: Post-COVID relatively significant inflation, impacting expenses
- 2023: Blue-Ribbon Panel report released, but with very limited government response
- 2024: Retroactive compensation payments stemming from the Bill 124 repeal, and subsequent arbitration awards and salary settlements leading to ongoing budget pressure.
- 2023/24/25: Significant geopolitical changes, including between Canada, India and China, which have led to reduced recruitment from key countries for international students

- 2023/24/25: Significant changes in international student regulations and processes:
    - 2023: Significant delays in federal government processing of international student study visa applications significantly disrupt admissions cycles
    - 2024: Federal government caps international undergraduate student study visas
    - 2024: Provincial government cap allocations delayed, disrupting 2024 admissions
    - 2025: Federal government further restricts international student study visas, caps to include graduate students and transfers from in-province secondary schools
- 2025: Interest rates are projected to return to historic averages, resulting in reductions to projected interest income

These ongoing, long-term constraints, particularly those in provincial operating grants and domestic tuition rates, combined with recent constraints on international enrolments and inflationary pressures on salaries and other expenses, have resulted in a structural operating budget deficit in 2024/25 that has persisted into 2025/26. Despite our structural deficit, our financial statements have maintained a surplus when aggregated across all funds.

Budget Planning and Risk Context

Budget Planning Process

The University of Waterloo 2025/26 Operating Budget was arrived at via a budgetary planning process, significantly changed and more substantial than in previous years. The intent is for this process to continue to be developed and refined in future years.

At a high level, institutional / strategic planning and budgetary planning are closely linked and highly integrated. For the 2025/26 fiscal year:

- Spring 2024: Strategic planning, setting multi-year priorities, initiatives, and directions;
- Fall 2024: Budget planning, constructing a budget aligned with and informed by preceding multi-year plans;
- Spring 2025: Detailed in-year planning and milestones, informed by the Fall budget plan.

All three aspects of strategic planning, budget planning, and in-year planning involve the engagement of the entire Executive Council, which includes senior leadership from the Faculties and Academic Support Units (ASUs), with the explicit goal not only of integrating/coupling between planning and budgets, but also a tighter coordination between units throughout these processes.

The budget process led to decisions on operating budgets, with proposed cuts but also new investments, some of which are listed under *Priorities and Initiatives*, and which are then ultimately reflected in *Recommended 2025/26 Operating Budget: Expenses*. The budget process also asked university leaders to consider new revenue opportunities, however the lead time on such initiatives is typically longer (multiple years) and may be reflected in budgets in future years.

Assessment of Financial Risks

The Office of Risk Management and Compliance (ORMC) supports the university risk management (URM) program. The URM enhances risk governance, oversight and awareness to enable risk-informed decision making across the organization. The URM program supports the University in achieving its strategic and operational objectives. The ORMC reports to the Audit & Risk Committee of the Board on a quarterly basis to provide updates on risk management, compliance, insurance, and internal audit.

The risk assessment process has identified several external factors, outside of the University's control, which are currently causing adverse impacts on the University's ability to achieve and maintain financial sustainability: provincial grant levels, domestic tuition stagnation, federal constraints impacting international students, and labour market costs. Geopolitical tensions between the Canadian and foreign governments have led to reduced applicants from key countries for international student recruitment, and Federal government policy and associated provincial processes on student visa caps are disrupting last year's and this year's application cycles. Business transitions and expense reductions in fiscal 2025/26 and beyond may impact student experience and employee engagement. Interest income could decrease more quickly than forecast due to declining interest rates and the university's use of one-time resources. Finally, there are key risks with regards to capital costs associated with Deferred Maintenance.

Ontario Ministry of Colleges and Universities (MCU) Financial Accountability Framework

Effective for the 2023/24 year, MCU launched the University Financial Accountability framework to monitor and assess the financial health of Ontario universities. Under this framework, each university calculates and reports financial health metrics based on its annual audited financial statements. These metrics are point in time and historical (i.e. lagging indicator). The metrics are grouped into three categories: Liquidity, Sustainability, and Performance. The metrics from each category are assessed to determine one of four possible action outcomes for the institution. A medium action outcome or a high action outcome would result in MCU requiring the University to develop and report on a recovery plan with monitoring by the MCU. To date, the University has had a no action outcome on the MCU Financial Accountability Framework; however, if the University audited financial statements (which include all funds, not only the operating fund), have an excess of expenses over revenues in any particular year, we expect that the University would have a medium or high action outcome on this framework, triggering the requirement for a recovery plan with additional reporting to and monitoring by the MCU. The recommended 2025/26 operating budget deficit increases the likelihood of a medium or high action outcome with a resulting recovery plan requirement; however, whether or not there is a consolidated deficit will also be influenced by other factors that cannot be easily estimated in advance such as the market value of the endowment investments as at the next year end date. The results of the financial health metrics included in the MCU Financial Accountability Framework are reported to and discussed with the Audit & Risk Committee.

Our focus will remain on achieving the 2025/26 expense reduction target and the work to return to a balanced budget in year 3 of the 3-year planning period.

Risk Mitigation Activities

The following alleviation activities are underway to further mitigate operating budget risk:

- Maintain a forward-thinking organization and culture, with Waterloo at 100 as the anchor
- Work to return to a balanced budget in year 3 of the 3-year planning period (2025/26 – 2027/28), including the use of one-time funds (see next section)
- Ongoing enhancements of strategic enrolment management activities
- Increased collaborations and strategic planning across offices to further enable international enrolment and diversification
- Expense reduction plan for 2025/26 with regular monitoring and reporting
- Examining administrative efficiency opportunities through a series of functional reviews and participation in the UniForum benchmarking group
- The development of an Innovation Action Group to identify, evaluate, and prioritize process improvement opportunities across the University 's administrative functions to achieve significant cost reductions through process improvements and operational efficiencies, providing advice and recommendations to University senior leadership
- The formation of an Academic Innovation Working Group to lead the important work of developing and implementing effective and financially sustainable academic models

Use of One Time Funds to Support Returning to a Balanced Budget in 3 Years

The 2024/25 Board-approved operating budget, the 2025/26 recommended operating budget, and the current forecast for year 2 (2026/27) of the 3-year plan to return to a balanced budget reflect structural operating deficits totalling $95M. The University will draw down its one-time funds on hand to cover the structural operating deficits in these years. These one-time funds are the result of underspending of past operating budgets to save for important projects such as investment in new technologies, capital renewal, and risk mitigation.

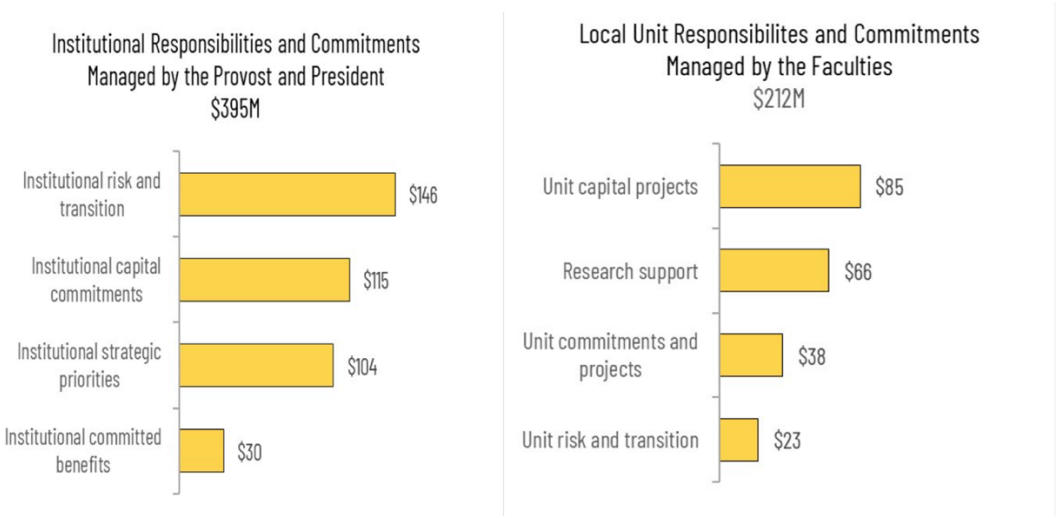


Figure 4: The total reserves available, by fund, as of April 30, 2024.

The University's 3-year plan to return to a balanced budget takes into account the available one-time funds on hand and the desired preservation of such one-time funds for future strategic projects and risk mitigation. As shown, above, at the start of the current fiscal year, the University had $607M in one-time funds, with the largest designations of these one-time funds being $200M in commitments for capital projects. The $146M in centrally managed risk and transition funds will be used as needed to cover the structural deficits for the 2024/25 – 2026/27 years, and to fund some one-time costs associated with the implementation of plans to reduce the budget deficit, both expense reduction and revenue growth initiatives. If necessary, the University will consider repurposing the one-time funds previously designated for strategic projects to risk and transition. The estimated draw-down from the $200M on hand that is committed to capital projects is as follows:

- 2024/25: $91M
- 2025/26: $52M
- 2026/27: $35M
- 2027/28: $22M

For further details, please see the section, below, on *Three-Year Plan to Return to Balanced Budget*.

Priorities and Initiatives – Update from the 2024/25 Budget

The University Fund is a multi-purpose fund, available for use at the direction of the Provost on behalf of the University, to provide budget support for a variety of strategic priorities across the institution within both Faculties and Academic Support Units (ASUs). While some investments are short-term, with one-time funds provided for a specific project, others have a longer time span, with commitments made for multiple years reflecting the more complex nature of such investments.

As part of the Fiscal 2024/25 budget cuts, the ongoing Operating Budget allocation to the University Fund was reduced from $43.1M in 2023/24 to $32.4M in 2024/25. Expressed within the broad categories within the *Waterloo at 100* goals (see overview at the beginning of this document), the proportions of committed funds were distributed as

47% (C) Community, Campus, and Culture
21% (K) Knowledge, Graduates, and Co-op
27% (R) Fundamental and Applied Research
5% (I) Innovation and Entrepreneurship

The Waterloo at 100 categories in the preceding breakdown and in Table 1 are a high-level assessment of the primary Waterloo at 100 categories, but as would be expected for strategic initiatives, the categorization is somewhat notional, and nearly all initiatives impact more than one goal. The largest individual project investments impacting each category are listed in Table 1.

New Interdisciplinary Networks, Programs and Initiatives Fund (INPI)	$2.7M	(C,K,R)	14 Interdisciplinary Projects that all include collaboration of at least two different Faculties, such as the new speaker series on Antagonism and Intimidation in Academia, investments in the Trust in Science and Technology research network, and a cross-Faculty Masters co-supervision initiative
Cluster Hire Program	$2.2M	(C)	The Black Excellence cluster hires program and the Indigenous Excellence cluster hire program, launched in July 2021, which have together supported 18 new faculty hires at Waterloo
Indigenous Gathering Space	$2M	(C)	A new outdoor gathering space, constructed near the Student Life Centre and the BMH Green
Research Centres and Institutes	$2.4M	(R)	Research support for university-level centres and institutes
Student Venture Fund	$1M	(I)	Hands-on training in venture capital investing with guidance from industry experts
Work Integrated Learning	$700k	(K)	Pilot projects in expanding Work Integrated Learning opportunities for graduate students

Table 1: An overview of the largest investments from the University Fund in 2024/25 for each of the Waterloo at 100 goals.

Priorities and Initiatives – Plans for the 2025/26 Budget

As just discussed under Priorities and Initiatives for 2024/25, the University Fund contains commitments on timeframes from one to ten years, so there are significant commitments that extend into the upcoming 2025/26 fiscal year, but still lie well within the allocated budget:

University Fund recommended budget for 2025/26:	$32.4M
University Fund prior commitments in place for 2025/26:	$19.5M

The $12.9M balance of the budgeted University Fund, not yet committed, may be allocated in-year to address emerging strategic academic priorities and to help manage budget risk and uncertainty.

Separate from the University Fund, the University of Waterloo budget planning process for the 2025/26 fiscal year involved substantial iteration and consultation. One key outcome was the set of initiatives to be supported, listed in Table 2, even in a time of budget cutbacks. These initiatives are aligned with the Waterloo at 100 goals and institutional priorities, amounting to $9.7M:

$6.0M	(C) Community, Campus, and Culture
$1.8M	(K) Knowledge, Graduates, and Co-op
$0.4M	(R) Fundamental and Applied Research
$1.5M	(I) Innovation and Entrepreneurship

Major Campaign	$0M in FY26	(C)	To be initiated with existing funds in 2025/26, but the budget process has committed to a budget increase in later years
Deferred maintenance and Sustainability	$5M	(C)	This is net new Operating Budget spending, on top of the ongoing $6M currently budgeted and provincial facility renewal funds (FRF).
Data Resources and Cybersecurity	$400k / year	(C,K,R)	An institutional imperative, given the significant ongoing risks, and also the need to develop long-term robust Data Governance and Data Management standards.
Faculty Lifecycle Information System	$450k / year (estimate)	(C,K,R)	A Workday-compatible system to oversee the entire faculty lifecycle, from recruitment to retirement.
Strategic Enrolment Management Structure	$200k	(K)	Holistic and strategic student enrolment, institution-wide.
Library Space and Space Utilization Planning	$0	(C,K)	A long-term initiative to re-think the role of the library and library space. This initial stage is being paid from Library operating budget.
Institutional change management initiatives	$3M / year	(K,I)	Business process innovations, AI technology innovations, Academic program innovations, and UniForum assessments
Global Futures Networks	$0 / year	(K,R)	No net increase beyond the current funding to the research centres.
Convocation	$320k / year	(C)	Increased convocation costs (due to more ceremonies and increased staffing) had been paid as one-time offsets. This commitment normalizes the financial support (and associated expectations) on convocation.

Table 2: The initiatives recommended for budgetary allocation as the outcome of the 2025/26 budget process.

Three-Year Operating Budget Forecast

The University has set the intention to return to a balanced budget in year 3 of its 3-year planning period. The University's recommended 2025/26 operating budget is presented within this context. Total estimated revenues and expenses for the 2025/26 year (recommended operating budget) and the 2026/27 and 2027/28 years (as current forecasts of operating budgets) are presented in Table 3.

	2024/2025 Board approved operating budget	2025/2026 Year 1 Recommended operating budget	2026/2027 Year 2 Current forecast	2027/2028 Year 3 Current forecast
Total revenue	$870	$842	$835	$835
Total expenses	(945)	(936)	(899)	(855)
Unmitigated operating budget deficit	(75)	(94)	(64)	(20)
Expense budget reductions	43	50	45	20
Structural operating budget deficit	$(32)	$(44)	$(19)	-
Deficit as percentage operating budget revenue	(4%)	(5%)		

Table 3: Three-Year Plan to Return to Balanced Budget 2025/26 through 2027/28 (in millions)

These budgeted and forecast amounts incorporate assumptions that are subject to possible change over time, including enrolment levels, tuition rates, and inflationary cost increases. The unmitigated operating budget deficit estimates represent a *minimum* expectation, in light of

- Salary and benefits expenses
  - 2025/26 – incorporates salary agreements currently in place
  - 2026/27 and 2027/28 – incorporates only those salary agreements currently in place; where salary agreements are not in place, 0% increases are assumed
- Significant uncertainty and downside potential remains on international tuition revenues
- The inflationary environment

Eliminating the structural deficit by the 2027/28 year will require significant annual expense reductions through organizational transformation. To achieve such a transformation successfully, the University recognizes that we must carefully manage a transition of our academic model to a sustainable, future oriented model, focus our resources on priorities, and use and manage our one-time resources carefully.

We expect existing revenue constraints and uncertainties on Ontario provincial government grants, domestic tuition rates, and international enrolments to remain in place throughout the 3-year planning period. Efforts to enhance revenues through strategic enrolment management and a reconsideration of the delivery of academic programs are expected to lead to meaningful results over a medium-term time horizon, however expense reduction is required to balance the budget within this shorter term 3-year period. The focus for expense reduction is on salary and benefits expenses, as these are the most significant expenses of the University and are subject to annual cost increases, but an attention to non-salary expenses continues. We are continuing our focus on reducing duplication and improving efficiency, including through recent and ongoing reviews of units and functions, with reviews of other administrative areas to be initiated in the near term. Finally, the integrated planning process has called on *every* unit to identify savings, a cyclical process to take place every year, and which has contributed significantly to understanding what sorts of proposed changes or initiatives may be feasible or not.

Please refer to the earlier discussion of *Operating Budget Risks* for background on risks and risk management activities.

Recommended 2025/26 Operating Budget: Summary

The operating fund includes revenues and expenses related to the core activities of the University. Ongoing, long-term constraints in provincial operating grants and domestic tuition rates, recent constraints on international enrolments, combined with inflationary pressures on salaries and other expenses, have all resulted in a structural operating budget deficit in 2024/25 that has persisted into 2025/26.

As has been discussed (see *Overview and Context*), constraints and uncertainties on all of government grants, domestic tuition rates, and international enrolments are expected to impact the 2025/26 fiscal year. A variety of parallel efforts are being launched to explore strategies to enhance revenues, however the resulting revenue increases would be expected over a medium-term time horizon, so that near-term expense reduction is still required to move towards a balanced budget.

Overall, relative to 2024/25, operating revenues are projected to *decline* in 2025/26, with limited growth in grant revenues offset by larger declines in tuition revenues and other income.

The presentation of the recommended Operating Budget is organized into the following discussions:

- The Recommended 2025/26 Operating Budget: Revenues
- Details on Student Enrolment
- The Recommended 2025/26 Operating Budget: Expenses
- Overview of Employee Counts
- Overview of Unit-Level Budgets and Expenses

The accompanying motions to Senate and the Board of Governors seek approval of:

- The recommended operating budget revenues, in Table 4
- The recommended operating budget expenses, in Table 8

The remainder of this document provides significant context and information, but is not presented for approval.

Recommended 2025/26 Operating Budget: Revenues

The overall recommended operating budget revenue for 2025/26 is summarized in Table 4.

	2024/2025 Operating Budget	2025/2026 Increases (Decreases)	**2025/2026 Recommended Operating Budget**
REVENUE			
Operating Grant			
Enrolment	99,700		**99,700**
Performance Outcomes	150,900		**150,900**
Sustainability Fund	7,000	5,600	**12,600**
Special Purpose	5,650	250	**5,900**
International Student Recovery	(4,500)	800	**(3,700)**
Transfers to AFIW	(12,800)	(300)	**(13,100)**
	245,950	6,350	**252,300**
Tuition			
Domestic - Undergraduate	244,400	5,600	**250,000**
Domestic - Graduate	26,500	1,100	**27,600**
International - Undergraduate	222,000	(30,800)	**191,200**
International - Graduate	56,200	(2,700)	**53,500**
Transfers to AFIW	(20,200)	(100)	**(20,300)**
	528,900	(26,900)	**502,000**
Other Revenue			
Co-op Recovery	27,700	1,300	**29,000**
Student Services Fees	18,300	1,000	**19,300**
Interest	35,000	(10,000)	**25,000**
Services to AFIW	3,850	50	**3,900**
Miscellaneous Income	10,800		**10,800**
	95,650	(7,650)	**88,000**
Total Revenue	870,500	(28,200)	**842,300**

Table 4: The recommended operating budget revenues for 2025/26 (in thousands)

As can be seen, the operating revenues are grouped into three broad categories of

- Operating Grant,
- Tuition (domestic and international), and
- Other Income.

Overall, operating revenues are projected to decline in 2025/26 (in comparison with 2024/25), as illustrated in Figure 5, with limited growth in grant revenues offset by larger declines, particularly in international student tuition revenues and interest income.

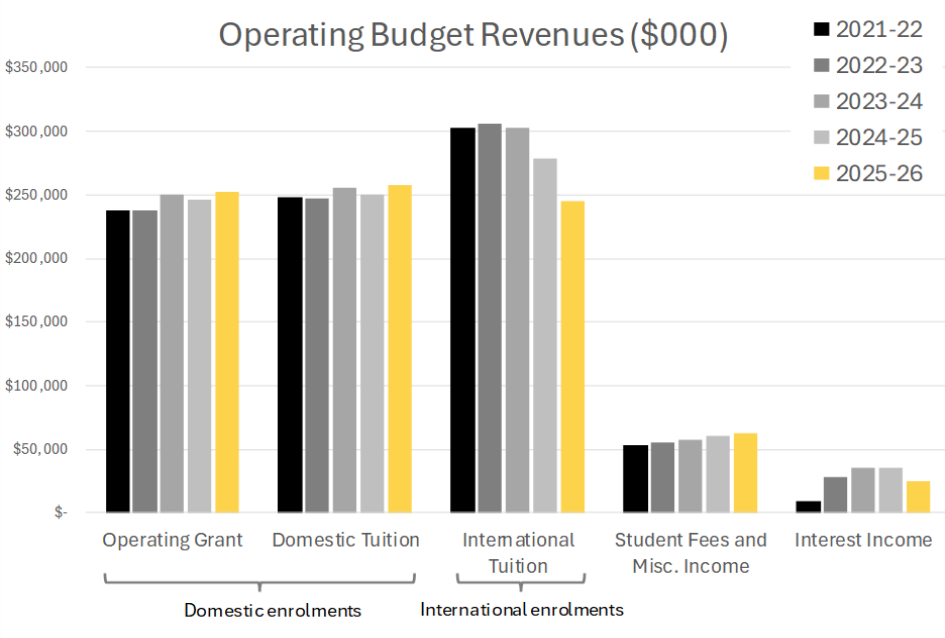


Figure 5: Operating Budget Revenues (in thousands)

Operating Grant

The University of Waterloo receives operating grant support from the provincial government through three primary grant funding allocations, as seen in Figure 6. The Enrolment Grant and Performance Outcomes Grant provide funding that is broadly expected to roll forward from one year to the next, while Special Purpose Grants are tied to specified provincial priorities that shift over time. These grants are offset by the International Student Recovery (ISR) which reduces overall grant funding in line with international enrolments in undergraduate and masters programs. Beginning in 2024/25, the province began to provide additional funding through the Sustainability Fund, a time-limited investment that continues in 2025/26, which has modestly increased the overall grant revenues estimated for 2025/26 (in comparison with 2024/25).

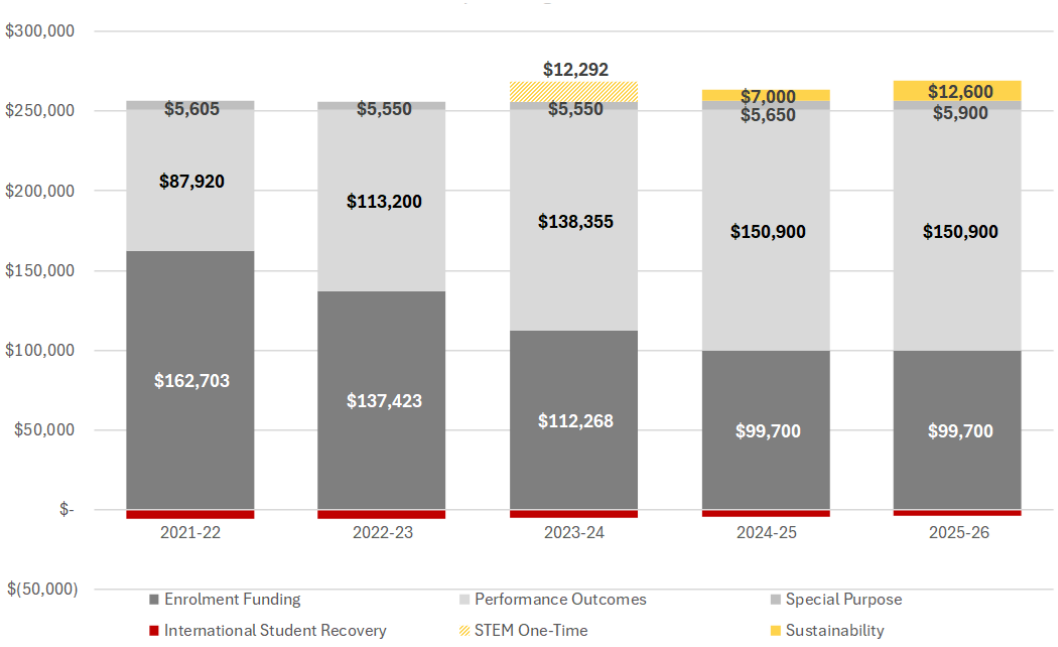


Figure 6: Provincial operating grant (in thousands)

A brief explanation on each of the components of the provincial Operating Grant:

- *Enrolment Funding*: Core Operating Grant funding provided by the province in support of eligible (domestic) enrolment, calculated using Weighted Grant Units (WGUs) that allocate different grant funding weights to different programs by level (UG, Masters, and PhD), and by discipline (e.g. Sociology, Engineering). This grant is capped by the funding corridor.
- *Performance Outcomes*: Grant funding provided by the province in support of eligible (domestic) enrolment. This grant is also calculated using WGUs and is capped by the funding corridor. A portion of these funds are deemed to be 'at risk', subject to Waterloo's performance on specified performance metrics (e.g. graduation rates) and allowable performance targets as established through the Strategic Mandate Agreements signed with the province.
- *Sustainability*: Grant funding introduced in 2024/25 providing a three-year commitment to modestly increase the overall per-student grant funding for eligible enrolment within the enrolment corridor.
- *International Student Recovery* (ISR): Introduced in 2012, the ISR is a grant *reduction* equal to $750 for every FFTE of international enrolment in undergraduate and Masters programs.
- *Special Purpose*: Additional grant envelopes that include funding from the province for specific projects or purposes. Examples include funding for accessibility services for students, clinical funding for Waterloo's Optometry and Pharmacy programs, and funding for mental health services.
- *STEM One-time*: These funds include $12.3M of one-time funding received at the end of 2023/24. Due to the timing of this funding, these revenues were not included in the 2023/24 budget approved by the board of governors. These funds are one-time, and are not expected to roll forward into the current 2024/25 year (or beyond), so assumptions regarding those funds are not included in the recommended 2025/26 budgets.

While the incremental funding provided by the Sustainability Grant is certainly welcome, it is important to recognize that this additional funding is time-limited (2024/25 to 2026/27) and does not represent the incremental grant funding support that would have been provided had the province fully implemented the recommendations of the Blue-Ribbon Panel on Postsecondary Education Financial Sustainability, released in November 2023, which called for an initial 10% increase in per-student grant funding, followed by annual inflationary rate increases, and a mechanism to reset funding corridor midpoints on a regular basis to better reflect actual eligible enrolment levels at institutions.

The operating grant support provided through the enrolment grant and performance outcomes grant continue to be constrained by the grant funding corridor which caps the funding allocation, and which has not been adjusted since 2019/20. Waterloo, like several other research-intensive universities in the province, has experienced growth in eligible (domestic) enrolment in recent years that, if fully funded, would generate an additional ≈$25 million in grant funding annually. In addition to caps on overall funding allocations, per-student grant funding has remained frozen since 2016, creating significant financial challenges as costs continue to rise.

Domestic Tuition

Domestic tuition fees are constrained by provincial tuition policy. In 2019, the province mandated a 10% tuition decrease for all programs, and domestic tuition fees have remained frozen at these reduced levels since. The consequence of this policy has been that the tuition fees assessed by Waterloo in 2025/26 are equivalent, in dollar terms (ignoring inflation), to the tuition fees assessed to students in 2014/15.

In November 2024, MCU provided Ontario Universities and Colleges an official Tuition Fee Framework for 2024/25 through 2026/27. The framework outlined that domestic Ontario tuition fees will continue to be frozen (with limited exceptions) for fiscal years 2025/26 and 2026/27.

Beginning in 2021/22, the province permitted universities to increase tuition rates for out-of-province students, initially by a maximum of 3% per year and then subsequently by a maximum of 5% per year. The University of Waterloo implemented differential domestic out-of-province tuition fees for the first time in Fall 2023, and in 2025/26 the University is moving ahead with a 5% tuition fee increase in most programs, with limited exceptions. The incremental revenue generated through these tuition increases for fiscal 2025/26 is projected to be $4.4M.

International Tuition

International tuition fees are not regulated by the MCU Tuition Fee Framework. The University's practice is to set international fees annually. Multiple factors are considered when international tuition rate increase decisions are made, including the value of the Waterloo degree, student demand, and comparisons between Waterloo degrees and those offered by peer institutions.

Tuition revenues projected in the 2025/26 budget reflect modest tuition fee increases, combined with predicted declining international student enrolments.

As in previous years, tuition fees for international undergraduate and Master programs include an amount to offset the mandated amounts directly charged to the university: an MCU $750/student International Student Recovery (ISR) charge, and a $75/student reduction to the provincial grant in-lieu-of-taxes.

Other Revenue

The Co-op recovery and Student Services Fees are governed by provincial tuition fee policy; in general, fees are collected to offset specific expenses within the operating budget (e.g., co-op fee revenues fund the operation of the co-op program), so increased fees reflect estimated increased expenses for the coming year.

Co-op Fee Plan

The Co-op Fee assessed to undergraduate and graduate students registered in centrally-supported co-operative education programs will be increasing by 4.0%, from $786/term to $817/term, effective spring term 2025.

In addition, changes are planned, beginning in the Fall 2025 term, to the timing and frequency of co-op fee assessments for graduate students registered in centrally-supported co-operative education programs. The planned changes will improve alignment of assessment practices for undergraduate and graduate students.

Student Services Fee Plan

Undergraduate and graduate student services fees are developed in accordance with the Student Services Protocol. Under this Protocol, the fees are the result of recent actual costs of the student services units and agreed-upon cost sharing percentages for these services between the University, undergraduate students and graduate students.

The per term dollar amount increase in the 2025/26 student services fees as compared to the 2024/25 student services fees are approximately

- Undergraduate: $25/term
- Graduate: $32/term

The allocation of student fees, by unit, is summarized in Table 5. Note that the fee increases listed as "Proposed" have been approved by the board, and are not being proposed as part of this overall package.

	Undergraduate (full-time)			Graduate (full-time)		
	Current	Proposed	Change	Current	Proposed	Change
Wellness	$59.38	**$69.96**	17.8%	$59.38	**$69.96**	17.8%
Student Success Office	$20.28	**$20.74**	2.3%	$15.77	**$29.42**	86.6%
Writing Centre	$3.00	**$3.16**	5.3%	$18.15	**$18.86**	3.9%
Athletics & Recreational Services	$130.23	**$141.39**	8.6%	$79.12	**$83.97**	6.1%
Centre for Career Development	$30.85	**$31.73**	2.9%	$30.85	**$31.73**	2.9%
Student Buildings	$6.69	**$8.00**	19.6%	$6.69	**$8.00**	19.6%
Total	$250.43	**$274.98**	9.8%	$209.96	**$241.94**	15.2%

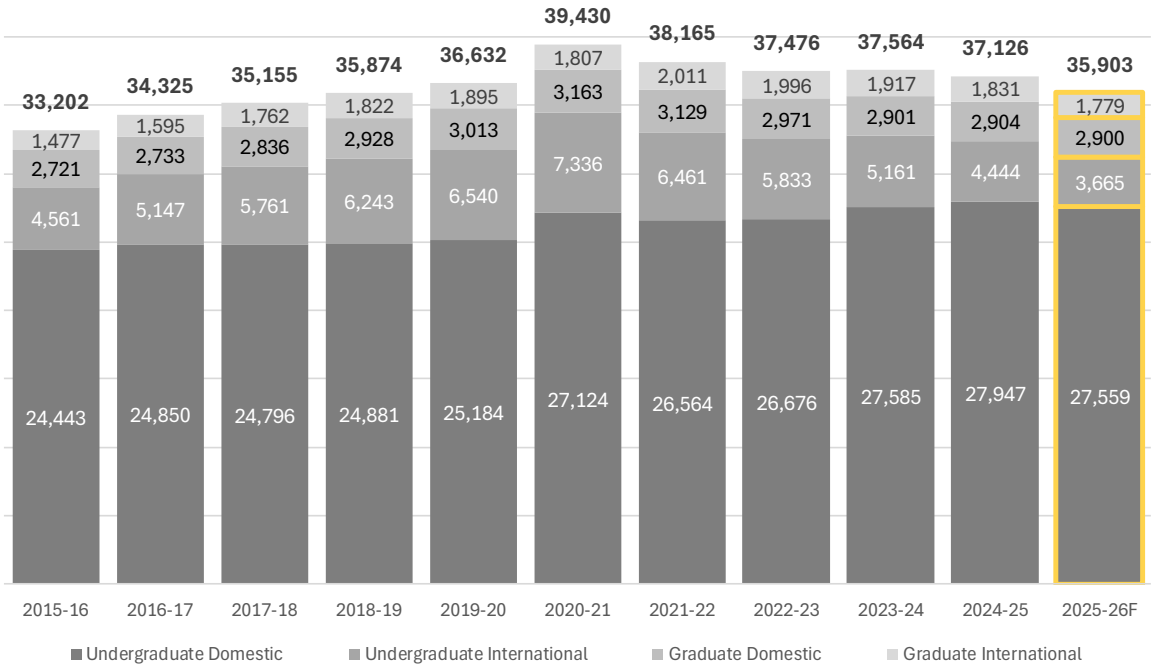
Table 5: The allocation of undergraduate and graduate student fees (per student per term).

Interest Income

The investment income earned on operational funds is based on current and forecasted cash management and investment plans. Interest income rose significantly in 2022/23 as a result of external factors that are not expected to persist long term. This income is expected to decrease in 2025/26 due to declining interest rates and the use of one-time funds for approved capital projects and the transition to a balanced operating budget. Interest income in 2025/26 is estimated at $25 million, a decline of $10 million over the 2024/25 budget plan.

Student Enrolment

A very large proportion of the University of Waterloo's operating revenues are comprised of provincial grants and tuition fees, which are ultimately enrolment driven. As is shown in Figure 7, the volume and composition of student enrolment has changed considerably over 10 years.



[1] *Domestic refers to domestic fee paying enrolment and includes enrolment for which no fees are assessed.*

[2] *International refers to international fee paying enrolment.*

[3] *Actual enrollment values up to and including 2024/25; forecast values for 2025/26.*

Figure 7: Ten year history of full-time-equivalent (FTE) enrollment.

Undergraduate domestic student enrolment has increased over the past ten years. While relatively consistent up to and including 2019/20, in 2020/21 the University of Waterloo experienced a significant increase in demand from domestic students, as well as a substantial increase in the rate at which offers of admission to domestic applicants were accepted, increasing new student enrolment. As a result, domestic enrolment has grown to exceed the funded corridor, reflecting the University's position as a highly sought after choice with domestic students.

Undergraduate and graduate international enrolment grew steadily up until 2020/21, when it reached its highest level in the past ten years. Since then, international enrolments have been declining, the result of numerous environmental and geopolitical challenges. This decline was further exacerbated in 2024/25 by the federal cap and the timing and confusion surrounding the immigration changes on student study visa permits for new international students.

Graduate domestic enrolment has remained relatively consistent for the past ten years with oscillations between decline and growth since 2020/21.

In all of these categories of enrolment, and as part of a developing Strategic Enrolment Management (SEM) process, in 2025/26 the university will seek to balance and align future enrolment growth, our *Waterloo at 100* goals, and the constraints of the funding environment.

Table 6 summarizes the composition of student enrolment between undergraduate and graduate student enrolment, as well as between domestic and international fee-paying status. The overall fractional composition of student enrolment between undergraduate and graduate studies has remained consistent over the past five years and is forecast to continue in 2025/26.

	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26F
Undergraduate Domestic[1]	27,124	26,564	26,676	27,585	27,947	27,559
Undergraduate International[2]	7,336	6,461	5,833	5,161	4,444	3,665
Undergraduate	**34,460**	**33,025**	**32,509**	**32,746**	**32,391**	**31,224**
Undergraduate % of Total	87.4%	86.5%	86.7%	87.2%	87.2%	87.0%
International % of Undergraduate	21.3%	19.6%	17.9%	15.8%	13.7%	11.7%
Graduate Domestic[1]	3,163	3,129	2,971	2,901	2,904	2,900
Graduate International[2]	1,807	2,011	1,996	1,917	1,831	1,779
Graduate	**4,970**	**5,140**	**4,967**	**4,818**	**4,735**	**4,679**
Graduate % of Total	12.6%	13.5%	13.3%	12.8%	12.8%	13.0%
International % of Graduate	36.4%	39.1%	40.2%	39.8%	38.7%	38.0%
FTE Total	**39,430**	**38,165**	**37,476**	**37,564**	**37,126**	**35,903**

[1] *Domestic refers to domestic fee paying enrolment and includes enrolment for which no fees are assessed.*

[2] *International refers to international fee paying enrolment.*

Table 6: Enrollment (full-time equivalent) by Undergraduate / Graduate mix.

Table 7 summarizes the composition of graduate student enrolment across degree level. Doctoral students as a proportion of total graduate enrolment have remained consistent over the past five years. This distribution is expected to continue in 2025/26. Masters student enrolment continues to comprise a similar proportion of total graduate enrolment, however, there has been a shift towards higher levels of course-based masters, which is forecasted to continue in 2025/26.

	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26F
Doctoral	2,036	2,075	2,044	1,993	1,959	1,921
Masters Research	1,909	1,892	1,819	1,665	1,561	1,559
Masters Course Based	1,013	1,154	1,082	1,139	1,188	1,190
Other Graduate[1]	12	19	22	21	27	9
Graduate FTE	**4,970**	**5,140**	**4,967**	**4,818**	**4,735**	**4,679**

	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26F
Doctoral	41.0%	40.4%	41.2%	41.4%	41.4%	41.1%
Masters Research[1]	38.4%	36.8%	36.6%	34.6%	33.0%	33.3%
Masters Course Based[1]	20.4%	22.5%	21.8%	23.6%	25.1%	25.4%
Other Graduate[2]	0.2%	0.4%	0.4%	0.4%	0.6%	0.2%
Graduate FTE	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

[1] *The Masters sub-categorization of Masters Research and Masters Course Based was re-organized in January 2024 to enhance the accuracy of go forward reporting.*

[2] *Other Graduate includes diploma, non-degree and qualifying.*

Table 7: Graduate Enrollment (full-time equivalent) by degree level (detailed)

Recommended 2025/26 Operating Budget: Expenses

The overall recommended operating budget expenses for 2025/26 is summarized in Table 8.

	2024/2025 Operating Budget Before Budget Reduction Allocation	2024/2025 Budget Reduction Allocation	2024/2025 Operating Budget After Budget Reduction Allocation	2025/2026 Increases (Decreases)	2025/2026 Operating Budget Before Allocation of Budget Reductions and New Investments	2025/2026 Budget Reductions and New Investments Allocation	**2025/2026 Recommended Operating Budget**
EXPENSES							
Salary and Benefits							
Salaries and wages	576,700	(15,000)	561,700	23,000	584,700	(43,000)	**541,700**
Benefits	143,900		143,900	8,500	152,400	(11,000)	**141,400**
	720,600	(15,000)	705,600	31,500	737,100	(54,000)	**683,100**
Non Salary Expenses - Strategic and Priority Spending							
Student Support	76,000		76,000	(1,000)	75,000	-	**75,000**
University Fund	43,100	(10,700)	32,400	-	32,400	-	**32,400**
Institutional Change Management	-	-	-	-	-	3,000	**3,000**
Capital Project Fund	4,300	(4,300)	-	-	-	-	**-**
Deferred Maintenance Fund	6,000		6,000		6,000	5,000	**11,000**
	129,400	(15,000)	114,400	(1,000)	113,400	8,000	**121,400**
Non-Salary Expenses - Operational							
Insurance	3,250	(50)	3,200	-	3,200	-	**3,200**
Municipal taxes	3,050	50	3,100	-	3,100	-	**3,100**
Utilities	24,500		24,500	-	24,500	-	**24,500**
Other non-salary expenses	77,700	(12,000)	65,700	3,000	68,700	(4,000)	**64,700**
	108,500	(12,000)	96,500	3,000	99,500	(4,000)	**95,500**
Gross expenses	958,500	(42,000)	916,500	33,500	950,000	(50,000)	**900,000**
Cost recoveries and ancillary contributions	(13,500)	(500)	(14,000)	-	(14,000)	-	**(14,000)**
Estimated net expenses	945,000	(42,500)	902,500	33,500	936,000	(50,000)	**886,000**
Estimated income	870,500		870,500		842,300		**842,300**
Deficit	(74,500)		(32,000)		(93,700)		**(43,700)**

Table 8: The recommended operating budget expenses for 2025/26 (in thousands). The institution is committed to a total cut of $50M, but the actual distribution between salary, benefits, and non-salary is not yet known, and will be based on the roll-up of plans, which will be based on how units meet their assigned budget objectives.

Expenses – Salaries and Wages

The Salary and wages budget is estimated and included in the operating budget for the following categories of employees:

- Faculty
- Staff in Faculties
- Staff in Academic Support Units
- Plant Operations and Special Constable Services unions
- Teaching Assistants, co-op students and other part-time/casual

The salaries and wages are subject to the following current compensation agreements:

- Faculty: Salary Settlement Agreement May 1, 2024 to April 30, 2027, but with the 2026/27 arrangements subject to further negotiation
- Staff: Staff Compensation Recommendation May 1, 2025 to April 30, 2026
- Canadian Union of Public Employees (CUPE): Collective Agreement CUPE Local 793 May 1, 2024 to April 30, 2027

The $43 million salary reduction recommended for 2025/26 includes an estimated $5 million of cost recoveries of salary expenses and $38 million as a preliminary estimate of salary reductions to be achieved through the hiring freeze and other cost reduction activities.

Expenses – Benefits

Employee benefits include

- University contribution to defined benefit pension plan
- Government mandated costs (CPP, EI, Ontario employer health tax, WISB, etc.)
- Non-retirement benefits (health and dental, tuition benefit, etc.)
- Other benefits include WSIB, tuition benefit, parental leave top-ups, FPER etc.

Figure 8 gives a sense of the financial distribution of the different benefit components.

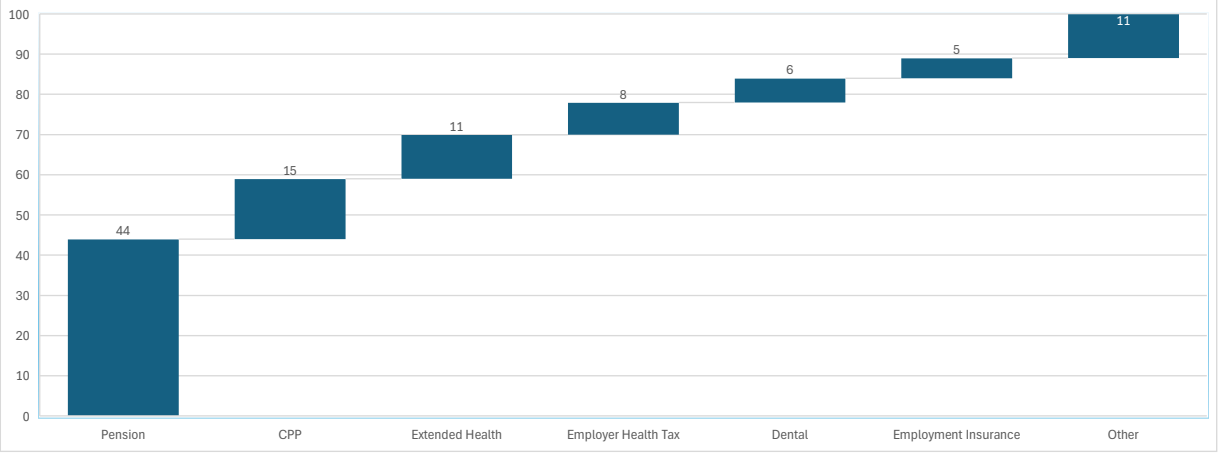


Figure 8: Percentage breakdown of benefits paid from Operating funds

The $8.5 million in benefit *increases* (under "2025/2026 Increases") are based on both *salary* increases (pension plan contributions, Ontario Employer Health Tax) and *rate* increases (CPP, EI, dental, extended health), in addition to the implementation of the Faculty Salary Settlement Agreement for May 1, 2024 to April 30, 2027.

The $11 million in benefits *reduction* (under "2025/2026 Budget Reductions") includes $6 million in benefits expense reductions related to the preliminary estimate of salary reductions, and a further $5 million as an estimated reduction in voluntary additional University contributions to the registered pension plan.

Non-Salary Expenses: Strategic and Priority Spending

Student Support:

Student Support includes Tuition Set Aside (TSA), as well as undergraduate and graduate support in the form of scholarships, bursaries and awards. The TSA amount (approximately $27.5 million) is calculated based on a formula mandated by the Ministry of Colleges and Universities (MCU), to be used for needs-based student support programs.

The $1 million decrease in student support reflects reduced costs of student tuition fee support for international graduate students, consistent with the reduction in international enrolment and tuition revenue.

In addition to the Operating Fund, student support is also provided from other funds. The total student support for 2023/24 is $147M, broken down as

- $76M from the Operating Budget
- $6M from the Endowment
- $21M from Trust Funds
- $44M from Research Funds

University Fund:

The University Fund is used for funding the University's strategic priorities and managing risk. The University Fund was discussed earlier, in some detail, under *Priorities and Initiatives*.

Institutional Change Management:

The significant external challenges, identified in *Overview and Context*, will require substantial organizational change to accomplish the recommended budgetary reductions and associated steps in organizational efficiency and effectiveness. This new budget, listed under Priorities and Initiatives, represents investments to pursue institution-wide operational projects, focused on

- Business process and administrative innovations,
- Academic program development and innovations,
- Innovations with regards to the use of AI,
- UniForum assessments to better understand and benchmark our current processes.

Deferred Maintenance Fund:

The Deferred Maintenance Fund supports central funding of deferred maintenance projects. Additional funding for deferred maintenance includes other central operating funds, faculty funding, grants and donations. Deferred maintenance is discussed in significantly further detail as part of the *Capital Projects Report*.

Non-Salary Expenses: Operational

Other non-salary expenses reflect the budget for a variety of non-salary operating expenses of the Faculties and Academic Support Units, which determine the use of this budget based on their respective operational requirements. The $3 million in increased costs are associated with expectations on committed enterprise software-related costs. The $4 million in decreased costs stem from all units, working collectively, to achieve reductions in non-salary spending.

Some of the more significant costs include Library Acquisitions and Enterprise Software. More generally, non-salary expenses also include computer equipment, contracted services and consulting, software licensing fees, books and periodicals, office and lab supplies, travel, and training. Also see the Capital Projects Report, since non-salary operating budgets may also be used to fund capital projects, repairs, and maintenance.

Cost Recoveries and Ancillary Contributions:

Chargeouts and cost recoveries primarily include recoveries from Ancillary Enterprises (Housing, Food Services, Print & Retail Solutions, Watcard and Parking) for space charges and administrative support.

Overview of Employee Counts

This section provides information about the composition of the University's employee base. It is intended to demonstrate how the salary and wages expense budget is being deployed. The headcount information includes:

- Faculty headcount:
  - Regular ongoing – permanent faculty roles
  - Definite term – faculty positions that have a specific end date

- Staff headcount includes staff employees and union group (CUPE and OPSEU) employees (Plant Operations and Special Constable Services)
  - Regular ongoing: permanent staff and union roles
  - Temporary: staff appointments for periods exceeding 3 months but less than 2 years, with regular weekly work hours

The counts do not include student employees (e.g., teaching assistants, co-op students etc.) and casual employees. The non-faculty family group includes postdoctoral researchers and research associates, where those salaries are charged to an operating fund. For context, the demographic breakdown of university employees is shown in Figure 9.

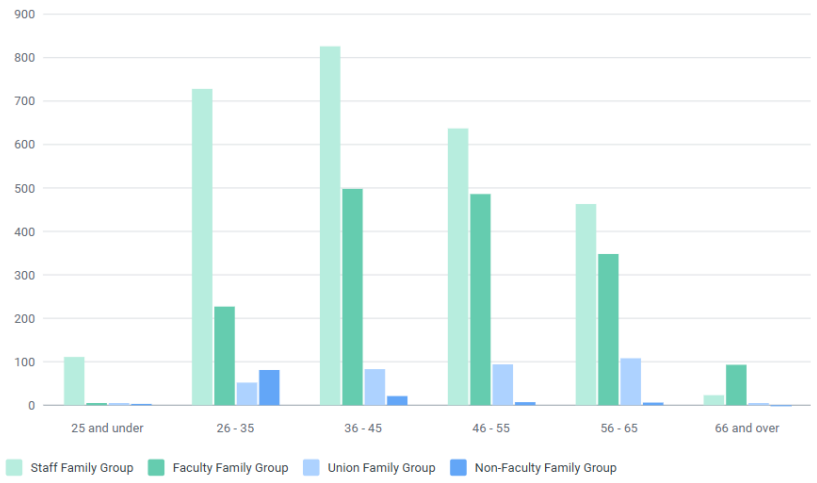


Figure 9: Demographic Distribution of University Employees

The slight irregularity in age ranges stems from pension-related criteria:

- 55-62 is the group eligible to retire with a penalty for taking an early pension,
- 62-71 is the group that can retire with an unreduced pension
- 71+ is the group of individuals who must start their pension

Senior Administration

University leadership encompasses academic and non-academic employees focused on strategic initiatives and priorities across several portfolios. The Faculty Academic Executives group includes Senior Administrators with academic appointments including AVPs, VPs and the President. The Senior Non-Academic Executives include senior management and administrative roles, usually leading academic support units.

The count of these positions, over time, is summarized in Table 9.

Group	2020	2021	2022	2023	2024	*2025
Faculty Academic Executives	9	10	12	14	15	16
Senior Non-Academic Executives	26	26	26	26	27	25

*Count as of March 2025

Table 9: Counts of Senior Administrative Positions

Headcount Data

The headcount information in Table 10 aligns with the operating salary and wage costs incurred by units. Headcount is based on each employee's primary position in the operating fund. Each employee represents a count of 1, regardless of full/part-time status.

The headcount data replaces the previous reporting approach of complement count which reflected permanent positions in the operating fund (both filled and unfilled). This updated approach is more complete and aligns with the University's current budget management and HR data practices.

It is important to recognize that Table 10 presents employee counts in units as they existed, historically, in contrast to the tables presented under Unit-Level Budgets, in which historical budgets and spending are reallocated to match the organizational structure as of September 2024.

Faculty Positions:	Notes	Headcount November 1, 2023 Regular, Ongoing	Headcount November 1, 2023 Temporary/ Definite Term	Headcount April 30, 2024 Regular, Ongoing	Headcount April 30, 2024 Definite Term	Headcount November 1, 2024 Regular, Ongoing	Headcount November 1, 2024 Temporary/ Definite Term	Headcount January 31, 2025 Regular, Ongoing	Headcount January 31, 2025 Definite Term
Arts		308	219	310	189	319	186	313	174
Engineering		320	101	320	91	336	69	335	63
Environment		91	33	92	26	93	35	93	21
Health		77	21	78	23	79	27	79	22
Mathematics		270	97	266	107	290	87	290	95
Science		191	97	192	92	193	91	192	97
Total Faculty Positions		**1257**	**568**	**1258**	**528**	**1310**	**495**	**1302**	**472**

Academic Support Staff Positions:	Notes	Headcount November 1, 2023 Regular, Ongoing	Headcount November 1, 2023 Temporary	Headcount April 30, 2024 Regular, Ongoing	Headcount April 30, 2024 Temporary	Headcount November 1, 2024 Regular, Ongoing	Headcount November 1, 2024 Temporary	Headcount January, 31 2025 Regular, Ongoing	Headcount January, 31 2025 Temporary
Arts		128	12	124	17	132	14	129	14
Engineering		245	29	254	41	248	32	249	30
Environment		47	16	53	15	49	9	48	8
Health		51	13	52	10	53	11	51	11
Mathematics		159	19	175	17	182	14	177	12
Science		212	31	224	26	233	29	228	27
Faculty Subtotal - Academic Support Staff		**842**	**120**	**882**	**126**	**897**	**109**	**882**	**102**
University Research Centres		23	18	22	19	21	19	20	20
Office of the President		5	0	5	0	5	0	5	0
Vice-President, Academic & Provost		7	0	5	0	5	0	5	0
Associate Provost, Integrated Planning & Budgeting	Note 1	6	0	6	0	6	0	N/A	N/A
Associate Provost, Campus Support and Accessibility		28	8	38	5	41	4	41	3
Institutional Analysis & Planning	Note 1	21	0	21	0	21	0	N/A	N/A
Legal & Immigration Services		8	0	9	0	9	0	8	0
Library		110	15	114	14	116	6	111	5
Registrar		124	20	133	13	129	11	127	8
WatSPEED		27	4	28	3	27	5	26	5
Associate Vice-President, Graduate Studies & Postdoctoral Affairs		31	1	32	1	31	1	30	1
Associate Vice-President, International		13	3	13	2	9	1	10	1
University Secretary		9	0	8	0	8	1	9	1
Vice-President, Advancement		78	13	73	11	75	9	78	10
Vice-President, University Relations		49	3	49	2	48	1	48	1
Vice-President, University Research		106	32	109	41	106	45	100	44
Vice-President, Administration & Finance	Note 2	4	0	5	1	13	1	12	0
Human Resources		68	5	68	7	65	2	61	4
Information Systems and Technology		163	1	156	2	148	4	152	4
Finance		55	3	57	3	57	3	57	3
Plant Operations		441	18	439	15	424	15	412	17
Safety Office		12	0	12	0	12		12	0
Special Constable Services		27	2	25	1	24	2	22	2
Sustainability		3	1	3	1	4	1	4	1
Associate Provost, Co-operative & Experiential Education	Note 3,4	256	42	256	54	252	38	252	32
Associate Vice-President, Academic	Note 4,5	105	26	99	28	95	22	94	19
Associate Vice-President, Academic Operations	Note 1	1	0	1	0	1	0	28	0
Associate Vice-President, Equity Diversity, Inclusion & Anti-Racism		13	4	12	1	14	1	12	1
Associate Vice-President, Faculty Planning & Policy		3	0	3	0	5	0	4	0
Associate Vice-President, Indigenous Relations		6	0	4	0	5	0	5	0
Associate Provost, Students	Note 4,6	156	85	150	64	145	86	144	81
Non-Faculty Subtotal - Academic Support Staff		**1,935**	**286**	**1,933**	**269**	**1900**	**259**	**1,869**	**243**
Total Academic Support Staff Positions	Note 7	**2,800**	**424**	**2,837**	**414**	**2,818**	**387**	**2,771**	**365**

Table 10: University of Waterloo Employee Count Data

Table 10 notes:

1. AP-IPB and IAP merged with AVP Academic Operations.
2. The increase in staff roles in the VPAF office represents a reporting change for Project Management and Change Management from IST and HR to the VPAF office.
3. Positions supporting the co-op program are funded through the co-op fee. Approximately 80% of the positions under AP, Co-operative & Experiential Education are funded through this fee.
4. Positions in Athletics, Wellness, Student Success Office, Writing Centre, Centre for Career Development are partly (often significantly) funded by student services fees.
5. Associate Vice-President, Academic includes the Centre for Extended Learning, the Writing & Communication Centre, and the Centre for Teaching Excellence.
6. Associate Provost Students includes Athletics & Recreational Services, Campus Wellness, Counselling Services, Health Services, and Student Success.
7. By way of reminder, the table includes only positions funded by the operating fund.

Overview of Unit-Level Operating Budgets and Expenses

The following tables provide high-level operating budget information, listing ongoing operating budgets (Table 11), salary expenses (Table 12), and non-salary expenses (Table 13). The tables provide some degree of historical context, providing four years of prior information regarding unit budgets. The tables also allow certain aspects of the recommended operating budget, and particularly the allocation of new resources or budget cuts, to be understood via a more complete context.

The reporting in the following tables is provided based on the organizational structure as of September 2024, meaning that historical budgets and spending are reallocated to match the current structure. This is in contrast to Table 10, which presented employee counts in units as they existed, historically, and therefore a close comparison of Table 10 and Table 11 or Table 12 is not meaningful.

Certainly there are many details missing here, and caution must be exercised in interpreting the numbers. In particular, some units may have had significant temporary budgets, which are not listed here. In general, these reports do not include ASU managed specific-purpose budgets, including student support managed by the Registrar's Office and GSPA, WatSPEED, utilities, shared positions (particularly those between Advancement and the Faculties), enterprise software, library acquisitions, property taxes, and insurance.

In Table 12, salary expenses include all categories of employees paid from the operating fund, and include benefits expenses in cost-recovery units.

In Table 13, non-salary expenses include capital equipment, renovations, maintenance, contracted/outsourced services, software, books and periodicals, supplies, professional consulting, travel, telephone charges, and training. Actual expenses do not include revenues recorded at the unit level, or interfund transfers (transfers to/from units other than the operating fund).

Ongoing Budget	Historical Ongoing Budget - Rounded ($M)				As of 28 Feb 2025
	2020/21	2021/22	2022/23	2023/24	2024/25
President's Office	$1.0	$1.1	$1.2	$1.3	$1.3
Secretariat	$1.6	$1.6	$1.4	$1.4	$1.6
Vice-President, Academic & Provost					
Faculty of Arts	75.5	77.3	78.2	81.4	82.0
Faculty of Engineering	99.0	101.0	101.8	105.4	105.8
Faculty of Environment	22.8	23.3	23.7	24.6	24.7
Faculty of Health	21.1	21.6	21.8	22.6	22.7
Faculty of Mathematics	91.3	92.7	93.3	96.0	95.7
Faculty of Science	64.2	65.5	66.1	68.3	68.5
Faculty Total	$373.9	$381.3	$384.9	$398.3	$399.4
Office of the Provost	2.5	2.6	2.8	2.8	2.8
AP Co-operative & Experiential Education	23.4	23.5	23.5	23.8	23.1
AP Campus Support & Accessibility	0.6	2.4	2.5	3.4	4.3
AP Students	17.1	17.3	18.5	19.9	20.0
AVP Academic Operations	2.9	3.1	3.3	3.7	3.6
AVP Equity, Diversity, Inclusion, & Anti-Racism	1.2	1.1	2.0	1.5	1.6
AVP Faculty Planning & Policy	-	-	-	0.5	0.8
AVP Graduate Studies & Postdoctoral Affairs	2.7	2.9	3.0	3.0	2.9
AVP Indigenous Relations	-	-	-	0.7	0.7
AVP Academic	9.2	9.6	10.2	10.6	10.3
Library	10.9	11.1	11.3	11.6	11.6
Legal & Immigration Services	0.8	1.0	1.0	1.1	1.1
Registrar incl. Student Service Centre	11.6	12.4	12.5	13.9	14.0
Academic Support Total	$83.0	$86.8	$90.5	$96.5	$96.9
Vice-President, Administration & Finance					
Office of the VP Administration & Finance	0.5	0.5	1.1	1.5	2.5
Safety Office	1.2	1.3	1.4	1.4	1.4
Special Constable Services	2.5	2.6	2.6	2.7	2.6
Sustainability Office	0.2	0.3	0.4	0.4	0.4
Facilities	31.4	31.6	32.1	33.6	33.1
Finance	5.0	5.1	5.2	5.7	5.7
Human Resources	5.2	5.5	6.0	6.2	5.9
Information Systems & Technology	18.1	17.9	17.7	18.4	17.8
VPAF Total	$64.1	$64.8	$66.5	$70.0	$69.5
Vice-President, Research and International					
Office of the VP University Research	0.8	0.8	0.8	0.9	0.6
Office of Research	8.7	9.0	9.2	9.5	8.3
University Research Centres	0.8	0.8	0.8	0.8	0.8
Waterloo International	1.9	1.9	1.9	2.0	1.6
Waterloo Ventures	0.3	0.3	0.3	0.5	1.5
VPRI Total	$12.6	$12.9	$13.1	$13.8	$12.8
Vice-President, Advancement					
Office of the VP Advancement	1.2	1.1	1.3	1.5	0.3
AVP Engagement	1.5	1.5	1.5	1.6	1.8
AVP Development	0.6	0.6	0.6	0.6	0.7
AVP Advancement Services	4.9	5.0	5.0	4.9	5.0
Principal Giving & Strategy	0.7	0.9	0.9	0.9	0.7
VPA Total	$8.9	$9.0	$9.2	$9.5	$8.4
Vice-President, University Relations					
Office of the VP University Relations	4.8	4.9	5.4	5.9	5.8
Marketing & Strategic Initiatives	2.1	2.1	2.2	2.2	2.2
VPUR Total	$6.8	$7.0	$7.5	$8.1	$8.0

Table 11: Unit Level Ongoing Budgets

Salary Expenses	Historical Salary Expenses - Rounded ($M)			
	2020/21	2021/22	2022/23	2023/24
President's Office	$0.9	$0.9	$1.0	$1.2
Secretariat	$1.1	$1.6	$1.5	$1.2
Vice-President, Academic & Provost				
Faculty of Arts	70.5	74.6	78.0	83.7
Faculty of Engineering	90.3	93.9	95.9	101.5
Faculty of Environment	20.2	21.6	22.4	24.1
Faculty of Health	20.1	21.0	21.4	23.1
Faculty of Mathematics	72.3	75.8	78.2	82.4
Faculty of Science	59.6	60.4	62.1	67.6
Faculty Total	$333.1	$347.3	$358.1	$382.4
Office of the Provost	0.7	1.2	1.4	1.3
AP Co-operative & Experiential Education	34.0	26.7	24.7	28.2
AP Campus Support & Accessibility	0.6	1.4	2.8	3.3
AP Students	14.5	16.4	17.4	19.5
AVP Academic Operations	2.6	2.7	2.8	3.4
AVP Equity, Diversity, Inclusion, & Anti-Racism	1.2	1.3	1.8	1.8
AVP Faculty Planning & Policy	-	-	-	0.5
AVP Graduate Studies & Postdoctoral Affairs	2.5	2.9	2.7	3.0
AVP Indigenous Relations	-	-	-	0.6
AVP Academic	8.7	10.0	10.8	12.1
Library	9.0	9.5	10.0	11.1
Legal & Immigration Services	0.7	0.8	0.8	1.0
Registrar incl. Student Service Centre	9.5	10.2	11.0	11.5
Academic Support Total	$84.0	$82.9	$86.1	$97.3
Vice-President, Administration & Finance				
Office of the VP Administration & Finance	0.4	0.4	0.5	0.8
Safety Office	0.9	1.2	1.1	1.2
Special Constable Services	2.2	2.1	2.2	2.6
Sustainability Office	0.1	0.3	0.3	0.4
Facilities	28.0	27.8	29.6	32.4
Finance	4.4	4.6	4.8	5.2
Human Resources	5.1	5.8	5.9	6.5
Information Systems & Technology	16.4	16.3	17.0	18.4
VPAF Total	$57.5	$58.5	$61.4	$67.6
Vice-President, Research and International				
Office of the VP University Research	2.3	2.7	3.0	3.9
Office of Research	8.4	9.1	9.4	9.9
University Research Centres	5.8	6.3	6.6	5.9
Waterloo International	1.3	1.4	1.4	1.5
Waterloo Ventures	1.1	0.9	1.3	1.2
VPRI Total	$18.9	$20.4	$21.5	$22.3
Vice-President, Advancement				
VP Advancement	1.1	1.0	1.1	1.2
AVP Engagement	1.8	1.9	2.0	2.4
AVP Development	0.3	0.3	0.4	0.4
AVP Advancement Services	3.7	3.7	3.5	4.2
Principal Giving & Strategy	0.8	0.9	0.8	0.6
VPA Total	$7.6	$7.7	$7.9	$8.8
Vice-President, University Relations				
VP University Relations	1.4	1.3	3.1	3.7
Marketing & Strategic Initiatives	2.5	2.8	1.7	1.7
VPUR Total	$4.0	$4.1	$4.8	$5.4

Table 12: Unit Level Salary Expenses

Non-Salary Expenses	Historical Salary Expenses - Rounded ($M)			
	2020/21	2021/22	2022/23	2023/24
President's Office	$0.1	$0.1	$0.2	$0.2
Secretariat	$0.1	$0.4	$0.5	$0.3
Vice-President, Academic & Provost				
Faculty of Arts	6.6	7.3	9.3	12.1
Faculty of Engineering	16.4	17.5	24.5	22.8
Faculty of Environment	3.8	3.5	4.1	4.2
Faculty of Health	3.0	2.5	2.6	3.3
Faculty of Mathematics	12.7	13.7	15.4	18.3
Faculty of Science	16.8	19.2	20.5	22.1
Faculty Total	$59.3	$63.9	$76.5	$82.8
Office of the Provost	2.1	1.6	2.3	1.9
AP Co-operative & Experiential Education	1.5	2.2	3.1	4.0
AP Campus Support & Accessibility	0.3	0.2	0.1	0.2
AP Students	3.8	4.6	5.6	6.2
AVP Academic Operations	0.9	1.0	2.7	3.1
AVP Equity, Diversity, Inclusion, & Anti-Racism	0.2	0.2	0.2	1.3
AVP Faculty Planning & Policy	-	-	-	0.1
AVP Graduate Studies & Postdoctoral Affairs	0.1	0.1	0.3	0.2
AVP Indigenous Relations	-	-	-	0.1
AVP Academic	0.3	0.7	0.6	0.8
Library	1.0	1.2	1.1	1.6
Legal & Immigration Services	-	-	0.1	0.1
Registrar incl. Student Service Centre	3.3	3.5	4.1	3.9
Academic Support Total	$13.5	$15.4	$20.2	$23.5
Vice-President, Administration & Finance				
Office of the VP Administration & Finance	0.1	0.3	0.2	0.8
Safety Office	0.2	0.7	0.4	0.4
Special Constable Services	1.1	1.4	1.2	1.2
Sustainability Office	-	-	0.8	0.1
Facilities	9.5	11.6	13.4	12.5
Finance	0.8	0.6	0.6	0.8
Human Resources	0.3	0.4	0.6	1.2
Information Systems & Technology	4.4	2.4	4.6	6.6
VPAF Total	$16.4	$17.5	$21.7	$23.7
Vice-President, Research and International				
Office of the VP University Research	2.0	2.2	2.3	2.1
Office of Research	0.4	0.3	0.6	1.0
University Research Centres	4.0	5.7	6.6	4.9
Waterloo International	0.2	0.4	0.5	0.5
Waterloo Ventures	2.4	2.3	3.4	3.0
VPRI Total	$9.2	$10.9	$13.5	$11.5
Vice-President, Advancement				
Office of the VP Advancement	-	0.1	0.2	0.2
AVP Engagement	0.9	1.1	1.3	1.4
AVP Development	-	0.1	-	-
AVP Advancement Services	0.4	0.3	0.3	0.7
Principal Giving & Strategy	-	-	0.1	-
VPA Total	$1.5	$1.6	$1.9	$2.4
Vice-President, University Relations				
Office of the VP University Relations	0.9	1.3	1.9	1.8
Marketing & Strategic Initiatives	2.3	1.3	1.4	1.2
VPUR Total	$3.2	$2.6	$3.3	$3.0

Table 13: Unit Level Non-Salary Expenses

Capital Projects Report

Capital and renovation and maintenance projects are prioritized by faculties and units and managed centrally by the Planning, Design, and Construction group (PD&C). The capital projects included in this report include projects managed by the PD&C team and include costs related to construction, equipment, and furniture.

All capital projects with contracts over $5M are approved by the Building and Properties Committee; all capital projects with contracts over $10M are recommended by the Building and Properties Committee and approved by the Board of Governors. A three-year forecast for maintenance priorities is provided to the Building and Properties Committee. The President's Advisory Committee on Design (PACOD) meets regularly throughout the year and provides feedback on land use requests and building design for significant projects. PACOD includes representatives from various groups including students, academic administration, the school of Architecture, the School of Planning, the Indigenous Office, and Accessibility. Campus maintenance projects are provided for information to the Building and Properties Committee.

Major Capital Projects

Table 14 provides costs for major capital projects for the fiscal years ending April 30, 2020 (F2020) to April 30, 2028 (F2028). Many large projects require years of planning and design and approval processes. Costs incurred for planning and design require approval by the Building and Properties Committee. After design and cost estimates are completed, the construction and equipment costs of the project are approved and contracts for the projects are finalized.

($ millions) All Funds See Commentary Below on Funding Sources	**F2020** Actuals	**F2021** Actuals	**F2022** Actuals	**F2023** Actuals	**F2024** Actuals	**F2025** Forecast	**F2026** Forecast	**F2027** Forecast	**F2028** Forecast
Science Teaching Complex	2.8	0.5	-	-	-	-	-	-	-
Auto. Vehicle (AVRIL)	1.9	0.1	-	-	-	-	-	-	-
Campus Fieldhouse	1.3	0.1	-	-	-	-	-	-	-
Tunnels and Other	1.7	1.5	0.2	3.1	0.6	-	-	-	-
PAC/SLC Addition	10.2	14.9	1.0	0.3	0.1	-	-	-	-
Innovation Arena (1)	-	0.2	0.9	6.8	20.9	7.4	-	-	-
Earth Sciences Chemistry (2)	-	0.1	0.2	1.4	12.8	14.2	-	-	-
Graham Project (3)	-	-	-	-	-	43.0	-	-	-
Math 4 (4)	0.1	-	1.2	3.2	2.9	9.6	64.0	29.0	-
Waterloo Eye Institute (5)	-	0.3	0.4	0.2	1.1	7.0	26.5	17.0	-
Residence Building NRB26 (6)	-	-	-	0.5	2.0	15.5	65.9	46.1	-
WaterFEL (7)	-	-	-	-	-	2.0	30.6	19.2	-
Total	**18.0**	**17.7**	**3.9**	**15.5**	**40.4**	**98.7**	**187.0**	**111.3**	**-**

Table 14: Cost Overview for Major Capital Projects

In Table 14, F2025 to F2028 represent forecast amounts based on approved project budgets; all projects in progress are within their respective approved budgets.

As illustrated in Figure 10, there are three funding sources for the capital projects of Table 14:

- *Student fees* are billed and collected specific to funding the PAC/SLC addition based on a past student referendum, and Housing residence fees which are funding the residence building NRB26 and tunnels;
- *Grants and donations,* which have supported the Innovation Arena, ESC, Graham Project, Waterloo Eye Institute, and WaterFEL;
- *Operating reserves*, via central and faculty contributions, are set aside and accumulate over time to support all other projects.

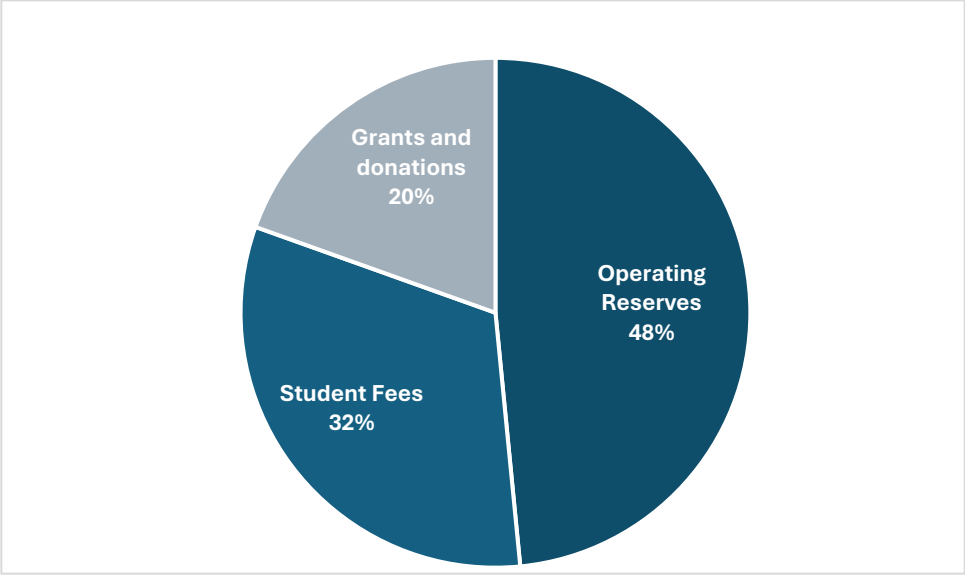


Figure 10: Funding Sources for Major Capital Projects (F2020 to F2028)

Repairs & maintenance and renovations for the residence buildings are funded through residence fees, minor repairs for other buildings are funded by the operating budget. Large, deferred maintenance projects are managed with operating funds (one-time funds set aside for significant projects and ongoing allocations through the annual operating budget), and the Ontario facilities renewal grant (FRP). Certain projects are supported through internal loans or external debt such that the funding sources can pay for the projects over time. The University did not have any external debt as at April 30, 2024, and is finalizing a previously-approved construction loan of approximately $85M to support the Residence Building NRB26. The three-year operating budget forecast includes the increased estimated operating costs for the new buildings as they come online.

1. Innovation Arena – Downtown Kitchener $36.2M

In October 2022, the Board approved a budget of $36.2M for the renovation of the former Ontario Seed Company building located at the downtown Kitchener campus. The second floor of the renovated building is the new home of Velocity. In September 2024, the University received building occupancy and moved Velocity from its previous location across the street at leased space with Communitech.

Funding – The renovation project was funded by $18.5M in donations and grants and $17.7M in university capital funds.

2. Earth Sciences and Chemistry (ESC) Renovations $28.7M

In March 2023, the Board approved a budget of $28.7M for renovations of the ESC building on Main Campus. These renovations included upgrades to the labs and equipment and updates to address maintenance needs. The renovation project will be completed in April 2025 and is expected to be completed under budget.

Funding – The renovation project was funded by $1.2M through FRP grants $13.7M from the Faculty of Science and $13.8M from university capital funds. No internal or external loans are required.

3. Graham Advanced Research Computing System $43.0M

In January 2024, the University of Waterloo was successful in securing $43.0M from Alliance and Compute Ontario to upgrade equipment for the Graham Centre in the Math & Computing Building. The funding includes construction costs ($3.0M) and equipment ($40.0M). Despite a tight timeline, the system is expected to be operational by March 31, 2025.

Funding – All costs for the project are funded by grants. The University has made an additional contribution to the project which consisted of $3.9M in a heat exchange project already funded through previous deferred maintenance and sustainability projects.

4. Math 4 $110.0M

In October 2022, the Board approved a budget of $110.0M for construction of the Math 4 building. Construction began in July 2024 and will continue until 2027. The completed building will provide additional classrooms, offices, space for a consolidated data centre, and extensive student space.

Funding – the Math 4 project includes $17.5M of university funding and $92.5M from the Faculty of Mathematics. No internal or external loans for the project are anticipated.

5. Waterloo Eye Institute $52.5M

In April 2021the Board approved a budget of $45.3M for the Waterloo Eye Institute Project. A subsequent budget $50.3M was approved in February 2023. An updated budget of $52.5M was approved in June 2024. Construction is underway and completion is expected in July 2026. During construction, certain services have been temporarily moved to leased space on Phillip Street. The Waterloo Eye Institute will include updated lab space, classrooms, and optometry practice space.

Funding – the project includes $20.4M in donations and pledges, $6.5M in university funding, and $25.6M in contributions from the Faculty of Science. No internal or external loans for the project are anticipated.

6. **New Residence NRB 2026 $130.0M**

In October 2023, the Board approved a budget of $135.0M for the building of a new residence. This budget was reduced to $130.0M in June 2024 due to the federal and provincial HST rebates provided for student residence buildings. Construction began in June 2024 and completion is expected in fall 2026. The residence will have over 500 beds and will be connected to the Claudette Millar Hall Residence by a pedestrian bridge over the LRT tracks. The residence is funded through the ancillary fund (i.e., by student residence fees).

Funding – The building is funded by approximately $45M from existing ancillary funds and will require approximately $85M of external debt. The external debt will be paid through the ancillary fund over a 25-year amortization period. The residence fee revenue will fund the principal and the interest related to the debt.

7. **WaterFEL $51.8M**

The Free Electron Laser project (WaterFEL) was approved by the Board in June 2024. This project is supported by a Canadian Foundation for Innovation (CFI) grant of $13.1M for equipment and installation of the free electron laser. A separate grant of $3.5M will cover operating costs for the first five years of operation. Various locations for the project were considered and a location on North Campus was selected.

Funding – The building is expected to cost approximately $39M and will be funded by the Faculty of Science through operating funds (one-time funds on hand and internal loan to be repaid with operating funds). The CFI grant covers the funding needed for the equipment.

Other Capital Projects

Each year, renovation projects are considered across campus to improve student services and to update required space. These projects are funded through various sources including operating funds (such as the University Fund Faculty budgets or carryforward balances or academic support unit budgets), donations, or research funds. During the past year, the following projects over $2M were completed or in final stages of completion:

- Hagey Theatre equipment and lighting upgrades ($4.0M)
- Needles Hall Student Services renovations ($2.7M)
- Indigenous Outdoor Gathering Space ($2.5M)
- East Campus Hall Longhouse Labs - fully funded through grants($2.8M)
- Needles Hall phase two space renovations ($3.1M)

Deferred maintenance projects are tracked and reported separately. Due to ongoing fiscal constraints and deferred maintenance needs of the University, priority for future projects will include renovations that address maintenance, safety, and accessibility needs of the campus. Projects that can be funded through research grants, other grants, and donations will also be prioritized.

Projects in Planning Phases

As the University completes an updated campus plan, additional renovation and building projects will be considered as funding allows and in alignment with the updated campus plan expected to be complete in February 2026. The University will also consider buildings that may require demolition and costs associated with space changes and demolition expenses as part of the longer-term plan.

Each year, faculty from the University apply for Canadian Foundation for Innovation (CFI) grants which are often matched with Ontario Research Fund (ORF) grants. These grants support capital and renovation costs related to the grants. Commitments are made during the application phase so that projects can proceed with a defined timeline and budget when the grants are announced. In the past, faculties have applied separately for the grants with some input from the Planning, Construction, and Design Group. During the past year, the Office of Research worked closely with the faculties, space planning, the president and provost offices and the PC&D team to better align priorities, collaborations across faculties, and proposed locations. When funding is announced, final planning and approval for the projects will occur. Applications for this year include an MRI machine, and a data centre in the new Math 4 building,

Projects currently in the planning phase include the following:

- Geothermal Bore Holes Project $3.7M (funded by CFI grant)
- Innovation Arena Main Floor Fit Out Project
- Indigenous Land Based Learning Site – North Campus
- Engineering classroom renovations (funded by donations)

At this time, there are no large building projects in the planning phase.

Capital Project and Space Allocation Committee (CAPS)

In order to prioritize and properly plan upcoming capital projects, the University is putting in place a Capital Project and Space Allocation Committee (CAPS). This internal committee will review all capital, renovation, and maintenance projects over $100,000. The purpose of the committee is to assess requests, consider alternate options, ensure appropriate funding, and recommend projects for approval. Due to fiscal and internal resource constraints, the committee will carefully consider future projects to ensure they are aligned with the campus plan activities, maintenance priorities, and student space and classroom requirements.

Deferred Maintenance

The University of Waterloo has significant deferred maintenance liabilities due to aging buildings and increasing costs of repairs. Over the past two years, additional review and a prioritization process was put in place to identify urgent maintenance projects. Internal resources are also being considered to ensure that the infrastructure and energy team has the appropriate experience to manage complex maintenance projects. Sustainability projects are also considered as part of the prioritization process.

Deferred Maintenance is defined as work on the maintenance of physical facilities that has been deferred on a planned or unplanned basis to a future cycle. Universities across Ontario use a capital-asset management system to assess, track, and report on the condition of facilities. Each major component of a building – roof section, classrooms, heating, ventilation, air-conditioning systems, etc. are assessed to determine an estimated liability related to maintenance. These cost forecasts provide valuable information about the University's building to identify and plan for maintenance.

Over the past two years, a more formal assessment of priority projects across the University began to better identify the urgent / priority projects. With limited funding and building the resources for an internal team, a more formal process for prioritizing projects has been put in place. Updates on the priority projects over the next three years for maintenance and sustainability are shared with the Building & Properties Committee.

In the past, the University has relied on Facilities Renewal Program (FRP) grants to funding deferred building maintenance needs. These grants, provided by the provincial government to post-secondary institutions, contribute approximately $7M to Waterloo per year. Additional funding has been provided over the years as needed for specific maintenance projects. In 2022/23, the University began allocating $6M per year from the operating budget towards deferred maintenance projects. In 2025/ 2026 this budget has been increased to $11M per year.

The maintenance projects for the residences are funded through the ancillary fund and are covered by student residence fees. The multi-year financial plan for the Campus Housing (ancillary fund) takes into account costs of building the new residence currently under construction.

Repairs, Maintenance, and Renovation Costs

Actuals ($ millions)	**F2020**	**F2021**	**F2022**	**F2023**	**F2024**
Betterments (capital)*	-	-	-	4.5	0.9
Building Equipment (capital)*	8.3	4.4	7.4	8.7	14.7
Site Improvements (capital)*	0.4	-	0.1	0.7	3.1
Alterations / Renovations	14.2	9.4	11.6	8.9	10.4
Site improvement expenses	0.7	1.3	0.8	0.3	0.3
Building maintenance	5.6	5.1	3.2	2.7	3.0
Equipment maintenance	2.4	2.3	2.5	2.8	4.5
Network maintenance	0.1	0.1	-	0.4	0.2
Total	**31.7**	**22.6**	**25.6**	**29.0**	**37.1**
Funding Source:					
Ancillary	7.6	5.6	3.0	4.1	4.4
Research	2.4	2.8	2.3	3.7	2.7
Operating / Reserves	21.7	14.2	20.3	21.2	30.0
Total	**31.7**	**22.6**	**25.6**	**29.0**	**37.1**

Table 15: Repairs and Maintenance (R&M) Expenses and Capital Investments

Over the past five years, repairs, maintenance, and renovation costs have been funded through the ancillary fund (Campus Housing and Food Services), research funds (grants and funding for renovation, equipment replacements) and operating (one-time funds for priority projects and faculty funded repairs and maintenance (R&M) and renovations). For accounting purposes, some

of these projects are considered expenses and some are capitalized as assets that are depreciated over their useful lives. All expenses and capital investments related to R&M and renovations are summarized in Table 15.

In Table 15, some major capital projects (starred) include budgets for R&M. For example, the ESC project includes significant replacement and betterment costs. New buildings or additions to existing buildings are not included in this summary as they represent new assets of the University.

The significant costs over the past five years are driven by a focus on renovating existing buildings and addressing deferred maintenance liabilities.

Priority Deferred Maintenance and Sustainability Projects

($ millions)	**Forecast 2024/25**	**Budget 2025/26**	**Projected 2026/27***	**Projected 2027/28***
Maintenance	11.9	18.5	22.7	31.1
Sustainability	6.4	4.6	8.7	7.0
Ancillary	5.0	5.0	5.0	5.0
Total	**23.3**	**28.1**	**36.4**	**43.1**
Funding Source				
FRP Grant	7.0	7.0	7.0	7.0
Ongoing Operating	6.0	11.0	11.0	11.0
Ancillary	5.0	5.0	5.0	5.0
Capital Reserves	5.3	5.1	-	-
Unfunded	**-**	**-**	**13.4**	**20.1**

Table 16: Priority Deferred Maintenance and Sustainability Projects

Spending on priority projects is listed in Table 16. As many of these projects are multi-year, there are commitments shown extending into 2026/27 and 2027/28. Other priority projects are being reviewed to ensure that limited resources can be used to maximize the impact for needed repairs across campus.

The FRP grant is confirmed each year by the Ministry of Colleges and Universities (MCU). The projections for future years are based on the expectation that the grant will continue at its current levels, but this funding is not yet confirmed.

One-time funds have been used to address critical maintenance projects. Due to the University's operating deficit position, there are no additional one-time funds available to supplement the deferred maintenance projects. To meet urgent maintenance needs for 25/26 and beyond, the University will need to consider financing arrangements or additional operating fund contributions to support future projects. Allocation of operating budget would be required over time to service and repay the debt.

During the past year, the following projects over $2M were completed or in final stages of completion. Most maintenance projects require one year to plan and two to three years to complete.

- Hagey Theatre safety upgrades and maintenance ($2.3M)
- Heat Recovery Chiller ($4.0M)
- Replace Primary Electrical Feed ($5.4M)
- Replace Chiller Plan ($7.7M)

The following significant maintenance projects are in progress with expected completion by F2027:

- Sustainability project – submetering final phases ($6.1M)
- PAC HVAC and roof replacement ($6.7M)

The following significant maintenance projects are in the planning phase:

- CIF boiler and distribution replacement ($5M to $9M)
- HV cable upgrades ($5M)
- Transformer / Distribution replacement ($5.5M)
- Chemistry 2 roof, electrical, and mechanical replacement (TBD)

Deferred Maintenance to Current Replacement Value

Universities in Ontario receive significantly less funding for maintenance than other provinces in Canada and require additional operating funds to support maintenance needs. Universities also track the Facility Condition Index which calculates the ratio of deferred maintenance to current replacement value. The table below outlines this calculation for the University's non-residence and residence buildings.

For 2024/25 the reports indicate that deferred maintenance at the University is $626 million for non-residential building and $181 million for residence buildings, leading to the resulting Facility Condition Index shown in Table 17. Major components of deferred maintenance include mechanical and electrical requirements, as well as roofs and windows.

	Non- Residence Buildings	Residence Buildings
Current Replacement Value	$3,448 million	$897 million
Deferred Maintenance	$626 million	$181 million
DM/CRV	18.2%	20.2%

Table 17: Facility Condition Index for 2024/25.

The University aims to keep the calculated ratio under 20% as way to measure the condition of the facilities. Due to the age of the buildings, some buildings require more critical repairs than others. The deferred maintenance liability estimate also includes buildings that may be considered for demolition. These buildings are managed by addressing short term requirements without the need for full replacement of building components.

For buildings and building components expected to last for 50 years, annual maintenance should approximate 2% of replacement value. For non-residence buildings this would result in $68 million in maintenance costs per year. For the residence buildings, the maintenance costs would be $18M per year. Over the past few years, this estimate has increased due to the significant increase in construction and maintenance costs.

As the University updates the Campus Housing Plan and the Campus Plan, future plans for space and buildings will help to identify which buildings will require maintenance and which buildings will need to be considered for future demolition. These decisions will also help to address the deferred maintenance liability and to set priorities.

Resources and Financing

When one-time funds on hand allow, the University can provide internal loans, summarized in Table 18, for certain capital projects. These loans are secured by future cash flows including residence fees and student fees.

($ millions)	**Balance**	**Repayment Period**	**Funding**
UWP and MKV Student Residences	8.2	5 years	Residence Fees
Claudette Millar Hall	22.2	15 years	Residence Fees
Student Life Centre / PAC addition	21.5	14 years	Student Fees

Table 18: Internal Loan Balances (as of April 2025)

As one-time funds on hand are expected to decline in upcoming years, the University will limit additional internal loans and consider external borrowing options. All construction projects in progress will be funded with existing one-time funds on hand, including central funds and faculty carryforward balances. The WaterFEL project will require a partial internal loan, and the new residence will be partially funded through external debt. The University has the one-time funds on hand to support the internal loan needs for the WaterFEL project.

Universities across Ontario are also considering other financing options to address maintenance costs, particularly for residence buildings.

An updated debt policy has been drafted to be approved in spring 2025. The updated policy will provide guidance on the University's level of external debt and process for approval.

As planning for maintenance and renovation projects continues, appropriate resources will also be required. The Infrastructure, Energy, and Sustainability teams will be adding resources to support upcoming maintenance and sustainability projects. Large multi-year projects require specialized consultants and engineers. Preventative maintenance and processes will also need to be prioritized to ensure that buildings remain in a good condition when large replacement projects need to be planned and executed.

UNIVERSITY OF WATERLOO | Senate

For Approval **Open Session**

To:	Senate
From:	Senate Graduate and Research Council
Presenter(s):	Charmaine Dean Vice-President, Research & International Clarence Woudsma Interim Co-Associate Vice-President, Graduate Studies and Postdoctoral Affairs
Date of Meeting:	April 7, 2025
Agenda Item:	**7.1 Senate Graduate and Research Council: Faculty of Arts**

Recommendation/Motion

Motion: That Senate approve the major modifications to the PhD in Psychology effective May 1, 2025; MA in English - Critical Media Studies, and MA in English - Critical Media Studies (Co-op) effective September 1, 2025, as presented.

Summary

Senate Graduate and Research Council met on March 17, 2025 and agreed to forward the following items to Senate for approval as part of the regular agenda.

a. PhD in Psychology
b. MA in English - Critical Media Studies
c. MA in English - Critical Media Studies (Co-op)

Purpose/Rationale

Phd in Psychology

Updating the degree requirements to include a new Graduate Research Field called "General Psychology" and clarify a pre-requisite for the Industrial/Organizational Psychology (IO) graduate research field: Psychology currently has 6 Graduate Research Fields. To accommodate flexibility in course selection for graduate students we are adding a "General Psychology" graduate research field. This will allow, for example, a student whose research focus crosses the boundaries of our current disciplinary structure to better customize their associated courses to complement that focus. The General Psychology graduate research field has the same course number requirements and distribution (i.e., core, breadth, statistics) as most of the other Graduate Research Fields. We have long allowed students this flexibility informally with some success. This change will formalize this process administratively. With respect to clarifying the pre-requisite for the IO graduate research

field. This requirement is already in place in practice just not currently reflected in the GSAC. The change will rectify this issue.

MA in English - Critical Media Studies and MA in English - Critical Media Studies (Co-op)

Changing the names of the "Master of Arts (MA) in English - Experimental Digital Media" programs to "Master of Arts (MA) in English - Critical Media Studies": The motion for changing the name of the MA in English - Experimental Digital Media (XDM) program comes out two exigencies: 1) declining enrollments in the XDM program; 2) the need for English's digital program to be flexible and dynamic in its name as to adjust with changing technologies and changing fields that engage with these technologies. Faculty who currently teach in the program have determined, in consultation with similar programs in the province, that it has been facing declining enrollments in part because students post-COVID in this study area are opting to enroll in programs that seem less "experimental" and more traditional, in some ways. Changing the name of the XDM program to "Critical Media Studies" [CMS] not only is in alignment with this changing student preference, but it continues to reflect what English faculty in this MA stream do (highlighting faculty expertise in fields such as media theory, tech ethics, feminist media studies, social media studies, critical design, device and interface analysis, and game studies). The name change from XDM to CMS importantly retains a clear and designated connection between Critical Media Studies and the Critical Media Lab, which has long been a centre of activity for these English MA students (students are currently required to complete elements of the degree with the Critical Media Lab). Renaming the program thus provides greater correlation between the degree itself and locations for student activity within the degree.

We anticipate that this name change will not only help in recruiting students to this MA program from local undergraduate programs that have an emphasis on both English and Critical Media Studies (such as Western's Media, Information, and Technoculture program or Trent University's Media Studies program), but also be appealing to a number of University of Waterloo Communication Arts undergraduate students who may be studying in this area and seeking hands-on application at the graduate level of ideas in critical media studies.

Jurisdictional Information

This item is being submitted to Senate in accordance with Senate Bylaw 2, section 4.03: "Consider, study and review all proposals for new graduate programs, the deletion of graduate programs, major changes to existing graduate programs, arrange for internal appraisals as the council shall see fit, and make recommendations to Senate thereon."

Governance Path

Senate Graduate and Research Council: 03/17/2025

Senate: 04/07/2025

Documentation Provided

Attachment: Faculty of Arts – Major Modifications

Meeting Information

Agenda Page Title
SGRC - Regular Agenda - Faculty of Arts - January 27, 2025

Career Level
Graduate

Faculty/Unit
Arts

Date
01/27/2025

Time

Location

Summary

Other Business

Attachment(s)

Course Proposals

Course Proposal Details

Courses: Retire
No proposals have been added.

Courses: New
No proposals have been added.

Courses: Changes
No proposals have been added.

Programs & Plans Proposals

Programs & Plans Proposal Details

Programs & Plans: Retire
No proposals have been added.

Programs & Plans: Major Modifications

Code	Title	Type	Workflow Step
PhD in Psychology	Doctor of Philosophy (PhD) in Psychology	Program	SGRC, Senate Graduate and Research Council (SGRC) | Under Review
MA in English-Critical Media Studies	Master of Arts (MA) in English - Critical Media Studies	Program	SGRC, Senate Graduate and Research Council (SGRC) | Under Review
MA in English-Critical Media Studies-Co-op	Master of Arts (MA) in English - Critical Media Studies - Co-operative Program (direct entry)	Program	SGRC, Senate Graduate and Research Council (SGRC) | Under Review

Programs & Plans: Minor Modifications

No proposals have been added.

Regulations Proposals

Regulations Proposal Details

Regulations: Retire

No proposals have been added.

Regulations: New

No proposals have been added.

Regulations: Changes

No proposals have been added.

PhD in Psychology
Doctor of Philosophy (PhD) in Psychology

Under Review | Spring 2025

Proposal Information

Status
Active

Workflow Status
In Progress

SGRC, Senate Graduate and Research Council (SGRC) expand ▲
Waiting for Approval | Approval Delegate(s)

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

Changes

- Calendar Activation Date
- Graduate Course Requirements
- Graduate Research Fields
- Effective Term and Year
- Admin Notes

Effective Date and Career

Career
Graduate

Important!

Proposed
Effective Term and Year
Spring 2025

Existing
Effective Term and Year
Winter 2024

Proposal Details

Proposal Type
Change

Academic Unit Approval
09/10/2024

Quality Assurance Designation
Major Modification

Major Modification Categories
Add/re-name a graduate research field, graduate specialization, honours, option, specialization, undergraduate diploma, minor

Is there an impact to existing students?
Yes

Impact on Existing Students
No impact for the most part. Students who currently have arrangements that mirror the formal “General Psychology” GRF will receive that designation when they graduate (assuming they meet the requirements).

Is the credential name changing?
No

Graduate Co-operative Requirements
Not Applicable

Internship Requirements
Not Applicable

Rationale and Background for Change(s)
Updating the degree requirements to include a new Graduate Research Field called “General Psychology” and clarify a pre-requisite for the Industrial/Organizational Psychology (IO) graduate research field: Psychology currently has 6 Graduate Research Fields. To accommodate flexibility in course selection for graduate students we are adding a “General Psychology” graduate research field. This will allow, for example, a student whose research focus crosses the boundaries of our current disciplinary structure to better customize their associated courses to complement that focus. The General Psychology graduate research field has the same course number requirements and distribution (i.e., core, breadth, statistics) as most of the other Graduate Research Fields. We have long allowed students this flexibility informally with some success. This change will formalize this process administratively.
With respect to clarifying the pre-requisite for the IO graduate research field. This requirement is already in place in practice just not currently reflected in the GSAC. The change will rectify this issue.

Consultations (Departmental)

Supporting Documentation

General Program/Plan Information

Faculty
Faculty of Arts

Academic Unit
Department of Psychology

Graduate Field of Study
Psychology

Faculty
Faculty of Arts

Program/Plan Name
Doctor of Philosophy (PhD) in Psychology

Graduate Credential Type

Accelerated Program

PhD

Not applicable

Program Types

Admit Term(s)

Fall

Delivery Mode

On-campus

Delivery Mode Information

Length of Program

- The Department requires a minimum period of registration of 9 terms beyond an Honours Bachelor's degree or 6 terms beyond a Master's degree. While a PhD may be obtained within 9 terms of an Honours BA, a period of 12 to 18 terms is typical.

Registration Option(s)

Full-time

Registration Options Information

Proposed

Graduate Research Fields

- Clinical Psychology
- Cognitive Neuroscience
- Cognitive Psychology
- Developmental Psychology
- General Psychology
- Industrial/Organizational Psychology
- Social Psychology

Existing

Graduate Research Fields

- Clinical Psychology
- Cognitive Neuroscience
- Cognitive Psychology
- Developmental Psychology
- Industrial/Organizational Psychology
- Social Psychology

Graduate Specializations

Additional Program Information

- Students admitted to the Clinical Psychology field (area of research) of the PhD program must supply a Criminal Record Check (Vulnerable Sector) to the Department of Psychology prior to being matriculated.

Admissions

Admission Requirements: Minimum Requirements

- A 80% overall standing, or equivalent, in the last two years of study in the previous degree is the minimum requirement for admission.
- Candidates applying to the Industrial/Organizational Psychology graduate research field within the program must submit results from the Graduate Record Examination (Verbal, Quantitative, and Analytic scores). These scores are optional for students applying to the Cognitive Neuroscience, Cognitive Psychology, and Developmental Psychology graduate research fields.
- Please note that in most areas a Master's degree is not required for admission into the PhD program (the exception is Social Psychology and Clinical Psychology).
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Graduate Record Examination (GRE)
    - Required for candidates applying to the Industrial/Organizational Psychology graduate research field within the program and optional for candidates applying to the Cognitive Neuroscience, Cognitive Psychology, and Developmental Psychology graduate research fields.
- Personal statement
- Supplementary information form
- Transcript(s)

Admission Requirements: References

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

Requirements Information

Graduate Degree Requirements

- Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).
- Students must be admitted to one of the following Graduate Research Fields:
    - Clinical Psychology
    - Cognitive Neuroscience
    - Cognitive Psychology
    - Developmental Psychology
    - Industrial/Organizational Psychology
    - Social Psychology

Graduate Course Requirements

No Rules

Proposed

Graduate Course Requirements

- Course requirements are determined by the student's previous academic background and their Graduate Research Field.
- Where applicable course requirements for students entering with a Bachelors degree or equivalent or an MA degree from the University of Waterloo in the Graduate Research Field in which they are completing their PhD are described below. Students entering directly into a PhD without completing an MA may be permitted to complete an MA during their PhD. If students have relevant academic background beyond a Bachelor's degree or equivalent but have not completed the MA degree from the University of Waterloo in the Graduate Research Field in which they are completing their PhD, then the PhD course requirements can, when deemed appropriate, be determined in consultation with the student's advisor, the Area Head, and Associate Chair, Graduate Studies in Psychology prior to admission.
- Students enrolled in the doctoral program must complete the Department's core requirements, statistics requirements (or credit granted for evidence of a strong undergraduate statistics background) and comprehensive breadth requirements as described within each Graduate Research Field's course requirements below. Courses with a numeric grading basis must be taken to meet the core and statistics requirements unless departmental permission is provided to take a course with a Credit/No Credit grading basis. For the purposes of the breadth requirement the relevant areas are listed below. Whether a course meets a breadth requirement is determined by the Graduate Research Field. If a student is unclear about whether a course will meet their breadth requirements, then they should consult with their supervisor and area head before enrolling in the course.
    - Clinical Psychology
    - Cognitive Psychology
    - Cognitive Neuroscience
    - Developmental Psychology
    - Industrial/Organizational Psychology
    - Quantitative Methods
    - Social Psychology
- All courses taken to meet degree requirements must be accepted for graduate credit by the Department of Psychology and no degree candidate can fulfil more than half of the minimum department course requirements with Credit/No Credit courses.
- Course requirements are minimum requirements only. Students may be required to take additional courses depending on their previous academic background and Graduate Research Field.
- Courses from outside the Department of Psychology may also be considered. Departmental permission is required. Note: When selecting a course from outside of the Department of Psychology, students should check with their advisor about its suitability.
- Transfer credits may also be considered. The acceptance of transfer credits from prior registration at another university will be determined in individual cases by the Associate Dean (Graduate Studies) of the Faculty at the time of admission to the program. Transfer credits must be "unused" credits (i.e., they must not have been credited towards an earlier acquired degree or other academic credential). Transfer credits must be specified in writing at the time of departmental recommendation for admission. A minimum of 70% (University of Waterloo converted grade) is required for transfer credit.
- Courses from outside the Department of Psychology and transfer credits can usually count for no more than 2 one-term credits toward breadth requirements.
- Use of a course not listed in the course requirements below to meet a degree requirement and other course substitutions are permitted but require departmental permission. Students should confirm the appropriateness of the course substitution with their advisor and have it approved by the Area head, and Associate Chair, Graduate Studies in Psychology.
- Students pursuing the **Clinical Psychology** Graduate Research Field must complete the following courses contingent upon the student's previous academic background.

- If a student enters the PhD with only a Bachelor's degree or equivalent, then the student is required to meet the course requirements beginning Year One below.
- If a student enters the PhD program having completed the MA in Psychology degree with a Clinical Psychology Graduate Research Field from the University of Waterloo, then the student is required to meet the course requirements beginning Year Three below in addition to completing any courses listed in Year One and Year Two not already completed. By the end of the PhD, students need to have completed all requirements from Year One to Year Six below or approved substitutes when courses completed during both the MA and PhD are considered. The courses are listed below in a typical sequence. Individual student's course sequences may vary, for example, based on course availability.
    - 2 statistics courses one of which must be PSYCH 630 Multiple Regression from the following list or an approved substitute:
        - PSYCH 630 Advanced Analysis of Variance
        - PSYCH 632 Multiple Regression
        - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
        - PSYCH 800 Psychometric Theory & Structural Equation Modeling
        - PSYCH 801 Advanced Structural Equation Modeling
        - PSYCH 803 Meta-Analysis
        - PSYCH 804 Multi-Level Modeling Applications in Psychology
    - 4 breadth courses from other graduate research fields outside of Clinical Psychology (e.g., not from the list of core, clinical practica, or research
      Clinical Psychology courses below) or an approved substitute. Students need to ensure that they meet the CPA breadth requirements.
    - Year One
        - Coursework (core):
            - PSYCH 716 Adult Psychopathology
            - PSYCH 717 Psychological Assessment I
            - PSYCH 718 Psychological Assessment II
            - PSYCH 719 Ethics and Professional Issues in Clinical Psychology
        - Clinical Practica:
            - PSYCH 720A Practicum in Interviewing & Cognitive Assessment I
            - PSYCH 720B Practicum in Interviewing & Cognitive Assessment II
            - PSYCH 721A Diagnostic Assessment Practicum I
            - PSYCH 721B Diagnostic Assessment Practicum II
            - PSYCH 722C Clinical Full-Time Fieldwork Placement I (0.50 unit weight) or PSYCH 811C Clinical Part-Time Fieldwork Placement I (0.25 unit weight)
        - Research Activities:
            - PSYCH 621 Advanced Clinical Research Forum I
        - Year Two
            - Coursework (core):
                - PSYCH 723 Child Psychopathology and Psychotherapy
                - PSYCH 724 Personality & Measurement Theory
                - PSYCH 725 Cognitive Behaviour Therapy
            - Clinical Practica:
                - PSYCH 726A Practicum in Integrated Assessment I
                - PSYCH 726B Practicum in Integrated Assessment II
                - Elective: PSYCH 738A, PSYCH 738B, PSYCH 738C Clinical Fieldwork Placement II (optional, by approval). Note: Students must have completed PSYCH 722C Clinical Full-Time Fieldwork Placement I or a set of 2 of PSYCH 811A, PSYCH 811B, and PSYCH 811C Clinical Part-Time Fieldwork Placement I, before they are eligible to take PSYCH 738A, PSYCH 738B, PSYCH 738C Clinical Fieldwork Placement II.
            - Research Activities:
                - PSYCH 621 Advanced Clinical Research Forum II
        - Year Three

        - Coursework (core):
            - PSYCH 727 Efficacy and Program Evaluation
            - PSYCH 728 Psychotherapy: Classical Roots & Contemporary Developments
        - Clinical Practica:
            - PSYCH 729A, PSYCH 729B, PSYCH 729C Child and Adolescent Psychotherapy Practicum I, II, III
            - PSYCH 730A, PSYCH 730B, PSYCH 730C Adult Psychotherapy Practicum I, II, III
            - Elective: PSYCH 738A, PSYCH 738B, PSYCH 738C Clinical Fieldwork Placement II (optional, by approval). Note: Students must have completed PSYCH 722C Clinical Full-Time Fieldwork Placement I or a set of 2 of PSYCH 811A, PSYCH 811B, and PSYCH 811C Clinical Part-Time Fieldwork Placement I, before they are eligible to take PSYCH 738A, PSYCH 738B, PSYCH 738C Clinical Fieldwork Placement II.
        - Research Activities:
            - PSYCH 621 Advanced Clinical Research Forum III
    - Year Four
        - Coursework (core):
            - PSYCH 731 Emotion-Focused Therapy
        - Clinical Practica:
            - PSYCH 732A, PSYCH 732B, PSYCH 732C Child and Adolescent Psychotherapy Practicum I, II, III
            - PSYCH 733A, PSYCH 733B, PSYCH 733C Adult Psychotherapy Practicum I, II, III
            - Elective: PSYCH 737A, PSYCH 737B, PSYCH 737C Emotion-Focused Therapy Practicum
            - Elective: PSYCH 738A, PSYCH 738B, PSYCH 738C Clinical Fieldwork Placement II or PSYCH 739A, PSYCH 739B, PSYCH 739C Clinical Fieldwork Placement III (optional, by approval)
        - Research Activities:
            - PSYCH 621 Advanced Clinical Research Forum IV
    - Year Five (and beyond)
        - Clinical Practica:
            - PSYCH 734A, PSYCH 734B, PSYCH 734C Practicum in Supervision I, II, III (required of all students)
            - PSYCH 735A, PSYCH 735B, PSYCH 735C Child and Adolescent Psychotherapy Practicum I, II, III
            - PSYCH 736A, PSYCH 736B, PSYCH 736C Adult Psychotherapy Practicum I, II, III
            - Elective: PSYCH 737A, PSYCH 737B, PSYCH 737C Emotion-Focused Therapy Practicum
            - Elective: PSYCH 740A, PSYCH 740B, PSYCH 740C Senior Practicum I or PSYCH 741A, PSYCH 741B, PSYCH 741C Senior Practicum II or PSYCH 742A, PSYCH 742B, PSYCH 742C Senior Practicum III (optional, by approval)
    - Year Six
        - Students must compete a year of predoctoral residency, the successful completion of which results in the crediting of the Graduate Studies Clinical Internship milestone.
- Students pursuing the **Cognitive Neuroscience** Graduate Research Field must complete the following courses contingent upon the student's previous academic background.
- If a student enters the PhD with only a Bachelor's degree or equivalent, then the student is required to complete 12 one-term (0.50 unit weight) courses.
- If a student enters the PhD having completed the MA in Psychology degree with a Cognitive Neuroscience Graduate Research Field from the University of Waterloo, then the student is required to complete 8 one-term (0.50 unit weight) courses such that students meet all of the course requirements listed below when courses completed during both the MA and PhD are considered.
    - 2 statistics courses from the following list or an approved substitute
        - PSYCH 630 Advanced Analysis of Variance
        - PSYCH 632 Multiple Regression
        - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)

        - PSYCH 800 Psychometric Theory & Structural Equation Modeling
        - PSYCH 801 Advanced Structural Equation Modeling
        - PSYCH 803 Meta-Analysis
        - PSYCH 804 Multi-Level Modeling Applications in Psychology
    - 6 core courses in Cognitive Neuroscience including PSYCH 677A Fundamentals of Behavioural Neuroscience and PSYCH 784 Human Neuroanatomy and Neuropathology with the remaining selected from the following list or an approved substitute:
        - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
        - PSYCH 670 Special Topics in Behavioural Neuroscience
        - PSYCH 779A Cognitive Neuropsychology I
        - PSYCH 781 Cognitive Neuroscience of Memory
        - PSYCH 782 Visual Neuroscience
        - PSYCH 783 Neuroimaging of Cognition
        - PSYCH 785 Attention and the Brain
        - PSYCH 788 (cross-listed as HLTH-672) Epidemiologic Methods in Aging Research
        - PSYCH 789 Mind-wandering and Inattention
        - PSYCH 790 Case Studies in Neuropsychology
        - PSYCH 792 An Introduction to Methods in Computational Neuroscience
        - PSYCH 794 Cognitive Neuroscience of Face Perception
    - 4 breadth courses from other graduate research fields outside of Cognitive Neuroscience (e.g., not from the list of Cognitive Neuroscience core courses
      above) or an approved substitute.
    - Students must also take PSYCH 707 Cognitive Neuroscience Seminar in the Fall and Winter terms for a minimum of 4 years unless departmental permission is provided otherwise, or the student completes the program early. Students are encouraged to take PSYCH 707 for a 5th year if they have not yet finished their PhD. Note: PSYCH 707 is a 0.0 unit weight credit/no credit course.
- Students pursuing the **Cognitive Psychology** Graduate Research Field must complete the following courses contingent upon the student's previous academic background.
- If a student enters the PhD with only a Bachelor's degree or equivalent, then the student is required to complete 12 one-term (0.50 unit weight) courses.
- If a student enters the PhD having completed the MA in Psychology degree with a Cognitive Psychology Graduate Research Field from the University of Waterloo, then the student is required to complete 8 one-term (0.50 unit weight) courses such that students meet all of the course requirements listed below when courses completed during both the MA and PhD are considered.
    - 2 statistics courses including PSYCH 630 Advanced Analysis of Variance with the remaining selected from the following list or an approved substitute:
        - PSYCH 632 Multiple Regression
        - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
        - PSYCH 800 Psychometric Theory & Structural Equation Modeling
        - PSYCH 801 Advanced Structural Equation Modeling
        - PSYCH 803 Meta-Analysis
        - PSYCH 804 Multi-Level Modeling Applications in Psychology
    - 6 core courses in Cognitive Psychology from the following list or an approved substitute:
        - COGSCI 600 Seminar in Cognitive Science
        - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
        - PSYCH 650 Special Topics in Cognition and Perception
        - PSYCH 758 Applied Practicum in Cognitive Psychology
        - PSYCH 759 Research Practicum in Cognitive Psychology
        - PSYCH 769 Causal Reasoning
        - PSYCH 770 Basic Issues in Cognition
        - PSYCH 771 Basic Visual Processes
        - PSYCH 774 Visual Cognition
        - PSYCH 775 Consciousness and Cognition

        - PSYCH 776 Problem Solving, Judgment and Decision Making
        - PSYCH 777 Human Memory
        - PSYCH 778 Attention
        - PSYCH 779 Language and Reading
        - PSYCH 810 Directed Studies (on departmentally approved topics)
    - 4 breadth courses from other graduate research fields outside of Cognitive Psychology (e.g., not from the list of Cognitive Psychology courses above) or an approved substitute.
    - Students must also take PSYCH 747 Cognitive Psychology Seminar in the Fall and Winter terms for a minimum of 4 years unless departmental permission is provided otherwise, or the student completes the program early. Note: PSYCH 747 is a 0.0 unit weight credit/no credit course.
- Students pursuing the **Developmental Psychology** must complete the following courses contingent upon the student's previous academic background.
- If a student enters the PhD with only a Bachelor's degree or equivalent, then the student is required to complete 12 one-term (0.50 unit weight) courses.
- If a student enters the PhD having completed the MA in Psychology degree with a Developmental Psychology Graduate Research Field from the University of Waterloo or the MASc in Developmental and Communication Science at the University of Waterloo, then the student is required to complete 8 one-term (0.50 unit weight) courses such that students meet all of the course requirements listed below when courses completed during both the MA or MASc and PhD are considered.
    - 2 statistics courses from the following list or an approved substitute:
        - PSYCH 630 Advanced Analysis of Variance
        - PSYCH 632 Multiple Regression
        - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
        - PSYCH 800 Psychometric Theory & Structural Equation Modeling
        - PSYCH 801 Advanced Structural Equation Modeling
        - PSYCH 804 Multi-Level Modeling Applications in Psychology
    - 6 core courses in Developmental Psychology from the following list or an approved substitute:
        - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
        - PSYCH 680 Special Topics in Child Behaviour and Development
        - PSYCH 701 Foundations in Cognitive/Social Development: Basic
        - PSYCH 702 Foundations in Cognitive/Social Development: Social Cognitive Development
        - PSYCH 705 Foundations in Language Development: Basic Language Development
        - PSYCH 706 Foundations in Language Development: Pragmatics of Language
        - PSYCH 708 Reasoning about Ownership of Property
        - PSYCH 709 Reasoning about Beliefs and Desires
        - PSYCH 713 Theories of Pretense
        - PSYCH 810 Directed Studies (on departmentally approved topics)
    - 4 breadth courses from other graduate research fields outside of Developmental Psychology (i.e., not from the list of Developmental Psychology courses above) or an approved substitute.
    - Students must also take PSYCH 710 Current Issues in Developmental Psych Seminar in the Fall and Winter terms for a minimum of 4 years unless departmental permission is provided otherwise, or the student completes the program early. Note: PSYCH 710 is a 0.00 unit weight credit/no credit course.
- Students pursuing the Industrial/Organizational Psychology Graduate Research Field are required to have completed the Master of Applied Science (MASc) in Industrial and Organizational (I-O) Psychology degree from the University of Waterloo before entering the PhD program. Master's degrees in I-O psychology or related fields from other universities will be considered on a case-by-case basis.
- Students pursuing the **Industrial/Organizational Psychology** Graduate Research Field must complete the following courses:
    - 2 statistics courses from the following list or an approved substitute:
        - PSYCH 630 Advanced Analysis of Variance
        - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
        - PSYCH 800 Psychometric Theory & Structural Equation Modeling
        - PSYCH 801 Advanced Structural Equation Modeling

        - PSYCH 804 Multi-Level Modeling Applications in Psychology
    - 2 core courses in Industrial/Organizational Psychology selected from the following list or an approved substitute:
        - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
        - PSYCH 876 The Psychology of Justice in the Workplace
        - PSYCH 877 Work Motivation
        - PSYCH 878 Job Performance
        - PSYCH 883 Organizational and Management Development
        - PSYCH 884 Special Topics in Industrial & Organizational Psychology
        - PSYCH 886 Psychology of Training
        - PSYCH 888 Negotiation, Conflict Management, and Teamwork: Theory and Practice
    - 2 breadth courses from other graduate research fields outside of Industrial/Organizational Psychology (e.g., not from the list of core Industrial/Organizational Psychology courses above) or an approved substitute.
    - Students must also take PSYCH 885 Industrial and Organizational Psychology Research Seminar in the Fall and Winter terms for a minimum of 4 years unless departmental permission is provided otherwise, or the student completes the program early. Note: PSYCH 885 is a 0.00 unit weight credit/no credit course.
- Students in Industrial/Organizational Psychology must take all courses for a numeric grade unless they are only offered Credit/No Credit.
- Students pursuing the **Social Psychology** Graduate Research Field must complete the following courses contingent upon the student's previous academic background.
- If a student enters the PhD with only a Bachelor's degree or equivalent, then the student is required to complete 12 one-term (0.50 unit weight) courses.
- If a student enters the PhD having completed the MA in Psychology degree with a Social Psychology Graduate Research Field from the University of Waterloo, then the student is required to complete 8 one-term (0.50 unit weight) courses such that students meet all of the course requirements listed below when courses completed during both the MA and PhD are considered.
    - Minimum 2 statistics courses from the following list or an approved substitute:
        - PSYCH 630 Advanced Analysis of Variance
        - PSYCH 632 Multiple Regression
        - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
        - PSYCH 800 Psychometric Theory & Structural Equation Modeling
        - PSYCH 801 Advanced Structural Equation Modeling
        - PSYCH 804 Multi-Level Modeling Applications in Psychology
    - 6 core courses in Social Psychology including PSYCH 704A Social Psychology and PSYCH 870 Research Design & Methods with the remaining selected from the following list or an approved substitute:
        - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
        - PSYCH 690 Special Topics in Social and Personality
        - PSYCH 743 Advanced Intergroup Relations
        - PSYCH 744 Personality in Social Context
        - PSYCH 745 Close Relationships
        - PSYCH 746 Culture and the Mind
        - PSYCH 748 Self-Regulation and Motivation
        - PSYCH 749 Wisdom
    - 4 breadth courses from other graduate research fields outside of Social Psychology (i.e., not from the list of Social Psychology courses above) or an approved substitute. Up to 2 of these breadth courses may be additional statistics courses.
    - Students must also take PSYCH 714 Social Seminar in the Fall and Winter terms for a minimum of 4 years unless departmental permission is provided otherwise, or the student completes the program early. Note: PSYCH 714 is a 0.00 unit weight credit/no credit course.
- The General Psychology Graduate Research Field is designed to capture student research trajectories that fall outside the six main Graduate Research Fields articulated above. Students cannot be admitted into the PhD program in the General Psychology Graduate Research Field. Entry into the General Psychology Graduate Research Field and course requirements require the approval of the Associate Chair Graduate Studies in Psychology.

- Students pursuing the **General Psychology** Graduate Research Field must complete the following courses contingent upon the student's previous academic background. If a student had entered the PhD with only a Bachelor's degree or equivalent, then the student is required to complete 12 one-term (0.50 unit weight) courses. If a student had entered the PhD having completed an MA or MASC in Psychology degree from the University of Waterloo, then the student is required to complete 8 one-term (0.50 unit weight) courses such that students meet all of the course requirements listed below when courses completed during both the MA/MASC and PhD are considered.
    - 2 statistics courses selected from the following list or an approved substitute:
        - PSYCH 630 Advanced Analysis of Variance
        - PSYCH 632 Multiple Regression
        - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
        - PSYCH 800 Psychometric Theory & Structural Equation Modeling
        - PSYCH 801 Advanced Structural Equation Modeling
        - PSYCH 803 Meta-Analysis
        - PSYCH 804 Multi-Level Modeling Applications in Psychology
    - 6 core courses from one or more of the Clinical Psychology, Cognitive Neuroscience, Cognitive Psychology, Developmental Psychology, Industrial/Organizational Psychology, or Social Psychology graduate research fields.
    - 4 breadth courses from other graduate research fields outside of the graduate research fields from which the core courses are selected or an approved substitute.
    - Students must also take one of PSYCH 621, PSYCH 707, PSYCH 710, PSYCH 714, PSYCH 747, PSYCH 885 (i.e., area seminars) in the Fall and Winter terms for a minimum of 4 years unless departmental permission is provided otherwise, or the student completes the program early. Note: PSYCH 621, PSYCH 707, PSYCH 710, PSYCH 714, PSYCH 747, PSYCH 885 are 0.00 unit weight credit/no credit courses.

Existing

Graduate Course Requirements

- Course requirements are determined by the student's previous academic background and their Graduate Research Field.
- Where applicable course requirements for students entering with a Bachelors degree or equivalent or an MA degree from the University of Waterloo in the Graduate Research Field in which they are completing their PhD are described below. Students entering directly into a PhD without completing an MA may be permitted to complete an MA during their PhD. If students have relevant academic background beyond a Bachelor's degree or equivalent but have not completed the MA degree from the University of Waterloo in the Graduate Research Field in which they are completing their PhD, then the PhD course requirements can, when deemed appropriate, be determined in consultation with the student's advisor, the Area Head, and Associate Chair, Graduate Studies in Psychology prior to admission.
- Students enrolled in the doctoral program must complete the Department's core requirements, statistics requirements (or credit granted for evidence of a strong undergraduate statistics background) and comprehensive breadth requirements as described within each Graduate Research Field's course requirements below. Courses with a numeric grading basis must be taken to meet the core and statistics requirements unless departmental permission is provided to take a course with a Credit/No Credit grading basis. For the purposes of the breadth requirement the relevant areas are listed below. Whether a course meets a breadth requirement is determined by the Graduate Research Field. If a student is unclear about whether a course will meet their breadth requirements, then they should consult with their supervisor and area head before enrolling in the course.
    - Clinical Psychology
    - Cognitive Psychology
    - Cognitive Neuroscience
    - Developmental Psychology
    - Industrial/Organizational Psychology
    - Quantitative Methods
    - Social Psychology
- All courses taken to meet degree requirements must be accepted for graduate credit by the Department of Psychology and no degree candidate can fulfil more than half of the minimum department course requirements with Credit/No Credit courses.

- Course requirements are minimum requirements only. Students may be required to take additional courses depending on their previous academic background and Graduate Research Field.
- Courses from outside the Department of Psychology may also be considered. Departmental permission is required. Note: When selecting a course from outside of the Department of Psychology, students should check with their advisor about its suitability.
- Transfer credits may also be considered. The acceptance of transfer credits from prior registration at another university will be determined in individual cases by the Associate Dean (Graduate Studies) of the Faculty at the time of admission to the program. Transfer credits must be "unused" credits (i.e., they must not have been credited towards an earlier acquired degree or other academic credential). Transfer credits must be specified in writing at the time of departmental recommendation for admission. A minimum of 70% (University of Waterloo converted grade) is required for transfer credit.
- Courses from outside the Department of Psychology and transfer credits can usually count for no more than 2 one-term credits toward breadth requirements.
- Use of a course not listed in the course requirements below to meet a degree requirement and other course substitutions are permitted but require departmental permission. Students should confirm the appropriateness of the course substitution with their advisor and have it approved by the Area head, and Associate Chair, Graduate Studies in Psychology.
- Students pursuing the **Clinical Psychology** Graduate Research Field must complete the following courses contingent upon the student's previous academic background.
- If a student enters the PhD with only a Bachelor's degree or equivalent, then the student is required to meet the course requirements beginning Year One below.
- If a student enters the PhD program having completed the MA in Psychology degree with a Clinical Psychology Graduate Research Field from the University of Waterloo, then the student is required to meet the course requirements beginning Year Three below in addition to completing any courses listed in Year One and Year Two not already completed. By the end of the PhD, students need to have completed all requirements from Year One to Year Six below or approved substitutes when courses completed during both the MA and PhD are considered. The courses are listed below in a typical sequence. Individual student's course sequences may vary, for example, based on course availability.
    - 2 statistics courses one of which must be PSYCH 630 Multiple Regression from the following list or an approved substitute:
        - PSYCH 630 Advanced Analysis of Variance
        - PSYCH 632 Multiple Regression
        - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
        - PSYCH 800 Psychometric Theory & Structural Equation Modeling
        - PSYCH 801 Advanced Structural Equation Modeling
        - PSYCH 803 Meta-Analysis
        - PSYCH 804 Multi-Level Modeling Applications in Psychology
    - 4 breadth courses from other graduate research fields outside of Clinical Psychology (e.g., not from the list of core, clinical practica, or research
      Clinical Psychology courses below) or an approved substitute. Students need to ensure that they meet the CPA breadth requirements.
    - Year One
        - Coursework (core):
            - PSYCH 716 Adult Psychopathology
            - PSYCH 717 Psychological Assessment I
            - PSYCH 718 Psychological Assessment II
            - PSYCH 719 Ethics and Professional Issues in Clinical Psychology
        - Clinical Practica:
            - PSYCH 720A Practicum in Interviewing & Cognitive Assessment I
            - PSYCH 720B Practicum in Interviewing & Cognitive Assessment II
            - PSYCH 721A Diagnostic Assessment Practicum I
            - PSYCH 721B Diagnostic Assessment Practicum II

        - PSYCH 722C Clinical Full-Time Fieldwork Placement I (0.50 unit weight) or PSYCH 811C Clinical Part-Time Fieldwork Placement I (0.25 unit weight)
    - Research Activities:
        - PSYCH 621 Advanced Clinical Research Forum I
    - Year Two
        - Coursework (core):
            - PSYCH 723 Child Psychopathology and Psychotherapy
            - PSYCH 724 Personality & Measurement Theory
            - PSYCH 725 Cognitive Behaviour Therapy
        - Clinical Practica:
            - PSYCH 726A Practicum in Integrated Assessment I
            - PSYCH 726B Practicum in Integrated Assessment II
            - Elective: PSYCH 738A, PSYCH 738B, PSYCH 738C Clinical Fieldwork Placement II (optional, by approval). Note: Students must have completed PSYCH 722C Clinical Full-Time Fieldwork Placement I or a set of 2 of PSYCH 811A, PSYCH 811B, and PSYCH 811C Clinical Part-Time Fieldwork Placement I, before they are eligible to take PSYCH 738A, PSYCH 738B, PSYCH 738C Clinical Fieldwork Placement II.
        - Research Activities:
            - PSYCH 621 Advanced Clinical Research Forum II
    - Year Three
        - Coursework (core):
            - PSYCH 727 Efficacy and Program Evaluation
            - PSYCH 728 Psychotherapy: Classical Roots & Contemporary Developments
        - Clinical Practica:
            - PSYCH 729A, PSYCH 729B, PSYCH 729C Child and Adolescent Psychotherapy Practicum I, II, III
            - PSYCH 730A, PSYCH 730B, PSYCH 730C Adult Psychotherapy Practicum I, II, III
            - Elective: PSYCH 738A, PSYCH 738B, PSYCH 738C Clinical Fieldwork Placement II (optional, by approval). Note: Students must have completed PSYCH 722C Clinical Full-Time Fieldwork Placement I or a set of 2 of PSYCH 811A, PSYCH 811B, and PSYCH 811C Clinical Part-Time Fieldwork Placement I, before they are eligible to take PSYCH 738A, PSYCH 738B, PSYCH 738C Clinical Fieldwork Placement II.
        - Research Activities:
            - PSYCH 621 Advanced Clinical Research Forum III
    - Year Four
        - Coursework (core):
            - PSYCH 731 Emotion-Focused Therapy
        - Clinical Practica:
            - PSYCH 732A, PSYCH 732B, PSYCH 732C Child and Adolescent Psychotherapy Practicum I, II, III
            - PSYCH 733A, PSYCH 733B, PSYCH 733C Adult Psychotherapy Practicum I, II, III
            - Elective: PSYCH 737A, PSYCH 737B, PSYCH 737C Emotion-Focused Therapy Practicum
            - Elective: PSYCH 738A, PSYCH 738B, PSYCH 738C Clinical Fieldwork Placement II or PSYCH 739A, PSYCH 739B, PSYCH 739C Clinical Fieldwork Placement III (optional, by approval)
        - Research Activities:
            - PSYCH 621 Advanced Clinical Research Forum IV
    - Year Five (and beyond)
        - Clinical Practica:
            - PSYCH 734A, PSYCH 734B, PSYCH 734C Practicum in Supervision I, II, III (required of all students)
            - PSYCH 735A, PSYCH 735B, PSYCH 735C Child and Adolescent Psychotherapy Practicum I, II, III

        - PSYCH 736A, PSYCH 736B, PSYCH 736C Adult Psychotherapy Practicum I, II, III
        - Elective: PSYCH 737A, PSYCH 737B, PSYCH 737C Emotion-Focused Therapy Practicum
        - Elective: PSYCH 740A, PSYCH 740B, PSYCH 740C Senior Practicum I or PSYCH 741A, PSYCH 741B, PSYCH 741C Senior Practicum II or PSYCH 742A, PSYCH 742B, PSYCH 742C Senior Practicum III (optional, by approval)
    - Year Six
        - Students must compete a year of predoctoral residency, the successful completion of which results in the crediting of the Graduate Studies Clinical Internship milestone.
- Students pursuing the **Cognitive Neuroscience** Graduate Research Field must complete the following courses contingent upon the student's previous academic background.
- If a student enters the PhD with only a Bachelor's degree or equivalent, then the student is required to complete 12 one-term (0.50 unit weight) courses.
- If a student enters the PhD having completed the MA in Psychology degree with a Cognitive Neuroscience Graduate Research Field from the University of Waterloo, then the student is required to complete 8 one-term (0.50 unit weight) courses such that students meet all of the course requirements listed below when courses completed during both the MA and PhD are considered.
    - 2 statistics courses from the following list or an approved substitute
        - PSYCH 630 Advanced Analysis of Variance
        - PSYCH 632 Multiple Regression
        - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
        - PSYCH 800 Psychometric Theory & Structural Equation Modeling
        - PSYCH 801 Advanced Structural Equation Modeling
        - PSYCH 803 Meta-Analysis
        - PSYCH 804 Multi-Level Modeling Applications in Psychology
    - 6 core courses in Cognitive Neuroscience including PSYCH 677A Fundamentals of Behavioural Neuroscience and PSYCH 784 Human Neuroanatomy and Neuropathology with the remaining selected from the following list or an approved substitute:
        - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
        - PSYCH 670 Special Topics in Behavioural Neuroscience
        - PSYCH 779A Cognitive Neuropsychology I
        - PSYCH 781 Cognitive Neuroscience of Memory
        - PSYCH 782 Visual Neuroscience
        - PSYCH 783 Neuroimaging of Cognition
        - PSYCH 785 Attention and the Brain
        - PSYCH 788 (cross-listed as HLTH-672) Epidemiologic Methods in Aging Research
        - PSYCH 789 Mind-wandering and Inattention
        - PSYCH 790 Case Studies in Neuropsychology
        - PSYCH 792 An Introduction to Methods in Computational Neuroscience
        - PSYCH 794 Cognitive Neuroscience of Face Perception
    - 4 breadth courses from other graduate research fields outside of Cognitive Neuroscience (e.g., not from the list of Cognitive Neuroscience core courses
      above) or an approved substitute.
    - Students must also take PSYCH 707 Cognitive Neuroscience Seminar in the Fall and Winter terms for a minimum of 4 years unless departmental permission is provided otherwise, or the student completes the program early. Students are encouraged to take PSYCH 707 for a 5th year if they have not yet finished their PhD. Note: PSYCH 707 is a 0.0 unit weight credit/no credit course.
- Students pursuing the **Cognitive Psychology** Graduate Research Field must complete the following courses contingent upon the student's previous academic background.
- If a student enters the PhD with only a Bachelor's degree or equivalent, then the student is required to complete 12 one-term (0.50 unit weight) courses.
- If a student enters the PhD having completed the MA in Psychology degree with a Cognitive Psychology Graduate Research Field from the University of Waterloo, then the student is required to complete 8 one-term (0.50 unit weight)

courses such that students meet all of the course requirements listed below when courses completed during both the MA and PhD are considered.

- 2 statistics courses including PSYCH 630 Advanced Analysis of Variance with the remaining selected from the following list or an approved substitute:
  - PSYCH 632 Multiple Regression
  - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
  - PSYCH 800 Psychometric Theory & Structural Equation Modeling
  - PSYCH 801 Advanced Structural Equation Modeling
  - PSYCH 803 Meta-Analysis
  - PSYCH 804 Multi-Level Modeling Applications in Psychology
- 6 core courses in Cognitive Psychology from the following list or an approved substitute:
  - COGSCI 600 Seminar in Cognitive Science
  - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
  - PSYCH 650 Special Topics in Cognition and Perception
  - PSYCH 758 Applied Practicum in Cognitive Psychology
  - PSYCH 759 Research Practicum in Cognitive Psychology
  - PSYCH 769 Causal Reasoning
  - PSYCH 770 Basic Issues in Cognition
  - PSYCH 771 Basic Visual Processes
  - PSYCH 774 Visual Cognition
  - PSYCH 775 Consciousness and Cognition
  - PSYCH 776 Problem Solving, Judgment and Decision Making
  - PSYCH 777 Human Memory
  - PSYCH 778 Attention
  - PSYCH 779 Language and Reading
  - PSYCH 810 Directed Studies (on departmentally approved topics)
- 4 breadth courses from other graduate research fields outside of Cognitive Psychology (e.g., not from the list of Cognitive Psychology courses above) or an approved substitute.
- Students must also take PSYCH 747 Cognitive Psychology Seminar in the Fall and Winter terms for a minimum of 4 years unless departmental permission is provided otherwise, or the student completes the program early. Note: PSYCH 747 is a 0.0 unit weight credit/no credit course.

- Students pursuing the **Developmental Psychology** must complete the following courses contingent upon the student's previous academic background.
- If a student enters the PhD with only a Bachelor's degree or equivalent, then the student is required to complete 12 one-term (0.50 unit weight) courses.
- If a student enters the PhD having completed the MA in Psychology degree with a Developmental Psychology Graduate Research Field from the University of Waterloo or the MASc in Developmental and Communication Science at the University of Waterloo, then the student is required to complete 8 one-term (0.50 unit weight) courses such that students meet all of the course requirements listed below when courses completed during both the MA or MASc and PhD are considered.
  - 2 statistics courses from the following list or an approved substitute:
    - PSYCH 630 Advanced Analysis of Variance
    - PSYCH 632 Multiple Regression
    - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
    - PSYCH 800 Psychometric Theory & Structural Equation Modeling
    - PSYCH 801 Advanced Structural Equation Modeling
    - PSYCH 804 Multi-Level Modeling Applications in Psychology
  - 6 core courses in Developmental Psychology from the following list or an approved substitute:
    - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
    - PSYCH 680 Special Topics in Child Behaviour and Development
    - PSYCH 701 Foundations in Cognitive/Social Development: Basic
    - PSYCH 702 Foundations in Cognitive/Social Development: Social Cognitive Development
    - PSYCH 705 Foundations in Language Development: Basic Language Development

        - PSYCH 706 Foundations in Language Development: Pragmatics of Language
        - PSYCH 708 Reasoning about Ownership of Property
        - PSYCH 709 Reasoning about Beliefs and Desires
        - PSYCH 713 Theories of Pretense
        - PSYCH 810 Directed Studies (on departmentally approved topics)
    - 4 breadth courses from other graduate research fields outside of Developmental Psychology (i.e., not from the list of Developmental Psychology courses above) or an approved substitute.
    - Students must also take PSYCH 710 Current Issues in Developmental Psych Seminar in the Fall and Winter terms for a minimum of 4 years unless departmental permission is provided otherwise, or the student completes the program early. Note: PSYCH 710 is a 0.00 unit weight credit/no credit course.
- Students pursuing the **Industrial/Organizational Psychology** Graduate Research Field must complete the following courses:
    - 2 statistics courses from the following list or an approved substitute:
        - PSYCH 630 Advanced Analysis of Variance
        - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
        - PSYCH 800 Psychometric Theory & Structural Equation Modeling
        - PSYCH 801 Advanced Structural Equation Modeling
        - PSYCH 804 Multi-Level Modeling Applications in Psychology
    - 2 core courses in Industrial/Organizational Psychology selected from the following list or an approved substitute:
        - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
        - PSYCH 876 The Psychology of Justice in the Workplace
        - PSYCH 877 Work Motivation
        - PSYCH 878 Job Performance
        - PSYCH 883 Organizational and Management Development
        - PSYCH 884 Special Topics in Industrial & Organizational Psychology
        - PSYCH 886 Psychology of Training
        - PSYCH 888 Negotiation, Conflict Management, and Teamwork: Theory and Practice
    - 2 breadth courses from other graduate research fields outside of Industrial/Organizational Psychology (e.g., not from the list of core Industrial/Organizational Psychology courses above) or an approved substitute.
    - Students must also take PSYCH 885 Industrial and Organizational Psychology Research Seminar in the Fall and Winter terms for a minimum of 4 years unless departmental permission is provided otherwise, or the student completes the program early. Note: PSYCH 885 is a 0.00 unit weight credit/no credit course.
- Students in Industrial/Organizational Psychology must take all courses for a numeric grade unless they are only offered Credit/No Credit.
- Students pursuing the **Social Psychology** Graduate Research Field must complete the following courses contingent upon the student's previous academic background.
- If a student enters the PhD with only a Bachelor's degree or equivalent, then the student is required to complete 12 one-term (0.50 unit weight) courses.
- If a student enters the PhD having completed the MA in Psychology degree with a Social Psychology Graduate Research Field from the University of Waterloo, then the student is required to complete 8 one-term (0.50 unit weight) courses such that students meet all of the course requirements listed below when courses completed during both the MA and PhD are considered.
    - Minimum 2 statistics courses from the following list or an approved substitute:
        - PSYCH 630 Advanced Analysis of Variance
        - PSYCH 632 Multiple Regression
        - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)
        - PSYCH 800 Psychometric Theory & Structural Equation Modeling
        - PSYCH 801 Advanced Structural Equation Modeling
        - PSYCH 804 Multi-Level Modeling Applications in Psychology
    - 6 core courses in Social Psychology including PSYCH 704A Social Psychology and PSYCH 870 Research Design & Methods with the remaining selected from the following list or an approved substitute:
        - PSYCH 640 Special Topics in Psychology (on departmentally approved topics)

        - PSYCH 690 Special Topics in Social and Personality
        - PSYCH 743 Advanced Intergroup Relations
        - PSYCH 744 Personality in Social Context
        - PSYCH 745 Close Relationships
        - PSYCH 746 Culture and the Mind
        - PSYCH 748 Self-Regulation and Motivation
        - PSYCH 749 Wisdom
    - 4 breadth courses from other graduate research fields outside of Social Psychology (i.e., not from the list of Social Psychology courses above) or an approved substitute. Up to 2 of these breadth courses may be additional statistics courses.
    - Students must also take PSYCH 714 Social Seminar in the Fall and Winter terms for a minimum of 4 years unless departmental permission is provided otherwise, or the student completes the program early. Note: PSYCH 714 is a 0.00 unit weight credit/no credit course.

Milestone Requirements

PhD Thesis

- The Department requires a successful defense of the PhD Thesis.
- Students must be admitted to one of the following Graduate Research Fields:
    - Clinical Psychology
    - Cognitive Neuroscience
    - Cognitive Psychology
    - Developmental Psychology
    - Industrial/Organizational Psychology
    - Social Psychology
- A Graduate Research Field is a University credential that is recognized on the student's transcript and is intended to reflect that a student has successfully completed research concentrated in the area of the Graduate Research Field. The Department, represented by the student's supervisor and examining committee, must assess whether a student's completed research warrants the field designation at the time of degree completion. To obtain the Graduate Research Field designation, students must also complete the required courses associated with their chosen Graduate Research Field outlined in the above course requirements section.

Notes

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

Workflow Information

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

Dependencies

Dependent Courses and Programs/Plans

PREREQUISITES

- PSYCH 621 - Advanced Clinical Research — View Courses
- PSYCH 747 - Cognition and Perception Seminar — View Courses
- PSYCH 714 - Current Topics in Social Psych Seminar — View Courses

- PSYCH 707 - Cognitive Neuroscience Seminar — View Courses
- PSYCH 710 - Current Issues in Developmental Psych Seminar — View Courses
- PSYCH 885 - Industrial & Organizational Psychology Research Seminar — View Courses

MA in English-Critical Media Studies
Master of Arts (MA) in English - Critical Media Studies

Under Review | Fall 2025

Proposal Information

Status
Active

Workflow Status
In Progress
SGRC, Senate Graduate and Research Council (SGRC) expand ▲
Waiting for Approval | Approval Delegate(s)

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

Changes

- Program/Plan Name
- Coursework Option: Course Requirements
- Master's Research Paper Option: Course Requirements
- Notes
- Effective Term and Year

Show All ▼

Effective Date and Career

Career
Graduate

Important!

Proposed
Effective Term and Year ?
Fall 2025

Existing
Effective Term and Year ?
Spring 2024

Proposal Details

Proposal Type ?
Change

Quality Assurance Designation ?
Major Modification

Major Modification Categories

Academic Unit Approval
09/27/2024

Change program name

Is there an impact to existing students?
Yes

Impact on Existing Students
See "Current Student Impact" section below.

Is the credential name changing?
Yes

Impact of Credential Name Change
The name change applies only to future students (current students may opt in)

Current Student Impact
All currently registered students in the MA in English - Experimental Digital Media programs will have the option of graduating with either the original or revised program name. Details of the program name change will be communicated to them by the Department, via email. By default, students will retain the original program name. Students who wish to change to the revised program name will need indicate this to the Graduate Officer/Graduate Coordinator.

Graduate Co-operative Requirements
Not Applicable

Internship Requirements
Not Applicable

Rationale and Background for Change(s)
Changing the names of the “Master of Arts (MA) in English - Experimental Digital Media” programs to “Master of Arts (MA) in English - Critical Media Studies”: The motion for changing the name of the MA in English - Experimental Digital Media (XDM) program comes out two exigencies: 1) declining enrollments in the XDM program; 2) the need for English’s digital program to be flexible and dynamic in its name as to adjust with changing technologies and changing fields that engage with these technologies. Faculty who currently teach in the program have determined, in consultation with similar programs in the province, that it has been facing declining enrollments in part because students post-COVID in this study area are opting to enroll in programs that seem less “experimental” and more traditional, in some ways. Changing the name of the XDM program to “Critical Media Studies” [CMS] not only is in alignment with this changing student preference, but it continues to reflect what English faculty in this MA stream do (highlighting faculty expertise in fields such as media theory, tech ethics, feminist media studies, social media studies, critical design, device and interface analysis, and game studies). The name change from XDM to CMS importantly retains a clear and designated connection between Critical Media Studies and the Critical Media Lab, which has long been a centre of activity for these English MA students (students are currently required to complete elements of the degree with the Critical Media Lab). Renaming the program thus provides greater correlation between the degree itself and locations for student activity within the degree.
We anticipate that this name change will not only help in recruiting students to this MA program from local undergraduate programs that have an emphasis on both English and Critical Media Studies (such as Western’s Media, Information, and Technoculture program or Trent University’s Media Studies program), but also be appealing to a number of University of Waterloo Communication Arts undergraduate students who may be studying in this area and seeking hands-on application at the graduate level of ideas in critical media studies.

Consultations (Departmental)

Supporting Documentation

General Program/Plan Information

Faculty
Faculty of Arts

Academic Unit
Department of English Language and Literature

Graduate Field of Study
English Language and Literature

Faculty
Faculty of Arts

Proposed

Program/Plan Name

Master of Arts (MA) in English - Critical Media Studies

Existing

Program/Plan Name

Master of Arts (MA) in English - Experimental Digital Media

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Master's Research Paper / Coursework

Program Types

Admit Term(s)

Fall

Delivery Mode

On-campus

Delivery Mode Information

Length of Program

- 3 terms (12 months)

Registration Option(s)

Full-time
Part-time

Registration Options Information

Graduate Research Fields

Graduate Specializations

Additional Program Information

Admissions

Admission Requirements: Minimum Requirements

- An Honours Bachelor's degree in English, or its equivalent, with an average of at least 78% in English courses, and at least 75% overall.
    - Those with Honours degrees not in English may apply to the program but may be required to take as many as 10 undergraduate courses in English to prepare them for graduate-level study in the discipline. Additional courses will be chosen in consultation with the Graduate Officer and will generally correspond to the minor program in English.
- A Statement of Interest, no more than 500 words, explaining your reasons for applying to the program.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Supplementary information form
- Transcript(s)

Admission Requirements: References

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

Requirements Information

Graduate Degree Requirements

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

Coursework Option: Course Requirements

No Rules

Proposed

Coursework Option: Course Requirements

- Students must complete the following 8 courses:
    - ENGL 701 Critical Design Methods (with an added "digital bootcamp" element)
    - 3 courses designated as Critical Media Studies
    - 1 course designated as Literature
    - 3 elective courses
- Students may include 2 extra-departmental graduate courses in their degree requirements, but these courses must be approved by the Graduate Committee. For a course outside the University of Waterloo, the Ontario Visiting Graduate Student (OVGS) form must be completed. For a course inside the University, the Departmental Graduate Studies Committee must approve. In either case, the Department's Graduate Office must be supplied with a syllabus in electronic form and the course must be approved before the beginning of the term in which it is scheduled to run.
- If students can demonstrate that a reading course is necessary to their overall program, they may petition the Departmental Graduate Studies Committee to allow such an independent course. Directed reading courses must be designed and submitted to the Graduate Committee by the instructor in consultation with the student, and the course outline (with rationale, reading list, assignments and schedule) must be approved by the Graduate Committee in the term prior to the one in which the course is to be run. A reading course will not be approved if a course in a similar area, or with the same faculty member, will be taught that year; if the proposed course overlaps substantially with work that is also to be credited as an MRP or thesis; or if it would not be feasible within that term's scheduling and enrolment constraints. Students are permitted to take only 1 reading course as part of the degree.
- In order to graduate, candidates must receive an average of at least 75% in their courses. If a student receives one failing grade or two grades lower than 70%, the Departmental Graduate Studies Committee will review their standing in the program and the student may be asked to withdraw from the program.

Existing

Coursework Option: Course Requirements

- Students must complete the following 8 courses:
    - ENGL 701 Critical Design Methods (with an added "digital bootcamp" element)
    - 3 courses designated as Experimental Digital Media
    - 1 course designated as Literature
    - 3 elective courses
- Students may include 2 extra-departmental graduate courses in their degree requirements, but these courses must be approved by the Graduate Committee. For a course outside the University of Waterloo, the Ontario Visiting Graduate Student (OVGS) form must be completed. For a course inside the University, the Departmental Graduate Studies Committee must approve. In either case, the Department's Graduate Office must be supplied with a syllabus in electronic form and the course must be approved before the beginning of the term in which it is scheduled to run.
- If students can demonstrate that a reading course is necessary to their overall program, they may petition the Departmental Graduate Studies Committee to allow such an independent course. Directed reading courses must be designed and submitted to the Graduate Committee by the instructor in consultation with the student, and the course outline (with rationale, reading list, assignments and schedule) must be approved by the Graduate Committee in the term prior to the one in which the course is to be run. A reading course will not be approved if a course in a similar area, or with the same faculty member, will be taught that year; if the proposed course overlaps substantially with work that is also to be credited as an MRP or thesis; or if it would not be feasible within that term's scheduling and enrolment constraints. Students are permitted to take only 1 reading course as part of the degree.
- In order to graduate, candidates must receive an average of at least 75% in their courses. If a student receives one failing grade or two grades lower than 70%, the Departmental Graduate Studies Committee will review their standing in the program and the student may be asked to withdraw from the program.

Coursework Option: Milestone Requirements

Master's Research Paper Option: Course Requirements

No Rules

Proposed

Master's Research Paper Option: Course Requirements

- Students must complete the following 6 courses:
    - ENGL 701 Critical Design Methods (with an added "digital bootcamp" element)
    - 2 courses designated as Critical Media Studies
    - 1 course designated as Literature
    - 2 elective courses from either within or outside the Department
- Students may include 2 extra-departmental graduate courses in their degree requirements, but these courses must be approved by the Graduate Committee. For a course outside the University of Waterloo, the Ontario Visiting Graduate Student (OVGS) form must be completed. For a course inside the University, the Departmental Graduate Studies Committee must approve. In either case, the Department's Graduate Office must be supplied with a syllabus in electronic form and the course must be approved before the beginning of the term in which it is scheduled to run.
- If students can demonstrate that a reading course is necessary to their overall program, they may petition the Departmental Graduate Studies Committee to allow such an independent course. Directed reading courses must be designed and submitted to the Graduate Committee by the instructor in consultation with the student, and the course outline (with rationale, reading list, assignments and schedule) must be approved by the Graduate Committee in the term prior to the one in which the course is to be run. A reading course will not be approved if a course in a similar area, or with the same faculty member, will be taught that year; if the proposed course overlaps substantially with work that is also to be credited as an MRP or thesis; or if it would not be feasible within that term's scheduling and enrolment constraints. Students are permitted to take only 1 reading course as part of the degree.
- In order to graduate, candidates must receive an average of at least 75% in their courses. If a student receives one failing grade or two grades lower than 70%, the Departmental Graduate Studies Committee will review their standing in the program and the student may be asked to withdraw from the program.

Existing

Master's Research Paper Option: Course Requirements

- Students must complete the following 6 courses:
    - ENGL 701 Critical Design Methods (with an added "digital bootcamp" element)
    - 2 courses designated as Experimental Digital Media
    - 1 course designated as Literature
    - 2 elective courses from either within or outside the Department
- Students may include 2 extra-departmental graduate courses in their degree requirements, but these courses must be approved by the Graduate Committee. For a course outside the University of Waterloo, the Ontario Visiting Graduate Student (OVGS) form must be completed. For a course inside the University, the Departmental Graduate Studies Committee must approve. In either case, the Department's Graduate Office must be supplied with a syllabus in electronic form and the course must be approved before the beginning of the term in which it is scheduled to run.
- If students can demonstrate that a reading course is necessary to their overall program, they may petition the Departmental Graduate Studies Committee to allow such an independent course. Directed reading courses must be designed and submitted to the Graduate Committee by the instructor in consultation with the student, and the course outline (with rationale, reading list, assignments and schedule) must be approved by the Graduate Committee in the term prior to the one in which the course is to be run. A reading course will not be approved if a course in a similar area, or with the same faculty member, will be taught that year; if the proposed course overlaps substantially with work that is also to be credited as an MRP or thesis; or if it would not be feasible within that term's scheduling and enrolment constraints. Students are permitted to take only 1 reading course as part of the degree.
- In order to graduate, candidates must receive an average of at least 75% in their courses. If a student receives one failing grade or two grades lower than 70%, the Departmental Graduate Studies Committee will review their standing in the program and the student may be asked to withdraw from the program.

Master's Research Paper Option: Milestone Requirements

Master's Research Paper

- Students must prepare a proposal for their project and a working bibliography with advice from their planned supervisor. These proposals must be submitted for approval to the Department Graduate Committee before the end of the second academic term.
- The project is the culminating point of the program, in which students demonstrate a mastery of critical theories and theoretical concepts by embodying them in digital artifacts, environments, or practice. Projects will entail the design, conception or production of objects-to-think-with, evocative objects that focus attention on key cultural and theoretical issues in the humanities.
- In many cases the project will remain at a design or prototype stage, although the manufacture of the object is by no means ruled out in principle. The design or prototype itself will be accompanied by a commentary of 40 pages in which the student will describe the theoretical and cultural context of the project and its aims, analyse its feasibility and its functioning, describe its cultural and rhetorical significance, and indicate its possible lines of development.

Proposed

Notes

- Department of English Language and Literature website
- Master of Arts (MA) in English - Critical Media Studies future students program page

Existing

Notes

- Department of English Language and Literature website
- Master of Arts (MA) in English - Experimental Digital Media future students program page

Workflow Information

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

Dependencies

Dependent Courses and Programs/Plans

PREREQUISITES

ENGL 799 - Media Theory and Critique	View Courses
ENGL 700 - Rhetorical Studies	View Courses
ENGL 797 - Digital Media and Literature	View Courses
ENGL 796 - Propaganda and Ideology	View Courses
ENGL 780 - Studies in Genre	View Courses
ENGL 755 - Studies in 19th Century American Literature	View Courses
ENGL 770 - Studies in Canadian Literature	View Courses
ENGL 725 - Studies in Romanticism	View Courses
ENGL 710 - Studies in Renaissance Drama	View Courses
ENGL 750 - Studies in Early American Literature	View Courses
ENGL 715 - Studies in Renaissance Prose and Poetry	View Courses
ENGL 705 - Studies in Old and Middle English Literature	View Courses

- ENGL 790 - Discourse Analysis — View Courses
- ENGL 735 - Studies in Modern British Literature — View Courses
- ENGL 793 - History of Rhetoric — View Courses
- ENGL 792 - Semiotics — View Courses
- ENGL 785 - Studies in Literary Criticism — View Courses
- ENGL 791 - Professional Writing — View Courses
- ENGL 794 - Digital Culture — View Courses
- ENGL 775 - Studies in Commonwealth Literature — View Courses
- ENGL 720 - Studies in the Restoration and Eighteenth Century Literature — View Courses
- ENGL 730 - Studies in Victorian Literature — View Courses
- ENGL 795 - Studies in Selected Topics — View Courses
- ENGL 789 - Writing Studies — View Courses
- ENGL 702 - Rhetorical Research Methods — View Courses

MA in English-Critical Media Studies-Co-op
Master of Arts (MA) in English - Critical Media Studies - Co-operative Program (direct entry)

Under Review | Fall 2025

Proposal Information

Status
Active

Workflow Status
In Progress

SGRC, Senate Graduate and Research Council (SGRC) expand ▲
Waiting for Approval | Approval Delegate(s)

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

Changes

- Program/Plan Name
- Coursework Option: Course Requirements
- Master's Research Paper Option: Course Requirements
- Notes
- Effective Term and Year

Show All ▼

Effective Date and Career

Career
Graduate

Important!

Proposed
Effective Term and Year
Fall 2025

Existing
Effective Term and Year
Spring 2024

Proposal Details

Proposal Type
Change

Academic Unit Approval
09/27/2024

Quality Assurance Designation
Major Modification

Major Modification Categories

Change program name

Is there an impact to existing students?
Yes

Impact on Existing Students
See "Current Student Impact" section below.

Is the credential name changing?
Yes

Impact of Credential Name Change
The name change applies only to future students (current students may opt in)

Current Student Impact
All currently registered students in the MA in English - Experimental Digital Media programs will have the option of graduating with either the original or revised program name. Details of the program name change will be communicated to them by the Department, via email. By default, students will retain the original program name. Students who wish to change to the revised program name will need indicate this to the Graduate Officer/Graduate Coordinator.

Graduate Co-operative Requirements
No

Internship Requirements
Not Applicable

Rationale and Background for Change(s)
Changing the names of the “Master of Arts (MA) in English - Experimental Digital Media” programs to “Master of Arts (MA) in English - Critical Media Studies”: The motion for changing the name of the MA in English - Experimental Digital Media (XDM) program comes out two exigencies: 1) declining enrollments in the XDM program; 2) the need for English’s digital program to be flexible and dynamic in its name as to adjust with changing technologies and changing fields that engage with these technologies. Faculty who currently teach in the program have determined, in consultation with similar programs in the province, that it has been facing declining enrollments in part because students post-COVID in this study area are opting to enroll in programs that seem less “experimental” and more traditional, in some ways. Changing the name of the XDM program to “Critical Media Studies” [CMS] not only is in alignment with this changing student preference, but it continues to reflect what English faculty in this MA stream do (highlighting faculty expertise in fields such as media theory, tech ethics, feminist media studies, social media studies, critical design, device and interface analysis, and game studies). The name change from XDM to CMS importantly retains a clear and designated connection between Critical Media Studies and the Critical Media Lab, which has long been a centre of activity for these English MA students (students are currently required to complete elements of the degree with the Critical Media Lab). Renaming the program thus provides greater correlation between the degree itself and locations for student activity within the degree.
We anticipate that this name change will not only help in recruiting students to this MA program from local undergraduate programs that have an emphasis on both English and Critical Media Studies (such as Western’s Media, Information, and Technoculture program or Trent University’s Media Studies program), but also be appealing to a number of University of Waterloo Communication Arts undergraduate students who may be studying in this area and seeking hands-on application at the graduate level of ideas in critical media studies.

Consultations (Departmental)

Supporting Documentation

General Program/Plan Information

Faculty
Faculty of Arts

Academic Unit
Department of English Language and Literature

Graduate Field of Study
English Language and Literature

Faculty
Faculty of Arts

Proposed

Program/Plan Name

Master of Arts (MA) in English - Critical Media Studies - Co-operative Program (direct entry)

Existing

Program/Plan Name

Master of Arts (MA) in English - Experimental Digital Media - Co-operative Program (direct entry)

Graduate Credential Type

Master's

Accelerated Program

Not applicable

Study Options (New)

Master's Research Paper / Coursework

Program Types

Co-operative

Admit Term(s)

Fall

Delivery Mode

On-campus

Delivery Mode Information

Length of Program

- 5 terms (20 months)

Registration Option(s)

Full-time
Part-time

Registration Options Information

Graduate Research Fields

Graduate Specializations

Additional Program Information

Admissions

Admission Requirements: Minimum Requirements

- An Honours Bachelor's degree in English, or its equivalent, with an average of at least 78% in English courses, and at least 75% overall.
    - Those with Honours degrees not in English may apply to the program but may be required to take as many as 10 undergraduate courses in English to prepare them for graduate-level study in the discipline. Additional courses will be chosen in consultation with the Graduate Officer and will generally correspond to the minor program in English.
- A Statement of Interest, no more than 500 words, explaining your reasons for applying to the program.
- English language proficiency (ELP) (if applicable)

Admission Requirements: Application materials

- Supplementary information form
- Transcript(s)

Admission Requirements: References

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

Requirements Information

Graduate Degree Requirements

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

Coursework Option: Course Requirements

No Rules

Proposed

Coursework Option: Course Requirements

- Students must complete the following 8 courses:
    - ENGL 701 Critical Design Methods (with an added "digital bootcamp" element)
    - 3 courses designated as Critical Media Studies
    - 1 course designated as Literature
    - 3 elective courses
- Students may include 2 extra-departmental graduate courses in their degree requirements, but these courses must be approved by the Graduate Committee. For a course outside the University of Waterloo, the Ontario Visiting Graduate Student (OVGS) form must be completed. For a course inside the University, the Departmental Graduate Studies Committee must approve. In either case, the Department's Graduate Office must be supplied with a syllabus in electronic form and the course must be approved before the beginning of the term in which it is scheduled to run.
- If students can demonstrate that a reading course is necessary to their overall program, they may petition the Departmental Graduate Studies Committee to allow such an independent course. Directed reading courses must be designed and submitted to the Graduate Committee by the instructor in consultation with the student, and the course outline (with rationale, reading list, assignments and schedule) must be approved by the Graduate Committee in the term prior to the one in which the course is to be run. A reading course will not be approved if a course in a similar area, or with the same faculty member, will be taught that year; if the proposed course overlaps substantially with work that is also to be credited as an MRP or thesis; or if it would not be feasible within that term's scheduling and enrolment constraints. Students are permitted to take only 1 reading course as part of the degree.
- In order to graduate, candidates must receive an average of at least 75% in their courses. If a student receives one failing grade or two grades lower than 70%, the Departmental Graduate Studies Committee will review their standing in the program and the student may be asked to withdraw from the program.

Existing

Coursework Option: Course Requirements

- Students must complete the following 8 courses:
    - ENGL 701 Critical Design Methods (with an added "digital bootcamp" element)
    - 3 courses designated as Experimental Digital Media
    - 1 course designated as Literature
    - 3 elective courses
- Students may include 2 extra-departmental graduate courses in their degree requirements, but these courses must be approved by the Graduate Committee. For a course outside the University of Waterloo, the Ontario Visiting Graduate Student (OVGS) form must be completed. For a course inside the University, the Departmental Graduate Studies Committee must approve. In either case, the Department's Graduate Office must be supplied with a syllabus in electronic form and the course must be approved before the beginning of the term in which it is scheduled to run.
- If students can demonstrate that a reading course is necessary to their overall program, they may petition the Departmental Graduate Studies Committee to allow such an independent course. Directed reading courses must be designed and submitted to the Graduate Committee by the instructor in consultation with the student, and the course outline (with rationale, reading list, assignments and schedule) must be approved by the Graduate Committee in the term prior to the one in which the course is to be run. A reading course will not be approved if a course in a similar area, or with the same faculty member, will be taught that year; if the proposed course overlaps substantially with work that is also to be credited as an MRP or thesis; or if it would not be feasible within that term's scheduling and enrolment constraints. Students are permitted to take only 1 reading course as part of the degree.
- In order to graduate, candidates must receive an average of at least 75% in their courses. If a student receives one failing grade or two grades lower than 70%, the Departmental Graduate Studies Committee will review their standing in the program and the student may be asked to withdraw from the program.

Coursework Option: Milestone Requirements

Graduate Studies Work Report I

Graduate Studies Work Report II

Master's Research Paper Option: Course Requirements

No Rules

Proposed

Master's Research Paper Option: Course Requirements

- Students must complete the following 6 courses:
    - ENGL 701 Critical Design Methods (with an added "digital bootcamp" element)
    - 2 courses designated as Critical Media Studies
    - 1 course designated as Literature
    - 2 elective courses from either within or outside the Department
- Students may include 2 extra-departmental graduate courses in their degree requirements, but these courses must be approved by the Graduate Committee. For a course outside the University of Waterloo, the Ontario Visiting Graduate Student (OVGS) form must be completed. For a course inside the University, the Departmental Graduate Studies Committee must approve. In either case, the Department's Graduate Office must be supplied with a syllabus in electronic form and the course must be approved before the beginning of the term in which it is scheduled to run.
- If students can demonstrate that a reading course is necessary to their overall program, they may petition the Departmental Graduate Studies Committee to allow such an independent course. Directed reading courses must be designed and submitted to the Graduate Committee by the instructor in consultation with the student, and the course outline (with rationale, reading list, assignments and schedule) must be approved by the Graduate Committee in the term prior to the one in which the course is to be run. A reading course will not be approved if a course in a similar area, or with the same faculty member, will be taught that year; if the proposed course overlaps substantially with work that is also to be credited as an MRP or thesis; or if it would not be feasible within that term’s scheduling and enrolment constraints. Students are permitted to take only 1 reading course as part of the degree.
- In order to graduate, candidates must receive an average of at least 75% in their courses. If a student receives one failing grade or two grades lower than 70%, the Departmental Graduate Studies Committee will review their standing in the program and the student may be asked to withdraw from the program.

Existing

Master's Research Paper Option: Course Requirements

- Students must complete the following 6 courses:
    - ENGL 701 Critical Design Methods (with an added "digital bootcamp" element)
    - 2 courses designated as Experimental Digital Media
    - 1 course designated as Literature
    - 2 elective courses from either within or outside the Department
- Students may include 2 extra-departmental graduate courses in their degree requirements, but these courses must be approved by the Graduate Committee. For a course outside the University of Waterloo, the Ontario Visiting Graduate Student (OVGS) form must be completed. For a course inside the University, the Departmental Graduate Studies Committee must approve. In either case, the Department's Graduate Office must be supplied with a syllabus in electronic form and the course must be approved before the beginning of the term in which it is scheduled to run.
- If students can demonstrate that a reading course is necessary to their overall program, they may petition the Departmental Graduate Studies Committee to allow such an independent course. Directed reading courses must be designed and submitted to the Graduate Committee by the instructor in consultation with the student, and the course outline (with rationale, reading list, assignments and schedule) must be approved by the Graduate Committee in the term prior to the one in which the course is to be run. A reading course will not be approved if a course in a similar area, or with the same faculty member, will be taught that year; if the proposed course overlaps substantially with work that is also to be credited as an MRP or thesis; or if it would not be feasible within that term’s scheduling and enrolment constraints. Students are permitted to take only 1 reading course as part of the degree.

- In order to graduate, candidates must receive an average of at least 75% in their courses. If a student receives one failing grade or two grades lower than 70%, the Departmental Graduate Studies Committee will review their standing in the program and the student may be asked to withdraw from the program.

Master's Research Paper Option: Milestone Requirements

Graduate Studies Work Report I

Graduate Studies Work Report II

Master's Research Paper

- Students must prepare a proposal for their project and a working bibliography with advice from their planned supervisor. These proposals must be submitted for approval to the Department Graduate Committee before the end of the second academic term.
- The project is the culminating point of the program, in which students demonstrate a mastery of critical theories and theoretical concepts by embodying them in digital artifacts, environments, or practice. Projects will entail the design, conception or production of objects-to-think-with, evocative objects that focus attention on key cultural and theoretical issues in the humanities.
- In many cases the project will remain at a design or prototype stage, although the manufacture of the object is by no means ruled out in principle. The design or prototype itself will be accompanied by a commentary of 40 pages in which the student will describe the theoretical and cultural context of the project and its aims, analyse its feasibility and its functioning, describe its cultural and rhetorical significance, and indicate its possible lines of development.

Proposed

Notes

- Department of English Language and Literature website
- Master of Arts (MA) in English - Critical Media Studies - Co-operative Program future students program page

Existing

Notes

- Department of English Language and Literature website
- Master of Arts (MA) in English - Experimental Digital Media - Co-operative Program future students program page

Workflow Information

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

Dependencies

Dependent Courses and Programs/Plans

PREREQUISITES

- ENGL 799 - Media Theory and Critique — View Courses
- ENGL 700 - Rhetorical Studies — View Courses
- ENGL 797 - Digital Media and Literature — View Courses
- ENGL 796 - Propaganda and Ideology — View Courses

ENGL 780 - Studies in Genre	View Courses
ENGL 755 - Studies in 19th Century American Literature	View Courses
ENGL 770 - Studies in Canadian Literature	View Courses
ENGL 725 - Studies in Romanticism	View Courses
ENGL 710 - Studies in Renaissance Drama	View Courses
ENGL 750 - Studies in Early American Literature	View Courses
ENGL 715 - Studies in Renaissance Prose and Poetry	View Courses
ENGL 705 - Studies in Old and Middle English Literature	View Courses
ENGL 790 - Discourse Analysis	View Courses
ENGL 735 - Studies in Modern British Literature	View Courses
ENGL 793 - History of Rhetoric	View Courses
ENGL 792 - Semiotics	View Courses
ENGL 785 - Studies in Literary Criticism	View Courses
ENGL 791 - Professional Writing	View Courses
ENGL 794 - Digital Culture	View Courses
ENGL 775 - Studies in Commonwealth Literature	View Courses
ENGL 720 - Studies in the Restoration and Eighteenth Century Literature	View Courses
ENGL 730 - Studies in Victorian Literature	View Courses
ENGL 795 - Studies in Selected Topics	View Courses
ENGL 789 - Writing Studies	View Courses
ENGL 702 - Rhetorical Research Methods	View Courses

UNIVERSITY OF WATERLOO | Senate

For Approval **Open Session**

To:	Senate
From:	Senate Graduate and Research Council
Presenter(s):	Charmaine Dean Vice-President, Research & International Clarence Woudsma Interim Co-Associate Vice-President, Graduate Studies and Postdoctoral Affairs
Date of Meeting:	April 7, 2025
Agenda Item:	**7.2 Senate Graduate and Research Council: Faculty of Engineering**

Recommendation/Motion

Motion: That Senate approve the new specialization in Future Cities for the MEng in Civil Engineering, and the new collaborative programs MEng - Civil Engineering - Health Technologies (Co-op), MEng - Electrical and Computer Engineering - Health Technologies (Co-op), and MEng - Systems Design Engineering - Health Technologies (Co-op), as presented.

Summary

Senate Graduate and Research Council met on March 17, 2025 and agreed to forward the following items to Senate for approval as part of the regular agenda.

a. MEng in Civil Engineering – New Specialization in Future Cities
b. MEng - Civil Engineering - Health Technologies (Co-op)
c. MEng - Electrical and Computer Engineering - Health Technologies (Co-op)
d. MEng - Systems Design Engineering - Health Technologies (Co-op)

Jurisdictional Information

This item is being submitted to Senate in accordance with Senate Bylaw 2, section 4.03: "Consider, study and review all proposals for new graduate programs, the deletion of graduate programs, major changes to existing graduate programs, arrange for internal appraisals as the council shall see fit, and make recommendations to Senate thereon."

Governance Path

Senate Graduate and Research Council: 03/17/2025

Senate: 04/07/2025

Documentation Provided

Appendix A: MEng in Civil Engineering – New Specialization in Future Cities

Appendix B: Graduate Proposal - MEng - Civil Engineering - Health Technologies - Co-operative Program

Appendix C: Graduate Proposal - MEng - Electrical and Computer Engineering - Health Technologies - Co-operative Program

Appendix D: Graduate Proposal - MEng - Systems Design Engineering - Health Technologies - Co-operative Program

SGRC - Regular Agenda - Faculty of Engineering - March 17, 2025

Meeting Information

Agenda Page Title

SGRC - Regular Agenda - Faculty of Engineering - March 17, 2025

Career Level

Graduate

Faculty/Unit

Date

03/17/2025

Time

Location

Summary

Programs & Plan Changes:

MEng in Civil Engineering & MEng in Civil Engineering – Co-operative Program: new Graduate Specialization in Future Cities

New Collaborative Programs:

Master of Engineering (MEng) in Civil Engineering - Health Technologies - Co-operative Program

Master of Engineering (MEng) in Electrical and Computer Engineering - Health Technologies - Co-operative Program

Master of Engineering (MEng) in Systems Design Engineering - Health Technologies - Co-operative Program

Other Business

Attachment(s)

- Civil MEng & MEng Coop - Future Cities Specialization -Reviewed by GSPA.docx
- CEE - MEng in HealthTech - Program Brief and Template.pdf
- ECE - MEng in HealthTech - Program Brief and Template.pdf
- SYDE - MEng in HealthTech - Program Brief and Template.pdf
- MEng in HealthTech - Industry and Job Analysis by CEE-2.pdf

Course Proposals

Course Proposal Details

Courses: Retire

No proposals have been added.

Courses: New

No proposals have been added.

Courses: Changes

No proposals have been added.

Programs & Plans Proposals

Programs & Plans Proposal Details

Programs & Plans: Retire

No proposals have been added.

Programs & Plans: Major Modifications

No proposals have been added.

Programs & Plans: Minor Modifications

No proposals have been added.

Regulations Proposals

Regulations Proposal Details

Regulations: Retire

No proposals have been added.

Regulations: New

No proposals have been added.

Regulations: Changes

No proposals have been added.

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 Civil Engineering

2) Master of Engineering (MEng) in Civil Engineering – Co-operative Program

Program contact name(s): Adil Al-Mayah

Form completed by: Adil Al-Mayah

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

Updating the MEng degree requirements to include a new Graduate Specialization in Future Cities.

Note: the content in the "Current Graduate Studies Academic Calendar content" column includes material that was approved by SGRC on November 18, 2024 which takes effect Spring 2025.

Is this a major modification to the program? Yes

Rationale for change(s):

Offering the MEng with an option focused on Future Cities was envisioned by the Future Cities Institute and proposed earlier in the mandate of the Turkstra Chair in Urban Engineering. The new specialization aims to revitalize engineering leadership within municipalities by positioning the civil engineering profession as the critical role in designing sustainable and resilient infrastructure for urban prosperity by applying technology and technical competencies. The motives for the new specialization include:

- *Increasing demand for engineering decision-makers in Canadian municipalities.*
- *Addressing urban challenges that are interrelated and complex.*
- *Opportunity for interdisciplinary knowledge and practice.*
- *Need for resilient and sustainable infrastructure to address climate change mitigation and adaptation.*
- *Urban engineering promotes economic and social prosperity.*
- *Engineering is a leadership profession and cities need engineering leadership.*

Proposed effective date: Term: Fall Year: 2025

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

https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/programs/Syig1A0s3

https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/programs/Syly8tXsR

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
Graduate specializations • Architectural Engineering • Environmental and Water Resources Engineering • Sustainable Structural Systems • Transportation Engineering **Degree requirements** • Students must complete the course requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM). **Coursework option: Course requirements** • Students must complete 8 one-term graduate level courses (0.50 unit weight) taken from the 500, 600 and 700 series courses (or courses acceptable for graduate credit). • At least 4 of the 8 required courses must be taken within the Department of Civil and Environmental Engineering. • An English for Multilingual Speakers (EMLS) technical/professional writing course for Engineers is required for all students who were not English Language Proficiency (ELP) exempt at the time of admission. • A maximum of 2 500 level courses may be counted for credit. • The candidate must obtain a pass in all courses credited to their program, with a minimum overall average of 70% (a grade of less than 65% in any course counts as a failure). • At least half of the courses used for credit must normally be Faculty of Engineering courses. • Students in the MEng in Civil Engineering program may choose to pursue a maximum of two of the following Graduate Specializations: 1. Architectural Engineering 2. Environmental and Water Resources Engineering 3. Sustainable Structural Systems 4. Transportation Engineering • A Graduate Specialization is a University credential that is recognized on the student's transcript but not on the diploma and is intended to reflect that a student has successfully completed a set of courses that together provide an in-depth study in the area of the Graduate Specialization. A student will only obtain the Graduate Specialization on	**Graduate specializations** • Architectural Engineering • Environmental and Water Resources Engineering • <u>Future Cities</u> • Sustainable Structural Systems • Transportation Engineering **Degree requirements** • Students must complete the course requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM). **Coursework option: Course requirements** • Students must complete 8 one-term graduate level courses (0.50 unit weight) taken from the 500, 600 and 700 series courses (or courses acceptable for graduate credit). • At least 4 of the 8 required courses must be taken within the Department of Civil and Environmental Engineering. • An English for Multilingual Speakers (EMLS) technical/professional writing course for Engineers is required for all students who were not English Language Proficiency (ELP) exempt at the time of admission. • A maximum of 2 500 level courses may be counted for credit. • The candidate must obtain a pass in all courses credited to their program, with a minimum overall average of 70% (a grade of less than 65% in any course counts as a failure). • At least half of the courses used for credit must normally be Faculty of Engineering courses. • Students in the MEng in Civil Engineering program may choose to pursue a maximum of two of the following Graduate Specializations: 1. Architectural Engineering 2. Environmental and Water Resources Engineering 3. Sustainable Structural Systems 4. Transportation Engineering <u>5. Future Cities</u> • A Graduate Specialization is a University credential that is recognized on the student's transcript but not on the diploma and is intended to reflect that a student has successfully completed a set of courses that together provide an in-depth study in the area of the Graduate Specialization. A student will

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
their transcript if they have completed the requirements associated with the MEng degree and the requirements associated with the Graduate Specialization. • All MEng Graduate Specializations in Civil Engineering consist of a set of at least 4 graduate (0.50 weight) level courses and this set is comprised of a mix of compulsory and elective courses. Compulsory courses are those that are prescribed as part of the Graduate Specialization. Elective courses are those that are on a list of courses designated as electives for a given Graduate Specialization. The requirements for the Graduate Specializations are described below. 1. Graduate Specialization in Architectural Engineering • To receive the Graduate Specialization in Architectural Engineering, students must successfully complete AE 601 Comprehensive Building Design Studio, at least 2 compulsory courses and 1 elective course. Alternatively, students have the option to complete 4 courses from the compulsory courses list. Note: If students have already successfully completed the compulsory courses, students must complete alternate courses that are approved by the Department Associate Chair, Graduate Studies. o Compulsory courses: ▪ AE 601 Comprehensive Building Design Studio ▪ Choose at least 2 from the following list: ▪ CIVE 507 Building Science and Technology ▪ ARCH 642 Modernism to the 21st Century ▪ CIVE 630/AE 572/ME 572 Building Energy Analysis o Elective courses (choose at least 1 from the following list): ▪ ARCH 684 Special Topics in Architecture ▪ CIVE 505 Structural Dynamics ▪ CIVE 512 Rehabilitation of Structures ▪ CIVE 596 Construction Engineering ▪ CIVE 601 Risk and Reliability ▪ CIVE 602 Prestressed Concrete	only obtain the Graduate Specialization on their transcript if they have completed the requirements associated with the MEng degree and the requirements associated with the Graduate Specialization. • All MEng Graduate Specializations in Civil Engineering consist of a set of at least 4 graduate (0.50 weight) level courses and this set is comprised of a mix of compulsory and elective courses. Compulsory courses are those that are prescribed as part of the Graduate Specialization. Elective courses are those that are on a list of courses designated as electives for a given Graduate Specialization. The requirements for the Graduate Specializations are described below. 1. Graduate Specialization in Architectural Engineering • To receive the Graduate Specialization in Architectural Engineering, students must successfully complete AE 601 Comprehensive Building Design Studio, at least 2 compulsory courses and 1 elective course. Alternatively, students have the option to complete 4 courses from the compulsory courses list. Note: If students have already successfully completed the compulsory courses, students must complete alternate courses that are approved by the Department Associate Chair, Graduate Studies. o Compulsory courses: ▪ AE 601 Comprehensive Building Design Studio ▪ Choose at least 2 from the following list: ▪ CIVE 507 Building Science and Technology ▪ ARCH 642 Modernism to the 21st Century ▪ CIVE 630/AE 572/ME 572 Building Energy Analysis o Elective courses (choose at least 1 from the following list): ▪ ARCH 684 Special Topics in Architecture ▪ CIVE 505 Structural Dynamics ▪ CIVE 512 Rehabilitation of Structures ▪ CIVE 596 Construction Engineering ▪ CIVE 601 Risk and Reliability ▪ CIVE 602 Prestressed Concrete

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
▪ CIVE 603 Reinforced Concrete Mechanics and Design ▪ CIVE 604 Advanced Structural Steel Design ▪ CIVE 622 Finite Element Analysis ▪ CIVE 700 Topics in Structural Engineering: Topic 15 Earthquake Engineering ▪ CIVE 700 Topics in Structural Engineering: Topic 25 Timber Design ▪ CIVE 700 Topics in Structural Engineering: Topic 27 Design of Structural Concrete Systems ▪ CIVE 700 Topics in Structural Engineering: Topic 33 Smart Structure Technology ▪ CIVE 700 Topics in Structural Engineering: Topic 34 Scientific Machine Learning for Engineers ▪ CIVE 700 Topics in Structural Engineering: Topic 35 Fire and Structures ▪ CIVE 700 Topics in Structural Engineering: Topic 36 Sustainable Buildings and Environment ▪ CIVE 700 Topics in Structural Engineering: Topic 39 Circular Engineering and the Built Environment ▪ CIVE 704 Bridge Design ▪ CIVE 710 Advanced Project Management ▪ CIVE 790R Master of Engineering Project ▪ ME 671 Fundamental Fire Dynamics ▪ ME 672 Advanced Fire Dynamics ▪ ME 673 Fire Modeling ▪ ME656 (AE573/ME573) HVAC Systems, Equipment & Energy Efficiency ▪ SYDE 532 Introduction to Complex Systems	▪ CIVE 603 Reinforced Concrete Mechanics and Design ▪ CIVE 604 Advanced Structural Steel Design ▪ CIVE 622 Finite Element Analysis ▪ CIVE 700 Topics in Structural Engineering: Topic 15 Earthquake Engineering ▪ CIVE 700 Topics in Structural Engineering: Topic 25 Timber Design ▪ CIVE 700 Topics in Structural Engineering: Topic 27 Design of Structural Concrete Systems ▪ CIVE 700 Topics in Structural Engineering: Topic 33 Smart Structure Technology ▪ CIVE 700 Topics in Structural Engineering: Topic 34 Scientific Machine Learning for Engineers ▪ CIVE 700 Topics in Structural Engineering: Topic 35 Fire and Structures ▪ CIVE 700 Topics in Structural Engineering: Topic 36 Sustainable Buildings and Environment ▪ CIVE 700 Topics in Structural Engineering: Topic 39 Circular Engineering and the Built Environment ▪ CIVE 704 Bridge Design ▪ CIVE 710 Advanced Project Management ▪ CIVE 790R Master of Engineering Project ▪ ME 671 Fundamental Fire Dynamics ▪ ME 672 Advanced Fire Dynamics ▪ ME 673 Fire Modeling ▪ ME656 (AE573/ME573) HVAC Systems, Equipment & Energy Efficiency ▪ SYDE 532 Introduction to Complex Systems
2. Graduate Specialization in Environmental and Water Resources Engineering • To receive the Graduate Specialization in Environmental and Water Resources Engineering, students must successfully complete at least 2 compulsory courses and 2	2. Graduate Specialization in Environmental and Water Resources Engineering • To receive the Graduate Specialization in Environmental and Water Resources Engineering, students must successfully complete at least 2 compulsory courses and 2

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
elective courses. Alternatively, students have the option to complete 4 courses from the compulsory courses list. ○ Compulsory courses (choose at least 2 from the following list): ▪ ENVE 573 Contaminant Transport ▪ ENVE 577 Engineering for Solid Waste Management ▪ ENVE 585 Air Quality Engineering & Impacts ▪ CIVE 671 Aquatic Chemistry ▪ CIVE 680 Water Management ○ Elective courses (choose 2 from the following list): ▪ CIVE 583/ENVE 583 Design of Urban Water Systems ▪ CIVE 670 Physico-Chemical Processes of Water and Wastewater Treatment ▪ CIVE 682 Free Surface Hydraulics ▪ CIVE 770 Topics in Environmental Engineering: Topic 24 River Restoration ▪ CIVE 770 Topics in Environmental Engineering: Topic 41 Atmospheric Emissions to Impacts ▪ CIVE 770 Topics in Environmental Engineering: Topic 45 Environmental Fate of Organic Pollutants ▪ CIVE 770 Topics in Environmental Engineering: Topic 53 Environmental and Water Resources Simulation Model Calibration ▪ CIVE 771 Biological Wastewater Treatment: Theory and Practice ▪ CIVE 781 Principles of Hydrologic Modelling ▪ CIVE 790R Master of Engineering Project ▪ EARTH 691 Special Studies for MSc Students: Topic 159 Geothermal Energy ▪ EARTH 691 Special Studies for MSc Students: Topic 161 Energy Geomechanics	elective courses. Alternatively, students have the option to complete 4 courses from the compulsory courses list. ○ Compulsory courses (choose at least 2 from the following list): ▪ ENVE 573 Contaminant Transport ▪ ENVE 577 Engineering for Solid Waste Management ▪ ENVE 585 Air Quality Engineering & Impacts ▪ CIVE 671 Aquatic Chemistry ▪ CIVE 680 Water Management ○ Elective courses (choose 2 from the following list): ▪ CIVE 583/ENVE 583 Design of Urban Water Systems ▪ CIVE 670 Physico-Chemical Processes of Water and Wastewater Treatment ▪ CIVE 682 Free Surface Hydraulics ▪ CIVE 770 Topics in Environmental Engineering: Topic 24 River Restoration ▪ CIVE 770 Topics in Environmental Engineering: Topic 41 Atmospheric Emissions to Impacts ▪ CIVE 770 Topics in Environmental Engineering: Topic 45 Environmental Fate of Organic Pollutants ▪ CIVE 770 Topics in Environmental Engineering: Topic 53 Environmental and Water Resources Simulation Model Calibration ▪ CIVE 771 Biological Wastewater Treatment: Theory and Practice ▪ CIVE 781 Principles of Hydrologic Modelling ▪ CIVE 790R Master of Engineering Project ▪ EARTH 691 Special Studies for MSc Students: Topic 159 Geothermal Energy ▪ EARTH 691 Special Studies for MSc Students: Topic 161 Energy Geomechanics
3. Graduate Specialization in Sustainable Structural Systems	3. Graduate Specialization in Sustainable Structural Systems

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

• To receive the Graduate Specialization in Sustainable Structural Systems, students must successfully complete at least 2 compulsory course and 2 elective courses. Alternatively, students have the option to complete 4 courses from the compulsory courses list.
  ○ Compulsory courses (choose at least 2 from the following list):
  ▪ CIVE 505 Structural Dynamics
  ▪ CIVE 507 Building Science and Technology
  ▪ CIVE 596 Construction Engineering
  ▪ CIVE 601 Engineering Risk and Reliability
  ▪ CIVE 622 Finite Element Analysis
  ○ Elective courses (choose 2 from the following list):
  ▪ CIVE 512 Rehabilitation of Structures
  ▪ CIVE 602 Prestressed Concrete
  ▪ CIVE 603 Reinforced Concrete Mechanics and Design
  ▪ CIVE 604 Advanced Structural Steel Design
  ▪ CIVE 700 Topics in Structural Engineering: Topic 15 Earthquake Engineering
  ▪ CIVE 700 Topics in Structural Engineering: Topic 21 Building Energy Analysis
  ▪ CIVE 700 Topics in Structural Engineering: Topic 25 Timber Design
  ▪ CIVE 700 Topics in Structural Engineering: Topic 27 Design of Structural Concrete Systems
  ▪ CIVE 700 Topics in Structural Engineering: Topic 33 Smart Structure Technology
  ▪ CIVE 700 Topics in Structural Engineering: Topic 34 Scientific Machine Learning for Engineers
  ▪ CIVE 700 Topics in Structural Engineering: Topic 35 Fire and Structures
  ▪ CIVE 700 Topics in Structural Engineering: Topic 36 Sustainable Buildings and Environment
  ▪ CIVE 700 Topics in Structural Engineering: Topic 39 Circular Engineering and the Built Environment
	• To receive the Graduate Specialization in Sustainable Structural Systems, students must successfully complete at least 2 compulsory course and 2 elective courses. Alternatively, students have the option to complete 4 courses from the compulsory courses list.
	  ○ Compulsory courses (choose at least 2 from the following list):
	  ▪ CIVE 505 Structural Dynamics
	  ▪ CIVE 507 Building Science and Technology
	  ▪ CIVE 596 Construction Engineering
	  ▪ CIVE 601 Engineering Risk and Reliability
	  ▪ CIVE 622 Finite Element Analysis
	  ○ Elective courses (choose 2 from the following list):
	  ▪ CIVE 512 Rehabilitation of Structures
	  ▪ CIVE 602 Prestressed Concrete
	  ▪ CIVE 603 Reinforced Concrete Mechanics and Design
	  ▪ CIVE 604 Advanced Structural Steel Design
	  ▪ CIVE 700 Topics in Structural Engineering: Topic 15 Earthquake Engineering
	  ▪ CIVE 700 Topics in Structural Engineering: Topic 21 Building Energy Analysis
	  ▪ CIVE 700 Topics in Structural Engineering: Topic 25 Timber Design
	  ▪ CIVE 700 Topics in Structural Engineering: Topic 27 Design of Structural Concrete Systems
	  ▪ CIVE 700 Topics in Structural Engineering: Topic 33 Smart Structure Technology
	  ▪ CIVE 700 Topics in Structural Engineering: Topic 34 Scientific Machine Learning for Engineers
	  ▪ CIVE 700 Topics in Structural Engineering: Topic 35 Fire and Structures
	  ▪ CIVE 700 Topics in Structural Engineering: Topic 36 Sustainable Buildings and Environment
	  ▪ CIVE 700 Topics in Structural Engineering: Topic 39 Circular Engineering and the Built Environment

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
▪ CIVE 710 Advanced Project Management ▪ CIVE 790R Master of Engineering Project 4. Graduate Specialization in Transportation Engineering • To receive the Graduate Specialization in Transportation Engineering, students must successfully complete at least 2 compulsory courses and 2 elective courses. Alternatively, students have the option to complete 4 courses from the compulsory courses list. o Compulsory courses (choose at least 2 from the following list): ▪ CIVE 542 Pavement Structural Design ▪ CIVE 640 Urban Transportation Planning Models: Principles & Applications ▪ CIVE 641 Advances in Public Transportation Planning, Operations & Control ▪ CIVE 642 Pavement Design and Management I ▪ CIVE 643 Fundamentals of Traffic Flow Theory o Elective courses (choose 2 from the following list): ▪ CIVE 644 Innovative and Sustainable Infrastructure Materials ▪ CIVE 645 Modeling Transportation, Land Use and Spatial Economics ▪ CIVE 646 Computer Applications in Transportation Engineering ▪ CIVE 742 Pavement Design and Management II	▪ CIVE 710 Advanced Project Management ▪ CIVE 790R Master of Engineering Project 4. Graduate Specialization in Transportation Engineering • To receive the Graduate Specialization in Transportation Engineering, students must successfully complete at least 2 compulsory courses and 2 elective courses. Alternatively, students have the option to complete 4 courses from the compulsory courses list. o Compulsory courses (choose at least 2 from the following list): ▪ CIVE 542 Pavement Structural Design ▪ CIVE 640 Urban Transportation Planning Models: Principles & Applications ▪ CIVE 641 Advances in Public Transportation Planning, Operations & Control ▪ CIVE 642 Pavement Design and Management I ▪ CIVE 643 Fundamentals of Traffic Flow Theory o Elective courses (choose 2 from the following list): ▪ CIVE 644 Innovative and Sustainable Infrastructure Materials ▪ CIVE 645 Modeling Transportation, Land Use and Spatial Economics ▪ CIVE 646 Computer Applications in Transportation Engineering ▪ CIVE 742 Pavement Design and Management II <u>5. Graduate Specialization in Future Cities</u> • <u>To receive the Graduate Specialization in Future Cities, students must successfully complete at least 4 compulsory courses and 4 elective courses.</u> o <u>Compulsory courses (choose 4 from the following list):</u> ▪ <u>CIVE 507 Building Science and Technology</u> ▪ <u>CIVE 583 Design of Urban Water Systems</u>

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
	▪ CIVE 596 Construction Engineering ▪ CIVE 601 Engineering Risk and Reliability ▪ CIVE 605 Advanced Building Energy Analysis ▪ CIVE 640 Urban Transportation Models: Principles & Applications ▪ CIVE 641 Advances in Public Transportation Planning, Operations & Control ▪ CIVE 642 Pavement Design and Management 1 ▪ CIVE 643 Fundamentals of Traffic Flow Theory ▪ CIVE 644 Innovative and Sustainable Infrastructure Materials ▪ CIVE 645 Modeling Transportation, Land Use and Spatial Economics ▪ CIVE 670 Physico-Chemical Processes of Water and Wastewater Treatment ▪ CIVE 680 Water Management ▪ CIVE 700 Topics in Structural Engineering: Topic 21 Building Energy Analysis ▪ CIVE 700 Topics in Structural Engineering: Topic 36 Sustainable Buildings and Environment ▪ CIVE 700 Topics in Structural Engineering: Topic 39 Circular Engineering and the Built Environment ▪ CIVE 770 Topics in Environmental Engineering: Topic 41 Atmospheric Emissions to Impacts ▪ CIVE 770 Topics in Environmental Engineering: Topic 53 Environmental and Water Resources Simulation Model Calibration ▪ CIVE 771 Biological Wastewater Treatment: Theory and Practice ▪ CIVE 781 Principles of Hydrologic Modelling ▪ ENVE 577 Engineering for Solid Waste Management ▪ ENVE 585 Air Quality Engineering & Impacts

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
	○ Choose 2 electives from the following list: ▪ ARCH 710 Special Topics in Visual and Digital Media (note: topics must be approved by the Department Associate Chair, Graduate Studies) ▪ ARCH 720 Special Topics in Urbanism and Landscape (note: topics must be approved by the Department Associate Chair, Graduate Studies) ▪ ARCH 740 Special Topics in Architectural History and Theory (note: topics must be approved by the Department Associate Chair, Graduate Studies) ▪ ARCH 770 Special Topics in Building Technology and Environment (note: topics must be approved by the Department Associate Chair, Graduate Studies) ▪ ARCH 780 Special Topics in Race, Equity and Environmental Justice (note: topics must be approved by the Department Associate Chair, Graduate Studies) ▪ ECE 660 Operation and Control of Future Integrated Energy Systems ▪ ECE 663 Energy Processing ▪ ECE 763 Sustainable Distributed Power Generation ▪ MSE 602 Strategic Management of Technological Innovation ▪ MSE 603 Principles of Operations Research ▪ MSE 744 Science and Technology Policy ▪ MSE 751 Knowledge Management ▪ SYDE 600 Systems Theory, Models, Research & Design ▪ SYDE 625 Tools of Intelligent Systems Design ▪ SYDE 632 Optimization Methods ▪ SYDE 643 Collaborative Systems Design ○ Choose 2 electives from the following list:

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
	▪ ECON 637 Economic Analysis and Global Governance ▪ ECON 655 Resource Economics ▪ ECON 657 Environmental Economics ▪ ECON 658 Water Resource Economics ▪ ERS 615/GEOG 615/ PLAN 615 Community Economic Development ▪ ERS 680 Sustainability Foundations ▪ ERS 701 Sustainability in Complex Socio-Ecological Systems ▪ FCIT 600 Cities, Systems, Synergy and Collaboration ▪ FCIT 601 Tools for Futures Thinking ▪ FCIT 602 Future Thinking and Cities ▪ FCIT 603 Sustainable Future Cities ▪ FCIT 604 The Socially Just City ▪ FCIT 606/GEMCC 653 Sustainability Transitions in Cities ▪ GEOG 609/PLAN 657 GIS and Spatial Decision Support for Planning and Resource Management ▪ GEOG 621/ PLAN 621 Metropolitan Form and Structure in Canada ▪ GEOG 665 Environmental Planning Theory and Practice ▪ GEOG 669/ERS 619 Energy Sustainability ▪ GEMCC 640 Climate Change Governance: From Global Treaties to Local Innovation ▪ GGOV 664 Law, Tech & Society ▪ PLAN 606 Modelling the City ▪ PLAN 627 Climate Change ▪ PLAN 669 Landscape restoration ▪ PSCI 604/ERS 604/GGOV 620 Advanced Topics in Global Environmental Governance ▪ PSCI 633 Canadian Public Policy ▪ PSCI 688/GGOV 610/PAC 630 Governance of Global Economy

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
	Milestone requirements **Leadership Modules** • Students pursuing the Graduate Specialization in Future Cities must complete the Leadership Modules milestone to develop their skills in self-leadership, team leadership, organization leadership, and societal leadership. To satisfy the milestone, students must complete 4 of the following modules: 1. Introduction to sustainable engineering leadership 2. Connecting your personal values to leadership and sustainability 3. Social intelligence and leadership 4. Developing team identity 5. Applied leadership in sustainable cities 6. Technological stewardship 7. Sustainable Engineering Leadership reflection

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

Current MEng students who satisfy the degree requirements of the new Graduate Specialization may obtain the Graduate Specialization by completing/submitting a program change form prior to degree completion.

Department/School approval date (mm/dd/yy): 01/16/25
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 01/13/25
Faculty approval date (mm/dd/yy):
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):

UNIVERSITY OF WATERLOO

GRADUATE PROPOSAL

COLLABORATIVE HEALTH TECHNOLOGIES PROGRAM

MASTER OF ENGINEERING IN CIVIL ENGINEERING – HEALTH TECHNOLOGIES (CO-OP)

For submission to the
Ontario Universities Council on Quality Assurance

VOLUME I - PROPOSED BRIEF

DECEMBER 2024

*The Quality Council will normally require only an Expedited Approval process where:

a) there is a proposal for a **new Collaborative Program** at the graduate level; or
b) there is a proposal for **a new for-credit graduate diploma**.

NOTE: This template **must** be used for submission of a new program proposal.
Please consult the University of Waterloo Institutional Quality Assurance Process and the Quality Assurance Framework (QAF) for details or the Quality Assurance Office.
****Volumes I, II must be reviewed and approved by the Quality Assurance Office, GSPA and IAP prior to submission to your Faculty Council****

TABLE OF CONTENTS

1. Introduction

Brief Listing of the Program

The Collaborative Health Technologies Program offers students professional Master of Engineering (MEng) degree with mandatory co-op, as preparation to enter the broad and rapidly evolving field of *Health Technology*. Not only is co-op highly beneficial to students while completing this program, it also offers an important opportunity to those students who *never* had co-op experience during their undergraduate degree. The program is centered around a collaborative and interdisciplinary suite of courses offered by six departments in Engineering and supported by the Faculties of Arts and Health. In addition to coursework, the mandatory co--op program serves to enrich the learning of students with practical experience in industrial settings. This is a full-time, on-campus program, with an expected duration of 4-6 terms, based on the co-op and study sequence selected by particular students. Program tuition follows the existing UW graduate home program tuition structure.

To enroll in the Collaborative Health Technologies Program, students must meet the admission requirements of, and register in, the department of Civil and Environmental Engineering (CEE). Students must complete the Collaborative Health Technologies Program requirements that are structured as a combination of CEE department's MEng degree requirement, and the additional Collaborative Health Technologies Program requirements (i.e., the completion of sufficient courses from specified pools, and successful co-op work terms/reports).

The degree conferred will be that of the participating program (i.e. Civil Engineering), with the completion of the Collaborative Health Technologies Program indicated by a transcript notation to the degree and adjunct qualification to the degree (i.e. Master of Engineering in Civil Engineering – Health Technologies). The proposed collaborative program also offers a platform to allow future participation of other Faculties.

Method Used for Preparation of the Brief

The Collaborative Health Technologies Program was conceptualized by the Dean of Engineering and the Associate Dean Graduate Studies – Engineering. In April 2023, the initiative to develop the program received support from the New Interdisciplinary Networks, Programs, and Initiatives Fund from the University. The proposal was developed following consultations by the Associate Dean with Graduate Associate Chairs of the departments of Chemical Engineering, Civil and Environmental Engineering, Electrical and Computer Engineering, Management Science and Engineering, Mechanical and Mechatronics Engineering, and Systems Design Engineering. The Associate Dean also had discussions with counterparts in other Faculties (e.g., Arts, Health, and Science). The general proposal was presented to the departments in Engineering for consideration within the unit. Following approval, this departmental proposal brief to participate in the collaborative program evolved, incorporating the specific requirements of the home unit.

2. Objectives of the Program (QAF 2.1.2.1)

The Collaborative Health Technologies Program is timely and justified not only based on the critical need for skilled professionals at the intersection of healthcare and technology, but also by the University of Waterloo's own goals, e.g. Waterloo at 100, Global Futures. The following are some of the compelling reasons that justify the establishment of a Collaborative Health Technologies Program:

1. **Rapid Technological Advancements in Healthcare**: The healthcare industry is experiencing an unprecedented transformation due to rapid advancements in technology. Innovations such as artificial intelligence, telemedicine, wearable devices, and data analytics are reshaping healthcare delivery, diagnosis, treatment, and patient care. A dedicated program will equip future professionals with leading-edge skills needed to leverage and drive innovations in this field.
2. **Increasing Demand for Health Technology Experts**: There is a growing demand for professionals who possess a deep understanding of both healthcare and technology. This demand arises from the need to bridge the gap between traditionally siloed fields and create holistic solutions that address complex healthcare challenges. Graduates of a Collaborative Health Technology Program will fill this talent gap and drive innovation in healthcare settings.
3. **Addressing Healthcare Challenges**: The global healthcare landscape faces numerous challenges, including rising costs, an aging population, chronic diseases, disparities in healthcare access, and pandemics. A Collaborative Health Technologies Program will empower students to develop innovative solutions to address these challenges, improve healthcare access, and enhance patient outcomes.
4. **Opportunity for Interdisciplinary Collaboration**: A program that combines healthcare and technology will foster interdisciplinary collaboration. Students will learn to collaborate with healthcare professionals, engineers, data scientists, ethicists, and policymakers, fostering a diverse and comprehensive approach to problem-solving.
5. **Industry-Relevant Skill Development**: Employers in the healthcare and technology sectors seek professionals with specialized skills in areas such as health data analytics, digital health, telemedicine, medical device development, regulatory compliance, and AI applications in healthcare. Both the course-based components and the mandatory co-op of this Collaborative Health Technologies Program combine to ensure that graduates are well-prepared with these in-demand skills.
6. **Economic and Innovation Impact**: Investing in a Collaborative Health Technologies Program aligns with the current market demand and presents an opportunity to contribute to economic growth and innovation. Graduates equipped with the skills to develop and implement Health Technology solutions can drive entrepreneurship, create job opportunities, and contribute to the expansion of healthcare technology sectors.
7. **Addressing Future Healthcare Needs**: With the evolving landscape of healthcare and technology, preparing future professionals to navigate and lead in this dynamic environment is essential. Establishing a Collaborative Health Technologies Program now ensures that the workforce is ready to address the future needs and challenges of the healthcare industry.

Program Learning Outcomes and Graduate Degree Level Expectations (GDLE):

1. **Depth and Breadth of Knowledge**
    a. Understand the principles, concepts, terminology and tools of health technology
    b. Demonstrate awareness of key elements of both the ethical considerations and impacts of health technologies
    c. Interpret, understand, and critically assess state-of-the-art methods, theories, and advances in health technology
2. **Research & Scholarship**
    a. Integrate complex engineering concepts related to the breadth of health technology, and the underlying and associated sciences.
3. **Level of Application of Knowledge**
    a. Interpret, critically assess and apply state-of-the-art methods, theories, and advances in health technology
    b. Understand current issues faced by the health technology industry
4. **Professional Capacity / Autonomy**
    a. Independently recognize, define, and solve complex real-world health technology needs and associated challenges
    b. Engage in self-directed professional development and life-long learning
    c. Develop an ability to recognize, appreciate, consider and apply appropriate ethics, law, regulations, and accountability to the field of health technologies
    d. Understand the value of engaging in inter-disciplinary collaboration in health technology as well as the complexity of knowledge & limitations of different fields
    e. Adopt a mindset for collaboration (work effectively in interdisciplinary teams including healthcare professionals, engineers, designers, business developers, etc.)
5. **Level of Communication Skills**
    a. Effectively communicate complex concepts in health technology to a wide audience ranging from general public to experts in the field. Concepts may include health technology needs and associated challenges (includes GDLE 6 Awareness of Limits of Knowledge)
    b. The ability to communicate ideas, issues and conclusions clearly.
6. **Awareness of Limits of Knowledge**
    a. Cognizance of the complexity of knowledge and of the potential contributions of other interpretations, methods, and disciplines.
    b. Understand the value of inter-disciplinarity in the field of health technologies.

How does this Program align with the University of Waterloo Strategic Plan and Strategic Mandate Agreement?

The Collaborative Health Technologies Program aligns well with the University of Waterloo's strategic plan in several ways:

1. **Interdisciplinary Collaboration:** The program's collaboration between the departments in Engineering as well as the support by Arts and Health, demonstrate a commitment to interdisciplinary collaboration, a key focus area of the strategic plan. This collaboration brings together diverse perspectives and expertise, fostering innovation in health technology by integrating engineering skills with insights from health, social sciences, and humanities.
2. **Work-integrated Learning through Co-op:** The mandatory co-op component of the program aligns with the strategic plan's emphasis on experiential learning. This practical work experience allows students to apply their knowledge in real-world settings, contributing to their professional development while addressing real challenges in health technology.
3. **Benefits of Innovation and Research:** The program's focus on Health Technologies aligns with the strategic plan's emphasis on fostering innovation. Even though this is a course-based program, it does enable students to connect with faculty from various departments to engage with cutting-edge technologies and understand solutions to real-world problems.
4. **Community Partnerships:** Collaboration between different departments within Engineering, along with the support, through course offering, by Faculties of Arts and Health, opens opportunities for partnership with external organizations, hospitals, and industry players. This engagement aligns with the strategic plan's focus on strengthening community partnerships. Co-op placements also will play a key role in this aspect.
5. **Technology and Global Challenges:** By addressing healthcare challenges through technology and innovation, the program contributes to addressing global challenges, which is in line with the University's strategic goal of leveraging technology for positive societal impact.
6. **Commitment to Excellence and Diversity:** The collaborative nature of the program reflects the University's commitment to excellence in education and research. Furthermore, by integrating diverse perspectives from multiple departments and faculties, the program contributes to promoting diversity and inclusion, a priority area in the strategic plan.

   Overall, the Collaborative Health Technologies Program embodies many key pillars of the University of Waterloo's Strategic Plan by promoting interdisciplinary collaboration, experiential learning, innovation, community engagement, and a commitment to excellence and diversity.

3. Admission Requirements (QAF 2.1.2.5)

Admission into the Collaborative Health Technologies Program is through direct application to the program offered through the home administrative unit, i.e. CEE. Admission requirements for the program will be the same as those existing for the Master of Engineering (Co-op) degree in CEE.

The minimum academic requirements – including admissions requirements, minimum overall averages, and timelines for any milestones – in the program will be consistent with the requirements of the primary existing master's program for each participating department.

In detail, the admission requirements for MEng in the department of Civil and Environmental Engineering are:

- An Honours Bachelor's degree (or equivalent) with a 75% standing.
- Graduate Record Examination (GRE) score (only for those applicants who completed their degree outside of Canada or United States).
- A Supplementary Information Form (SIF), which contains questions specific to the program about why applicants want to enroll and their experience in the field, must be completed.
- Required application materials include, Resume, SIF, Academic transcript(s), Two reference letters from academic or professional sources, and Proof of English language Proficiency (ELP), if applicable.
  Minimum English Language Proficiency requirement: TOEFL 80 (writing 22, speaking 20, reading 20, listening 18), or IELTS 6.5 (writing 6.0, speaking 6.0)

These admission requirements are appropriate given the precedent of existing co-op Master's programs in the Faculty of Engineering. The level of required academic performance is indicative of what will be required of students during their studies within this proposed program and serves to select only students who will be capable of meeting course expectations and overall program learning outcomes. Furthermore, the Supplementary Information Form, resume, and reference letters will allow for recognition of the prior work, experience, aspirations, and career trajectory of applicants.

4. Structure (QAF 2.1.2.2)

The Collaborative Health Technologies Program is a co-op only, course-based program. Completion of 9 courses will be required to meet the coursework requirement of the program. Selection of courses will be as follows:

2 courses from the following University-level courses (ARTS, ENG):

- PHIL 626: Bioethics and Technology
- ECON 643: Health Economics
- MSE 619: Healthcare Analytics

2 courses, inclusive of ENVE 585, from the following Faculty-level courses (6 ENG depts):

- BME 600: Design of Biomedical Technologies
- BME 602: Foundations in Biomechanical Engineering
- CHE 621:Model Building and Response Surface Methodology
- ENVE 585: Air Quality Engineering and Impacts
- ECE 608: Quantitative Methods in Biomedical Engineering
- MSE 630: Human-Computer Interaction

1 course from the following Faculty of Health courses:

- HLTH 612: Introduction to Health Information and Data Standards
- HLTH 633: Digital Health
- HLTH 605B: Quantitative Methods and Analysis
- HLTH 650A/650B: Application of Artificial Intelligence in Health (0.25) / Machine Learning Techniques in Health (0.25)
- HLTH 606B: Principles of Epidemiology for Public Health
- HLTH 615: Requirements Specifications and Analysis in Health Systems

At least 3 courses of the total 9 courses, in addition to ENVE 585, from Civil and Environmental Engineering, with no more than 2 courses at the 500- level.

An English for Multilingual Speakers (EMLS) technical/professional writing course for Engineers is required for all students who were not English Language Proficiency (ELP) exempt at the time of admission.

The program study / co-op sequence is illustrated below. Having co-op during the program both allows students to apply what they have learned in school to their co-op employment, but also the reverse: apply what has been learned during co-op terms to their in-school experiences. This model allows for bidirectional inspiration and gives students an important *context* for what they are learning.

Term-1	Term-2	Term-3	Term-4	Term-5	Term-6
study	study	Co-op	Co-op	study	(study)
study	study	Co-op	study	(study)	

Rationale and Justification

The structure and regulations of the Collaborative Health Technologies Program align with the program learning outcomes and Degree-Level Expectations. More detail is given below.

Alignment with Program Learning Outcomes:

1. **Diversity of Course Offerings:** The coursework structure ensures a breadth of courses from various levels (University, Faculty, Department) covering different aspects of health technologies, such as ethics, analytics, biomedical engineering, rehabilitation engineering, human-computer interaction, health-care systems, epidemiology, systems theory etc. The proposed program is designed in such a way that potential future participation of additional Faculties with their own master's program model is both possible and would further enrich the program content.

2. **Integration of Practical Experience:** The mandatory incorporation of co-op allows students to apply theoretical knowledge gained in the classroom to real-world scenarios, and vice versa. This aligns with the objective of the program to foster practical application and real-world learning.

Meeting Degree Level Expectations:

1. **Depth and Breadth of Knowledge:** The variety of courses spanning different Departments and Faculties suggests a comprehensive coverage of topics relevant to health technologies, meeting the depth and breadth of knowledge expected at the master's level.
2. **Professional Skills Development:** The incorporation of co-op experiences facilitates the development of professional skills, preparing students for practical challenges in the field.

Rationale for Program Length:

The proposed program length is reasonable for several reasons:

1. **Course Load and Requirements:** 9 courses within the program, structured across different units and levels, can be reasonably completed within three to four study terms.
2. **Integration of Co-op Experience:** The inclusion of co-op necessitates a program duration that allows students to engage in these practical experiences without significantly extending the program length.
3. **Balancing Academic and Practical Learning:** The program aims to balance academic learning with real-world application. A structured timeframe enables students to attain both theoretical knowledge and practical skills within a manageable period.

5. Program Content (QAF 2.1.2.3)

Health Technologies represent the dynamic intersection of healthcare and cutting-edge technology, encompassing a diverse array of innovations designed to revolutionize patient care, improve healthcare accessibility, and enhance overall well-being. Embracing a multidisciplinary approach, Health Technologies integrate advancements in artificial intelligence, data analytics, telemedicine, medical imaging, ethics, and more, to drive transformative changes in the diagnosis, treatment, and management of health conditions. The Collaborative Health Technologies Program is a muti-disciplinary course-based program in the Faculty of Engineering with mandatory co-op, integrated within the timeline of the program. Its multi-disciplinarity is derived on the basis of the participation, through course offerings, of the Faculties of Arts and Health. Additionally, the enrolled students will also take appropriate courses across several departments within Engineering. All courses taken are at the graduate level. An overview of the program's course structure was given in Section 4. Here, additional information on the courses is given.

A brief description of the University-level courses, from which a student would be required to take two, is given below:

- **PHIL 626: Bioethics and Technology** (Arts)
  Students will grapple with a sample of ethical issues related to advanced and emerging medical technologies and/or biotechnologies. The primary goals of doing so are: (1) To gain familiarity with key ethical concepts and values, which may include patient autonomy, beneficence, justice, care, anti-ableism, inclusion, and others; and (2) to enhance core critical

thinking skills needed for ethics, which will help improve each student's self-understanding (of not only what they think is right and wrong, but, more importantly, why) and their capacity to engage with different perspectives on the "whats" and "whys" of ethics in a spirit of open-mindedness, mutual respect, and constructive cooperation. Frequent in-class discussion is typically an important element of student learning in this course.

- **ECON 643: Health Economics** (Arts)
  This course introduces students to the role of economics in health care and health policy. It is meant to be a survey of major topics in health economics and an introduction to the ongoing debate over health care policy. Topics include the economic determinants of health and health policy, the market for medical care, the market for health insurance, and the role of the government in health care, and health care reform.
- **MSE 619: Healthcare Analytics** (Engineering)
  This course provides an introductory course on health analytics including such topics as data acquisition, modelling, and predictive analytics. The course focuses on the practical application of the concepts to improve the quality of the analyses often found in the health sector. Application areas will be concentrated on topics found in health systems and may include topics such as planning and scheduling, disease diagnosis, and treatment planning. The learning outcomes include the ability to identify and apply appropriate analytical methods and models for healthcare.

A brief description of the Faculty-level courses, from which a student would be required to take two, is given below:

- **BME 600: Design of Biomedical technologies** (SYDE)
  Systems theory and formulation of system dynamics problems. Design and research methods for biomedical technologies. Problem formulation and definition, stakeholder engagement, needs analysis, generation of alternative solutions, feasibility analysis, optimization, selection, and solution implementation.
- **BME602: Foundations in Biomechanical Engineering** (MME)
  This course focuses on equipping students with foundational knowledge in the biomechanics of human physiology, pathology and treatment. The overarching aim of this course is to develop students' literacy in applying biomechanics principles and modern tools towards understanding the human body. The course will build on existing knowledge in mathematics and physics to develop new expertise and hands-on experience in the biomechanical modeling and analysis of physiological systems.
- **CHE 621: Model Building and Response Surface Methodology** (CHE)
  This course teaches process / product optimization based on design of experiments, empirical modelling, and non-linear mechanistic models. These methodologies aid in refining healthcare processes and products, ensuring they meet stringent standards of efficiency, safety, and effectiveness.
- **ENVE 585: Air Quality Engineering and Impacts** (CEE)
  This course introduces air quality design of engineering solutions and associated health and economic impacts. It includes topics focused on the indoor environment, the outdoor

environment, or both, such as: air pollution sources, emission estimation, control strategies, measurement, modeling methods, health impact assessment, cost-benefit analysis, technical policy analysis, and co-impacts with climate change.

- **ECE 608: Quantitative Methods in Biomedical Engineering** (ECE)
  This course focuses on topics related to the use of quantitative tools in biomedical engineering research studies. Educational emphasis will be placed on developing students' core competence in biostatistics and biomedical computing, so as to prepare them to pursue biomedical engineering investigations that are backed by quantitative reasoning and numerical insights.
- **MSE 630: Human Computer Interaction** (MSE)
  This course concentrates on the theoretical and practical issues related to the design of the human-computer interfaces. Aspects of human perception, cognition and various models of task analysis are discussed.

A brief description of the Faculty of Health courses that are part of the department-specific and health-specific list of electives is given below:

- **HLTH 612: Introduction to Health Information and Data Standards**
  This course focuses on health data as a key component of all health informatics systems. Topics include ontologies and other classification taxonomies found in health systems, data standards (with a focus on Canadian implementations of international standards), privacy and security of health data, client/patient assessment tools, and ethical considerations.
- **HLTH 633: Digital Health**
  The wide adoption of mobile technology presents a new opportunity. Leveraging this existing technology, healthcare systems can deliver remote care and collect real-time data on patients outside of health centres, minimizing unnecessary visits to hospitals and providing healthcare access to remote populations. In this course, we will explore how digital health technology has been designed, evaluated, and deployed in different countries. Case studies will be used to demonstrate how institutional and governmental constraints have a strong impact on the success of the deployment. The course will address the different digital health technologies in the market, such as Telehealth, remote patient monitoring, tele radiology, consumer health informatics, and mHealth. Important aspects of technology development like patient confidentiality, privacy, standards, communication and security protocols, regulatory requirements, among others, will be discussed when presenting the development of each digital health solution. By the end of this course, students will be prepared to design, evaluate, and deploy a digital health intervention and will have a solid understanding of the barriers and requirements for deploying digital health technology.
- **HLTH 605B: Quantitative Methods and Analysis**
  This course is a rigorous introduction to biostatistics for those planning a career in public health. Students will learn various biostatistical techniques, how to apply those techniques in the analysis of data from health studies, and how to interpret the results from those analyses. After a brief review of material from a basic statistics course, topics covered will include simple and multiple linear regression, analysis of categorical data, simple and

multiple logistic regression, and survival analysis. Emphasis will be on (i) conceptual understanding of topics, including literacy necessary for understanding scientific papers in public health, as well as (ii) carrying out various data analysis applications.

- **HLTH 650A / 650B: Application of Artificial Intelligence in Health (0.25) / Machine Learning Techniques in Health (0.25)**
  HLTH 650A focuses on the application of machine learning (ML) and artificial intelligence (AI) techniques in the field of healthcare and public health settings. Big data sources available for population health studies will be introduced to students and challenges related to AI in health data will also be discussed. The learning activities consist of lectures, student-led journal club discussions and a term paper to propose the application of ML techniques to solve population health or public health problems.
  HLTH 650B focusses on the techniques of machine learning (ML) commonly used to solve healthcare and public health problems. Various analytics techniques, including data wrangling, visualization, 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.
- **HLTH 606B: Principles of Epidemiology for Public Health**
  This course introduces the principles, methods, and uses of epidemiology in the practice of public health. After completion of this course, students will be able to critically read and interpret epidemiologic research and clearly communicate epidemiologic findings. They will be familiar with health status measurement, data sources, screening, surveillance, outbreak investigation, and methods to support program planning and evaluation. Students will have a sound understanding of basic epidemiologic concepts, including prevalence, incidence, study designs, measures of association, bias, confounding and causal inference.
- **HLTH 615: Requirements Specifications and Analysis in Health Systems**
  This course introduces students to the requirements of definition phase of software development. Models, notations, and processes for software requirements identification, representation, validation, and analysis are discussed, as are mechanisms to evaluate the efficacy and efficiency of health information systems.

6. Mode of Delivery (QAF 2.1.2.2)

Courses made available for students of the Collaborative Health Technologies Program use a wide variety of teaching and learning methodologies (e.g., lectures, case-studies, student presentations, in-class group discussion, etc.) designed to provide students with an engaging learning experience. Though not specific to this program, at the University of Waterloo, instructors from all faculties are encouraged to make use of the Center for Teaching Excellence, which offers many resources to aid instructors in improving their teaching, course design, and delivery, emphasising *Active Learning* techniques. Instructors of courses offered to Collaborative Health Technologies Program students will be reminded of these resources.

Following program approval and implementation, the faculty-level administrative staff will ensure the program is continually meeting both intended learning outcomes and degree-level expectations.

7. Assessment of Teaching and Learning (QAF 2.1.2.4)

The performance of students will be assessed both on conventional and existing methods stipulated by the courses they will take, but also based on input from the co-operative education component of this program.

Assessment of teaching and learning will be conducted at the *student* and *program* levels. The program will be assessed at the program level by the Graduate Program Committee and program director. As part of this assessment, the Program Committee will review statistics, such as program performance versus learning objectives, student success rates and teaching evaluations – as provided through both student perception surveys and peer-assessment of teaching. The committee will identify opportunities to improve performance, such as enriching course content or teaching.

Performance indicators that will be considered by the Program Committee will include:

- Applications to and enrollment within the program;
- Student evaluations of courses;
- Student graduation rates;
- Surveys of alumni; and
- Surveys of employers/industry partners.

At the student level, there will be the following types of activities with assessments:

a) Coursework: Students will be assigned a grade based on typical assessment methods used in other graduate courses, such as papers, reports, tests, projects, and presentations.
b) Co-operative Education Work-Term Reports.

Refer to the table in Appendix A for more specific information on how assessments will be made, both for course-based and co-operative education components of this program.

8. Resources for All Programs (QAF 2.1.2.6)

For the anticipated enrolment numbers of the Collaborative Health Technologies Program, the additional students enrolling into pre-existing courses will not present a significant burden on the University's resources (i.e., students take courses from large pools and therefore, there will likely not be so many additional students per course that additional sections and having more instructors would be necessary – in fact, in some cases, the additional grad students enrolling may help improve the instructor utilization efficiency for courses that typically have too low of enrollment numbers). The program would not necessitate hiring any new faculty members and instead would rely on existing known-to-be qualified faculty members already teaching courses. In addition, students will have access to the University's

facilities and spaces, including library resources, working spaces, access to existing resources for student well-being and counselling, as well as technology support from their home department. This program is not expected to impose additional student costs for use of resources. Program coordination can be handled by existing staff resources in the home departments with the Faculty of Engineering providing additional support as needed, as is the case for other existing collaborative programs.

9. Resources for Graduate Programs (QAF 2.1.2.7)

Given the course-based nature of the Collaborative Health Technologies Program, an assessment of the research-related and supervisory expertise of faculty is not required for this program to function. The breadth of courses available for students to take is immense and course instructors may change from term-to-term. Therefore, nearly *all* faculty from the participating units may serve this program through the teaching of courses in which Health Technology students may enroll. On a course-by-course /offering-to-offering basis, ensuring instructor competence is left to the discretion of the corresponding department. Following the precedent of existing professional master's programs in Engineering, no financial assistance will be provided to students. Ensuring the quality of incoming students, will be left to the discretion of the home departments and will be put into action through the standard program admission requirements, as are described in Section 3.

10. Quality and Other Indicators (QAF 2.1.2.8)

To ensure the quality of the program a Program Committee will be created to oversee and regularly evaluate the program, to ensure all program requirements and course related graduate-level degree requirements are met. This committee will consist of a Program Director, the Course Coordinator, a faculty member from each participating department, and a graduate student representative. Furthermore, the co-op office will principally oversee all co-op related activities and components of this program. Within each department of Engineering, Graduate Associate Chairs will monitor the progress of their constituent students from this program, as is already their responsibility for existing professional programs. Specifically, student progression through the program, grades, and successful completion of co-op terms will be tracked. Where needed, remedial action will be taken to ensure students remain on-track and able to maximally benefit from participation in this program.

Appendix A - Summary of Learning Outcomes Mapped to Courses and Assessment Methods

Specific GDLEs and Associated Learning Outcomes	Courses										Co-operative Education			Assessment method							
	University-level ARTS | ENG			Faculty-level SYDE | MME | CHE | CIVE | ECE | MSE						Dept-level CEE | HEALTH										
	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	CHE 621: Model Building and Response Surface Methodology	ENVE 585: Air Quality Engineering & Impact	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Dept-specific and Health-specific Elective Courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
1. Depth and Breadth of Knowledge																					
Understand the principles, concepts, terminology, tools of health technology	A	A	A	C	A	A	A	A	A	AC	NA	NA	A	NA	A	A	A	A	A	A	NA
Demonstrate awareness of key elements of both the ethical considerations and impacts of health technologies	A	A	A	NA	C	NA	NA	NA	C	AC	A	NA	A	NA	A	A	A	A	A	A	NA
Interpret, understand, and critically assess state-of-the-art methods, theories, and advances in health technology	C	C	A	NA	A	C	C	A	A	AC	NA	NA	C	NA	A	A	A	A	A	A	NA
2. Research & Scholarship																					
Integrate complex engineering concepts related to the breadth of health technology, and the underlying and associated sciences.	NA	NA	A	C	A	A	A	A	A	AC	C	NA	C	NA	A	A	A	A	A	A	NA

Specific GDLEs and Associated Learning Outcomes	Courses										Co-operative Education			Assessment method							
	University-level ARTS | ENG			Faculty-level SYDE | MME | CHE | CIVE | ECE | MSE						Dept-level CEE | HEALTH										
	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	CHE 621: Model Building and Response Surface Methodology	ENVE 585: Air Quality Engineering & Impact	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Dept-specific and Health-specific Elective Courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
3. Level of Application of Knowledge																					
Interpret, critically assess and apply state-of-the-art methods, theories, and advances in health technology	A	A	A	C	A	A	A	A	A	AC	NA	NA	A	NA	A	A	A	A	A	A	NA
Understand current issues faced by the health technology industry	A	A	C	C	A	NA	NA	C	A	AC	A	C	A	NA	A	A	A	A	A	A	NA
4. Professional Capacity / Autonomy																					
Independently recognize, define, and solve complex real-world health technology needs and associated challenges	A	A	NA	C	C	C	C	C	C	AC	A	A	A	NA	AC	AC	AC	AC	C	AC	NA
Engage in self-directed professional development and life-long learning	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	C	C	A	NA	NA	NA	NA	NA	A	NA	NA
Develop an ability to recognize, appreciate, consider and apply appropriate ethics, law, regulations, and accountability to the field of health technologies	A	A	C	C	C	NA	NA	C	C	AC	A	C	A	NA	A	A	A	A	A	A	NA

Specific GDLEs and Associated Learning Outcomes	Courses										Co-operative Education			Assessment method							
	University-level ARTS | ENG			Faculty-level SYDE | MME | CHE | CIVE | ECE | MSE						Dept-level CEE | HEALTH										
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Understand the value of engaging in inter-disciplinary collaboration in health technology as well as the complexity of knowledge & limitations of different fields	C	C	C	C	NA	NA	NA	NA	NA	AC	NA	NA	A	NA	NA	NA	C	NA	A	C	NA
Adopt a mindset for collaboration (work effectively in interdisciplinary teams including healthcare professionals, engineers, designers, business developers, etc.)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	A	A	C	NA	NA	NA	NA	NA	C	NA	NA
5. Level of Communications Skills																					
Effectively communicate complex concepts in health technology to a wide audience ranging from general public to experts in the field. Concepts may include health technology needs and associated challenges (includes GDLE 6 Awareness of Limits of Knowledge)	C	C	C	NA	NA	NA	NA	NA	NA	NA	C	C	C	NA	NA	NA	NA	NA	C	C	NA
The ability to communicate ideas, issues and conclusions clearly.	C	C	NA	NA	NA	NA	NA	NA	NA	NA	C	C	A	NA	NA	NA	NA	NA	A	C	NA

Specific GDLEs and Associated Learning Outcomes	Courses										Co-operative Education			Assessment method							
	University-level ARTS | ENG			Faculty-level SYDE | MME | CHE | CIVE | ECE | MSE						Dept-level CEE | HEALTH										
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6. Awareness of Limits of Knowledge																					
Cognizance of the complexity of knowledge and of the potential contributions of other interpretations, methods, and disciplines.	A	A	C	C	C	C	C	C	C	AC	A	A	A	NA	C	NA	NA	NA	A	A	NA
Understand the value of inter-disciplinarity in the field of health technology.	C	C	C	C	C	C	C	C	C	AC	C	C	C	NA	C	NA	C	NA	C	C	NA

Table Legend:

Assessed (A) ..... The outcome is addressed and is formally assessed.
Covered (C) ..... The outcome is addressed but not assessed.
Assessed or Covered (AC)..... The outcome may be addressed and assessed but is at least covered (depending on selected courses).
Not addressed (NA) ..... The outcome is not addressed.

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 Engineering (MEng) in Civil Engineering – Health Technologies – Co-operative Program

Program contact name(s): Adil Al-Mayah, Siva Sivoththaman

Form completed by:

Description of proposed changes:

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

The Department of Civil and Environmental Engineering is joining the inaugural Collaborative Health Technologies Program and is thus adding a Master of Engineering (MEng) in Civil Engineering - Health Technologies - Co-operative Program (direct entry).

Is this a major modification to the program? Yes

Rationale for change(s):

Please refer to the attached brief for full details.

Proposed effective date: Term: Fall Year: 2025

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

https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/programs?group=Civil%20and%20Environmental%20Engineering&bc=true&bcCurrent=Civil%20and%20Environmental%20Engineering&bcItemType=programs

Current primary program in the home unit: MEng in Civil Engineering - Co-operative Program Graduate Studies Academic Calendar content:	**Proposed MEng in Civil Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content**:
Master of Engineering (MEng) in Civil Engineering - Co-operative Program (direct entry)	**Master of Engineering (MEng) in Civil Engineering - Health Technologies - Co-operative Program (direct entry)**

Current primary program in the home unit: MEng in Civil Engineering - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MEng in Civil Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
Admit term(s) • Fall • Winter • Spring **Delivery mode** • On-campus **Registration option(s)** • Full-time **Program type(s)** • Co-operative **Study option(s)** • Coursework **Length of program** • Full-time: 4-5 terms (16-20 months) **Additional program information** • The University of Waterloo does not provide funding for MEng in Civil Engineering students, and the candidates are expected to be self-supporting. **Admission requirements: Minimum requirements** • An Honours Bachelor's degree (or equivalent) with a 75% standing. • Graduate Record Examination (GRE) score (only for those applicants who completed their degree outside of Canada and the United States). • English language proficiency (ELP) (if applicable) **Admission requirements: Application materials** • Résumé • Supplementary information form • Transcript(s) **Admission requirements: References** • Number of references: 2 • Type of references: academic or professional **Degree requirements** • Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).	**Admit term(s)** • Fall • Winter • Spring **Delivery mode** • On-campus **Registration option(s)** • Full-time **Program type(s)** • Co-operative • Collaborative **Study option(s)** • Coursework **Length of program** • Full-time: 4-5 terms (16-20 months) **Additional program information** • The University of Waterloo does not provide funding for MEng in Civil Engineering students, and the candidates are expected to be self-supporting. **Admission requirements: Minimum requirements** • An Honours Bachelor's degree (or equivalent) with a 75% standing. • Graduate Record Examination (GRE) score (only for those applicants who completed their degree outside of Canada and the United States). • English language proficiency (ELP) (if applicable) **Admission requirements: Application materials** • Résumé • Supplementary information form • Transcript(s) **Admission requirements: References** • Number of references: 2 • Type of references: academic or professional **Degree requirements** • Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).

Current primary program in the home unit: MEng in Civil Engineering - Co-operative Program Graduate Studies Academic Calendar content:	**Proposed MEng in Civil Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content**:

• The MEng in Civil Engineering - Co-operative Program will enable students to combine graduate studies with work experience.
• The program includes completion of 1-2 required work terms. The work term(s) typically takes place in term 3 (or terms 3 and 4). The work term(s) must meet Co-operative and Experiential Education (CEE) standard work term requirements and Departmental requirements. Students should apply to jobs related to their program of study. Note: the program must start and end on an academic term. Students in the program are encouraged to complete WIL 601 Career Foundations for Work-Integrated Learning in the academic term prior to the first work term.
 	
Coursework option: Course requirements
• Students must complete 8 one-term graduate level courses (0.50 unit weight) taken from the 500, 600 and 700 series courses (or courses acceptable for graduate credit).
• At least 4 of the 8 required courses must be taken within the Department of Civil and Environmental Engineering.
• An English for Multilingual Speakers (EMLS) technical/professional writing course for Engineers is required for all students who were not English Language Proficiency (ELP) exempt at the time of admission.
• A maximum of 2 500 level courses may be counted for credit.
• The candidate must obtain a pass in all courses credited to their program, with a minimum overall average of 70% (a grade of less than 65% in any course counts as a failure).
• At least half of the courses used for credit must normally be Faculty of Engineering courses.
 	
Coursework option: Milestone requirements
 	
Graduate Studies Work Report
• Students must complete one or two work-term experiences. For each work experience, a work report must be submitted to the Department for review to earn credit for the work report.
• Students are responsible for following the roles and responsibilities of Co-operative and Experiential Education (CEE).
	• The MEng in Civil Engineering - Health Technologies - Co-operative Program will enable students to combine graduate studies with work experience.
	• The program includes completion of 1-2 required work terms. The work term(s) typically takes place in term 3 (or terms 3 and 4). The work term(s) must meet Co-operative and Experiential Education (CEE) standard work term requirements and Departmental requirements. Students should apply to jobs related to their program of study. Note: the program must start and end on an academic term. Students in the program are encouraged to complete WIL 601 Career Foundations for Work-Integrated Learning in the academic term prior to the first work term.
	
	Coursework option: Course requirements
	• Students must complete ~~8~~ the following 9 one-term graduate level courses (0.50 unit weight) ~~taken from the 500, 600 and 700 series courses~~ (or courses acceptable for graduate credit):
	  ○ ENVE 585 Air Quality Engineering and Impacts
	  ○ 2 of the following Health Technologies core courses:
	  ▪ ECON 643 Health Economics
	  ▪ MSE 619 Healthcare Analytics
	  ▪ PHIL 626 Bioethics and Technology
	  ○ 1 of the following Faculty of Engineering Health Technologies elective courses:
	  ▪ BME 600 Design of Biomedical Technologies
	  ▪ BME 602 Foundations in Biomechanical Engineering
	  ▪ CHE 621 Model Building and Response Surface Methodology
	  ▪ ECE 608 Quantitative Methods in Biomedical Engineering
	  ▪ MSE 630 Human-Computer Interaction
	  ○ 1 of the following Health Technologies elective courses:
	  ▪ HLTH 605B Quantitative Methods and Analysis
	  ▪ HLTH 606B Principles of Epidemiology for Public Health

Current primary program in the home unit: MEng in Civil Engineering - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MEng in Civil Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
	▪ HLTH 612 Introduction to Health Information and Data Standards ▪ HLTH 615 Requirements Specifications and Analysis in Health Systems ▪ HLTH 633 Digital Health ▪ HLTH 650A Application of Artificial Intelligence in Health (0.25) and 650B Machine Learning Techniques in Health (0.25) ○ 4 CIVE graduate level courses • ~~At least 4 of the 8 required courses must be taken within the Department of Civil and Environmental Engineering.~~ • An English for Multilingual Speakers (EMLS) technical/professional writing course for Engineers is required for all students who were not English Language Proficiency (ELP) exempt at the time of admission. • A maximum of 2 500 level courses may be counted for credit. • The candidate must obtain a pass in all courses credited to their program, with a minimum overall average of 70% (a grade of less than 65% in any course counts as a failure). • At least half of the courses used for credit must normally be Faculty of Engineering courses. **Coursework option: Milestone requirements** **Graduate Studies Work Report** • Students must complete one or two work-term experiences. For each work experience, a work report must be submitted to the Department for review to earn credit for the work report. • Students are responsible for following the roles and responsibilities of Co-operative and Experiential Education (CEE).

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

Current students will not be impacted. The program will be open to new students once it goes into effect.

Department/School approval date (mm/dd/yy): 01/16/25
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 01/14/25
Faculty approval date (mm/dd/yy):

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

UNIVERSITY OF WATERLOO

GRADUATE PROPOSAL

COLLABORATIVE HEALTH TECHNOLOGIES PROGRAM

MASTER OF ENGINEERING IN ELECTRICAL AND COMPUTER ENGINEERING – HEALTH TECHNOLOGIES (CO-OP)

For submission to the
Ontario Universities Council on Quality Assurance

VOLUME I - PROPOSED BRIEF

DECEMBER 2024

*The Quality Council will normally require only an Expedited Approval process where:

a) there is a proposal for a **new Collaborative Program** at the graduate level; or
b) there is a proposal for **a new for-credit graduate diploma**.

NOTE: This template **must** be used for submission of a new program proposal.
Please consult the University of Waterloo Institutional Quality Assurance Process and the Quality Assurance Framework (QAF) for details or the Quality Assurance Office.
****Volumes I, II must be reviewed and approved by the Quality Assurance Office, GSPA and IAP prior to submission to your Faculty Council****

TABLE OF CONTENTS

1. Introduction

Brief Listing of the Program

The Collaborative Health Technologies Program offers students professional Master of Engineering (MEng) degree with mandatory co-op, as preparation to enter the broad and rapidly evolving field of *Health Technology*. Not only is co-op highly beneficial to students while completing this program, it also offers an important opportunity to those students who *never* had co-op experience during their undergraduate degree. The program is centered around a collaborative and interdisciplinary suite of courses offered by six departments in Engineering and supported by the Faculties of Arts and Health. In addition to coursework, the mandatory co--op program serves to enrich the learning of students with practical experience in industrial settings. This is a full-time, on-campus program, with an expected duration of 4-6 terms, based on the co-op and study sequence selected by particular students. Program tuition follows the existing UW graduate home program tuition structure.

To enroll in the Collaborative Health Technologies Program, students must meet the admission requirements of, and register in, the department of Electrical and Computer Engineering (ECE). Students must complete the Collaborative Health Technologies Program requirements that are structured as a combination ECE department's MEng degree requirement, and the additional Collaborative Health Technologies Program requirements (i.e., the completion of sufficient courses from specified pools, and successful co-op work terms/reports).

The degree conferred will be that of the participating program (i.e. Electrical and Computer Engineering), with the completion of the Collaborative Health Technologies Program indicated by a transcript notation to the degree and adjunct qualification to the degree (i.e. Master of Engineering in Electrical and Computer Engineering – Health Technologies). The proposed collaborative program also offers a platform to allow future participation of other Faculties.

Method Used for Preparation of the Brief

The Collaborative Health Technologies Program was conceptualized by the Dean of Engineering and the Associate Dean Graduate Studies – Engineering. In April 2023, the initiative to develop the program received support from the New Interdisciplinary Networks, Programs, and Initiatives Fund from the University. The proposal was developed following consultations by the Associate Dean with Graduate Associate Chairs of the departments of Chemical Engineering, Civil and Environmental Engineering, Electrical and Computer Engineering, Management Science and Engineering, Mechanical and Mechatronics Engineering, and Systems Design Engineering. The Associate Dean also had discussions with counterparts in other Faculties (e.g., Arts, Health, and Science). The general proposal was presented to the departments in Engineering for consideration within the unit. Following approval, this departmental proposal brief to participate in the collaborative program evolved, incorporating the specific requirements of the home unit.

2. Objectives of the Program (QAF 2.1.2.1))

The Collaborative Health Technologies Program is timely and justified not only based on the critical need for skilled professionals at the intersection of healthcare and technology, but also by the University of Waterloo's own goals, e.g. Waterloo at 100, Global Futures. The following are some of the compelling reasons that justify the establishment of a Collaborative Health Technologies Program:

1. **Rapid Technological Advancements in Healthcare**: The healthcare industry is experiencing an unprecedented transformation due to rapid advancements in technology. Innovations such as artificial intelligence, telemedicine, wearable devices, and data analytics are reshaping healthcare delivery, diagnosis, treatment, and patient care. A dedicated program will equip future professionals with leading-edge skills needed to leverage and drive innovations in this field.
2. **Increasing Demand for Health Technology Experts**: There is a growing demand for professionals who possess a deep understanding of both healthcare and technology. This demand arises from the need to bridge the gap between traditionally siloed fields and create holistic solutions that address complex healthcare challenges. Graduates of a Collaborative Health Technology Program will fill this talent gap and drive innovation in healthcare settings.
3. **Addressing Healthcare Challenges**: The global healthcare landscape faces numerous challenges, including rising costs, an aging population, chronic diseases, disparities in healthcare access, and pandemics. A Collaborative Health Technologies Program will empower students to develop innovative solutions to address these challenges, improve healthcare access, and enhance patient outcomes.
4. **Opportunity for Interdisciplinary Collaboration**: A program that combines healthcare and technology will foster interdisciplinary collaboration. Students will learn to collaborate with healthcare professionals, engineers, data scientists, ethicists, and policymakers, fostering a diverse and comprehensive approach to problem-solving.
5. **Industry-Relevant Skill Development**: Employers in the healthcare and technology sectors seek professionals with specialized skills in areas such as health data analytics, digital health, telemedicine, medical device development, regulatory compliance, and AI applications in healthcare. Both the course-based components and the mandatory co-op of this Collaborative Health Technologies Program combine to ensure that graduates are well-prepared with these in-demand skills.
6. **Economic and Innovation Impact**: Investing in a Collaborative Health Technologies Program aligns with the current market demand and presents an opportunity to contribute to economic growth and innovation. Graduates equipped with the skills to develop and implement Health Technology solutions can drive entrepreneurship, create job opportunities, and contribute to the expansion of healthcare technology sectors.
7. **Addressing Future Healthcare Needs**: With the evolving landscape of healthcare and technology, preparing future professionals to navigate and lead in this dynamic environment is essential. Establishing a Collaborative Health Technologies Program now ensures that the workforce is ready to address the future needs and challenges of the healthcare industry.

Program Learning Outcomes and Graduate Degree Level Expectations (GDLE):

1. **Depth and Breadth of Knowledge**
    a. Understand the principles, concepts, terminology and tools of health technology
    b. Demonstrate awareness of key elements of both the ethical considerations and impacts of health technologies
    c. Interpret, understand, and critically assess state-of-the-art methods, theories, and advances in health technology
2. **Research & Scholarship**
    a. Integrate complex engineering concepts related to the breadth of health technology, and the underlying and associated sciences.
3. **Level of Application of Knowledge**
    a. Interpret, critically assess and apply state-of-the-art methods, theories, and advances in health technology
    b. Understand current issues faced by the health technology industry
4. **Professional Capacity / Autonomy**
    a. Independently recognize, define, and solve complex real-world health technology needs and associated challenges
    b. Engage in self-directed professional development and life-long learning
    c. Develop an ability to recognize, appreciate, consider and apply appropriate ethics, law, regulations, and accountability to the field of health technologies
    d. Understand the value of engaging in inter-disciplinary collaboration in health technology as well as the complexity of knowledge & limitations of different fields
    e. Adopt a mindset for collaboration (work effectively in interdisciplinary teams including healthcare professionals, engineers, designers, business developers, etc.)
5. **Level of Communication Skills**
    a. Effectively communicate complex concepts in health technology to a wide audience ranging from general public to experts in the field. Concepts may include health technology needs and associated challenges (includes GDLE 6 Awareness of Limits of Knowledge)
    b. The ability to communicate ideas, issues and conclusions clearly.
6. **Awareness of Limits of Knowledge**
    a. Cognizance of the complexity of knowledge and of the potential contributions of other interpretations, methods, and disciplines.
    b. Understand the value of inter-disciplinarity in the field of health technologies.

How does this Program align with the University of Waterloo Strategic Plan and Strategic Mandate Agreement?

The Collaborative Health Technologies Program aligns well with the University of Waterloo's strategic plan in several ways:

1. **Interdisciplinary Collaboration:** The program's collaboration between the departments in Engineering as well as the support by Arts and Health, demonstrate a commitment to

interdisciplinary collaboration, a key focus area of the strategic plan. This collaboration brings together diverse perspectives and expertise, fostering innovation in health technology by integrating engineering skills with insights from health, social sciences, and humanities.

2. **Work-integrated Learning through Co-op:** The mandatory co-op component of the program aligns with the strategic plan's emphasis on experiential learning. This practical work experience allows students to apply their knowledge in real-world settings, contributing to their professional development while addressing real challenges in health technology.
3. **Benefits of Innovation and Research:** The program's focus on Health Technologies aligns with the strategic plan's emphasis on fostering innovation. Even though this is a course-based program, it does enable students to connect with faculty from various departments to engage with cutting-edge technologies and understand solutions to real-world problems.
4. **Community Partnerships:** Collaboration between different departments within Engineering, along with the support, through course offering, by Faculties of Arts and Health, opens opportunities for partnership with external organizations, hospitals, and industry players. This engagement aligns with the strategic plan's focus on strengthening community partnerships. Co-op placements also will play a key role in this aspect.
5. **Technology and Global Challenges:** By addressing healthcare challenges through technology and innovation, the program contributes to addressing global challenges, which is in line with the University's strategic goal of leveraging technology for positive societal impact.
6. **Commitment to Excellence and Diversity:** The collaborative nature of the program reflects the University's commitment to excellence in education and research. Furthermore, by integrating diverse perspectives from multiple departments and faculties, the program contributes to promoting diversity and inclusion, a priority area in the strategic plan.

Overall, the Collaborative Health Technologies Program embodies many key pillars of the University of Waterloo's Strategic Plan by promoting interdisciplinary collaboration, experiential learning, innovation, community engagement, and a commitment to excellence and diversity.

3. Admission Requirements (QAF 2.1.2.5)

Admission into the Collaborative Health Technologies Program is through direct application to the program offered through the home administrative unit, i.e. ECE. Admission requirements for the program will be the same as those existing for the Master of Engineering degree in ECE.

The minimum academic requirements – including admissions requirements, minimum overall averages, and timelines for any milestones – in the program will be consistent with the requirements of the primary existing master's program for each participating department.

In detail, the admission requirements for MEng in the department of Electrical and Computer Engineering are:

- Either (i) a 75% overall standing in the last two years, or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent or (ii) a 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent, as the minimum requirement for admission to a Master's program for applicants educated at a Canadian institution. A 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent is the minimum requirement for admission to a Master's program for applicants educated outside of Canada.
- A Supplementary Information Form (SIF), which contains questions specific to the program about why applicants want to enroll and their experience in the field, must be completed.
- Required application materials include, Resume, SIF, Academic Transcript(s); Proof of English language Proficiency (if applicable); and two references with at least one from academic sources

  Minimum English Language Proficiency requirement: TOEFL 80 (writing 22, speaking 20, reading 20, listening 18), or IELTS 6.5 (writing 6.0, speaking 6.0).

These admission requirements are appropriate given the precedent of existing co-op Master's programs in the Faculty of Engineering. The level of required academic performance is indicative of what will be required of students during their studies within this proposed program and serves to select only students who will be capable of meeting course expectations and overall program learning outcomes. Furthermore, the Supplementary Information Form, resume, and reference letters will allow for recognition of the prior work, experience, aspirations, and career trajectory of applicants.

4. Structure (QAF 2.1.2.2)

The Collaborative Health Technologies Program is a co-op only, course-based program. Completion of 9 courses and a compulsory PD course will be required to meet the coursework requirement of the program. Selection of courses will be as follows:

2 courses from the following University-level courses (ARTS, ENG):

- PHIL 626: Bioethics and Technology
- ECON 643: Health Economics
- MSE 619: Healthcare Analytics

1 course from the following Faculty-level courses (5 ENG depts):

- BME 600: Design of Biomedical Technologies
- BME 602: Foundations in Biomechanical Engineering
- CHE 621: Model Building and Response Surface Methodology
- ECE 608: Quantitative Methods in Biomedical Engineering
- MSE 630: Human-Computer Interaction

2 courses from the following Faculty of Health courses:

- HLTH 612: Introduction to Health Information and Data Standards
- HLTH 633: Digital Health
- HLTH 650A / 650B: Application of Artificial Intelligence in Health (0.25) / Machine Learning Techniques in Health (0.25)
- HLTH 606B: Principles of Epidemiology for Public Health
- HLTH 615: Requirements Specifications and Analysis in Health Systems

4 graduate courses from ECE or from the above HLTH courses

Must have a minimum of 4 ECE courses

The program study / co-op sequence is illustrated below. Having co-op during the program both allows students to apply what they have learned in school to their co-op employment, but also the reverse: apply what has been learned during co-op terms to their in-school experiences. This model allows for bidirectional inspiration and gives students an important *context* for what they are learning.

Term-1	Term-2	Term-3	Term-4	Term-5	Term-6
study	study	Co-op	Co-op	study	(study)
study	study	Co-op	study	(study)	

Rationale and Justification

The structure and regulations of the Collaborative Health Technologies Program align with the program learning outcomes and Degree-Level Expectations. More detail is given below.

Alignment with Program Learning Outcomes:

1. **Diversity of Course Offerings:** The coursework structure ensures a breadth of courses from various levels (University, Faculty, Department) covering different aspects of health technologies, such as ethics, analytics, biomedical engineering, rehabilitation engineering, human-computer interaction, health-care systems, epidemiology, systems theory etc. The proposed program is designed in such a way that potential future participation of additional Faculties with their own master's program model is both possible and would further enrich the program content.
2. **Integration of Practical Experience:** The mandatory incorporation of co-op allows students to apply theoretical knowledge gained in the classroom to real-world scenarios, and vice versa. This aligns with the objective of the program to foster practical application and real-world learning.

Meeting Degree Level Expectations:

1. **Depth and Breadth of Knowledge:** The variety of courses spanning different Departments and Faculties suggests a comprehensive coverage of topics relevant to health technologies, meeting the depth and breadth of knowledge expected at the master's level.
2. **Professional Skills Development:** The incorporation of co-op experiences facilitates the development of professional skills, preparing students for practical challenges in the field.

Rationale for Program Length:

The proposed program length is reasonable for several reasons:

1. **Course Load and Requirements:** 9 courses within the program, structured across different units and levels, can be reasonably completed within three to four study terms.
2. **Integration of Co-op Experience:** The inclusion of co-op necessitates a program duration that allows students to engage in these practical experiences without significantly extending the program length.
3. **Balancing Academic and Practical Learning:** The program aims to balance academic learning with real-world application. A structured timeframe enables students to attain both theoretical knowledge and practical skills within a manageable period.

5. Program Content (QAF 2.1.2.3)

Health Technologies represent the dynamic intersection of healthcare and cutting-edge technology, encompassing a diverse array of innovations designed to revolutionize patient care, improve healthcare accessibility, and enhance overall well-being. Embracing a multidisciplinary approach, Health Technologies integrate advancements in artificial intelligence, data analytics, telemedicine, medical imaging, ethics, and more, to drive transformative changes in the diagnosis, treatment, and management of health conditions. The Collaborative Health Technologies Program is a muti-disciplinary course-based program in the Faculty of Engineering with mandatory co-op, integrated within the timeline of the program. Its multi-disciplinarity is derived on the basis of the participation, through course offerings, of the Faculties of Arts and Health. Additionally, the enrolled students will also take appropriate courses across several departments within Engineering. All courses taken are at the graduate level. An overview of the program's course structure was given in Section 4. Here, additional information on the courses is given.

A brief description of the University-level courses, from which a student would be required to take two courses, is given below:

- **PHIL 626: Bioethics and Technology** (Arts)
  Students will grapple with a sample of ethical issues related to advanced and emerging medical technologies and/or biotechnologies. The primary goals of doing so are: (1) To gain familiarity with key ethical concepts and values, which may include patient autonomy, beneficence, justice, care, anti-ableism, inclusion, and others; and (2) to enhance core critical thinking skills needed for ethics, which will help improve each student's self-understanding (of not only what they think is right and wrong, but, more importantly, why) and their capacity to engage with different perspectives on the "whats" and "whys" of ethics in a spirit

of open-mindedness, mutual respect, and constructive cooperation. Frequent in-class discussion is typically an important element of student learning in this course.

- **ECON 643: Health Economics** (Arts)
  This course introduces students to the role of economics in health care and health policy. It is meant to be a survey of major topics in health economics and an introduction to the ongoing debate over health care policy. Topics include the economic determinants of health and health policy, the market for medical care, the market for health insurance, and the role of the government in health care, and health care reform.
- **MSE 619: Healthcare Analytics** (Engineering)
  This course provides an introductory course on health analytics including such topics as data acquisition, modelling, and predictive analytics. The course focuses on the practical application of the concepts to improve the quality of the analyses often found in the health sector. Application areas will be concentrated on topics found in health systems and may include topics such as planning and scheduling, disease diagnosis, and treatment planning. The learning outcomes include the ability to identify and apply appropriate analytical methods and models for healthcare.

A brief description of the Faculty-level courses, from which a student would be required to take one course, is given below:

- **BME 600: Design of Biomedical technologies** (SYDE)
  Systems theory and formulation of system dynamics problems. Design and research methods for biomedical technologies. Problem formulation and definition, stakeholder engagement, needs analysis, generation of alternative solutions, feasibility analysis, optimization, selection, and solution implementation.
- **BME602: Foundations in Biomechanical Engineering** (MME)
  This course focuses on equipping students with foundational knowledge in the biomechanics of human physiology, pathology and treatment. The overarching aim of this course is to develop students' literacy in applying biomechanics principles and modern tools towards understanding the human body. The course will build on existing knowledge in mathematics and physics to develop new expertise and hands-on experience in the biomechanical modeling and analysis of physiological systems.
- **CHE 621: Model Building and Response Surface Methodology** (CHE)
  This course teaches process / product optimization based on design of experiments, empirical modelling, and non-linear mechanistic models. These methodologies aid in refining healthcare processes and products, ensuring they meet stringent standards of efficiency, safety, and effectiveness.
- **ECE 608: Quantitative Methods in Biomedical Engineering** (ECE)
  This course focuses on topics related to the use of quantitative tools in biomedical engineering research studies. Educational emphasis will be placed on developing students' core competence in biostatistics and biomedical computing, so as to prepare them to pursue biomedical engineering investigations that are backed by quantitative reasoning and numerical insights.

- **MSE 630: Human Computer Interaction** (MSE)
  This course concentrates on the theoretical and practical issues related to the design of the human-computer interfaces. Aspects of human perception, cognition and various models of task analysis are discussed.

A brief description of the Faculty of Health courses, from which a student would be required to take two courses, and that are part of the department-specific and health-specific list of electives is given below:

- **HLTH 612: Introduction to Health Information and Data Standards**
  This course focuses on health data as a key component of all health informatics systems. Topics include ontologies and other classification taxonomies found in health systems, data standards (with a focus on Canadian implementations of international standards), privacy and security of health data, client/patient assessment tools, and ethical considerations.
- **HLTH 633: Digital Health**
  The wide adoption of mobile technology presents a new opportunity. Leveraging this existing technology, healthcare systems can deliver remote care and collect real-time data on patients outside of health centres, minimizing unnecessary visits to hospitals and providing healthcare access to remote populations. In this course, we will explore how digital health technology has been designed, evaluated, and deployed in different countries. Case studies will be used to demonstrate how institutional and governmental constraints have a strong impact on the success of the deployment. The course will address the different digital health technologies in the market, such as Telehealth, remote patient monitoring, tele radiology, consumer health informatics, and mHealth. Important aspects of technology development like patient confidentiality, privacy, standards, communication and security protocols, regulatory requirements, among others, will be discussed when presenting the development of each digital health solution. By the end of this course, students will be prepared to design, evaluate, and deploy a digital health intervention and will have a solid understanding of the barriers and requirements for deploying digital health technology.
- **HLTH 650A / 650B: Application of Artificial Intelligence in Health (0.25) / Machine Learning Techniques in Health (0.25)**
  HLTH 650A focuses on the application of machine learning (ML) and artificial intelligence (AI) techniques in the field of healthcare and public health settings. Big data sources available for population health studies will be introduced to students and challenges related to AI in health data will also be discussed. The learning activities consist of lectures, student-led journal club discussions and a term paper to propose the application of ML techniques to solve population health or public health problems.
  HLTH 650B focusses on the techniques of machine learning (ML) commonly used to solve healthcare and public health problems. Various analytics techniques, including data wrangling, visualization, 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.

- **HLTH 606B: Principles of Epidemiology for Public Health**
  This course introduces the principles, methods, and uses of epidemiology in the practice of public health. After completion of this course, students will be able to critically read and interpret epidemiologic research and clearly communicate epidemiologic findings. They will be familiar with health status measurement, data sources, screening, surveillance, outbreak investigation, and methods to support program planning and evaluation. Students will have a sound understanding of basic epidemiologic concepts, including prevalence, incidence, study designs, measures of association, bias, confounding and causal inference.
- **HLTH 615: Requirements Specifications and Analysis in Health Systems**
  This course introduces students to the requirements of definition phase of software development. Models, notations, and processes for software requirements identification, representation, validation, and analysis are discussed, as are mechanisms to evaluate the efficacy and efficiency of health information systems.

6. Mode of Delivery (QAF 2.1.2.2)

Courses made available for students of the Collaborative Health Technologies Program use a wide variety of teaching and learning methodologies (e.g., lectures, case-studies, student presentations, in-class group discussion, etc.) designed to provide students with an engaging learning experience. Though not specific to this program, at the University of Waterloo, instructors from all faculties are encouraged to make use of the Center for Teaching Excellence, which offers many resources to aid instructors in improving their teaching, course design, and delivery, emphasising *Active Learning* techniques. Instructors of courses offered to Collaborative Health Technologies Program students will be reminded of these resources.

Following program approval and implementation, the faculty-level administrative staff will ensure the program is continually meeting both intended learning outcomes and degree-level expectations.

7. Assessment of Teaching and Learning (QAF 2.1.2.4)

The performance of students will be assessed both on conventional and existing methods stipulated by the courses they will take, but also based on input from the co-operative education component of this program. Assessment of teaching and learning will be conducted at the *student* and *program* levels. The program will be assessed at the program level by the Graduate Program Committee and program director. As part of this assessment, the Program Committee will review statistics, such as program performance versus learning objectives, student success rates and teaching evaluations – as provided through both student perception surveys and peer-assessment of teaching. The committee will identify opportunities to improve performance, such as enriching course content or teaching.

Performance indicators that will be considered by the Program Committee will include:

- Applications to and enrollment within the program;
- Student evaluations of courses;
- Student graduation rates;

- Surveys of alumni; and
- Surveys of employers/industry partners.

At the student level, there will be the following types of activities with assessments:

a) Coursework: Students will be assigned a grade based on typical assessment methods used in other graduate courses, such as papers, reports, tests, projects, and presentations.
b) Co-operative Education Work-Term Reports.

Refer to the table in Appendix A for more specific information on how assessments will be made, both for course-based and co-operative education components of this program.

8. Resources for All Programs (QAF 2.1.2.6)

For the anticipated enrolment numbers of the Collaborative Health Technologies Program, the additional students enrolling into pre-existing courses will not present a significant burden on the University's resources (i.e., students take courses from large pools and therefore, there will likely not be so many additional students per course that additional sections and having more instructors would be necessary – in fact, in some cases, the additional grad students enrolling may help improve the instructor utilization efficiency for courses that typically have too low of enrollment numbers). The program would not necessitate hiring any new faculty members and instead would rely on existing known-to-be qualified faculty members already teaching courses. In addition, students will have access to the University's facilities and spaces, including library resources, working spaces, access to existing resources for student well-being and counselling, as well as technology support from their home department. This program is not expected to impose additional student costs for use of resources. Program coordination can be handled by existing staff resources in the home departments with the Faculty of Engineering providing additional support as needed, as is the case for other existing collaborative programs.

9. Resources for Graduate Programs (QAF 2.1.2.7)

Given the course-based nature of the Collaborative Health Technologies Program, an assessment of the research-related and supervisory expertise of faculty is not required for this program to function. The breadth of courses available for students to take is immense and course instructors may change from term-to-term. Therefore, nearly *all* faculty from the participating units may serve this program through the teaching of courses in which Health Technology students may enroll. On a course-by-course /offering-to-offering basis, ensuring instructor competence is left to the discretion of the corresponding department. Following the precedent of existing professional master's programs in Engineering, no financial assistance will be provided to students. Ensuring the quality of incoming students, will be left to the discretion of the home departments and will be put into action through the standard program admission requirements, as are described in Section 3.

10. Quality and Other Indicators (QAF 2.1.2.8)

To ensure the quality of the program a Program Committee will be created to oversee and regularly evaluate the program, to ensure all program requirements and course related graduate-level degree requirements are met. This committee will consist of a Program Director, the Course Coordinator, a faculty member from each participating department, and a graduate student representative. Furthermore, the co-op office will principally oversee all co-op related activities and components of this program. Within each department of Engineering, Graduate Associate Chairs will monitor the progress of their constituent students from this program, as is already their responsibility for existing professional programs. Specifically, student progression through the program, grades, and successful completion of co-op terms will be tracked. Where needed, remedial action will be taken to ensure students remain on-track and able to maximally benefit from participation in this program.

Appendix A - Summary of Learning Outcomes Mapped to Courses and Assessment Methods

Specific GDLEs and Associated Learning Outcomes	Courses									Co-operative Education			Assessment method							
	University-level ARTS | ENG			Faculty-level SYDE | MME | CHE | ECE | MSE					Dept-level ECE | HEALTH										
	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	CHE 621: Model Building and Response Surface Methodology	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Health-specific electives and Dept-specific courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
1. Depth and Breadth of Knowledge																				
Understand the principles, concepts, terminology, tools of health technology	A	A	A	C	A	A	A	A	AC	NA	NA	A	NA	A	A	A	A	A	A	NA
Demonstrate awareness of key elements of both the ethical considerations and impacts of health technologies	A	A	A	NA	C	NA	NA	C	AC	A	NA	A	NA	A	A	A	A	A	A	NA
Interpret, understand, and critically assess state-of-the-art methods, theories, and advances in health technology	C	C	A	NA	A	C	A	A	AC	NA	NA	C	NA	A	A	A	A	A	A	NA
2. Research & Scholarship																				
Integrate complex engineering concepts related to the breadth of health technology, and the underlying and associated sciences.	NA	NA	A	C	A	A	A	A	AC	C	NA	C	NA	A	A	A	A	A	A	NA

Specific GDLEs and Associated Learning Outcomes	Courses									Co-operative Education			Assessment method							
	University-level ARTS | ENG			Faculty-level SYDE | MME | CHE | ECE | MSE					Dept-level ECE | HEALTH										
	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	CHE 621: Model Building and Response Surface Methodology	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Health-specific electives and Dept-specific courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
3. Level of Application of Knowledge																				
Interpret, critically assess and apply state-of-the-art methods, theories, and advances in health technology	A	A	A	C	A	A	A	A	AC	NA	NA	A	NA	A	A	A	A	A	A	NA
Understand current issues faced by the health technology industry	A	A	C	C	A	NA	C	A	AC	A	C	A	NA	A	A	A	A	A	A	NA
4. Professional Capacity / Autonomy																				
Independently recognize, define, and solve complex real-world health technology needs and associated challenges	A	A	NA	C	C	C	C	C	AC	A	A	A	NA	AC	AC	AC	AC	C	AC	NA
Engage in self-directed professional development and life-long learning	NA	NA	NA	NA	NA	NA	NA	NA	NA	C	C	A	NA	NA	NA	NA	NA	A	NA	NA
Develop an ability to recognize, appreciate, consider and apply appropriate ethics, law, regulations, and accountability to the field of health technologies	A	A	C	C	C	NA	C	C	AC	A	C	A	NA	A	A	A	A	A	A	NA

Specific GDLEs and Associated Learning Outcomes	Courses									Co-operative Education			Assessment method							
	University-level ARTS | ENG			Faculty-level SYDE | MME | CHE | ECE | MSE					Dept-level ECE | HEALTH										
	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	CHE 621: Model Building and Response Surface Methodology	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Health-specific electives and Dept-specific courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
Understand the value of engaging in inter-disciplinary collaboration in health technology as well as the complexity of knowledge & limitations of different fields	C	C	C	C	NA	NA	NA	NA	AC	NA	NA	A	NA	NA	NA	C	NA	A	C	NA
Adopt a mindset for collaboration (work effectively in interdisciplinary teams including healthcare professionals, engineers, designers, business developers, etc.)	NA	NA	NA	NA	NA	NA	NA	NA	NA	A	A	C	NA	NA	NA	NA	NA	C	NA	NA
5. Level of Communications Skills																				
Effectively communicate complex concepts in health technology to a wide audience ranging from general public to experts in the field. Concepts may include health technology needs and associated challenges (includes GDLE 6 Awareness of Limits of Knowledge)	C	C	C	NA	NA	NA	NA	NA	NA	C	C	C	NA	NA	NA	NA	NA	C	C	NA
The ability to communicate ideas, issues and conclusions clearly.	C	C	NA	NA	NA	NA	NA	NA	NA	C	C	A	NA	NA	NA	NA	NA	A	C	NA

Specific GDLEs and Associated Learning Outcomes	Courses									Co-operative Education			Assessment method							
	University-level ARTS | ENG			Faculty-level SYDE | MME | CHE | ECE | MSE					Dept-level ECE | HEALTH										
	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	CHE 621: Model Building and Response Surface Methodology	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Health-specific electives and Dept-specific courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
6. Awareness of Limits of Knowledge																				
Cognizance of the complexity of knowledge and of the potential contributions of other interpretations, methods, and disciplines.	A	A	C	C	C	C	C	C	AC	A	A	A	NA	C	NA	NA	NA	A	A	NA
Understand the value of inter-disciplinarity in the field of health technology.	C	C	C	C	C	C	C	C	AC	C	C	C	NA	C	NA	C	NA	C	C	NA

Table Legend:

Assessed (A) ..... The outcome is addressed and is formally assessed.
Covered (C) ..... The outcome is addressed but not assessed.
Assessed or Covered (AC)..... The outcome may be addressed and assessed but is at least covered (depending on selected courses).
Not addressed (NA) ..... The outcome is not addressed.

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 Engineering (MEng) in Electrical and Computer Engineering – Health Technologies – Co-operative Program

Program contact name(s): Christopher Nielsen, Siva Sivoththaman, Jessica Rossi

Form completed by:

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

The Department of Electrical and Computer Engineering is joining the Collaborative Health Technologies Program and is thus adding a Master of Engineering (MEng) in Electrical and Computer Engineering - Health Technologies - Co-operative Program (direct entry).

Is this a major modification to the program? Yes

Rationale for change(s):

Please refer to the attached brief for full details.

Proposed effective date: Term: Fall Year: 2025

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

https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/programs?group=Electrical%20and%20Computer%20Engineering

Current primary program in the home unit: MEng in Electrical and Computer Engineering - Co-operative Program Graduate Studies Academic Calendar content:	**Proposed MEng in Electrical and Computer Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content**:
Master of Engineering (MEng) in Electrical and Computer Engineering - Co-operative Program (direct entry) **Admit term(s)** • Fall • Winter • Spring **Delivery mode**	**Master of Engineering (MEng) in Electrical and Computer Engineering - Health Technologies - Co-operative Program (direct entry)** **Admit term(s)** • Fall • Winter • Spring **Delivery mode**

Current primary program in the home unit: MEng in Electrical and Computer Engineering - Co-operative Program Graduate Studies Academic Calendar content:	**Proposed MEng in Electrical and Computer Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content**:
• On-campus **Registration option(s)** • Full-time **Program type(s)** • Co-operative **Study option(s)** • Coursework **Length of program** • Full-time: 5-6 terms (20-24 months) **Graduate specializations** • Artificial Intelligence and Machine Learning • Biomedical Engineering • Business Leadership • Computer Networking and Security • Nanoelectronic Circuits and Systems • Nanoelectronic Devices and Materials • Software • Sustainable Energy **Admission requirements: Minimum requirements** • The Department of Electrical and Computer Engineering requires either (i) a 75% overall standing in the last two years, or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent or (ii) a 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent, as the minimum requirement for admission to a Master's program for applicants educated at a Canadian institution. A 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent is the minimum requirement for admission to a Master's program for applicants educated outside of Canada. • English language proficiency (ELP) (if applicable) **Admission requirements: Application materials** • Résumé • Supplementary information form • Transcript(s) **Admission requirements: References** • Number of references: 2 • Type of references: at least 1 academic	• On-campus **Registration option(s)** • Full-time **Program type(s)** • Co-operative • <u>Collaborative</u> **Study option(s)** • Coursework **Length of program** • Full-time: 5-6 terms (20-24 months) ~~**Graduate specializations**~~ ~~• Artificial Intelligence and Machine Learning~~ ~~• Biomedical Engineering~~ ~~• Business Leadership~~ ~~• Computer Networking and Security~~ ~~• Nanoelectronic Circuits and Systems~~ ~~• Nanoelectronic Devices and Materials~~ ~~• Software~~ • ~~Sustainable Energy~~ **Admission requirements: Minimum requirements** • The Department of Electrical and Computer Engineering requires either (i) a 75% overall standing in the last two years, or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent or (ii) a 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent, as the minimum requirement for admission to a Master's program for applicants educated at a Canadian institution. A 75% overall standing or equivalent, in a relevant four-year Honours Bachelor's degree or equivalent is the minimum requirement for admission to a Master's program for applicants educated outside of Canada. • English language proficiency (ELP) (if applicable) **Admission requirements: Application materials** • Résumé • Supplementary information form • Transcript(s) **Admission requirements: References** • Number of references: 2

Current primary program in the home unit: MEng in Electrical and Computer Engineering - Co-operative Program Graduate Studies Academic Calendar content:	**Proposed MEng in Electrical and Computer Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content**:

Degree requirements
• Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).
• The MEng in Electrical and Computer Engineering - Co-operative Program will enable students to combine graduate studies with work experience. The program will foster professional development, networking and new collaborations while enhancing employment opportunities after degree completion.
• The program will include 1 or 2 work terms. The timing of work and academic terms is fairly flexible, but the program must start and end on an academic term. Students in the program are encouraged to complete WIL 601 Career Foundations for Work-Integrated Learning in the academic term prior to the first work term.
 	
Coursework option: Course requirements
• Students must successfully complete 8 one-term courses (0.50 unit weight) acceptable for credit by the Department.
• Students may register for any ECE course at the 600 or 700 levels.
• A minimum of 5 courses must be taken from within the ECE Department. A maximum of 3 courses may be taken from outside the Department but must be from the faculties of Engineering, Mathematics and Science. Students opting for the Graduate Specialization in Business Leadership are allowed to take a maximum of 4 courses from outside ECE, but from the specified list of BE/BET courses, detailed below.
• A minimum grade of 65% in each of the 8 courses and a minimum cumulative average of 70% are required to remain in the program. Students who receive a grade of less than 65% may be permitted to take a maximum of 2 additional courses to meet the minimum averages for the degree requirements (outlined above).
• Students wishing to complete a Graduate Specialization as part of their MEng program should consult the list of required courses for each Graduate Specialization before selecting courses, as the number of minimum required courses may differ.
• Students in the MEng in Electrical and Computer Engineering - Co-operative Program
	• Type of references: at least 1 academic
	
	Degree requirements
	• Students must complete the course and milestone requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM).
	• The MEng in Electrical and Computer Engineering - Health Technologies - Co-operative Program will enable students to combine graduate studies with work experience. The program will foster professional development, networking and new collaborations while enhancing employment opportunities after degree completion.
	• The program will include 1 or 2 work terms. The timing of work and academic terms is fairly flexible, but the program must start and end on an academic term. Students in the program are encouraged to complete WIL 601 Career Foundations for Work-Integrated Learning in the academic term prior to the first work term.
	
	Coursework option: Course requirements
	• Students must successfully complete the following 9 ~~8~~ one-term courses (0.50 unit weight) acceptable for credit by the Department.
	  ○ 2 of the following Health Technologies core courses:
	  ▪ ECON 643 Health Economics
	  ▪ MSE 619 Healthcare Analytics
	  ▪ PHIL 626 Bioethics and Technology
	  ○ 1 of the following Faculty of Engineering Health Technologies elective courses:
	  ▪ BME 600 Design of Biomedical Technologies
	  ▪ BME 602 Foundations in Biomechanical Engineering
	  ▪ CHE 621 Model Building and Response Surface Methodology
	  ▪ ECE 608 Quantitative Methods in Biomedical Engineering
	  ▪ MSE 630 Human-Computer Interaction
	  ○ 2 of the following Health Technologies elective courses:
	  ▪ HLTH 606B Principles of Epidemiology for Public Health

Current primary program in the home unit: MEng in Electrical and Computer Engineering - Co-operative Program Graduate Studies Academic Calendar content:	**Proposed MEng in Electrical and Computer Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content**:
may choose to pursue one of the following Graduate Specializations: 1. Artificial Intelligence and Machine Learning 2. Biomedical Engineering 3. Business Leadership 4. Computer Networking and Security 5. Nanoelectronic Circuits and Systems 6. Nanoelectronic Devices and Materials 7. Software 8. Sustainable Energy • A Graduate Specialization is a University credential that is recognized on the student's transcript but not on the diploma and is intended to reflect that a student has successfully completed a set of courses that together provide an in-depth study in the area of the Graduate Specialization. A student will only obtain the Graduate Specialization on their transcript if they have completed the requirements associated with the MEng degree and the requirements associated with the Graduate Specialization. • All MEng Graduate Specializations in Electrical and Computer Engineering consist of a set of at least 4 graduate (0.50 weight) level courses and this set is comprised of a mix of compulsory and elective courses. Compulsory courses are those that are prescribed as part of the Graduate Specialization. Elective courses are those that are on a list of courses designated as electives for a given Graduate Specialization. The requirements for each of the Graduate Specializations are described below. • Note: Not all elective courses for any given Graduate Specialization are guaranteed to be offered each year. Students are encouraged to take elective courses when they are offered and should plan accordingly. • Students will be able to complete the Business Leadership Graduate Specialization along with 1 other ECE Graduate Specialization, noting the following: o Each course will only be counted towards one Graduate Specialization and the MEng degree. o The number of required courses for the MEng degree will increase from 8 to 9 or 10 depending on the requirements associated with the Graduate Specializations. • Students must consult with the ECE Masters Coordinator to finalize their plan of study and	▪ HLTH 612 Introduction to Health Information and Data Standards ▪ HLTH 615 Requirements Specifications and Analysis in Health Systems ▪ HLTH 633 Digital Health ▪ HLTH 650A Application of Artificial Intelligence in Health (0.25) and 650B Machine Learning Techniques in Health (0.25) o 4 ECE graduate level courses or HLTH courses from the list above • Students may register for any ECE course at the 600 or 700 levels. • A minimum of ~~5~~ 4 courses must be taken from within the ECE Department. ~~A maximum of 3 courses may be taken from outside the Department but must be from the faculties of Engineering, Mathematics and Science. Students opting for the Graduate Specialization in Business Leadership are allowed to take a maximum of 4 courses from outside ECE, but from the specified list of BE/BET courses, detailed below.~~ • A minimum grade of 65% in each of the ~~8~~ 9 courses and a minimum cumulative average of 70% are required to remain in the program. Students who receive a grade of less than 65% may be permitted to take a maximum of 2 additional courses to meet the minimum averages for the degree requirements (outlined above). ~~• Students wishing to complete a Graduate Specialization as part of their MEng program should consult the list of required courses for each Graduate Specialization before selecting courses, as the number of minimum required courses may differ.~~ ~~• Students in the MEng in Electrical and Computer Engineering - Co-operative Program may choose to pursue one of the following Graduate Specializations:~~ ~~1. Artificial Intelligence and Machine Learning~~ ~~2. Biomedical Engineering~~ ~~3. Business Leadership~~ ~~4. Computer Networking and Security~~ ~~5. Nanoelectronic Circuits and Systems~~ ~~6. Nanoelectronic Devices and Materials~~ ~~7. Software~~ ~~8. Sustainable Energy~~

Current primary program in the home unit: MEng in Electrical and Computer Engineering - Co-operative Program Graduate Studies Academic Calendar content:	**Proposed MEng in Electrical and Computer Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content**:
to ensure that they are able to meet the degree and Graduate Specialization requirements within the program time limits. 1. Graduate Specialization in Artificial Intelligence and Machine Learning • To receive the Graduate Specialization in Artificial Intelligence and Machine Learning, students must successfully complete 2 compulsory courses and 3 elective courses: o Compulsory courses: ▪ ECE 657 Tools of Intelligent Systems Design ▪ ECE 657A Data and Knowledge Modelling and Analysis o Elective courses (choose 3 from the following list): ▪ ECE 602 Introduction to Optimization ▪ ECE 603 Statistical Signal Processing ▪ ECE 606 Algorithm Design and Analysis ▪ ECE 607 Fundamentals of Ultrasonics ▪ ECE 613 Image Processing and Visual Communication ▪ ECE 659 Intelligent Sensors and Sensor Networks ▪ ECE 700 Topic-7 Game Theory with Engineering Applications ▪ ECE 750 Topic-32 Biology and Computation ▪ ECE 750 Topic-33 Embodied Intelligence ▪ ECE 750 Topic-35 Social Robotics ▪ MSE 718 Statistical Methods for Data Analytics 2. Graduate Specialization in Biomedical Engineering • To receive the Graduate Specialization in Biomedical Engineering, students must successfully complete 3 compulsory courses and 2 elective courses: o Compulsory courses: ▪ ECE 601 Foundations of Biology in Engineering ▪ ECE 608 Quantitative Methods in Biomedical Engineering ▪ ECE 609 Engineering Analysis of Living Cells o Elective courses (choose 2 from the following list):	~~• A Graduate Specialization is a University credential that is recognized on the student's transcript but not on the diploma and is intended to reflect that a student has successfully completed a set of courses that together provide an in-depth study in the area of the Graduate Specialization. A student will only obtain the Graduate Specialization on their transcript if they have completed the requirements associated with the MEng degree and the requirements associated with the Graduate Specialization.~~ ~~• All MEng Graduate Specializations in Electrical and Computer Engineering consist of a set of at least 4 graduate (0.50 weight) level courses and this set is comprised of a mix of compulsory and elective courses. Compulsory courses are those that are prescribed as part of the Graduate Specialization. Elective courses are those that are on a list of courses designated as electives for a given Graduate Specialization. The requirements for each of the Graduate Specializations are described below.~~ ~~• Note: Not all elective courses for any given Graduate Specialization are guaranteed to be offered each year. Students are encouraged to take elective courses when they are offered and should plan accordingly.~~ ~~• Students will be able to complete the Business Leadership Graduate Specialization along with 1 other ECE Graduate Specialization, noting the following:~~ ~~o Each course will only be counted towards one Graduate Specialization and the MEng degree.~~ ~~o The number of required courses for the MEng degree will increase from 8 to 9 or 10 depending on the requirements associated with the Graduate Specializations.~~ ~~• Students must consult with the ECE Masters Coordinator to finalize their plan of study and to ensure that they are able to meet the degree and Graduate Specialization requirements within the program time limits.~~ ~~1. Graduate Specialization in Artificial Intelligence and Machine Learning~~ ~~• To receive the Graduate Specialization in Artificial Intelligence and Machine Learning, students must successfully complete 2 compulsory courses and 3 elective courses:~~

Current primary program in the home unit: MEng in Electrical and Computer Engineering - Co-operative Program Graduate Studies Academic Calendar content:	**Proposed MEng in Electrical and Computer Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content**:
▪ ECE 607 Fundamentals of Ultrasonics ▪ ECE 613 Image Processing and Visual Communications ▪ ECE 675 Radiation and Propagation of Electromagnetic Fields ▪ ECE 750 Topic-32 Biology and Computation ▪ ECE 750 Topic-33 Embodied Intelligence ▪ SYDE 677 Medical Imaging 3. Graduate Specialization in Business Leadership • To receive the Graduate Specialization in Business Leadership, students must successfully complete 2 compulsory courses and 2 elective courses: o Compulsory courses: ▪ BE 600 Management and Leadership ▪ BE 601 Introduction to Financial and Managerial Accounting o Elective courses (choose 2 from the following list): Note: not all elective courses may be offered each year. ▪ BE 602 Data Analysis and Management ▪ BE 603 Operations and Supply Chain Management ▪ BE 604 Marketing Management ▪ BE 605 Project Management ▪ BE 606 Entrepreneurship and Innovation ▪ BE 610 Special Topics in Business and Entrepreneurship ▪ BE 660 Negotiations ▪ BE 680 Consulting ▪ ECE 657A Data & Knowledge Modelling & Analysis ▪ ECE 699 Master of Engineering Project o Note: A maximum of 4 courses from outside the Department of ECE is permitted to satisfy both the MEng in ECE and Graduate Specialization in Business Leadership requirements. 4. Graduate Specialization in Computer Networking and Security • To receive the Graduate Specialization in Computer Networking and Security, students must successfully complete 3 compulsory courses and 2 elective courses: o Compulsory courses:	~~o Compulsory courses:~~ ~~▪ ECE 657 Tools of Intelligent Systems Design~~ ~~▪ ECE 657A Data and Knowledge Modelling and Analysis~~ ~~o Elective courses (choose 3 from the following list):~~ ~~▪ ECE 602 Introduction to Optimization~~ ~~▪ ECE 603 Statistical Signal Processing~~ ~~▪ ECE 606 Algorithm Design and Analysis~~ ~~▪ ECE 607 Fundamentals of Ultrasonics~~ ~~▪ ECE 613 Image Processing and Visual Communication~~ ~~▪ ECE 659 Intelligent Sensors and Sensor Networks~~ ~~▪ ECE 700 Topic-7 Game Theory with Engineering Applications~~ ~~▪ ECE 750 Topic-32 Biology and Computation~~ ~~▪ ECE 750 Topic-33 Embodied Intelligence~~ ~~▪ ECE 750 Topic-35 Social Robotics~~ ~~▪ MSE 718 Statistical Methods for Data Analytics~~ ~~2. Graduate Specialization in Biomedical Engineering~~ ~~• To receive the Graduate Specialization in Biomedical Engineering, students must successfully complete 3 compulsory courses and 2 elective courses:~~ ~~o Compulsory courses:~~ ~~▪ ECE 601 Foundations of Biology in Engineering~~ ~~▪ ECE 608 Quantitative Methods in Biomedical Engineering~~ ~~▪ ECE 609 Engineering Analysis of Living Cells~~ ~~o Elective courses (choose 2 from the following list):~~ ~~▪ ECE 607 Fundamentals of Ultrasonics~~ ~~▪ ECE 613 Image Processing and Visual Communications~~ ~~▪ ECE 675 Radiation and Propagation of Electromagnetic Fields~~ ~~▪ ECE 750 Topic-32 Biology and Computation~~

Current primary program in the home unit: MEng in Electrical and Computer Engineering - Co-operative Program Graduate Studies Academic Calendar content:	**Proposed MEng in Electrical and Computer Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content**:
▪ ECE 610 Broadband Communication Networks ▪ ECE 628 Computer Network Security ▪ ECE 655 Protocols, Software, and Issues in Mobile Systems ○ Elective courses (choose 2 from the following list): ▪ ECE 606 Algorithm Design and Analysis ▪ ECE 611 Digital Communications ▪ ECE 612 Information Theory ▪ ECE 656 Database Systems ▪ ECE 657 Tools of Intelligent Systems Design ▪ ECE 659 Intelligent Sensors & Wireless Sensor Network ▪ ECE 715 Wireless Communication Networks ▪ ECE 716 Communication Security 5. Graduate Specialization in Nanoelectronic Circuits and Systems • To receive the Graduate Specialization in Nanoelectronic Circuits and Systems, students must successfully complete 2 compulsory project courses, and 5 elective courses: • Note: Students are required to complete the 5 elective courses prior to enrolling in the ECE 699A project course. • The Graduate Specialization in Nanoelectronic Circuits and Systems is primarily designed for students starting in the Fall term. Therefore, if a student starts in the Spring or Winter term the Graduate Specialization may not be guaranteed, due to the sequencing of elective courses. ○ Compulsory courses: ▪ ECE 699A Master of Engineering Project 1 ▪ ECE 699B Master of Engineering Project 2 ○ Elective courses: Choose 5 total between Set-A and Set-B. A minimum of 2 of the 5 electives must be taken from Set-A. ▪ Set-A: ▪ ECE 621 Computer Organization ▪ ECE 627 Register-transfer-level Digital Systems	▪ ~~ECE 750 Topic-33 Embodied Intelligence~~ ▪ ~~SYDE 677 Medical Imaging~~ ~~3. Graduate Specialization in Business Leadership~~ • ~~To receive the Graduate Specialization in Business Leadership, students must successfully complete 2 compulsory courses and 2 elective courses:~~ ○ ~~Compulsory courses:~~ ▪ ~~BE 600 Management and Leadership~~ ▪ ~~BE 601 Introduction to Financial and Managerial Accounting~~ ○ ~~Elective courses (choose 2 from the following list): Note: not all elective courses may be offered each year.~~ ▪ ~~BE 602 Data Analysis and Management~~ ▪ ~~BE 603 Operations and Supply Chain Management~~ ▪ ~~BE 604 Marketing Management~~ ▪ ~~BE 605 Project Management~~ ▪ ~~BE 606 Entrepreneurship and Innovation~~ ▪ ~~BE 610 Special Topics in Business and Entrepreneurship~~ ▪ ~~BE 660 Negotiations~~ ▪ ~~BE 680 Consulting~~ ▪ ~~ECE 657A Data & Knowledge Modelling & Analysis~~ ▪ ~~ECE 699 Master of Engineering Project~~ ○ ~~Note: A maximum of 4 courses from outside the Department of ECE is permitted to satisfy both the MEng in ECE and Graduate Specialization in Business Leadership requirements.~~ ~~4. Graduate Specialization in Computer Networking and Security~~ • ~~To receive the Graduate Specialization in Computer Networking and Security, students must successfully complete 3 compulsory courses and 2 elective courses:~~ ○ ~~Compulsory courses:~~ ▪ ~~ECE 610 Broadband Communication Networks~~ ▪ ~~ECE 628 Computer Network Security~~ ▪ ~~ECE 655 Protocols, Software, and Issues in Mobile Systems~~ ○ ~~Elective courses (choose 2 from the following list):~~

Current primary program in the home unit: MEng in Electrical and Computer Engineering - Co-operative Program Graduate Studies Academic Calendar content:	**Proposed MEng in Electrical and Computer Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content**:
▪ ECE 630 Physics & Models Semiconductor Devices ▪ ECE 631 Microelectronic Processing Technology ▪ ECE 636 Advanced Analog Integrated Circuits ▪ ECE 637 Digital Integrated Circuits ▪ ECE 642 Radio Frequency IC Design ▪ ECE 671 Microwave & RF Engineering ▪ Set-B: ▪ ECE 606 Algorithm Design and Analysis ▪ ECE 638 CMOS Sensor Integrated Circuits ▪ ECE 730 Topic-9 VLSI Quality, Reliability and Yield Engineering ▪ ECE 730 Topic-16 Embedded Semiconductor RAM ▪ ECE 730 Topic-30 Advanced VLSI Devices ▪ ECE 738 VLSI Circuits for Wireless Communication ▪ ECE 740 Topic-3 CMOS Data Converters ▪ ECE 770 Topic-22 Radio and Wireless Systems 6. Graduate Specialization in Nanoelectronic Devices and Materials • To receive the Graduate Specialization in Nanoelectronic Devices and Materials, students must successfully complete 2 compulsory courses and 3 elective courses: ○ Compulsory courses: ▪ ECE 630 Physics and Models of Semiconductor Devices ▪ ECE 631 Microelectronic Processing Technology ○ Elective courses (choose 3 from the following list): ▪ ECE 632 Photovoltaic Energy Conversion ▪ ECE 633 Nanoelectronics ▪ ECE 634 Organic Electronics	~~▪ ECE 606 Algorithm Design and Analysis~~ ~~▪ ECE 611 Digital Communications~~ ~~▪ ECE 612 Information Theory~~ ~~▪ ECE 656 Database Systems~~ ~~▪ ECE 657 Tools of Intelligent Systems Design~~ ~~▪ ECE 659 Intelligent Sensors & Wireless Sensor Network~~ ~~▪ ECE 715 Wireless Communication Networks~~ ~~▪ ECE 716 Communication Security~~ ~~5. Graduate Specialization in Nanoelectronic Circuits and Systems~~ ~~• To receive the Graduate Specialization in Nanoelectronic Circuits and Systems, students must successfully complete 2 compulsory project courses, and 5 elective courses:~~ ~~• Note: Students are required to complete the 5 elective courses prior to enrolling in the ECE 699A project course.~~ ~~• The Graduate Specialization in Nanoelectronic Circuits and Systems is primarily designed for students starting in the Fall term. Therefore, if a student starts in the Spring or Winter term the Graduate Specialization may not be guaranteed, due to the sequencing of elective courses.~~ ~~○ Compulsory courses:~~ ~~▪ ECE 699A Master of Engineering Project 1~~ ~~▪ ECE 699B Master of Engineering Project 2~~ ~~○ Elective courses: Choose 5 total between Set-A and Set-B. A minimum of 2 of the 5 electives must be taken from Set-A.~~ ~~▪ Set-A:~~ ~~• ECE 621 Computer Organization~~ ~~• ECE 627 Register-transfer-level Digital Systems~~ ~~• ECE 630 Physics & Models Semiconductor Devices~~ ~~• ECE 631 Microelectronic Processing Technology~~

Current primary program in the home unit: MEng in Electrical and Computer Engineering - Co-operative Program Graduate Studies Academic Calendar content:	**Proposed MEng in Electrical and Computer Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content**:
▪ ECE 635 Fabrication in the Nanoscale: Technology and Applications ▪ ECE 672 Optoelectronic Devices ▪ NANO 600 Introduction to Nanotechnology 7. Graduate Specialization in Software • To receive the Graduate Specialization in Software, students must successfully complete 3 compulsory courses and 2 elective courses: o Compulsory courses: ▪ ECE 650 Methods and Tools for Software Engineering ▪ ECE 651 Foundations of Software Engineering ▪ ECE 653 Software Testing, Quality Assurance and Maintenance o Elective courses (choose 2 from the following list): ▪ ECE 606 Algorithm Design and Analysis ▪ ECE 655 Protocols, Software, Issues in Mobile Systems ▪ ECE 656 Database Systems ▪ ECE 657 Tools of Intelligent Systems Design ▪ ECE 658 Component Based Software 8. Graduate Specialization in Sustainable Energy • To receive the Graduate Specialization in Sustainable Energy, students must successfully complete 1 compulsory course and 4 elective courses: o Compulsory course: ▪ ECE 660 Operation and Control of Future Integrated Energy Systems o Elective courses (choose 4 from the following list): ▪ ECE 632 Photovoltaic Energy Conversion ▪ ECE 662 Power System Analysis and Control ▪ ECE 663 Energy Processing ▪ ECE 665 High Voltage Engineering Applications ▪ ECE 666 Power Systems Operation ▪ ECE 668 Distribution System Engineering ▪ ECE 669 Dielectric Materials	~~▪ ECE 636 Advanced Analog Integrated Circuits~~ ~~▪ ECE 637 Digital Integrated Circuits~~ ~~▪ ECE 642 Radio Frequency IC Design~~ ~~▪ ECE 671 Microwave & RF Engineering~~ ~~▪ Set-B:~~ ~~▪ ECE 606 Algorithm Design and Analysis~~ ~~▪ ECE 638 CMOS Sensor Integrated Circuits~~ ~~▪ ECE 730 Topic-9 VLSI Quality, Reliability and Yield Engineering~~ ~~▪ ECE 730 Topic-16 Embedded Semiconductor RAM~~ ~~▪ ECE 730 Topic-30 Advanced VLSI Devices~~ ~~▪ ECE 738 VLSI Circuits for Wireless Communication~~ ~~▪ ECE 740 Topic-3 CMOS Data Converters~~ ~~▪ ECE 770 Topic-22 Radio and Wireless Systems~~ ~~6. Graduate Specialization in Nanoelectronic Devices and Materials~~ ~~• To receive the Graduate Specialization in Nanoelectronic Devices and Materials, students must successfully complete 2 compulsory courses and 3 elective courses:~~ ~~o Compulsory courses:~~ ~~▪ ECE 630 Physics and Models of Semiconductor Devices~~ ~~▪ ECE 631 Microelectronic Processing Technology~~ ~~o Elective courses (choose 3 from the following list):~~ ~~▪ ECE 632 Photovoltaic Energy Conversion~~ ~~▪ ECE 633 Nanoelectronics~~ ~~▪ ECE 634 Organic Electronics~~ ~~▪ ECE 635 Fabrication in the Nanoscale: Technology and Applications~~ ~~▪ ECE 672 Optoelectronic Devices~~

Current primary program in the home unit: MEng in Electrical and Computer Engineering - Co-operative Program Graduate Studies Academic Calendar content:	**Proposed MEng in Electrical and Computer Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content**:
▪ ECE 761 HVDC and FACTS ▪ ECE 762 Power System Components and Modelling ▪ ECE 763 Sustainable Distributed Power Generation ▪ ECE 765 Power System Protection and Relaying ▪ ECE 768 Power System Quality **Coursework option: Milestone requirements** **Graduate Studies Work Report** • Students must complete one or two work-term placements. A work report must be submitted to the Department for review and credit by the end of each work term. • Students are responsible for following the regulations and procedures of Co-operative and Experiential Education (CEE).	▪ ~~NANO 600 Introduction to Nanotechnology~~ ~~7. Graduate Specialization in Software~~ • ~~To receive the Graduate Specialization in Software, students must successfully complete 3 compulsory courses and 2 elective courses:~~ ○ ~~Compulsory courses:~~ ▪ ~~ECE 650 Methods and Tools for Software Engineering~~ ▪ ~~ECE 651 Foundations of Software Engineering~~ ▪ ~~ECE 653 Software Testing, Quality Assurance and Maintenance~~ ○ ~~Elective courses (choose 2 from the following list):~~ ▪ ~~ECE 606 Algorithm Design and Analysis~~ ▪ ~~ECE 655 Protocols, Software, Issues in Mobile Systems~~ ▪ ~~ECE 656 Database Systems~~ ▪ ~~ECE 657 Tools of Intelligent Systems Design~~ ▪ ~~ECE 658 Component Based Software~~ ~~8. Graduate Specialization in Sustainable Energy~~ • ~~To receive the Graduate Specialization in Sustainable Energy, students must successfully complete 1 compulsory course and 4 elective courses:~~ ○ ~~Compulsory course:~~ ▪ ~~ECE 660 Operation and Control of Future Integrated Energy Systems~~ ○ ~~Elective courses (choose 4 from the following list):~~ ▪ ~~ECE 632 Photovoltaic Energy Conversion~~ ▪ ~~ECE 662 Power System Analysis and Control~~ ▪ ~~ECE 663 Energy Processing~~ ▪ ~~ECE 665 High Voltage Engineering Applications~~ ▪ ~~ECE 666 Power Systems Operation~~ ▪ ~~ECE 668 Distribution System Engineering~~ ▪ ~~ECE 669 Dielectric Materials~~ ▪ ~~ECE 761 HVDC and FACTS~~ ▪ ~~ECE 762 Power System Components and Modelling~~ ▪ ~~ECE 763 Sustainable Distributed Power Generation~~

Current primary program in the home unit: MEng in Electrical and Computer Engineering - Co-operative Program Graduate Studies Academic Calendar content:	Proposed MEng in Electrical and Computer Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
	~~ECE 765 Power System Protection and Relaying~~ ~~ECE 768 Power System Quality~~ **Coursework option: Milestone requirements** **Graduate Studies Work Report** • Students must complete one or two work-term placements. A work report must be submitted to the Department for review and credit by the end of each work term. • Students are responsible for following the regulations and procedures of Co-operative and Experiential Education (CEE).

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

Current students will not be impacted. The program will be open to new students once it goes into effect.

Department/School approval date (mm/dd/yy):
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 02/06/25
Faculty approval date (mm/dd/yy):
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):

UNIVERSITY OF WATERLOO

GRADUATE PROPOSAL

COLLABORATIVE HEALTH TECHNOLOGIES PROGRAM

MASTER OF ENGINEERING IN SYSTEMS DESIGN ENGINEERING – HEALTH TECHNOLOGIES (CO-OP)

For submission to the
Ontario Universities Council on Quality Assurance

VOLUME I - PROPOSED BRIEF

NOVEMBER 2024

*The Quality Council will normally require only an Expedited Approval process where:

a) there is a proposal for a **new Collaborative Program** at the graduate level; or
b) there is a proposal for **a new for-credit graduate diploma**.

NOTE: This template **must** be used for submission of a new program proposal.
Please consult the University of Waterloo Institutional Quality Assurance Process and the Quality Assurance Framework (QAF) for details or the Quality Assurance Office.
****Volumes I, II must be reviewed and approved by the Quality Assurance Office, GSPA and IAP prior to submission to your Faculty Council****

TABLE OF CONTENTS

1. Introduction

Brief Listing of the Program

The Collaborative Health Technologies Program offers students professional Master of Engineering (MEng) degree with mandatory co-op, as preparation to enter the broad and rapidly evolving field of *Health Technology*. Not only is co-op highly beneficial to students while completing this program, it also offers an important opportunity to those students who *never* had co-op experience during their undergraduate degree. The program is centered around a collaborative and interdisciplinary suite of courses offered by six departments in Engineering and supported by the Faculties of Arts and Health. In addition to coursework, the mandatory co--op program serves to enrich the learning of students with practical experience in industrial settings. This is a full-time, on-campus program, with an expected duration of 4-6 terms, based on the co-op and study sequence selected by particular students. Program tuition follows the existing UW graduate home program tuition structure.

To enroll in the Collaborative Health Technologies Program, students must meet the admission requirements of, and register in, the department of Systems Design Engineering (SYDE). Students must complete the Collaborative Health Technologies Program requirements that are structured as a combination SYDE department's MEng degree requirement, and the additional Collaborative Health Technologies Program requirements (i.e., the completion of sufficient courses from specified pools, and successful co-op work terms/reports).

The degree conferred will be that of the participating program (i.e. Systems Design Engineering), with the completion of the Collaborative Health Technologies Program indicated by a transcript notation to the degree and adjunct qualification to the degree (i.e. Master of Engineering in Systems Design Engineering – Health Technologies). The proposed collaborative program also offers a platform to allow future participation of other Faculties.

Method Used for Preparation of the Brief

The Collaborative Health Technologies Program was conceptualized by the Dean of Engineering and the Associate Dean Graduate Studies – Engineering. In April 2023, the initiative to develop the program received support from the New Interdisciplinary Networks, Programs, and Initiatives Fund from the University. The proposal was developed following consultations by the Associate Dean with Graduate Associate Chairs of the departments of Chemical Engineering, Civil and Environmental Engineering, Electrical and Computer Engineering, Management Science and Engineering, Mechanical and Mechatronics Engineering, and Systems Design Engineering. The Associate Dean also had discussions with counterparts in other Faculties (e.g., Arts, Health, and Science). The general proposal was presented to the departments in Engineering for consideration within the unit. Following approval, this departmental proposal brief to participate in the collaborative program evolved, incorporating the specific requirements of the home unit.

2. Objectives of the Program (QAF 2.1.2.1)

The Collaborative Health Technologies Program is timely and justified not only based on the critical need for skilled professionals at the intersection of healthcare and technology, but also by the University of Waterloo's own goals, e.g. Waterloo at 100, Global Futures. The following are some of the compelling reasons that justify the establishment of a Collaborative Health Technologies Program:

1. **Rapid Technological Advancements in Healthcare**: The healthcare industry is experiencing an unprecedented transformation due to rapid advancements in technology. Innovations such as artificial intelligence, telemedicine, wearable devices, and data analytics are reshaping healthcare delivery, diagnosis, treatment, and patient care. A dedicated program will equip future professionals with leading-edge skills needed to leverage and drive innovations in this field.
2. **Increasing Demand for Health Technology Experts**: There is a growing demand for professionals who possess a deep understanding of both healthcare and technology. This demand arises from the need to bridge the gap between traditionally siloed fields and create holistic solutions that address complex healthcare challenges. Graduates of a Collaborative Health Technology Program will fill this talent gap and drive innovation in healthcare settings.
3. **Addressing Healthcare Challenges**: The global healthcare landscape faces numerous challenges, including rising costs, an aging population, chronic diseases, disparities in healthcare access, and pandemics. A Collaborative Health Technologies Program will empower students to develop innovative solutions to address these challenges, improve healthcare access, and enhance patient outcomes.
4. **Opportunity for Interdisciplinary Collaboration**: A program that combines healthcare and technology will foster interdisciplinary collaboration. Students will learn to collaborate with healthcare professionals, engineers, data scientists, ethicists, and policymakers, fostering a diverse and comprehensive approach to problem-solving.
5. **Industry-Relevant Skill Development**: Employers in the healthcare and technology sectors seek professionals with specialized skills in areas such as health data analytics, digital health, telemedicine, medical device development, regulatory compliance, and AI applications in healthcare. Both the course-based components and the mandatory co-op of this Collaborative Health Technologies Program combine to ensure that graduates are well-prepared with these in-demand skills.
6. **Economic and Innovation Impact**: Investing in a Collaborative Health Technologies Program aligns with the current market demand and presents an opportunity to contribute to economic growth and innovation. Graduates equipped with the skills to develop and implement Health Technology solutions can drive entrepreneurship, create job opportunities, and contribute to the expansion of healthcare technology sectors.
7. **Addressing Future Healthcare Needs**: With the evolving landscape of healthcare and technology, preparing future professionals to navigate and lead in this dynamic environment is essential. Establishing a Collaborative Health Technologies Program now ensures that the workforce is ready to address the future needs and challenges of the healthcare industry.

Program Learning Outcomes and Graduate Degree Level Expectations (GDLE):

1. **Depth and Breadth of Knowledge**
    a. Understand the principles, concepts, terminology and tools of health technology
    b. Demonstrate awareness of key elements of both the ethical considerations and impacts of health technologies
    c. Interpret, understand, and critically assess state-of-the-art methods, theories, and advances in health technology
2. **Research & Scholarship**
    a. Integrate complex engineering concepts related to the breadth of health technology, and the underlying and associated sciences.
3. **Level of Application of Knowledge**
    a. Interpret, critically assess and apply state-of-the-art methods, theories, and advances in health technology
    b. Understand current issues faced by the health technology industry
4. **Professional Capacity / Autonomy**
    a. Independently recognize, define, and solve complex real-world health technology needs and associated challenges
    b. Engage in self-directed professional development and life-long learning
    c. Develop an ability to recognize, appreciate, consider and apply appropriate ethics, law, regulations, and accountability to the field of health technologies
    d. Understand the value of engaging in inter-disciplinary collaboration in health technology as well as the complexity of knowledge & limitations of different fields
    e. Adopt a mindset for collaboration (work effectively in interdisciplinary teams including healthcare professionals, engineers, designers, business developers, etc.)
5. **Level of Communication Skills**
    a. Effectively communicate complex concepts in health technology to a wide audience ranging from general public to experts in the field. Concepts may include health technology needs and associated challenges (includes GDLE 6 Awareness of Limits of Knowledge)
    b. The ability to communicate ideas, issues and conclusions clearly.
6. **Awareness of Limits of Knowledge**
    a. Cognizance of the complexity of knowledge and of the potential contributions of other interpretations, methods, and disciplines.
    b. Understand the value of inter-disciplinarity in the field of health technologies.

How does this Program align with the University of Waterloo Strategic Plan and Strategic Mandate Agreement?

The Collaborative Health Technologies Program aligns well with the University of Waterloo's strategic plan in several ways:

1. **Interdisciplinary Collaboration:** The program's collaboration between the departments in Engineering as well as the support by Arts and Health, demonstrate a commitment to

interdisciplinary collaboration, a key focus area of the strategic plan. This collaboration brings together diverse perspectives and expertise, fostering innovation in health technology by integrating engineering skills with insights from health, social sciences, and humanities.

2. **Work-integrated Learning through Co-op:** The mandatory co-op component of the program aligns with the strategic plan's emphasis on experiential learning. This practical work experience allows students to apply their knowledge in real-world settings, contributing to their professional development while addressing real challenges in health technology.
3. **Benefits of Innovation and Research:** The program's focus on Health Technologies aligns with the strategic plan's emphasis on fostering innovation. Even though this is a course-based program, it does enable students to connect with faculty from various departments to engage with cutting-edge technologies and understand solutions to real-world problems.
4. **Community Partnerships:** Collaboration between different departments within Engineering, along with the support, through course offering, by Faculties of Arts and Health, opens opportunities for partnership with external organizations, hospitals, and industry players. This engagement aligns with the strategic plan's focus on strengthening community partnerships. Co-op placements also will play a key role in this aspect.
5. **Technology and Global Challenges:** By addressing healthcare challenges through technology and innovation, the program contributes to addressing global challenges, which is in line with the University's strategic goal of leveraging technology for positive societal impact.
6. **Commitment to Excellence and Diversity:** The collaborative nature of the program reflects the University's commitment to excellence in education and research. Furthermore, by integrating diverse perspectives from multiple departments and faculties, the program contributes to promoting diversity and inclusion, a priority area in the strategic plan.

Overall, the Collaborative Health Technologies Program embodies many key pillars of the University of Waterloo's Strategic Plan by promoting interdisciplinary collaboration, experiential learning, innovation, community engagement, and a commitment to excellence and diversity.

3. Admission Requirements (QAF 2.1.2.5)

Admission into the Collaborative Health Technologies Program is through direct application to the program offered through the home administrative unit, i.e. SYDE. Admission requirements for the program will be the same as those existing for the Master of Engineering degree in SYDE.

The minimum academic requirements – including admissions requirements, minimum overall averages, and timelines for any milestones – in the program will be consistent with the requirements of the primary existing master's program for each participating department.

In detail, the admission requirements for MEng in the department of Systems Design Engineering are:

- A 4-year Honours Bachelor's degree in engineering. For applicants whose previous degree was completed in Canada, a 75% overall standing in the last two years, or equivalent (at the sole discretion of the University of Waterloo, in all cases), in a four-year Honour's Bachelor's degree in engineering is the minimum requirement for admission to a Master's program.
- Due to the variable nature of international credentials, for applicants whose previous degree was completed outside of Canada, a 75% overall standing in a four-year Honours Bachelor's degree in engineering or equivalent is the minimum requirement for admission.
- Applicants who do not hold a Honours Bachelor's degree in engineering must justify their suitability by demonstrating formal or informal training in engineering through the supplementary information form (SIF), their resume/CV, or other supporting material.
- Required application materials include, Resume, SIF, Academic Transcript(s); Proof of English language Proficiency (if applicable); Minimum two reference letters.
  Minimum English Language Proficiency requirement: TOEFL 80 (writing 22, speaking 20, reading 20, listening 18), or IELTS 6.5 (writing 6.0, speaking 6.0).
  Type of references: A minimum of 1 academic reference. Applicants who complete their degree five or more years before the application date may submit 2 professional references.

These admission requirements are appropriate given the precedent of existing co-op Master's programs in the Faculty of Engineering. The level of required academic performance is indicative of what will be required of students during their studies within this proposed program and serves to select only students who will be capable of meeting course expectations and overall program learning outcomes. Furthermore, the Supplementary Information Form, resume, and reference letters will allow for recognition of the prior work, experience, aspirations, and career trajectory of applicants.

4. Structure (QAF 2.1.2.2)

The Collaborative Health Technologies Program is a co-op only, course-based program. Completion of 9 courses will be required to meet the coursework requirement of the program. Selection of courses will be as follows:

1 Compulsory core course, BME 601: Physiological Systems and Biomedical Design

1 course from the following University-level courses (ARTS, ENG):

- PHIL 626: Bioethics and Technology
- ECON 643: Health Economics
- MSE 619: Healthcare Analytics

2 courses, inclusive of BME 600, from the following Faculty-level courses (6 ENG depts):

- BME 600: Design of Biomedical Technologies
- BME 602: Foundations in Biomechanical Engineering
- CHE 621: Model Building and Response Surface Methodology
- ENVE 585: Air Quality Engineering and Impacts
- ECE 608: Quantitative Methods in Biomedical Engineering
- MSE 630: Human-Computer Interaction

1 course from:

- SYDE 660A: Systems Design Graduate Workshop 1 - AI and Machine Learning
- SYDE 660B: Systems Design Graduate Workshop 1 – Biomedical Systems
- SYDE 660C: Systems Design Graduate Workshop 1 – Human Factors

4 courses selected from other SYDE graduate courses and from the following Faculty of Health courses:

- HLTH 612: Introduction to Health Information and Data Standards
- HLTH 633: Digital Health
- HLTH 605B: Quantitative Methods and Analysis
- HLTH 650A/650B: Application of Artificial Intelligence in Health (0.25) / Machine Learning Techniques in Health (0.25)
- HLTH 606B: Principles of Epidemiology for Public Health
- HLTH 615: Requirements Specifications and Analysis in Health Systems

Of the 9 courses there must be a minimum of 3 SYDE courses, with at most 2 at the 500 level.

The program study / co-op sequence is illustrated below. Having co-op during the program both allows students to apply what they have learned in school to their co-op employment, but also the reverse: apply what has been learned during co-op terms to their in-school experiences. This model allows for bidirectional inspiration and gives students an important *context* for what they are learning.

Term-1	Term-2	Term-3	Term-4	Term-5	Term-6
study	study	Co-op	Co-op	study	(study)
study	study	Co-op	study	(study)	

Rationale and Justification

The structure and regulations of the Collaborative Health Technologies Program align with the program learning outcomes and Degree-Level Expectations. More detail is given below.

Alignment with Program Learning Outcomes:

1. **Diversity of Course Offerings:** The coursework structure ensures a breadth of courses from various levels (University, Faculty, Department) covering different aspects of health technologies, such as ethics, analytics, biomedical engineering, rehabilitation engineering, human-computer interaction, health-care systems, epidemiology, systems theory etc. The proposed program is designed in such a way that potential future participation of additional Faculties with their own master's program model is both possible and would further enrich the program content.
2. **Integration of Practical Experience:** The mandatory incorporation of co-op allows students to apply theoretical knowledge gained in the classroom to real-world scenarios, and vice versa. This aligns with the objective of the program to foster practical application and real-world learning.

Meeting Degree Level Expectations:

1. **Depth and Breadth of Knowledge:** The variety of courses spanning different Departments and Faculties suggests a comprehensive coverage of topics relevant to health technologies, meeting the depth and breadth of knowledge expected at the master's level.
2. **Professional Skills Development:** The incorporation of co-op experiences facilitates the development of professional skills, preparing students for practical challenges in the field.

Rationale for Program Length:

The proposed program length is reasonable for several reasons:

1. **Course Load and Requirements:** 9 courses within the program, structured across different units and levels, can be reasonably completed within three to four study terms.
2. **Integration of Co-op Experience:** The inclusion of co-op necessitates a program duration that allows students to engage in these practical experiences without significantly extending the program length.
3. **Balancing Academic and Practical Learning:** The program aims to balance academic learning with real-world application. A structured timeframe enables students to attain both theoretical knowledge and practical skills within a manageable period.

5. Program Content (QAF 2.1.2.3)

Health Technologies represent the dynamic intersection of healthcare and cutting-edge technology, encompassing a diverse array of innovations designed to revolutionize patient care, improve healthcare accessibility, and enhance overall well-being. Embracing a multidisciplinary approach, Health Technologies integrate advancements in artificial intelligence, data analytics, telemedicine, medical imaging, ethics, and more, to drive transformative changes in the diagnosis, treatment, and management of health conditions.
The Collaborative Health Technologies Program is a muti-disciplinary course-based program in the Faculty of Engineering with mandatory co-op, integrated within the timeline of the program. Its multi-disciplinarity is derived on the basis of the participation, through course offerings, of the Faculties of Arts and Health. Additionally, the enrolled students will also take appropriate courses across several departments within Engineering. All courses taken are at the graduate level. An overview of the program's course structure was given in Section 4. Here, additional information on the courses is given.

A brief description of the University-level courses, from which a student would be required to take one course, is given below:

- **PHIL 626: Bioethics and Technology** (Arts)
  Students will grapple with a sample of ethical issues related to advanced and emerging medical technologies and/or biotechnologies. The primary goals of doing so are: (1) To gain familiarity with key ethical concepts and values, which may include patient autonomy, beneficence, justice, care, anti-ableism, inclusion, and others; and (2) to enhance core critical thinking skills needed for ethics, which will help improve each student's self-understanding (of not only what they think is right and wrong, but, more importantly, why) and their capacity to engage with different perspectives on the "whats" and "whys" of ethics in a spirit of open-mindedness, mutual respect, and constructive cooperation. Frequent in-class discussion is typically an important element of student learning in this course.
- **ECON 643: Health Economics** (Arts)
  This course introduces students to the role of economics in health care and health policy. It is meant to be a survey of major topics in health economics and an introduction to the ongoing debate over health care policy. Topics include the economic determinants of health and health policy, the market for medical care, the market for health insurance, and the role of the government in health care, and health care reform.
- **MSE 619: Healthcare Analytics** (Engineering)
  This course provides an introductory course on health analytics including such topics as data acquisition, modelling, and predictive analytics. The course focuses on the practical application of the concepts to improve the quality of the analyses often found in the health sector. Application areas will be concentrated on topics found in health systems and may include topics such as planning and scheduling, disease diagnosis, and treatment planning. The learning outcomes include the ability to identify and apply appropriate analytical methods and models for healthcare.

A brief description of the Faculty-level courses, from which a student would be required to take two courses, is given below:

- **BME 600: Design of Biomedical technologies** (SYDE)
  Systems theory and formulation of system dynamics problems. Design and research methods for biomedical technologies. Problem formulation and definition, stakeholder engagement, needs analysis, generation of alternative solutions, feasibility analysis, optimization, selection, and solution implementation.
- **BME602: Foundations in Biomechanical Engineering** (MME)
  This course focuses on equipping students with foundational knowledge in the biomechanics of human physiology, pathology and treatment. The overarching aim of this course is to develop students' literacy in applying biomechanics principles and modern tools towards understanding the human body. The course will build on existing knowledge in mathematics

and physics to develop new expertise and hands-on experience in the biomechanical modeling and analysis of physiological systems.

- **CHE 621: Model Building and Response Surface Methodology** (CHE)
  This course teaches process / product optimization based on design of experiments, empirical modelling, and non-linear mechanistic models. These methodologies aid in refining healthcare processes and products, ensuring they meet stringent standards of efficiency, safety, and effectiveness.
- **ENVE 585: Air Quality Engineering and Impacts** (CEE)
  This course introduces air quality design of engineering solutions and associated health and economic impacts. It includes topics focused on the indoor environment, the outdoor environment, or both, such as: air pollution sources, emission estimation, control strategies, measurement, modeling methods, health impact assessment, cost-benefit analysis, technical policy analysis, and co-impacts with climate change.
- **ECE 608: Quantitative Methods in Biomedical Engineering** (ECE)
  This course focuses on topics related to the use of quantitative tools in biomedical engineering research studies. Educational emphasis will be placed on developing students' core competence in biostatistics and biomedical computing, so as to prepare them to pursue biomedical engineering investigations that are backed by quantitative reasoning and numerical insights.
- **MSE 630: Human Computer Interaction** (MSE)
  This course concentrates on the theoretical and practical issues related to the design of the human-computer interfaces. Aspects of human perception, cognition and various models of task analysis are discussed.

A brief description of the Faculty of Health courses that are part of the department-specific and health-specific list of electives is given below:

- **HLTH 612: Introduction to Health Information and Data Standards**
  This course focuses on health data as a key component of all health informatics systems. Topics include ontologies and other classification taxonomies found in health systems, data standards (with a focus on Canadian implementations of international standards), privacy and security of health data, client/patient assessment tools, and ethical considerations.
- **HLTH 633: Digital Health**
  The wide adoption of mobile technology presents a new opportunity. Leveraging this existing technology, healthcare systems can deliver remote care and collect real-time data on patients outside of health centres, minimizing unnecessary visits to hospitals and providing healthcare access to remote populations. In this course, we will explore how digital health technology has been designed, evaluated, and deployed in different countries. Case studies will be used to demonstrate how institutional and governmental constraints have a strong impact on the success of the deployment. The course will address the different digital health technologies in the market, such as Telehealth, remote patient monitoring, tele radiology, consumer health informatics, and mHealth. Important aspects of technology development like patient confidentiality, privacy, standards, communication and security protocols,

regulatory requirements, among others, will be discussed when presenting the development of each digital health solution. By the end of this course, students will be prepared to design, evaluate, and deploy a digital health intervention and will have a solid understanding of the barriers and requirements for deploying digital health technology.

- **HLTH 605B: Quantitative Methods and Analysis**
  This course is a rigorous introduction to biostatistics for those planning a career in public health. Students will learn various biostatistical techniques, how to apply those techniques in the analysis of data from health studies, and how to interpret the results from those analyses. After a brief review of material from a basic statistics course, topics covered will include simple and multiple linear regression, analysis of categorical data, simple and multiple logistic regression, and survival analysis. Emphasis will be on (i) conceptual understanding of topics, including literacy necessary for understanding scientific papers in public health, as well as (ii) carrying out various data analysis applications.
- **HLTH 650A / 650B: Application of Artificial Intelligence in Health (0.25) / Machine Learning Techniques in Health (0.25)**
  HLTH 650A focuses on the application of machine learning (ML) and artificial intelligence (AI) techniques in the field of healthcare and public health settings. Big data sources available for population health studies will be introduced to students and challenges related to AI in health data will also be discussed. The learning activities consist of lectures, student-led journal club discussions and a term paper to propose the application of ML techniques to solve population health or public health problems.
  HLTH 650B focusses on the techniques of machine learning (ML) commonly used to solve healthcare and public health problems. Various analytics techniques, including data wrangling, visualization, 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.
- **HLTH 606B: Principles of Epidemiology for Public Health**
  This course introduces the principles, methods, and uses of epidemiology in the practice of public health. After completion of this course, students will be able to critically read and interpret epidemiologic research and clearly communicate epidemiologic findings. They will be familiar with health status measurement, data sources, screening, surveillance, outbreak investigation, and methods to support program planning and evaluation. Students will have a sound understanding of basic epidemiologic concepts, including prevalence, incidence, study designs, measures of association, bias, confounding and causal inference.
- **HLTH 615: Requirements Specifications and Analysis in Health Systems**
  This course introduces students to the requirements of definition phase of software development. Models, notations, and processes for software requirements identification, representation, validation, and analysis are discussed, as are mechanisms to evaluate the efficacy and efficiency of health information systems.

6. Mode of Delivery (QAF 2.1.2.2)

Courses made available for students of the Collaborative Health Technologies Program use a wide variety of teaching and learning methodologies (e.g., lectures, case-studies, student presentations, in-class group discussion, etc.) designed to provide students with an engaging learning experience. Though not specific to this program, at the University of Waterloo, instructors from all faculties are encouraged to make use of the Center for Teaching Excellence, which offers many resources to aid instructors in improving their teaching, course design, and delivery, emphasising *Active Learning* techniques. Instructors of courses offered to Collaborative Health Technologies Program students will be reminded of these resources.

Following program approval and implementation, the faculty-level administrative staff will ensure the program is continually meeting both intended learning outcomes and degree-level expectations.

7. Assessment of Teaching and Learning (QAF 2.1.2.4)

The performance of students will be assessed both on conventional and existing methods stipulated by the courses they will take, but also based on input from the co-operative education component of this program.

Assessment of teaching and learning will be conducted at the *student* and *program* levels. The program will be assessed at the program level by the Graduate Program Committee and program director. As part of this assessment, the Program Committee will review statistics, such as program performance versus learning objectives, student success rates and teaching evaluations – as provided through both student perception surveys and peer-assessment of teaching. The committee will identify opportunities to improve performance, such as enriching course content or teaching.

Performance indicators that will be considered by the Program Committee will include:

- Applications to and enrollment within the program;
- Student evaluations of courses;
- Student graduation rates;
- Surveys of alumni; and
- Surveys of employers/industry partners.

At the student level, there will be the following types of activities with assessments:

a) Coursework: Students will be assigned a grade based on typical assessment methods used in other graduate courses, such as papers, reports, tests, projects, and presentations.
b) Co-operative Education Work-Term Reports.

Refer to the table in Appendix A for more specific information on how assessments will be made, both for course-based and co-operative education components of this program.

8. Resources for All Programs (QAF 2.1.2.6)

For the anticipated enrolment numbers of the Collaborative Health Technologies Program, the additional students enrolling into pre-existing courses will not present a significant burden on the University's resources (i.e., students take courses from large pools and therefore, there will likely not be so many additional students per course that additional sections and having more instructors would be necessary – in fact, in some cases, the additional grad students enrolling may help improve the instructor utilization efficiency for courses that typically have too low of enrollment numbers). The program would not necessitate hiring any new faculty members and instead would rely on existing known-to-be qualified faculty members already teaching courses. In addition, students will have access to the University's facilities and spaces, including library resources, working spaces, access to existing resources for student well-being and counselling, as well as technology support from their home department. This program is not expected to impose additional student costs for use of resources. Program coordination can be handled by existing staff resources in the home departments with the Faculty of Engineering providing additional support as needed, as is the case for other existing collaborative programs.

9. Resources for Graduate Programs (QAF 2.1.2.7)

Given the course-based nature of the Collaborative Health Technologies Program, an assessment of the research-related and supervisory expertise of faculty is not required for this program to function. The breadth of courses available for students to take is immense and course instructors may change from term-to-term. Therefore, nearly *all* faculty from the participating units may serve this program through the teaching of courses in which Health Technology students may enroll. On a course-by-course /offering-to-offering basis, ensuring instructor competence is left to the discretion of the corresponding department. Following the precedent of existing professional master's programs in Engineering, no financial assistance will be provided to students. Ensuring the quality of incoming students, will be left to the discretion of the home departments and will be put into action through the standard program admission requirements, as are described in Section 3.

10. Quality and Other Indicators (QAF 2.1.2.8)

To ensure the quality of the program a Program Committee will be created to oversee and regularly evaluate the program, to ensure all program requirements and course related graduate-level degree requirements are met. This committee will consist of a Program Director, the Course Coordinator, a faculty member from each participating department, and a graduate student representative. Furthermore, the co-op office will principally oversee all co-op related activities and components of this program. Within each department of Engineering, Graduate Associate Chairs will monitor the progress of their constituent students from this program, as is already their responsibility for existing professional programs. Specifically, student progression through the program, grades, and successful completion of co-op terms will be tracked. Where needed, remedial action will be taken to ensure students remain on-track and able to maximally benefit from participation in this program.

Appendix A - Summary of Learning Outcomes Mapped to Courses and Assessment Methods

Specific GDLEs and Associated Learning Outcomes	Courses											Co-operative Education			Assessment method							
	Core BME	**University-level** ARTS | ENG			**Faculty-level** SYDE | MME | CHE | CIVE | ECE | MSE						**Dept-level** SYDE | HEALTH										
	BME 601: Physiological Systems and Biomedical Design	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	CHE 621: Model Building and Response Surface Methodology	ENVE 585: Air Quality Engineering & Impact	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Dept-specific and Health-specific Elective Courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
1. Depth and Breadth of Knowledge																						
Understand the principles, concepts, terminology, tools of health technology	C	A	A	A	C	A	A	A	A	A	AC	NA	NA	A	NA	A	A	A	A	A	A	NA
Demonstrate awareness of key elements of both the ethical considerations and impacts of health technologies	NA	A	A	A	NA	C	NA	NA	NA	C	AC	A	NA	A	NA	A	A	A	A	A	A	NA
Interpret, understand, and critically assess state-of-the-art methods, theories, and advances in health technology	NA	C	C	A	NA	A	C	C	A	A	AC	NA	NA	C	NA	A	A	A	A	A	A	NA
2. Research & Scholarship																						
Integrate complex engineering concepts related to the breadth of health technology, and the underlying and associated sciences.	C	NA	NA	A	C	A	A	A	A	A	AC	C	NA	C	NA	A	A	A	A	A	A	NA

Specific GDLEs and Associated Learning Outcomes	Courses											Co-operative Education			Assessment method							
	Core BME	**University-level** ARTS | ENG			**Faculty-level** SYDE | MME | CHE | CIVE | ECE | MSE						**Dept-level** SYDE | HEALTH										
	BME 601: Physiological Systems and Biomedical Design	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	CHE 621: Model Building and Response Surface Methodology	ENVE 585: Air Quality Engineering & Impact	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Dept-specific and Health-specific Elective Courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
3. Level of Application of Knowledge																						
Interpret, critically assess and apply state-of-the-art methods, theories, and advances in health technology	C	A	A	A	C	A	A	A	A	A	AC	NA	NA	A	NA	A	A	A	A	A	A	NA
Understand current issues faced by the health technology industry	C	A	A	C	C	A	NA	NA	C	A	AC	A	C	A	NA	A	A	A	A	A	A	NA
4. Professional Capacity / Autonomy																						
Independently recognize, define, and solve complex real-world health technology needs and associated challenges	C	A	A	NA	C	C	C	C	C	C	AC	A	A	A	NA	AC	AC	AC	AC	C	AC	NA
Engage in self-directed professional development and life-long learning	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	C	C	A	NA	NA	NA	NA	NA	A	NA	NA
Develop an ability to recognize, appreciate, consider and apply appropriate ethics, law, regulations, and accountability to the field of health technologies	C	A	A	C	C	C	NA	NA	C	C	AC	A	C	A	NA	A	A	A	A	A	A	NA

Specific GDLEs and Associated Learning Outcomes	Courses											Co-operative Education			Assessment method							
	Core BME	**University-level** ARTS | ENG			**Faculty-level** SYDE | MME | CHE | CIVE | ECE | MSE						**Dept-level** SYDE | HEALTH										
	BME 601: Physiological Systems and Biomedical Design	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	CHE 621: Model Building and Response Surface Methodology	ENVE 585: Air Quality Engineering & Impact	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Dept-specific and Health-specific Elective Courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
Understand the value of engaging in inter-disciplinary collaboration in health technology as well as the complexity of knowledge & limitations of different fields	C	C	C	C	C	NA	NA	NA	NA	NA	AC	NA	NA	A	NA	NA	NA	C	NA	A	C	NA
Adopt a mindset for collaboration (work effectively in interdisciplinary teams including healthcare professionals, engineers, designers, business developers, etc.)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	A	A	C	NA	NA	NA	NA	NA	C	NA	NA
5. Level of Communications Skills																						
Effectively communicate complex concepts in health technology to a wide audience ranging from general public to experts in the field. Concepts may include health technology needs and associated challenges (includes GDLE 6 Awareness of Limits of Knowledge)	NA	C	C	C	NA	NA	NA	NA	NA	NA	NA	C	C	C	NA	NA	NA	NA	NA	C	C	NA
The ability to communicate ideas, issues and conclusions clearly.	NA	C	C	NA	NA	NA	NA	NA	NA	NA	NA	C	C	A	NA	NA	NA	NA	NA	A	C	NA

Specific GDLEs and Associated Learning Outcomes	Courses											Co-operative Education			Assessment method							
	Core BME	**University-level** ARTS | ENG			**Faculty-level** SYDE | MME | CHE | CIVE | ECE | MSE						**Dept-level** SYDE | HEALTH										
	BME 601: Physiological Systems and Biomedical Design	PHIL 626: Bioethics & Technology	ECON 643: Health Economics	MSE 619: Healthcare Analytics	BME 600: Design of Biomedical Technologies	BME 602: Foundations in Biomechanical Engineering	CHE 621: Model Building and Response Surface Methodology	ENVE 585: Air Quality Engineering & Impact	ECE 608: Quantitative Methods in Biomedical Engineering	MSE 630: Human-Computer Interaction	Dept-specific and Health-specific Elective Courses	Employer Input	Co-op Office Evaluation	Work Term Report	Forum communication	Multi-part assignments	Quizzes / Tests	Written assignments / arguments / policy briefs	Data interpretation, synthesis, visualization	Technical reports / plans	Slide decks / presentations	Video production
6. Awareness of Limits of Knowledge																						
Cognizance of the complexity of knowledge and of the potential contributions of other interpretations, methods, and disciplines.	C	A	A	C	C	C	C	C	C	C	AC	A	A	A	NA	C	NA	NA	NA	A	A	NA
Understand the value of inter-disciplinarity in the field of health technology.	C	C	C	C	C	C	C	C	C	C	AC	C	C	C	NA	C	NA	C	NA	C	C	NA

Table Legend:

Assessed (A) ..... The outcome is addressed and is formally assessed.
Covered (C) ..... The outcome is addressed but not assessed.
Assessed or Covered (AC)..... The outcome may be addressed and assessed but is at least covered (depending on selected courses).
Not addressed (NA) ..... The outcome is not addressed.

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 Engineering (MEng) in Systems Design Engineering - Health Technologies - Co-operative Program

Program contact name(s): Nasser Lashgarian Azad, Siva Sivoththaman

Form completed by:

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

The Department of Systems Design Engineering is joining the inaugural Collaborative Health Technologies Program and is thus adding a Master of Engineering (MEng) in Systems Design Engineering - Health Technologies - Co-operative Program (direct entry).

Is this a major modification to the program? Yes

Rationale for change(s):

Please refer to the attached brief for full details.

Proposed effective date: Term: Fall Year: 2025

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

https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/programs?group=Systems%20Design%20Engineering

Current primary program in the home unit: MEng in Systems Design Engineering Program Graduate Studies Academic Calendar content:	**Proposed MEng in Systems Design Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content**:
Master of Engineering (MEng) in Systems Design Engineering **Admit term(s)** • Fall • Winter • Spring **Delivery mode** • On-campus	**Master of Engineering (MEng) in Systems Design Engineering - Health Technologies – Co-operative Program** **Admit term(s)** • Fall • Winter • Spring **Delivery mode**

Current primary program in the home unit: MEng in Systems Design Engineering Program Graduate Studies Academic Calendar content:	Proposed MEng in Systems Design Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
Registration option(s) • Full-time • Part-time **Study option(s)** • Coursework **Length of program** • Full-time: 4 terms (16 months) • Part-time: 8 terms (32 months) **Graduate specializations** • Artificial Intelligence and Machine Learning • Biomedical Systems • Human Factors • Mechatronics and Physical Systems • Vision, Image and Signal Processing **Admission requirements: Minimum requirements** • An Honours Bachelor's degree (or equivalent) with at least an overall 75% standing from a recognized university. • A Graduate Record Examination (GRE) score is required for all students whose undergraduate degree is not from Canada or the USA. • English language proficiency (ELP) (if applicable) **Admission requirements: Application materials** • Résumé • Supplementary information form • Transcript(s) **Admission requirements: References** • Number of references: 2 • Type of references: a minimum of 1 academic reference. Applicants who complete their degree five or more years before the application date may submit 2 professional references. **Degree requirements** • Students must complete the course requirements listed below in addition to the Graduate Academic Integrity Module (Graduate AIM). **Coursework option: Course requirements**	• On-campus **Registration option(s)** • Full-time • ~~Part-time~~ **Program type(s)** • Co-operative • Collaborative **Study option(s)** • Coursework **Length of program** • Full-time: 4-5 terms (16-20 months) • ~~Part-time: 8 terms (32 months)~~ ~~**Graduate specializations**~~ • ~~Artificial Intelligence and Machine Learning~~ • ~~Biomedical Systems~~ • ~~Human Factors~~ • ~~Mechatronics and Physical Systems~~ • ~~Vision, Image and Signal Processing~~ **Admission requirements: Minimum requirements** • An Honours Bachelor's degree (or equivalent) with at least an overall 75% standing from a recognized university. • A Graduate Record Examination (GRE) score is required for all students whose undergraduate degree is not from Canada or the USA. • English language proficiency (ELP) (if applicable) **Admission requirements: Application materials** • Résumé • Supplementary information form • Transcript(s) **Admission requirements: References** • Number of references: 2 • Type of references: a minimum of 1 academic reference. Applicants who complete their degree five or more years before the application date may submit 2 professional references. **Degree requirements** • Students must complete the course and milestone requirements listed below in addition

Current primary program in the home unit: MEng in Systems Design Engineering Program Graduate Studies Academic Calendar content:	**Proposed MEng in Systems Design Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content**:

• Students must complete the following 2 core Systems Design Engineering graduate courses:
  ○ SYDE 600 Systems Theory, Models, Research & Design
  ○ 1 of:
  ▪ SYDE 660A Systems Design Graduate Workshop 1 - AI and Machine Learning,
  ▪ SYDE 660B Systems Design Graduate Workshop 1 - Biomedical Systems,
  ▪ SYDE 660C Systems Design Graduate Workshop 1 - Human Factors,
  ▪ SYDE 660D Systems Design Graduate Workshop 1 - Mechatronic & Physical Systems,
  ▪ SYDE 660E Systems Design Graduate Workshop 1 - Vision, Image & Signal Processing, or
  ▪ SYDE 660 Systems Design Graduate Workshop 1
• In addition to the 2 core courses, students must complete 6 Engineering graduate courses (0.50 unit weight per course) counting towards degree credit from the University of Waterloo satisfying the following criteria:
  ○ At least 2 Systems Design Engineering courses at the 500, 600 or 700 level.
  ○ At most 2 courses at the 500 level.
• Students in the MEng in Systems Design Engineering program may also choose to pursue one of the following five Graduate Specializations:
1. Artificial Intelligence and Machine Learning
2. Biomedical Systems
3. Human Factors
4. Mechatronics and Physical Systems
5. Vision, Image and Signal Processing
• A Graduate Specialization is a University credential that is recognized on the student's transcript but not on the diploma and is intended to reflect that a student has successfully completed a set of courses that together provide an in-depth study in the area of the Graduate Specialization. A student will only obtain the Graduate Specialization on their transcript if they have completed the requirements associated with the MEng degree
	to the Graduate Academic Integrity Module (Graduate AIM).
	• The MEng in Systems Design Engineering – Health Technologies - Co-operative Program will enable students to combine graduate studies with work experience. The program includes completion of 1-2 required work terms. The work term(s) typically takes place in term 3 (or terms 3 and 4). The work term(s) must meet CEE standard work term requirements and Departmental requirements. Students should apply to jobs related to their program of study. Note: the program must start and end on an academic term. Students in the program are encouraged to complete WIL 601 Career Foundations for Work-Integrated Learning in the academic term prior to the first work term.
	
	Coursework option: Course requirements
	• Students must complete the following ~~2 core Systems Design Engineering~~ graduate courses:
	  ~~○ SYDE 600 Systems Theory, Models, Research & Design~~
	  ○ 1 of:
	  ▪ SYDE 660A Systems Design Graduate Workshop 1 - AI and Machine Learning,
	  ▪ SYDE 660B Systems Design Graduate Workshop 1 - Biomedical Systems,
	  ▪ SYDE 660C Systems Design Graduate Workshop 1 - Human Factors,
	  ~~▪ SYDE 660D Systems Design Graduate Workshop 1 - Mechatronic & Physical Systems,~~
	  ~~▪ SYDE 660E Systems Design Graduate Workshop 1 - Vision, Image & Signal Processing, or~~
	  ~~▪ SYDE 660 Systems Design Graduate Workshop 1~~
	  ○ BME 600 Design of Biomedical Technologies
	  ○ BME 601 Physiological Systems and Biomedical Design
	  ○ 1 of the following Health Technologies core courses:
	  ▪ ECON 643 Health Economics
	  ▪ MSE 619 Healthcare Analytics

Current primary program in the home unit: MEng in Systems Design Engineering Program Graduate Studies Academic Calendar content:	**Proposed MEng in Systems Design Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content**:
and the requirements associated with the Graduate Specialization. • All MEng Graduate Specializations in Systems Design Engineering consist of a set of 4 graduate (0.50 weight) level courses and this set is comprised of a mix of specified and elective courses. Specified courses are those that are prescribed as part of the Graduate Specialization. Elective courses are those that are on a list of courses designated as electives for a given Graduate Specialization. The requirements for each of the five Graduate Specializations are described below. 1. Graduate Specialization in Artificial Intelligence and Machine Learning • Students must satisfy the following: • 3 Specified courses: o SYDE 522 Machine Intelligence or SYDE 552 Computational Neurosciences o SYDE 660A Systems Design Graduate Workshop 1 – AI and Machine Learning o SYDE 675 Pattern Recognition • Elective courses (at least 1 course from the following list): o SYDE 662 Systems Design Graduate Workshop 2 o SYDE 671 Advanced Image Processing o SYDE 672 Statistical Image Processing o SYDE 673 Video Processing & Analytics o SYDE 674 3D Computer Vision & Imaging 2. Graduate Specialization in Biomedical Systems • Students must satisfy the following: • 3 Specified courses: o SYDE 660B Systems Design Graduate Workshop 1 – Biomedical Systems o At least 2 from the following list: ▪ SYDE 544 Biomed Measure & SIP ▪ SYDE 684 Materials Biocompatability ▪ SYDE 750 Topic 20 Topics in Systems Modelling: Modeling of Biomechanical Systems ▪ SYDE 750 Topic 36 Topics in Systems Modelling: Assistive Tech and Rehab Eng	▪ PHIL 626 Bioethics and Technology o 1 of the following Faculty of Engineering Health Technologies elective courses: ▪ BME 602 Foundations in Biomechanical Engineering ▪ CHE 621 Model Building and Response Surface Methodology ▪ ECE 608 Quantitative Methods in Biomedical Engineering ▪ ENVE 585 Air Quality Engineering and Impacts ▪ MSE 630 Human-Computer Interaction o 4 from SYDE graduate courses and the following list of Health Technologies elective courses: ▪ HLTH 605B Quantitative Methods and Analysis ▪ HLTH 606B Principles of Epidemiology for Public Health ▪ HLTH 612 Introduction to Health Information and Data Standards ▪ HLTH 615 Requirements Specifications and Analysis in Health Systems ▪ HLTH 633 Digital Health ▪ HLTH 650A Application of Artificial Intelligence in Health (0.25) and 650B Machine Learning Techniques in Health (0.25) • ~~In addition to the 2 core courses,~~ Students must complete ~~6 Engineering~~ graduate courses (0.50 unit weight per course) counting towards degree credit from the University of Waterloo satisfying the following criteria: o ~~At least 2 Systems Design Engineering courses at the 500, 600 or 700 level.~~ o At most 2 courses at the 500 level. o At least 3 SYDE courses. • ~~Students in the MEng in Systems Design Engineering program may also choose to pursue one of the following five Graduate Specializations:~~ ~~1. Artificial Intelligence and Machine Learning~~ ~~2. Biomedical Systems~~ ~~3. Human Factors~~ ~~4. Mechatronics and Physical Systems~~ ~~5. Vision, Image and Signal Processing~~

Current primary program in the home unit: MEng in Systems Design Engineering Program Graduate Studies Academic Calendar content:	**Proposed MEng in Systems Design Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content**:

• Elective courses (at least 1 from the following list or an additional course from the Specified course list)
  ○ SYDE 552 Computational Neurosciences
  ○ SYDE 556 Simulating Neurobiological Systems
  ○ SYDE 652 Dynamics of Multibody Systems
  ○ SYDE 662 Systems Design Graduate Workshop 2
  ○ SYDE 677 Medical Imaging
• Note that only one 500 level course may be used to satisfy the requirements of a Graduate Specialization. Therefore, if SYDE 544 is taken as a Specified course, then SYDE 552 and SYDE 556 cannot be taken to satisfy the Elective course requirement.
3. Graduate Specialization in Human Factors
• Students must satisfy the following:
• 3 Specified courses:
  ○ SYDE 660C Systems Design Graduate Workshop 1 – Human Factors
  ○ At least 2 from the following list:
  ▪ SYDE 542 Interface Design or SYDE 543 Cognitive Ergonomics
  ▪ SYDE 642 Cognitive Engineering Methods
  ▪ SYDE 644 Human Factors Testing
• Elective courses (at least 1 from the following list or an additional course from the Specified course list):
  ○ SYDE 533 Conflict Resolution
  ○ SYDE 662 Systems Design Graduate Workshop 2
  ○ SYDE 740 Advanced Cognitive Ergonomics
• Note that only one 500 level course may be used to satisfy the requirements of a Graduate Specialization. Therefore, if SYDE 542 or SYDE 543 is taken as a Specified course, then SYDE 533 cannot be taken to satisfy the Elective course requirement.
4. Graduate Specialization in Mechatronic and Physical Systems
• Students must satisfy the following:
• 3 Specified courses:
  ○ SYDE 660D Systems Design Graduate Workshop 1 - Mechatronic & Physical Systems
	~~• A Graduate Specialization is a University credential that is recognized on the student's transcript but not on the diploma and is intended to reflect that a student has successfully completed a set of courses that together provide an in-depth study in the area of the Graduate Specialization. A student will only obtain the Graduate Specialization on their transcript if they have completed the requirements associated with the MEng degree and the requirements associated with the Graduate Specialization.~~
	~~• All MEng Graduate Specializations in Systems Design Engineering consist of a set of 4 graduate (0.50 weight) level courses and this set is comprised of a mix of specified and elective courses. Specified courses are those that are prescribed as part of the Graduate Specialization. Elective courses are those that are on a list of courses designated as electives for a given Graduate Specialization. The requirements for each of the five Graduate Specializations are described below.~~
	~~1. Graduate Specialization in Artificial Intelligence and Machine Learning~~
	~~• Students must satisfy the following:~~
	~~• 3 Specified courses:~~
	~~○ SYDE 522 Machine Intelligence or SYDE 552 Computational Neurosciences~~
	~~○ SYDE 660A Systems Design Graduate Workshop 1 – AI and Machine Learning~~
	~~○ SYDE 675 Pattern Recognition~~
	~~• Elective courses (at least 1 course from the following list):~~
	~~○ SYDE 662 Systems Design Graduate Workshop 2~~
	~~○ SYDE 671 Advanced Image Processing~~
	~~○ SYDE 672 Statistical Image Processing~~
	~~○ SYDE 673 Video Processing & Analytics~~
	~~○ SYDE 674 3D Computer Vision & Imaging~~
	~~2. Graduate Specialization in Biomedical Systems~~
	~~• Students must satisfy the following:~~
	~~• 3 Specified courses:~~
	~~○ SYDE 660B Systems Design Graduate Workshop 1 – Biomedical Systems~~
	~~○ At least 2 from the following list:~~
	~~▪ SYDE 544 Biomed Measure & SIP~~

Current primary program in the home unit: MEng in Systems Design Engineering Program Graduate Studies Academic Calendar content:	**Proposed MEng in Systems Design Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content**:
○ At least 2 from the following list: ▪ SYDE 553 Advanced Dynamics ▪ SYDE 652 Dynamics of Multibody Systems ▪ SYDE 655 Optimal Control ▪ SYDE 682 Advanced MEMS, Physics, Design & Fabrication ▪ SYDE 683 Modelling, Simulation & Design of MEMS ▪ SYDE 750 Modelling Continuum Systems • Elective courses (at least 1 from the following list or an additional course from the Specified course list): ○ SYDE 531 Design Opt. under Probabilistic Uncertainty ○ SYDE 631 Time Series Modelling ○ SYDE 661 Model-based robust design ○ SYDE 662 Systems Design Graduate Workshop 2 • Note that only one 500 level course may be used to satisfy the requirements of a Graduate Specialization. Therefore, if SYDE 553 is taken as a Specified course, then SYDE 531 cannot be taken to satisfy the Elective course requirement. 5. Graduate Specialization in Vision, Image and Signal Processing • Students must satisfy the following: • 3 Specified courses: ○ SYDE 660E Systems Design Graduate Workshop 1 - Vision, Image & Signal Processing ○ At least 2 from the following list: ▪ SYDE 575 Image Processing ▪ SYDE 671 Advanced Image Processing ▪ SYDE 677 Medical Imaging • Elective courses (at least 1 from the following list or an additional course from the Specified course list): ○ SYDE 544 Biomed Measure & SIP ○ SYDE 633 Remote Sensing Systems ○ SYDE 662 Systems Design Graduate Workshop 2 ○ SYDE 672 Statistical Image Processing ○ SYDE 673 Video Processing & Analytics ○ SYDE 674 3D Computer Vision & Imaging ○ SYDE 675 Pattern Recognition	~~▪ SYDE 684 Materials Biocompatability~~ ~~▪ SYDE 750 Topic 20 Topics in Systems Modelling: Modeling of Biomechanical Systems~~ ~~▪ SYDE 750 Topic 36 Topics in Systems Modelling: Assistive Tech and Rehab Eng~~ ~~• Elective courses (at least 1 from the following list or an additional course from the Specified course list)~~ ~~○ SYDE 552 Computational Neurosciences~~ ~~○ SYDE 556 Simulating Neurobiological Systems~~ ~~○ SYDE 652 Dynamics of Multibody Systems~~ ~~○ SYDE 662 Systems Design Graduate Workshop 2~~ ~~○ SYDE 677 Medical Imaging~~ ~~• Note that only one 500 level course may be used to satisfy the requirements of a Graduate Specialization. Therefore, if SYDE 544 is taken as a Specified course, then SYDE 552 and SYDE 556 cannot be taken to satisfy the Elective course requirement.~~ ~~3. Graduate Specialization in Human Factors~~ ~~• Students must satisfy the following:~~ ~~• 3 Specified courses:~~ ~~○ SYDE 660C Systems Design Graduate Workshop 1 – Human Factors~~ ~~○ At least 2 from the following list:~~ ~~▪ SYDE 542 Interface Design or SYDE 543 Cognitive Ergonomics~~ ~~▪ SYDE 642 Cognitive Engineering Methods~~ ~~▪ SYDE 644 Human Factors Testing~~ ~~• Elective courses (at least 1 from the following list or an additional course from the Specified course list):~~ ~~○ SYDE 533 Conflict Resolution~~ ~~○ SYDE 662 Systems Design Graduate Workshop 2~~ ~~○ SYDE 740 Advanced Cognitive Ergonomics~~ ~~• Note that only one 500 level course may be used to satisfy the requirements of a Graduate Specialization. Therefore, if SYDE 542 or SYDE 543 is taken as a Specified course, then~~

Current primary program in the home unit: MEng in Systems Design Engineering Program Graduate Studies Academic Calendar content:	Proposed MEng in Systems Design Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
• Note that only one 500 level course may be used to satisfy the requirements of a Graduate Specialization. Therefore, if SYDE 575 is taken as a specified course, then SYDE 544 cannot be taken to satisfy the Elective course requirement. • All course selections are arranged by the student. • Note: these requirements are in addition to satisfactory completion of any transitional courses that may be specified at the time of admission.	~~SYDE 533 cannot be taken to satisfy the Elective course requirement.~~ ~~4. Graduate Specialization in Mechatronic and Physical Systems~~ ~~• Students must satisfy the following:~~ ~~• 3 Specified courses:~~ ~~○ SYDE 660D Systems Design Graduate Workshop 1 - Mechatronic & Physical Systems~~ ~~○ At least 2 from the following list:~~ ~~▪ SYDE 553 Advanced Dynamics~~ ~~▪ SYDE 652 Dynamics of Multibody Systems~~ ~~▪ SYDE 655 Optimal Control~~ ~~▪ SYDE 682 Advanced MEMS, Physics, Design & Fabrication~~ ~~▪ SYDE 683 Modelling, Simulation & Design of MEMS~~ ~~▪ SYDE 750 Modelling Continuum Systems~~ ~~• Elective courses (at least 1 from the following list or an additional course from the Specified course list):~~ ~~○ SYDE 531 Design Opt. under Probabilistic Uncertainty~~ ~~○ SYDE 631 Time Series Modelling~~ ~~○ SYDE 661 Model-based robust design~~ ~~○ SYDE 662 Systems Design Graduate Workshop 2~~ ~~• Note that only one 500 level course may be used to satisfy the requirements of a Graduate Specialization. Therefore, if SYDE 553 is taken as a Specified course, then SYDE 531 cannot be taken to satisfy the Elective course requirement.~~ ~~5. Graduate Specialization in Vision, Image and Signal Processing~~ ~~• Students must satisfy the following:~~ ~~• 3 Specified courses:~~ ~~○ SYDE 660E Systems Design Graduate Workshop 1 - Vision, Image & Signal Processing~~ ~~○ At least 2 from the following list:~~ ~~▪ SYDE 575 Image Processing~~ ~~▪ SYDE 671 Advanced Image Processing~~ ~~▪ SYDE 677 Medical Imaging~~ ~~• Elective courses (at least 1 from the following list or an additional course from the Specified course list):~~ ~~○ SYDE 544 Biomed Measure & SIP~~ ~~○ SYDE 633 Remote Sensing Systems~~

Current primary program in the home unit: MEng in Systems Design Engineering Program Graduate Studies Academic Calendar content:	Proposed MEng in Systems Design Engineering - Health Technologies - Co-operative Program Graduate Studies Academic Calendar content:
	~~○ SYDE 662 Systems Design Graduate Workshop 2~~ ~~○ SYDE 672 Statistical Image Processing~~ ~~○ SYDE 673 Video Processing & Analytics~~ ~~○ SYDE 674 3D Computer Vision & Imaging~~ ~~○ SYDE 675 Pattern Recognition~~ • ~~Note that only one 500 level course may be used to satisfy the requirements of a Graduate Specialization. Therefore, if SYDE 575 is taken as a specified course, then SYDE 544 cannot be taken to satisfy the Elective course requirement.~~ • All course selections are arranged by the student. • Note: these requirements are in addition to satisfactory completion of any transitional courses that may be specified at the time of admission. • **Graduate Studies Work Report** ○ Students must complete one or two work-term experiences. For each work experience, a work report must be submitted to the Department for review to earn credit for the work report. ○ Students are responsible for following the roles and responsibilities of Cooperative and Experiential Education (CEE).

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

Current students will not be impacted. The program will be open to new students once it goes into effect.

Department/School approval date (mm/dd/yy):
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 12/05/24
Faculty approval date (mm/dd/yy):
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):

INDUSTRY AND JOB ANALYSIS FOR MASTER OF HEALTH TECHNOLOGIES

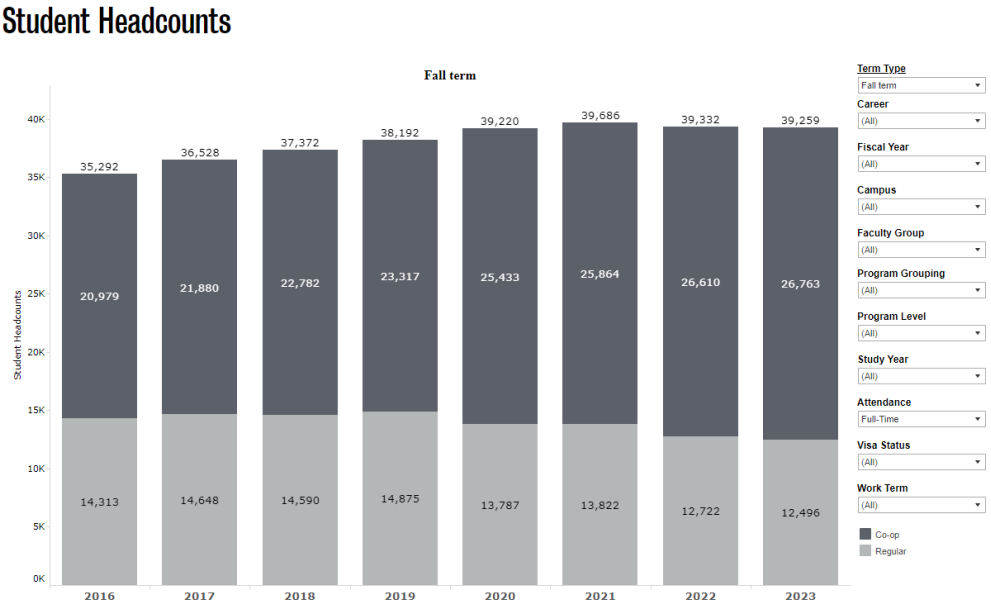
Prepared by Justin Kieffer, Faculty Relations Manager, Math & Eva Skuza, Faculty Relations Manager, Engineering

July 3, 2024

Introduction

Labour market and employment trends are volatile and may change quickly. While this report is a snapshot in time, Co-operative and Experiential Education (CEE) actively monitors labour market and employment changes. Additional insights will be provided through regular updates at the faculty and program level and more detailed data is provided in Cyclical Program Reviews.

As of fall 2023, approximately 68% or roughly 26,800 students at the University of Waterloo are enrolled in co-operative education programs. Both the number of students in co-op and the proportion of students in co-op programs have continued to increase annually (68% in 2023 vs 60% in 2017).



Graduate students in co-op programs currently represent a small proportion (~1.5%) of total co-op enrollment, with 390 total students as of fall 2023. The Faculty of Engineering has expanded its master level programs that include co-operative education as part of degree requirements. The most recently added programs are:

- Chemical Engineering
- Civil and Environmental Engineering
- Mechanical and Mechatronics Engineering
- Electrical and Computer Engineering

Upcoming programs are:

- Systems Design Engineering

Enrolment in these programs has increased the number of Engineering masters co-op students by approximately 100 students in 2024; an increase of approximately 26% in the number of masters co-op students at the University of Waterloo.

The proposed Master of Health Technologies program is expected to add an additional 50 co-op students.

To ensure that masters students are set up to succeed in co-op, Co-operative and Experiential Education (CEE) has conducted a competitive analysis to understand co-op employment trends, job opportunities, external labour markets, and surveyed employer interest in Master of Engineering co-op students.

Employment Trends

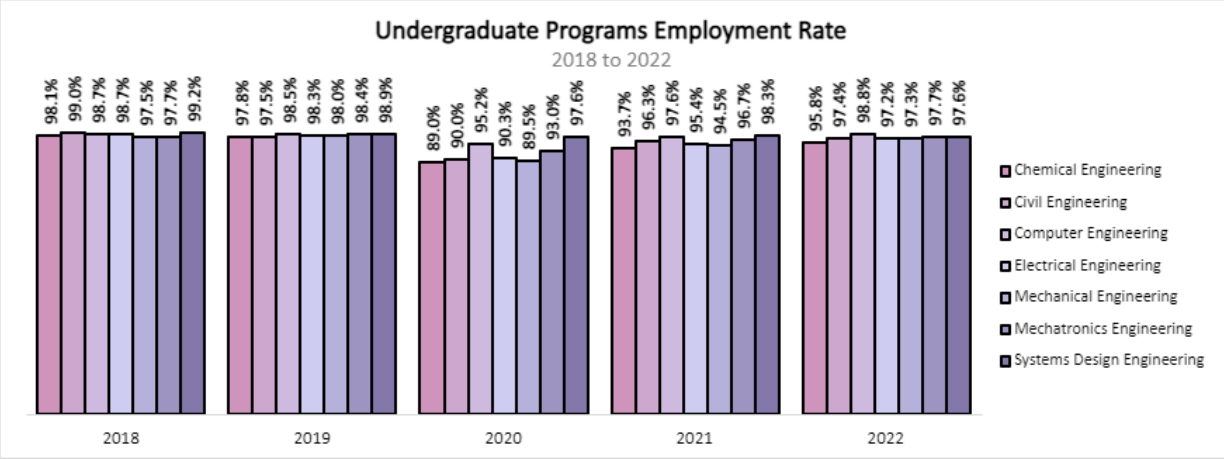
To get a sense of expected employment success for students in the Health Technologies program, CEE analyzed recent employment rates of comparable undergraduate Engineering co-op programs at Waterloo and existing master's co-op programs in the faculties of Engineering and Mathematics.

The list of programs used for comparison are listed below. While most data is summarized at the aggregate level, program level data is available upon request.

Undergraduate	Graduate
Chemical Engineering	Applied Mathematics
Civil Engineering	Computer Science
Computer Engineering	Data Science & Artificial Intelligence
Electrical Engineering	Management Sciences Engineering
Mechanical Engineering	Mechanical & Mechatronics Engineering
Mechatronic Engineering	
Systems Design Engineering	

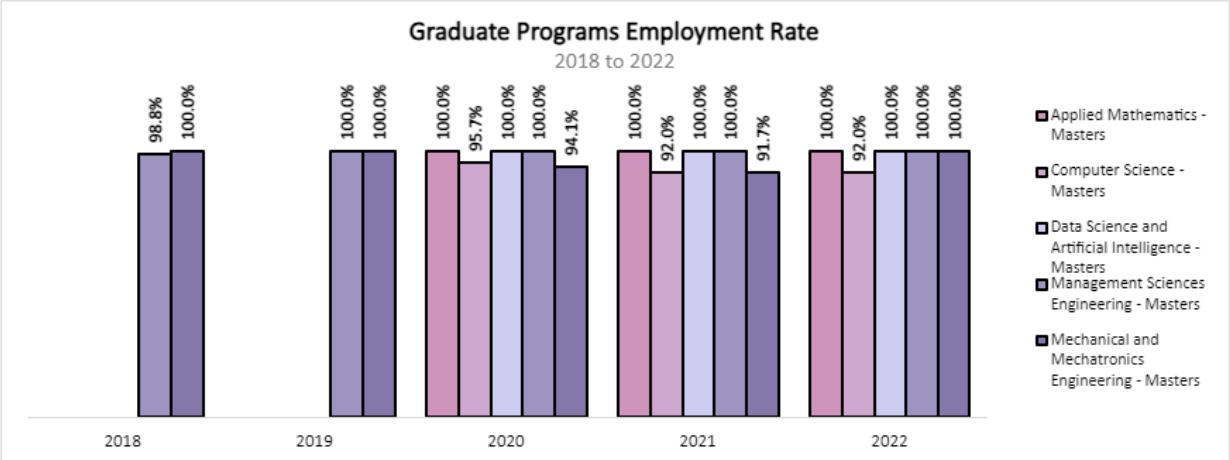
Employment rates in 2020 and 2021 were heavily impacted by the Covid-19 pandemic, the included undergraduate co-op programs in Engineering averaged an employment rate of 96.6% over the reporting period, representing more than 30,000 employed work terms. Undergraduate students in Chemical and Mechatronic Engineering programs were slightly less successful from an overall employment perspective than the other listed programs.

Shifting labour markets and economic downturns may indicate that additional focus on supporting these students in their job search by ensuring they access specific workshops and appointments offered by the Centre for Career Development to expand their work search would be beneficial. By searching for jobs both in and outside of WaterlooWorks, Undergraduate and Graduate students would uncover more work opportunities.



Unlike the undergraduate programs, co-op is not a requirement of all M. Eng degrees and students can

switch out of the co-op program, which impacts employment rates. Master's students in existing co-op programs have historically been very successful from an employment perspective, with employment rates often outperforming those at the undergraduate level. M. Eng co-op students are strongly competitive from an employment standpoint due to smaller program sizes, expertise and skills of students, different support models and increased flexibility in work term scheduling contributing to employment rate differences.



Where Students Work

Analysis by industry indicates strong alignment between the skills developed by students in the specific undergraduate Engineering programs and the sectors in which they worked. Computer systems, Architectural/building engineering, software development, universities and motor vehicle manufacturing are the five largest industries by volume of the specified undergraduate Engineering employment. Substantial growth has been observed in the Management, Scientific and Technical Consulting Services industry and its related organizations.

Overall Top 10 NAICS Codes by Employed Count for Compareable Undergraduate Programs from 2018 to 2022

Employer NAICS Code	2018 # Emp. / Rank	2019 # Emp. / Rank	2020 # Emp. / Rank	2021 # Emp. / Rank	2022 # Emp. / Rank	Overall 2018 to 2022	2018 to 2022	Overall Net Change
5415 - Computer Systems Design and Related Services	703 1	686 ▭1	601 ▭1	626 ▭1	679 ▭1	3295		0
5413 - Architectural, Engineering and Related Services	620 2	577 ▭2	444 ▼3	459 ▭3	534 ▲2	2634		0
5112 - Software Publishers	366 3	395 ▭3	375 ▼4	409 ▭4	440 ▲3	1985		0
6113 - Universities	333 4	326 ▭4	498 ▲2	520 ▭2	276 ▼5	1953		-1
3361 - Motor Vehicle Manufacturing	223 5	206 ▭5	245 ▭5	239 ▭5	319 ▲4	1232		1
5416 - Management, Scientific and Technical Consulting Services	164 9	181 ▲6	216 ▭6	210 ▭6	217 ▭6	988		3
5614 - Business Support Services	206 6	161 ▼7	141 ▼8	142 ▲7	122 ▼10	772		-4
3344 - Semiconductor and Other Electronic Component Manufacturing	182 7	133 ▼12	142 ▲7	131 ▼8	166 ▲7	754		0
3342 - Communications Equipment Manufacturing	128 12	143 ▲9	137 ▭9	125 ▭9	111 ▼11	644		1
3363 - Motor Vehicle Parts Manufacturing	165 8	126 ▼14	97 ▲12	124 ▲10	123 ▲9	635		-1

For graduate students, the landscape is slightly different in terms of industries that students are most likely to work in, which could be attributed to the skills and interests of the students in the sample list of programs used for comparison.

Overall Top 10 NAICS Codes by Employed Count for Compareable Graduate Programs from 2018 to 2022

Employer NAICS Code	2018 # Emp. / Rank	2019 # Emp. / Rank	2020 # Emp. / Rank	2021 # Emp. / Rank	2022 # Emp. / Rank	2018 to 2022	2018 to 2022	Overall Net Change
5415 - Computer Systems Design and Related Services	7 4	5 ▲3	10 ▼4	11 ▲3	28 ▲2	61		▲ 2
5221 - Depository Credit Intermediation	9 3	11 ▲2	7 ▼6	6 ▭6	8 ▲5	41		▼ -2
5173 - Telecommunications Resellers	47	▲38	19 ▲2	12 ▭2	7 ▼7	38		▲ 40
4451 - Grocery Stores	2 18	1 ▼19	11 ▲3	4 ▼8	18 ▲3	36		▲ 15
5241 - Insurance Carriers	4 11	1 ▼19	7 ▲6	7 ▲5	6 ▼8	25		▲ 3
9120 - Provincial and Territorial Public Administration	47	1 ▲19	▼37	8 ▲4	9 ▭4	18		▲ 43
3361 - Motor Vehicle Manufacturing	5 5	4 ▲4	▼37	3 ▲12	6 ▲8	18		▼ -3
5112 - Software Publishers	5 5	2 ▼8	3 ▼9	4 ▲8	4 ▼11	18		▼ -6
5412 - Accounting, Tax Preparation, Bookkeeping and Payroll Services	5 5	▼38	2 ▲12	2 ▼20	8 ▲5	17		▭ 0
6113 - Universities	47	▲38	8 ▲5	6 ▼6	2 ▼23	16		▲ 24

Focusing on industries related to health technologies, CEE analyzed recent co-op hiring data to understand the potential to source relevant employment opportunities for students in this program from

within the existing hiring base. More than 2,500 organizations by NAICS are actively participating in the co-op hiring process in relevant professional, scientific/technical services and health care industries.

UW Data - Count WW Organiations with NAICS Codes	Active
Professional, scientific and technical services	**1,979**
5415 - Computer Systems Design and Related Services	1,007
5416 - Management, Scientific and Technical Consulting Services	454
5417 - Scientific Research and Development Services	188
5419 - Other Professional, Scientific and Technical Services	330
Health care and social assistance	**554**
6211 - Offices of Physicians	36
6212 - Offices of Dentists	19
6213 - Offices of Other Health Practitioners	223
6214 - Out-Patient Care Centres	29
6215 - Medical and Diagnostic Laboratories	21
6216 - Home Health Care Services	19
6219 - Other Ambulatory Health Care Services	5
6221 - General Medical and Surgical Hospitals	56
62211 - Paediatric Hospitals	2
6222 - Psychiatric and Substance Abuse Hospitals	3
6223 - Specialty (except Psychiatric and Substance Abuse) Hospitals	7
6231 - Nursing Care Facilities	17
6232 - Residential Developmental Handicap, Mental Health and Substance Abuse Facilitie	17
6233 - Community Care Facilities for the Elderly	15
6239 - Other Residential Care Facilities	13
6241 - Individual and Family Services	56
6242 - Community Food and Housing, and Emergency and Other Relief Services	12
6243 - Vocational Rehabilitation Services	4
Overall Total	**2,533**

Speifically, within the Healthcare industry, by volume of students hired, the 10 largest organizations have accounted for 377 work terms since 2019 (587 hires by all organizations in these NAICS).

Organization Name	Top 10 Organizations by Work Terms (2019 to 2023)
University Health Network	107
Unity Health Toronto	87
The Hospital for Sick Children	60
Sunnybrook Health Sciences Centre	31
Swift Medical Inc	18
Scispot.io	16
Centre For Addiction and Mental Health	13
William Osler Health System	12
Grand River Hospital	9
London Health Sciences Centre	8
Mount Sinai Hospital	8
Mackenzie Health	8
Grand Total	**377**

Some of the most common job titles held by students in these positions include: Project Coordinator, Research Assistant, QA Tester, Special Project Engineering Assistant, Software Engineering and Software Developer.

Overall co-op hiring has grown in these industries since 2019, with recent hiring peaking in 2022.

UW Hiring Data (All Students)	2019	2020	2021	2022	2023	Trend 2019 to 2023	Net Growth/Decline
Professional, scientific and technical services	**3,125**	**2,690**	**3,489**	**3,714**	**3,421**		**296**
5415 - Computer systems design and related services	2,060	1,697	2,098	2,195	1,910		**-150**
5416 - Management, scientific and technical consulting services	621	634	815	858	787		**166**
5417 - Scientific research and development services	234	213	342	399	383		**149**
5419 - Other professional, scientific and technical services	210	146	234	262	341		**131**
Health care and social assistance	**787**	**779**	**942**	**1,140**	**1,130**		**343**
6211 - Offices of physicians	14	10	40	58	78		**64**
6212 - Offices of dentists	2	10	12	17	18		**16**
6213 - Offices of other health practitioners	156	175	243	256	298		**142**
6214 - Out-patient care centres	69	78	44	60	50		**-19**
6215 - Medical and diagnostic laboratories	28	34	43	51	41		**13**
6216 - Home health care services	21	26	36	19	25		**4**
6219 - Other ambulatory health care services	6	4	2	2	4		**-2**
6221 - General medical and surgical hospitals	310	283	310	453	351		**41**
62211 - Paediatric Hospitals	44	33	42	31	46		**2**
6222 - Psychiatric and substance use hospitals	8	1	3	3	3		**-5**
6223 - Specialty hospitals (except psychiatric and substance use)	19	16	18	11	21		**2**
6231 - Nursing care facilities	28	20	27	26	48		**20**
6232 - Residential facilities for persons with an intellectual or developmental disability, a mental health or substance use condition	43	58	63	75	72		**29**
6233 - Community care facilities for the elderly	11	18	24	22	17		**6**
6239 - Other residential care facilities	2	3	6	4	4		**2**
6241 - Individual and family services	21	3	19	42	45		**24**
6242 - Community food and housing, and emergency and other relief services	2	4	2	4	2		**0**
6243 - Vocational rehabilitation services	3	3	8	6	7		**4**

Hiring of Engineering students, specifically within the health care and social assistance NAICS have remained relatively flat, indicating opportunities to enhance and promote these roles to students in Engineering as well as to further promote the skills and knowledge of health technologies students to these organizations.

UW Hiring Data (Eng Only)	2019	2020	2021	2022	2023	Trend 2019 to 2023	Net Growth/Decline
Professional, scientific and technical services	**1,448**	**1,364**	**1,510**	**1,710**	**1,537**		**89**
5415 - Computer systems design and related services	978	874	918	1,036	865		**-113**
5416 - Management, scientific and technical consulting services	263	321	343	354	319		**56**
5417 - Scientific research and development services	96	105	147	198	185		**89**
5419 - Other professional, scientific and technical services	111	64	102	122	168		**57**
Health care and social assistance	**115**	**110**	**90**	**156**	**114**		**-1**
6211 - Offices of physicians		2	3	7	10		**10**
6212 - Offices of dentists				2	2		**2**
6213 - Offices of other health practitioners	14	10	10	6	4		**-10**
6214 - Out-patient care centres	10	10	1	6	2		**-8**
6215 - Medical and diagnostic laboratories	5	11	9	19	11		**6**
6216 - Home health care services	3	3	4	2			**-3**
6219 - Other ambulatory health care services	3				1		**-2**
6221 - General medical and surgical hospitals	54	60	49	99	67		**13**
62211 - Paediatric Hospitals	23	13	10	8	11		**-12**
6222 - Psychiatric and substance use hospitals	1						**-1**
6223 - Specialty hospitals (except psychiatric and substance use)			2	2	2		**2**
6231 - Nursing care facilities					1		**1**
6232 - Residential facilities for persons with an intellectual or developmental disability, a mental health or substance use condition	1			1			**-1**
6233 - Community care facilities for the elderly		1	2				**0**
6239 - Other residential care facilities							**0**
6241 - Individual and family services	1			4	3		**2**
6242 - Community food and housing, and emergency and other relief services							**0**
6243 - Vocational rehabilitation services							**0**

Analysis of the relevant occupation codes (NOCS) that Health Technologies are well suited to pursue indicate ongoing overall growth, but also indicate a need for further exploration on ways to increase Engineering student participation in these occupations.

UW Hiring Data (All Students)	2019	2020	2021	2022	2023	Trend 2019 to 2023	Net Growth/Decline
1122 – Professional occupations in business management consulting	1543	1445	1923	1899	1793		250
1211 – Court reporters, transcriptionists, records management technicians and statistical officers	45	47	66	62	72		27
2147 – Computer engineers (except software engineers and designers)	851	680	646	932	775		-76
2171 – Information systems analysts and consultants	820	643	776	807	764		-56
2172 – Database analysts and data administrators	395	472	589	656	657		262
2174 – Computer programmers and interactive media developers	774	709	726	744	678		-96
2211 – Chemical technologists and technicians	87	65	54	83	89		2
2281 – Computer network technicians	44	34	16	27	37		-7
4165 – Health policy researchers, consultants and program officers	60	43	78	69	75		15

UW Hiring Data (Eng Only)	2019	2020	2021	2022	2023	Trend 2019 to 2023	Net Growth/Decline
1122 – Professional occupations in business management consulting	348	422	468	459	418		70
1211 – Court reporters, transcriptionists, records management technicians and statistical officers	13	9	11	9	9		-4
2147 – Computer engineers (except software engineers and designers)	494	424	368	518	417		-77
2171 – Information systems analysts and consultants	307	280	303	324	328		21
2172 – Database analysts and data administrators	106	160	142	188	174		68
2174 – Computer programmers and interactive media developers	379	366	307	322	276		-103
2211 – Chemical technologists and technicians	38	36	28	45	40		2
2281 – Computer network technicians	20	17	6	14	24		4
4165 – Health policy researchers, consultants and program officers	3	1	2	0	11		8

As well as analyzing the current co-op landscape pertaining to relevant graduate and undergraduate co-op programs as a proxy for the upcoming Health Technologies program, CEE also analyzed external labour market data to understand relevant industry trends and business development opportunities to support co-op program growth.

Statistics Canada Labour Force data shows growth from 2019 to 2023 in terms of the number of people employed in the Professional, scientific, and technical services and the health care and social assistance industries.

NAICS Data (Canada)

NAICS Sector	2019	2020	2021	2022	2023	Trend 2019 to 2023	Net Growth/Decline
Professional, scientific and technical services [54]	1,343,400	1,358,900	1,470,200	1,581,900	1,645,500		302,100
Health care and social assistance [62]	1,937,900	1,908,000	1,982,300	2,061,900	2,131,000		193,100

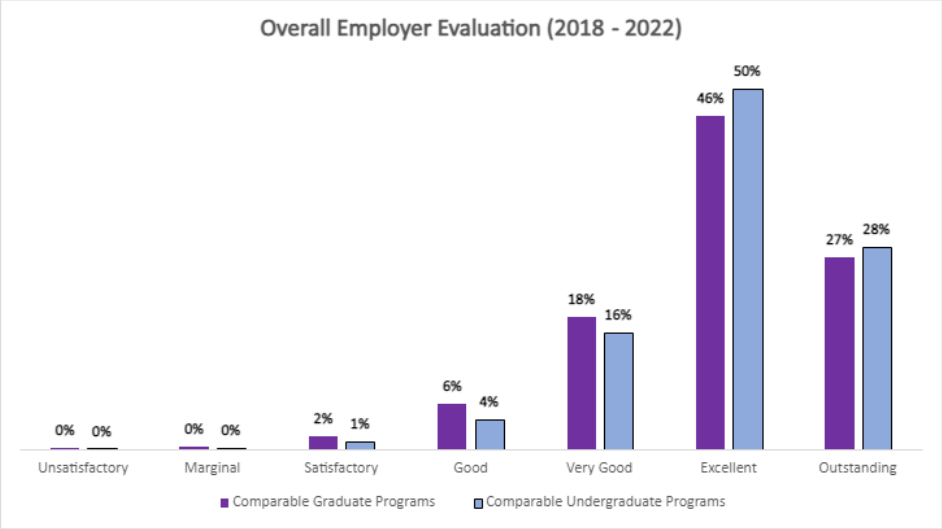
Similarly, growth in the number of Canadians working in occupations relevant to health technologies have also continued to grow over this time period.

NOCS Data

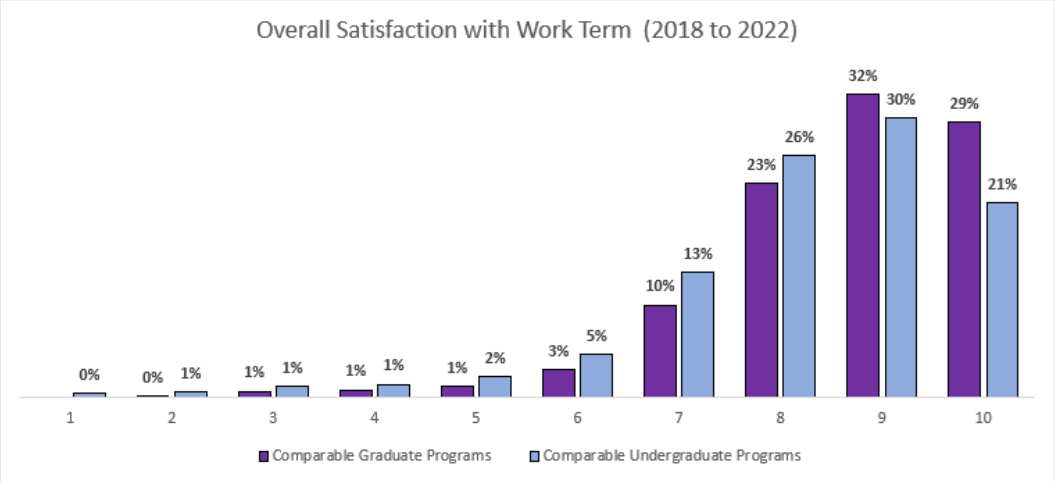
NOC	2019	2020	2021	2022	2023	Trend 2019 to 2023	Net Growth/Decline
Professional occupations in business [112]	334,500	365,900	398,700	421,600	429,700		95,200
Administrative and financial supervisors and specialized administrative occupations [12]	530,200	526,300	596,700	601,100	654,900		124,700
Professional occupations in applied sciences (except engineering) [212]	586,000	660,900	733,200	791,900	778,000		192,000
Professional occupations in engineering [213]	236,700	232,400	265,000	275,100	277,900		41,200
Technical occupations related to natural and applied sciences [22]	533,400	541,700	512,400	544,400	543,700		10,300
Health treating and consultation services professionals [311]	196,100	204,300	208,700	206,300	203,900		7,800
Therapy and assessment professionals [312]	67,200	71,800	71,800	71,800	84,300		17,100
Technical occupations in health [32]	257,200	263,700	270,900	283,200	301,900		44,700
Professional occupations in government services [414]	190,900	189,400	224,000	235,300	250,000		59,100

Student Experience

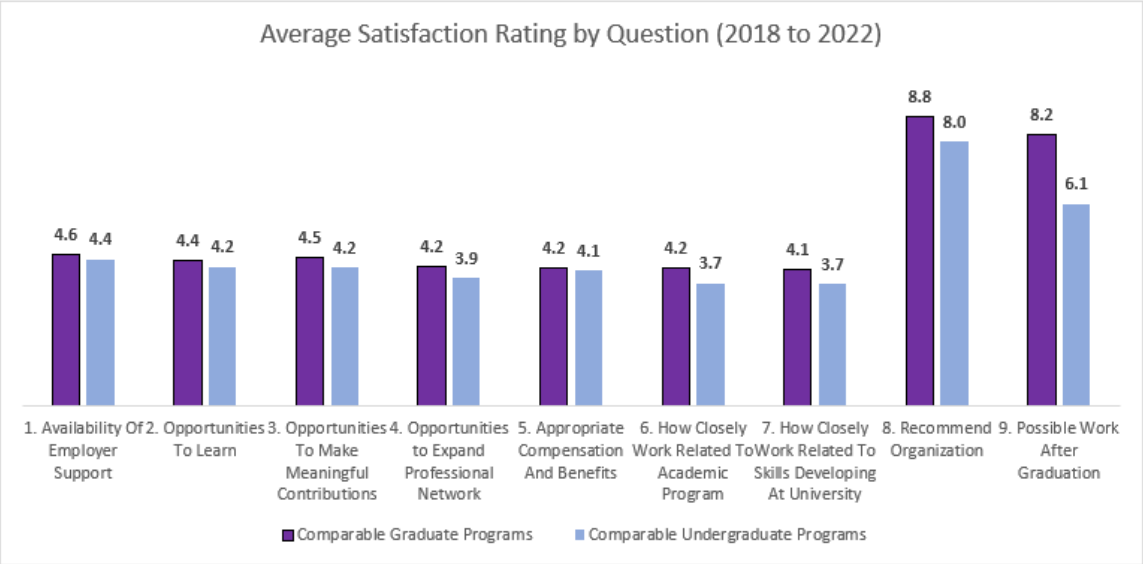
Analysis of evaluation data for comparable co-op programs reveals that undergraduate and graduate students received similar, strong overall evaluation ratings from their employers. The percentage of undergraduate students in comparable programs who received a 'Very Good' to 'Outstanding' rating was slightly higher than that of graduate co-op students (95% vs 92%).



Graduate students do appear to be more satisfied with their work term experiences compared to undergraduate students in comparable programs, with 84% of students rating their overall satisfaction an '8' or above, compared to 76% of undergraduate students (the undergraduate average is on par with the overall distribution for all students over this timeframe). This may indicate that students in graduate co-op programs are more likely to find employment in jobs that strongly align with their expectations.



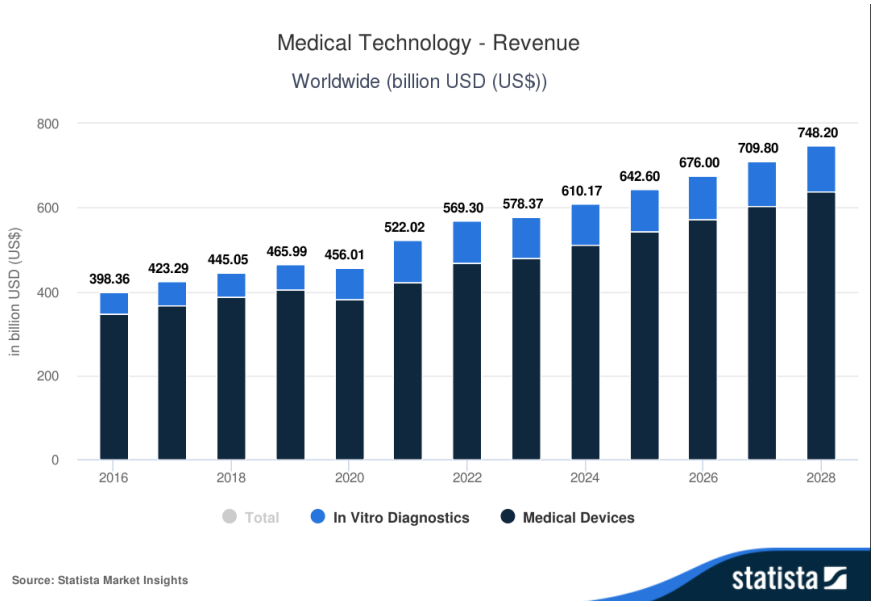
Graduate students also rate their overall average satisfaction on each of the individual work term attributes slightly higher than undergraduate students in comparable programs. Graduate co-op students are significantly more likely to rate the possibility of working with their employer post-graduation higher than undergraduate students. This may be indicative of a different employment approach or strategy by the organizations hiring graduate co-op students and the fact that these students are closer to program completion.



External Industry Projections

To understand the outlook of the medical and health technologies market, CEE analyzed industry projections conducted by Statista, which project continued growth out to 2028.

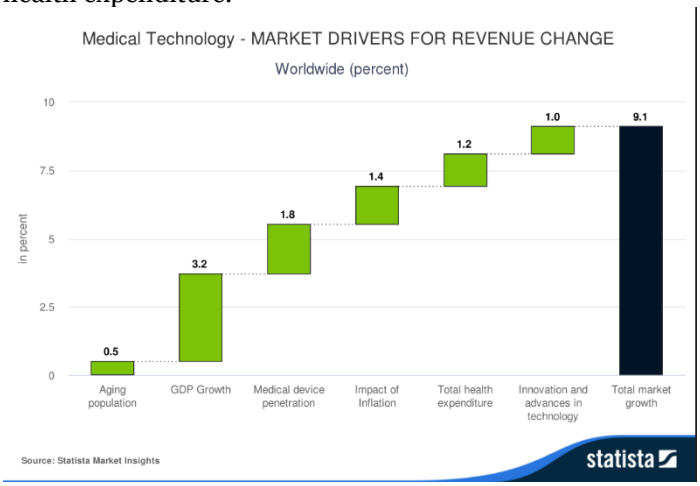
Medical Technology – The Medical Technology market, which encompasses various markets, including Medical Devices, is anticipated to witness significant revenue growth in the coming years. By 2024, the market is projected to reach a staggering US$610.20bn worldwide.



Among these markets, Medical Devices are expected to dominate, with a projected market volume of US$511.20bn by 2024. Furthermore, the Medical Technology market is expected to demonstrate a steady annual growth rate of 5.23% from 2024 to 2028.

As a result, the market volume is estimated to reach US$748.20bn by 2028. In terms of global comparison, the United States is poised to generate the highest revenue in the Medical Technology market.

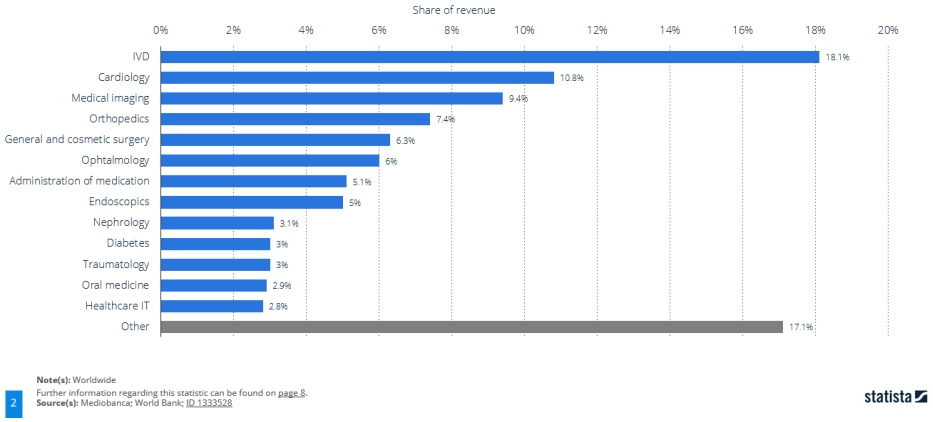
This growth is expected to be driven by overall GDP growth, increased device penetration globally, inflation and increased health expenditure.



In 2021, the medical technology industry generated revenue of approximately C$793 billion. The below statistic shows how global MedTech revenue was distributed across categories of different products. According to the data, in-vitro diagnostics generated 18.1 percent of the total MedTech revenue, while medical devices represented the remaining 81.9 percent of it. Among medical devices, the most important category was that of devices related to cardiology, which accounted for 10.8 percent of the total revenue of this industry.

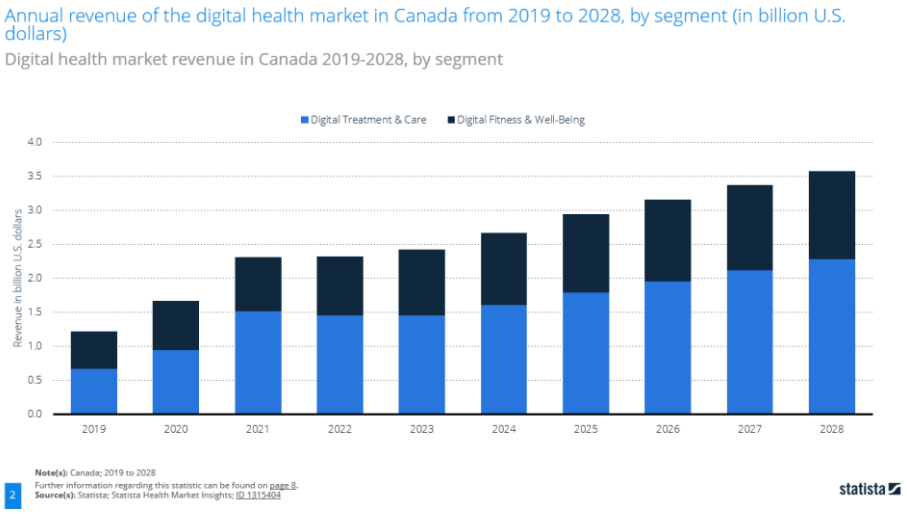
Distribution of the global revenue of medical technology industry in 2021, by category

Distribution of global revenue of MedTech industry 2021, by category



Digital Health in Canada

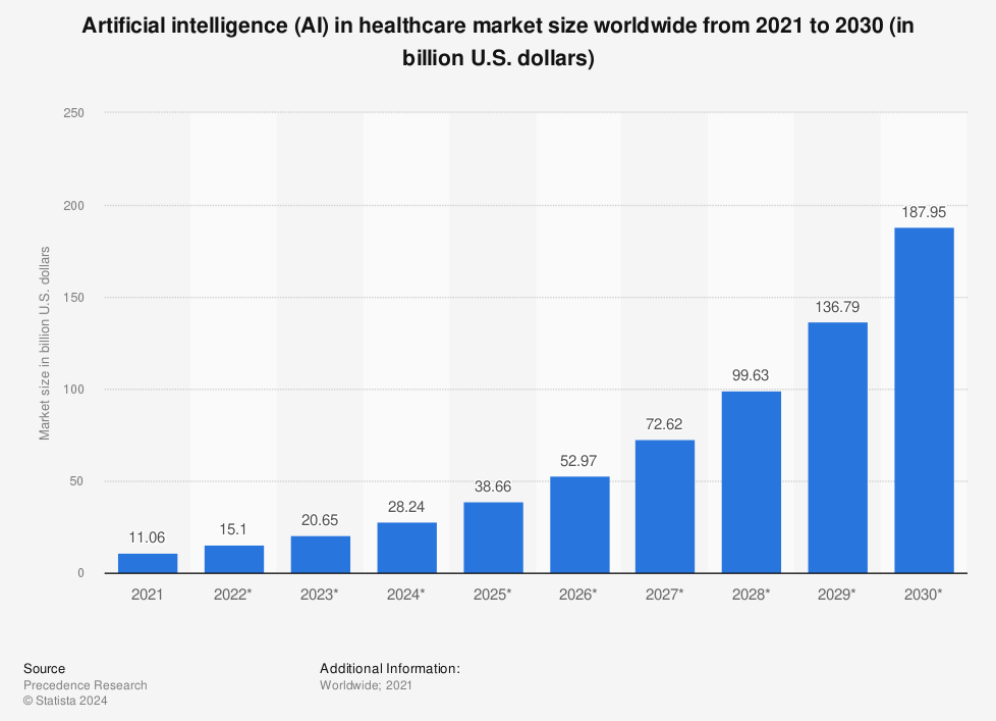
In 2022, the digital health market in Canada was forecast to reach revenues of approximately 2.4 billion U.S. dollars. This would represent a nine percent growth from the preceding year. When broken down, this market was projected to be made up of revenues of 1.4 billion U.S. dollars in the eHealth segment and 970 million U.S. dollars from the digital fitness and well-being division. The eHealth segment within digital health encompasses such things as doctor consultations which take place via technologies (such as video or online) rather than in-person, and devices that track the health metrics of a person.



Uses of AI in healthcare

As of 2021, around a fifth of healthcare organizations worldwide, which were surveyed, indicated they were in an early stage of adoption in regard to AI models. This meant that their models had been in production for less than two years. Fewer than ten percent of healthcare organizations had been utilizing AI for more than five years. The most common type of AI software in use in healthcare was functions related to healthcare data integration and natural language processing (NLP). The main intended users of AI among organizations in the mature stage of adoption were clinicians and providers, although 60 percent also reported that patients should be able to use the AI technologies implemented.

In 2021, the artificial intelligence (AI) in healthcare market was worth around 11 billion U.S. dollars worldwide. It was forecast that the global healthcare AI market would be worth almost 188 billion U.S. dollars by 2030, increasing at a compound annual growth rate of 37 percent from 2022 to 2030.



Labour Force Analysis

Employment and Social Development Canada (ESDC) uses the Canadian Occupational Projection System (COPS) and the National Occupational Classification (NOC, 2016 version) to identify occupations that may face labour shortage or labour surplus conditions over the projection period. The latest projections cover the 2022 to 2031 period. Their analysis of occupations expected to align with the Health Technologies program indicates:

Computer and information system managers – **SHORTAGE**: Over the period 2022-2031, the number of job openings (arising from expansion demand and replacement demand) are expected to total **42,600**, while the number of job seekers (arising from school leavers, immigration and mobility) is expected to total **53,400**.

This gap is not considered statistically significant, which means the number of job openings and seekers is projected to be similar over the 2022-2031 period. As such, the labour shortage conditions seen in recent years will not clear and are expected to persist over the projection period. Job openings are expected to arise equally from employment growth and retirements.

Health information management occupations – BALANCE: Over the period 2022-2031, the number of job openings (arising from expansion demand and replacement demand) are expected to total 10,500, while the number of job seekers (arising from school leavers, immigration, and mobility) is expected to total 10,600.

As job openings and job seekers are projected to be at relatively similar levels over the 2022-2031 period, the balance between labour supply and demand seen in recent years is expected to continue over the projection period.

Software engineers and designers – SHORTAGE: Over the period 2022-2031, the number of job openings (arising from expansion demand and replacement demand) for Software engineers and designers are expected to total 44,300, while the number of job seekers (arising from school leavers, immigration and mobility) is expected to total 48,800.

This gap is not considered statistically significant, which means the number of job openings and seekers is projected to be similar over the 2022-2031 period. As such, the labour shortage conditions seen in recent years will not clear and are expected to persist over the projection period. Employment is projected to grow at a significantly higher rate than the average of all occupations. As a result, job creation will represent around 68% of all openings, a proportion that is substantially above the average of all occupations (about 37% of openings). Most of these workers are employed in the computer systems design and related services industry; in telecommunications, information, and culture services; as well as in finance, insurance, real estate, and leasing services. Computer systems design will continue to outperform most industries in terms of production and employment growth, as demand is expected to be supported by technological changes. Demand for workers in this occupation will continue to be driven by the need for businesses and governments to upgrade their ICT systems to keep up with the most recent technologies and remain competitive.

Strategic Planning at UWaterloo

Part of the "Waterloo at 100" strategic plan includes Global Futures, which focuses on what lies ahead for humanity and the planet and inspires collaborative and interdisciplinary approaches in educational programs, research, and innovation activities. Under Global Futures are specific calls to action regarding Health Futures. As a result of these initiatives, we will be seeking to make connections with the Health Futures council to work alongside them, leverage partnerships and develop co-op opportunities for students.

Employer and Employment Relations Feedback

CEE reached out to selected, relevant employers as well as UWaterloo faculty members who have established connections to the health tech sector, by introducing the proposed program and soliciting feedback on the level of interest in future Health Technologies program students.

No faculty members and only one employer provided feedback at this time, therefore, more engagement both within Waterloo and outside of Waterloo will be necessary to identify new connections as well as those that already exist so that we can build a robust employment market for these students.

Employer Feedback

Employers were asked the same eight questions and one responded; their answers are listed below. Overall, the interest in the Health Technologies program seems to be positive, however, the employer noted that they are more interested in health sciences skills rather than engineering or business skills. It will be prudent for students in this program to focus on honing their specialized health sciences skills and to ensure they are able to differentiate themselves from other Engineering students.

Employer Survey Questions and Response from One Employer

1. Based on the introduction to the program provided, would you be interested in hiring co-op students from this program? (why or why not)

Possibly from the Electrical & Computer or Systems Design programs. We have had good bioinformatics undergraduate co-op students from both CS and Systems Design Engineering in the past. I would not be interested in students from the Chemical, Management Science, or Mechanical & Mechatronics programs.

2. What additional information about this program would be helpful for you to know?

Since Health Informatics is listed as an Area of Employment Interest, I would want to know what background the students have in the health sciences as opposed to engineering.

3. What specific skills would you expect students in this program to have?

Exceptional computer programming and scripting skills, experience with high-performance (i.e., cluster) computing and/or cloud computing, proficiency in scripting language (Python), advanced statistical analysis (likely proficiency in R/Bioconductor). These are more skills I would LIKE them to have, rather than EXPECT them to have, though.

4. Are there specific roles or job titles that you feel would be a good fit for Health Technologies co-op student within your organization?

Bioinformatician would be the most likely fit, or Programmer/Analyst. Not interested in business skills.

5. Which term(s) would you be most interested in hiring co-op students from this program? (Fall, Winter, Spring)

Any or all, we hire students continuously. The schedule above says only Spring or Fall though. The program might be more attractive if students were also available in Winter.

6. What length of time would you prefer to hire these co-op students for? (4, 8, 12 months)

8 months has usually worked well for us. 12 seems like too long a commitment, whereas 4 is often just enough time to bring a student up to speed. That works out well if they are returning, so if the intent is to have multiple terms, then 4-month terms would be ok if the student returns.

7. Is there anything else you'd like to add regarding the potential addition of the Bachelor of Business and Applied Science co-op program at the University of Waterloo?

I don't really understand the need to include the business part in here. There is an undergraduate Science & Business co-op program and I have never been impressed with the skills that these students have (and have rarely interviewed them).

8. Finally, do you have any suggestions on how Co-operative and Experiential Education at the University of Waterloo could better engage companies in your industry/sector?

You're doing a great job with us. Not sure if hitting the Toronto teaching hospitals (i.e., TAHSN network) at a higher level might get you more traction than interacting with individual institutions.

UWaterloo Employment Relations Team Feedback

The Employment Relations team within CEE was consulted and provided feedback on interactions they've had with other co-op employers as well as changes they've noticed in hiring patterns and in the current labour market.

The Employment Relations team stated that although there is demand for these kinds of specialized skillsets, this is a relatively new area of employment that is still developing, particularly in the private sector. As a result, competition between the faculties of Health and Engineering as well as competition with other universities in Ontario and Quebec suggests that students will need to engage early and often in their job search with a strong sense of independence. Employers have shared that the work in this sector does not lend itself to 4-month work terms since the responsibilities are complex and project-based and there is a strong interest to hire students for longer, 8-month work terms.

Students should also be aware that pay rates may not be as attractive as in the traditional "tech" sector. They should be encouraged to plan accordingly for remuneration to be more modest than in the tech sector.

GradWIL Pilot

Building on Waterloo's tradition and strength in experiential learning, students in graduate programs are encouraged to think beyond the classroom through engagement in work-integrated learning (WIL) opportunities. WIL provides students with crucial professional development, networking, funding, and opportunities to build skills for transition to the workforce. Through a partnership between Graduate Studies and Postdoctoral Affairs (GSPA) and Co-operative and Experiential Education (CEE), which began in 2020, the university continues to further develop graduate WIL opportunities.

Co-op is in the midst of a Graduate Work Integrated Learning pilot and in 2024 will be proposing an enhanced student support model and new program requirements for graduate students. It will leverage existing resources and infrastructure and provide customized resources and supports for programs and students. MEng programs and students involved in pilots are providing feedback and input to these changes.

Currently, the project team is also in the process of consulting with the campus community, including students, faculty, staff and senior leadership, to gather feedback on proposed models of grad WIL.

Conclusion

External industry data projects that the medical/health technologies sector will continue to grow over the next five years, driven by increases in automation, artificial intelligence, and research. This appears to

position the Health Technologies program well to address this market's needs, however, Health Technologies students will need to engage early and often in their job search with a strong sense of independence. These students will need to have clarity about their sense of purpose and their intended contributions to the sector so that CEE can support them in their job search. The planned student support model that has emerged from the GradWIL pilots will provide students with resources, programming, and advising to enable meaningful engagement with the health technologies sector.

The health technologies sector has not been an area of specific focus of opportunity development for CEE. The Health Technologies program will need engagement from those leading in Health Futures (researchers, faculty members and staff) so that relationships can be built in the sector to create opportunities for work terms and other WIL experiences for the M. Eng Health Technologies program.

CEE will leverage relationships with health-related organizations to identify potential health technology jobs, noting that historically, co-op hiring has been focused on patient care and research. To date, relatively few Engineering students are employed in health-related organizations, presenting both a challenge and opportunity for CEE and Waterloo to further investigate opportunities that would align with the skills students in the Health Technologies program would acquire.

CEE, the program, Health Futures researchers, faculty, staff, and students will need to partner to develop a plan to build a robust market of jobs for Health Technologies co-op students.

UNIVERSITY OF WATERLOO | Senate

For Approval **Open Session**

To:	Senate
From:	Senate Graduate and Research Council
Presenter(s):	Charmaine Dean Vice-President, Research & International Clarence Woudsma Interim Co-Associate Vice-President, Graduate Studies and Postdoctoral Affairs
Date of Meeting:	April 7, 2025
Agenda Item:	**7.3 Senate Graduate and Research Council: Faculty of Environment**

Recommendation/Motion

Motion: That Senate approve the major modifications to the Master of Climate Change (MCC), as presented.

Summary

Senate Graduate and Research Council met on March 17, 2025 and agreed to forward the following items to Senate for approval as part of the regular agenda.

a. Master of Climate Change (MCC)

Proposal/Rationale

Based on input from students, faculty, and program administrative staff the recently completed cyclical review made a recommendation (number 5) to revise the Master's Research Paper (MRP) study option to address noted administrative challenges (i.e., Reviewers noted the concentrated service and supervisor load on limited faculty members, difficulties finding suitable supervisors when faculty get no teaching/supervision credit for MRPs and in the Spring term when many are away for research, conferences and annual leave) and pedagogical value (i.e., Reviewers suggested to integrate the MRP milestone into a course to increase instructional support). The program undertook a review of options to address this recommendation and after consultation with the MCC program instructors and the Department, removing the MRP study option and replacing it with an alternative coursework study option that includes an additional course was deemed the best option to improve the learning experience of students in terms of professional skills development and the program's learning outcomes.

Pedagogically the MRPs are limited value because many students enter this study option at the last possible moment (when the search for an internship is not successful) which reduces their time to develop a topic and find a suitable supervisor. The limited time for the MRP means research ethics is not possible, which restricts topic scope/methods available during an MRP. The written format of the MRP is standardized and is not a format that students found valuable for career development. Some students noted that other written products would be more valuable from a career skills perspective (i.e., the flexibility of outputs in the 'Climate Change Projects' course was noted by some as more career oriented).

As part of this program change, the program is also enhancing the research experience opportunities for students in the new coursework study option by partnering with other professional Masters programs in the Faculty of Environment (MEDI, MDP, SUSM and Planning) to offer an expanded and interdisciplinary 'Applied Research Projects' course in the Spring term when the MRP was offered. This will replace the current 'Climate Change Projects' course which had been offered in the Winter term to MCC and undergraduate students. The new course will provide students with program aligned applied projects (i.e., climate change related projects for MCC students), greater team project opportunities (i.e., expected class of 25-30), expanded potential clients (i.e., instructors from each program will bring project concepts from a range of organizations and canvas the broader Faculty for additional external client-based or faculty research projects), and expanded professional development training (i.e., in areas such as project management, media engagement, and a range of common professional writing such as briefing notes, policy briefs). The new course will also directly address the cyclical reviewer's suggestion to provide non-internship study option MCC students with a class that supports professional research experience

Jurisdictional Information

This item is being submitted to Senate in accordance with Senate Bylaw 2, section 4.03: "Consider, study and review all proposals for new graduate programs, the deletion of graduate programs, major changes to existing graduate programs, arrange for internal appraisals as the council shall see fit, and make recommendations to Senate thereon."

Governance Path

Senate Graduate and Research Council: 03/17/2025

Senate: 04/07/2025

Documentation Provided

Attached Report: Master of Climate Change (MCC)

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): Daniel Scott, Wesley Van Wychen, Teresa Wilson

Form completed by:

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

1) *Removing the Master's Research Paper study option.*
2) *Adding a new Coursework study option that does not require a Graduate Studies Internship.*
   Note: the new Coursework study option will appear as a separate program page in the Calendar.

Is this a major modification to the program? Yes

Rationale for change(s):

Based on input from students, faculty, and program administrative staff the recently completed cyclical review made a recommendation (number 5) to revise the Master's Research Paper (MRP) study option to address noted administrative challenges (i.e., Reviewers noted the concentrated service and supervisor load on limited faculty members, difficulties finding suitable supervisors when faculty get no teaching/supervision credit for MPRs and in the Spring term when many are away for research, conferences and annual leave) and pedagogical value (i.e., Reviewers suggested to integrate the MRP milestone into a course to increase instructional support). The program undertook a review of options to address this recommendation and after consultation with the MCC program instructors and the Department, removing the MRP study option and replacing it with an alternative coursework study option that includes an additional course was deemed the best option to improve the learning experience of students in terms of professional skills development and the program's learning outcomes.

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Proposed effective date: Term: Spring Year: 2025

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

https://uwaterloo.ca/academic-calendar/graduate-studies/catalog#/programs/S176gkR0s3

Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
Master of Climate Change (MCC) **Admit term(s)** • Fall **Delivery mode** • On-campus **Registration option(s)** • Full-time • Part-time **Study option(s)** • Coursework • ~~Master's Research Paper~~ **Length of program** • Full-time: 3 terms (12 months) • Part-time: 8 terms (32 months) **Admission requirements: Minimum requirements** • Students must have completed a four-year honours Bachelor degree (or equivalent) in a humanities, social science, health, engineering, science, or business discipline with an overall average of at least 75% in the final 20 courses (or last 2 years). • English language proficiency (ELP) (if applicable) **Admission requirements: Application materials** • Résumé • Supplementary information form • Transcript(s) **Admission requirements: References** • Number of references: 3 • Type of references: normally from academic sources, but may be from professional	**Master of Climate Change (MCC)** **Admit term(s)** • Fall **Delivery mode** • On-campus **Registration option(s)** • Full-time • Part-time **Study option(s)** • Coursework **Length of program** • Full-time: 3 terms (12 months) • Part-time: 8 terms (32 months) **Admission requirements: Minimum requirements** • Students must have completed a four-year honours Bachelor degree (or equivalent) in a humanities, social science, health, engineering, science, or business discipline with an overall average of at least 75% in the final 20 courses (or last 2 years). • English language proficiency (ELP) (if applicable) **Admission requirements: Application materials** • Résumé • Supplementary information form • Transcript(s) **Admission requirements: References** • Number of references: 3 • Type of references: normally from academic sources, but may be from professional

Current Graduate Studies Academic Calendar content:	Proposed Graduate Studies Academic Calendar content:
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Current Graduate Studies Academic Calendar content:	**Proposed Graduate Studies Academic Calendar content**:
~~▪ GEMCC 653/FCIT 606 Sustainability Transitions in Cities~~ ~~▪ GEMCC 660 Carbon Accounting and Management~~ ~~▪ GEMCC 690 Climate Change Projects~~ ~~• 2 open electives chosen from the climate change designated electives list, partnering programs within the Faculty of Environment (that are willing to allow the student to enroll in a course), and graduate programs offered by other Faculties (that are willing to allow the student to enroll in a course).~~ ~~• Failure to maintain a course average of at least 75% will result in an automatic review of the student's status in the program. The review committee will consist of the Program Director and the Graduate Officer. The review committee may require that the student withdraw from the program.~~	▪ GEMCC 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 (subject to meeting pre-requisites and available capacity), and graduate programs offered by other Faculties (subject to meeting pre-requisites and available capacity). • 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.
~~Master's Research Paper option: Milestone requirements~~ **~~Master's Research Paper~~** • ~~The Master's Research Paper will normally be completed in the Spring (third) term. Each student undertaking the research paper option will identify a topic and a suitable advisor in the first two terms in the program. The student will develop a research proposal for approval by their advisor. The research paper should be approximately 12,000 words/50 pages in length. The research paper is evaluated by the advisor and one reader designated by the Program Director.~~ **Coursework option: Course requirements** • Students must successfully complete the following graduate level courses (0.50 unit weight per course): • 3 required courses: o GEMCC 601 Climate Change: Physical Science Basis o GEMCC 602 Climate Change Vulnerability and Adaptation o GEMCC 603 Climate Change Mitigation • 2 climate change electives: o Students are able to tailor their program of study based on their individual interests by completing 2 climate change designated electives which can	**Coursework <u>with internship</u> option: Milestone requirements** **Graduate Studies Internship** • All internship students are required to spend the equivalent of one academic term as an intern working on climate change in the public or private sector, at a research institute, or for a non-governmental organization. It is the student's primary responsibility to identify potential organizations with which to undertake their internship, although some employers recruit for positions through the program. The work-term will normally take place in the third term of the program. The internship must be approved as being a suitable practical learning experience having sufficient climate change focus to be eligible. Students will be required to submit a short proposal outlining how the work of the organization and the internship position relates to the climate change program curriculum, the student's professional interests, and the professional experience sought through the internship. A final written report arising out of the internship experience will be required and will be evaluated. **<u>Coursework option: Course requirements</u>** • <u>Students must successfully complete the following graduate level courses:</u> • <u>3 required courses (0.50 unit weight per course):</u>

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

Full time students will not be impacted by these changes. Full time students typically complete the program in 12 months, so that those who entered in September 2024 will have completed the program under the existing study options before the revised program options are available in September 2025.

The very few part time students in the program will be given the option to complete the program with the options available when they entered (i.e., the coursework with Internship or MRP option) or opt for the new option available (i.e., the coursework study option with 8 courses instead of the MRP option).

Department/School approval date (mm/dd/yy): 10/25/24
Reviewed by GSPA (for GSPA use only) ☒ date (mm/dd/yy): 10/15/24
Faculty approval date (mm/dd/yy): 01/16/25
Senate Graduate & Research Council (SGRC) approval date (mm/dd/yy):
Senate approval date (mm/dd/yy) (if applicable):

UNIVERSITY OF WATERLOO | Senate

For Recommendation **Open Session**

To:	Senate
From:	Environment Faculty Council
Presenter(s):	Bruce Frayne Dean, Faculty of Environment
Date of Meeting:	April 7, 2025
Agenda Item:	**8.1 Faculty Organizational Change – Department of Knowledge Integration**

Recommendation/Motion
To recommend that the University of Waterloo Board of Governors approve the removal of the Department of Knowledge Integration ("KI") from the organizational structure of the Faculty of Environment ("Environment"), effective July 1, 2025 (the "Effective Date").

Summary
For the reasons outlined below, Environment has decided to move the KI programs into the School of Environment Resources and Sustainability ("SERS") and remove the KI Department from its organizational structure.

Proposal/Rationale
Environment currently has five academic units, ranging in size from three faculty members to over 30. Some of Environment's larger academic units house multiple undergraduate and graduate degree programs.

SERS and KI each have one undergraduate degree program, have the fewest students, and KI only has three faculty members. Dissolving KI as an organizational unit and moving the faculty, students and degree program into SERS provides administrative and teaching support for KI, opportunities for academic collaboration, and, based on post-Effective Date numbers is administratively feasible. Post-Effective Date, SERS would have over 300 active students compared to other departments and schools in Environment which have 400-800 active students (as of Fall 2024).

SERS and KI have consulted widely with students, staff and faculty members since the middle of 2024.

Jurisdictional Information
Per Section 22(a) of the *University of Waterloo Act*, 1972, Senate is empowered

> *(a)* to make recommendations to the Board of Governors relative to the creation, establishment, maintenance, modification, or removal of organizational structures such as faculties, schools, institutes, departments or chairs within the University;

Governance Path

i. Environment Faculty Council - January 16, 2025

ii. Senate – April 7, 2025

UNIVERSITY OF WATERLOO | Senate

For Approval **Open Session**

To:	Senate
From:	Environment Faculty Council
Presenter(s):	Bruce Frayne Dean, Faculty of Environment
Date of Meeting:	April 7, 2025
Agenda Item:	**8.2 Amendments to the Faculty of Environment Constitution**

Recommendation/Motion
That Senate approve amendments to the Constitution of the Faculty of Environment as described in this report, with said amendments to take effect when approved by Senate except the change in Section 1.2 which will take effect on the later of July 1, 2025 and the date the related organizational change is approved by the University of Waterloo Board of Governors.

Summary
Following a review, Environment is proposing amendments to its Constitution to reflect the removal of the Department of Knowledge Integration, the addition of a research council, the extension of the chair's term, certain committee membership and process changes, as well as housekeeping changes to titles and roles, all as detailed below.

Proposal/Rationale
A summary of changes and rationale for each are below:

- The Department of Knowledge Integration has been removed from the list of "Sub-Units" to reflect the separate recommendation to Senate.
- The term of chair of Faculty Council is extended to two years, renewable for one term, from the one year, renewable once. The complexity of discussions and attendance have increased since moving to virtual meetings. Chairing effectively in this new context comes with a learning curve, so extending the chair's term is beneficial to good governance.
- Existing standing committee memberships have been changed to include new and relevant roles. E.g., the Manager, Environment Indigenous Initiatives has been added to all standing committees; the Director of Strategic Initiatives and Communications has been added to Administrative Committee and Undergraduate Studies Committee ("UGSC"); Associate Dean, Teaching has been added to UGSC and Graduate Studies Committee ("GSC"); all relevant associate chairs/directors have been added to UGSC and GSC; and the Associate Dean, Work-Integrated Learning ("WIL") has been added to UGSC.
- Voting on UGSC and GSC has been updated to reflect mandates and good practice. E.g. at UGSC, all associate chairs/directors are voting members (including the Director of Aviation Programs, a role previously identified as associate chair), and the voting role has changed from our Faculty Relations Manager ("FRM"), co-op to our Associate Dean, WIL (the co-op FRM remains a member). Finally, the Undergraduate Operations Manager has been made voting, and the phrase "who may vote only on

non-academic matters" has been changed to "non-voting" as the remit of the committee does not include any non-academic matters. Similar changes have been made to the GSC.
- A new Research Council, under the leadership of the Associate Dean, Research, has been created as a standing committee.
- The Constitution has been revised to reflect changes to job titles.

Jurisdictional Information
Per Senate Bylaw 1, Article 15.01, where a Faculty has adopted a formal constitution, that constitution and any amendments thereto are inoperative and ineffective until approved by Senate.

Governance Path

i. Environment Faculty Council – January 16, 2025

As required by Section VI of the Constitution, notice of this motion along with the revised draft and a summary of the changes were circulated to members by email 30 days in advance of the meeting held on January 16, 2025. The motion required a special majority (2/3) to pass and received more than the required number of votes.

ii. Senate, April 7, 2025

Documentation Provided

- Attachment: Amended version of the Constitution (redline)

CONSTITUTION OF THE

FACULTY OF ENVIRONMENT

AT THE

UNIVERSITY OF WATERLOO

The Faculty of Environment at the University of Waterloo (the "University") is constituted to (i) foster a collaborative community of engaged students, staff, faculty and alumni who are empowered and supported to contribute to impactful research that transcends disciplinary boundaries in addressing complex environmental and societal issues, (ii) build the University's reputation as a national and global leader by offering a brand of unique and highly regarded educational programs related to environment and sustainability.

I

FACULTY AND FACULTY COUNCIL

I.1 There shall be a unit of the University called the Faculty of Environment (the "Faculty").

I.2 The following departments and schools (called "Sub-Units" in the balance of this Constitution) shall form the Faculty: Department of Geography and Environmental Management; ~~Department of Knowledge Integration;~~ School of Environment, Enterprise and Development; School of Environment, Resources and Sustainability; School of Planning; and any such department or school as may be approved by the University and accepted by Faculty Council.

I.3 The plenary organ of the Faculty shall be the Faculty of Environment Faculty Council ("Faculty Council").

I.3.i Faculty Council shall consist of the following, all as voting members:

a) <u>Ex-officio from the University</u>

The President of the University

The Vice-President, Academic & Provost The Associate Vice-President, Academic

The Associate Vice-President, Graduate Studies and Postdoctoral Affairs

The University Registrar or delegate

The University Librarian or delegate

The Faculty Relations Manager (Environment) in the Department of Co-operative Education or delegate

b) <u>From other Faculties</u>

One representative from each of the other Faculties in the University

c) From the Faculty

Executive Officer

Director of Advancement of the Faculty

Director of ~~Computing~~ Educational Technology and Instructional Support of the Faculty

Director of Strategic Initiatives and Communications of the Faculty

Manager, Environment Indigenous Initiatives

two staff members elected from among all staff employed in the Faculty or any Sub-Unit

President of the Faculty of Environment Student Society

President of the Faculty of Environment Graduate Student Association or Association of Graduate Planners, for a one year term and alternating from year to year

d) From each Sub-Unit

All Professors, Associate Professors, Assistant Professors ~~and Lecturers~~ holding a regular, full- time faculty appointment in the Faculty

One full-time graduate student from each Sub-Unit, chosen by their peers for a term of one year

One full-time undergraduate student from each Sub-Unit, chosen by their peers for a term of one year

I.3.ii Faculty Council may invite representatives of other units and sub-units of the University to attend and participate in meetings of Faculty Council on such terms as Faculty Council may determine.

I.4 Except as may otherwise be determined by Faculty Council, meetings of Faculty Council shall be open. However, only members of Faculty Council shall have the privilege of the floor or shall vote. Observers may be given the privilege of the floor at the discretion of the chair of the meeting. Faculty Council may, with reasonable advance notice, close a meeting to any or all categories of spectators. Student members of Faculty Council shall not participate in meetings or parts of meetings in which individual student cases are discussed.

I.5 Faculty Council shall meet at least four times annually, normally in September, November, January and March. Additional meetings may be held either at the call of the Administrative Committee, established pursuant to Clause III.1 below, or within 15 working days of receipt by either the Chair or the Secretary of Faculty Council of the written request of one of the following:

- the Dean
- the Chair of Faculty Council
- a petition of 20% or more of any of

- faculty members with regular full-time appointments in the Faculty, or
- full-time staff in the Faculty, or
- full-time graduate students in the Faculty, or
- full-time undergraduate students in the Faculty.

I.6 A quorum at all meetings shall consist of 20% of Faculty Council members. For the purposes of identifying the members of Faculty Council so as to calculate quorum, ex officio members of Faculty Council representing the University as listed in paragraph I.3.i a) above, and representatives from other faculties as listed in paragraph 1.3.i b) above, shall not be counted. Proxy votes shall not be permitted.

I.7 Meetings of Faculty Council shall be conducted in accordance with Roberts Rules of Order and Procedure (to the extent that those Rules are not inconsistent with this Constitution) and such bylaws as may be adopted by Faculty Council. Except as otherwise provided for in this Constitution, notices of meetings with agenda and all relevant documentation shall be circulated to members of Faculty Council at least 5 working days in advance of its meetings.

I.8.i Faculty Council shall have the following powers and duties:

a) Subject to the approval of the Senate of the University (the “Senate”), to determine the course of study in the Faculty and the conditions of admission into, and continuation within, these courses of study;

b) To appoint such standing and ad hoc committees of Faculty Council as it shall determine, and to delegate to such committees the powers and responsibilities that Faculty Council itself possesses; and

c) To consider and report to Senate upon such matters affecting the Faculty as Faculty Council may deem appropriate.

II

OFFICERS

II.1 <u>The Dean</u>

II.1.1 The senior executive officer of the Faculty shall have the title "Dean of Environment” (the “Dean”).

II.1.ii The Dean is an officer of the University and is appointed in accordance with University Policy 45, The Dean of a Faculty, as it may be amended from time to time, or any document in substitution therefor.

II.1.iii In reporting to the Vice-President, Academic & Provost, the Dean leads the Faculty with respect to curriculum development, teaching, learning, research, and fostering its best

interests. The Dean represents the Faculty and acts on its behalf in any administrative and ceremonial matters pertaining to the Faculty as a whole. The Dean manages the Faculty, including matters relating to resourcing, resource allocation and Faculty development with advice from the Faculty Council and other relevant committees and performs such other duties or functions as required for the academic program of the Faculty.

II.1.iv On the recommendation of the Administrative Committee established pursuant to Clause III.1 below, the Dean has the authority to submit names to the Senate Honorary Degrees Committee for the awarding of honorary degrees and for distinguished professor emeritus appointments.

II.2 The Chair of Faculty Council

II.2.i The Chair shall be appointed, in rotation, by Faculty Council from among each of the Sub-Units for a ~~one~~ two year term. Only members of Faculty Council holding a regular, full-time faculty appointment in the Faculty shall be eligible to be appointed as Chair. The Chair/Director of the relevant Sub-Unit shall be responsible for submitting a name for consideration by Faculty Council to the last meeting of the Faculty Council in the year before the term is to commence. If, however, the incumbent Faculty Council Chair is willing, and Faculty Council is in favour, a second term may be served.

II.2.ii The duties of the Chair shall consist of:

a) Calling and chairing meetings of Faculty Council in accordance with Clause I.5 above; and

b) Such other duties as may be assigned to the Chair by this Constitution or through bylaws or resolutions of Faculty Council.

II.3 The Secretary of Faculty Council

II.3.i The Faculty Services Manager & Executive Assistant shall serve as secretary of Faculty Council.

II.3.ii The duties of the secretary shall consist of:

a) Giving notice of and recording the proceedings of Faculty Council meetings and keeping the attendance roll;

b) Giving notice of and recording proceedings of meetings of the Administrative Committee established pursuant to Clause III.1 below; and

c) Such other duties as may be assigned to the secretary by this Constitution or through bylaws or resolutions of Faculty Council.

III

STANDING COMMITTEES

III.0 Quorum

Unless otherwise established by resolution of Faculty Council, the quorum for the proper conduct of business at a meeting of any of the standing committees established by Faculty Council, including the standing committees referred to in this Constitution, shall be a majority of the voting members of such committee, present either in person ~~, by telephone or by teleconference~~or virtually.

III.1 Administrative Committee (the "AC")

III.1.i The AC shall:

a) Plan the forthcoming business of Faculty Council and arrange the agenda of its meetings;

b) Act on behalf of Faculty Council between meetings of Faculty Council;

c) Receive reports from standing and ad hoc committees of Faculty Council;

d) Assign matters to appropriate committees of Faculty Council and manage matters that do not otherwise fall within the mandates of committees of Faculty Council;

e) Report all decisions taken by the AC under paragraph III.1.i.b) above to Faculty Council at the next meeting of Faculty Council.

III.1.i. The AC may consider any questions related to the guidelines, administration, or general well- being of the Faculty. Recommendations arising as a result of any such considerations shall be sent by the AC to Faculty Council for consideration.

III.1.ii The AC shall consist of the following members, all of whom shall be voting members unless otherwise noted:

a) Dean, who shall be Chair;

b) Associate Deans;

c) Chair or Director of each Sub-Unit;

d) Chair of the Faculty Council;

e) Secretary of Faculty Council (non-voting);

f) President of the Faculty of Environment Students Society;

g) President of the Faculty of Environment Graduate Student Association or Association of Graduate Planners, for a one year term and alternating from year to year;

h) Executive Officer of the Faculty;

i) the two elected staff members referred to in paragraph I.1.i c) above;

j) Director of Advancement of the Faculty; ~~and~~

k) Director of ~~Computing~~ Educational Technology and Instructional Support of the Faculty~~.~~;

l) Director of Strategic Initiatives and Communication of the Faculty; and

m) Manager, Environment Indigenous Initiatives.

III.1.iii The secretary of Faculty Council shall act as secretary of the AC. Meetings of the AC shall be closed to everyone other than members of AC and those invited to attend at the request of the AC. A simple majority of the voting members shall constitute quorum.

III.1.iv Meetings of the AC will normally take place in advance of each meeting of Faculty Council for the purpose of setting the agenda for meetings of Faculty Council. Other meetings of AC will be held as required to allow it to execute its responsibilities.

III.2 Undergraduate Studies Committee (the "UGSC")

III.2.i Subject always as required to the approval of Senate, Senate committees, Senate councils and other bodies and offices with mandated responsibility for development and operation of undergraduate studies at the University, the UGSC shall:

a) Provide general academic oversight on proposals concerning curricula, courses, academic policies, academic standards, ~~continuation conditions~~academic progression, and general undergraduate affairs, and make recommendations on those matters to Faculty Council;

b) Define and oversee the functioning of the core curriculum in the Faculty, and make recommendations in that respect to Faculty Council;

c) Establish and oversee policies relating to admission of undergraduates to the Faculty, including policies governing advanced standing;

d) Oversee and coordinate the preparation of calendar and other informational material relating to undergraduate programs and plans in the Faculty;

e) Implement existing policies concerning examination results, standings, promotions, withdrawals, and related matters; and

f) Consult representatives of groups that do not have permanent representation on the UGSC whenever those groups may be affected by proposals to be considered by the UGSC, and, in the discretion of the UGSC, invite representatives of such groups to attend UGSC meetings at which such proposals are to be discussed.

III.2.ii The UGSC shall consist of the following as members, all of whom shall be voting members of the UGSC unless otherwise noted:

a) the Associate Dean, Undergraduate Studies;

b) the ~~Assistant~~ University Registrar, ~~Environment~~ or delegate;

c) ~~one faculty member~~all associate chairs/directors, undergraduate studies from all sub-units ~~representing each Sub-Unit~~;

d) the Aviation Programs Manager;

e) the Undergraduate Operations Manager;

f) the Associate Dean, Work-Integrated Learning;

g) the Associate Dean, Teaching;

h) the Manager, Environment Indigenous Initiatives;

~~d~~i) the President of the Environment Students Society;

~~e~~j) one student representative of each Sub-Unit (non-voting);

~~f~~k) all~~one~~ undergraduate advisors ~~representing each~~from all Sub-Units, ~~who may vote only on non-academic matters~~(non-voting);

~~g~~l) one representative of the Department of Co-operative Education (non-voting); and

~~h~~m) the Faculty Exchange and Undergraduate Co-ordinator, ~~who may vote only on non-academic matters~~(non-voting).

III.2.iii The chair of the UGSC shall be the Associate Dean, Undergraduate Studies and the secretary of the UGSC shall be the Assistant to the Associate Dean, Undergraduate Studies. Meetings of the UGSC shall be closed to everyone other than members of the UGSC and those invited to attend at the request of the UGSC. Meetings of the UGSC shall be held at the call of the Chair.

III.2.iv Except as otherwise provided in this Article III.2, the recommendations of the UGSC shall be referred to Faculty Council for consideration.

III.2.v The Faculty Council may, by resolution, delegate to the UGSC the responsibility for decision on any specific question or issue relating to undergraduate studies, including matters of academic discipline and grade or standing appeals.

III.3 Graduate Studies Committee (the "GSC")

III.3.i Subject always as required to the approval of Senate, Senate committee, Senate councils and other bodies and offices with mandated responsibility for development and operation of graduate studies at the University, the GSC shall:

a) Be responsible for the development and operation of graduate studies in the Faculty, and make recommendations on those matters where required to Faculty Council;

b) Consider all proposed new graduate courses and programs and all proposed changes in existing graduate courses and programs, and to make recommendations to Faculty Council in those respects;

c) Ensure the requirements for minimum qualifications as approved doctoral dissertation supervisors within the Faculty are met;

d) Approve the committees for doctoral thesis examinations;

e) Oversee the preparation of calendar and other informational material related to the graduate programs of the Faculty, and to coordinate such material prepared by Sub-Units;

f) Make recommendations to the appropriate bodies on the financial requirements for graduate student support; and

g) Have responsibility for the admissions policies and procedures for graduate students, subject to approval by Faculty Council.

III.3.ii The GSC shall consist of the following as members, all of whom shall be voting members of the GSC unless otherwise noted:

a) the Associate Dean, Graduate Studies;

b) ~~one faculty member representing~~all associate chairs/directors, graduate ~~each~~from all Sub-Units with graduate programs;

c) the Associate Dean, Teaching;

d) the Manager, Environment Indigenous Initiatives;

~~c~~e) all graduate program assistants representing graduate programs in the Faculty, ~~who may vote only on non-academic matters~~(non-voting);

~~d~~f) one graduate student representative from each Sub-Unit, ~~each of whom shall be~~ (non-voting);

~~e~~g) one graduate student representing each of the Faculty of Environment Graduate Student Association and the Association of Graduate Planners, ~~each of whom shall be~~ (non-voting); and

h~~f~~)the ~~Assistant to the Associate Dean~~Faculty's Administrator, Graduate Studies, ~~who may vote whenever non-academic matters are involved~~(non-voting).

III.3.iii The chair of the GSC shall be the Associate Dean, Graduate Studies, and the secretary of the GSC shall be the ~~Assistant to the Associate Dean~~Faculty's Administrator, Graduate Studies. Meetings of the GSC shall be closed to everyone other than members of the GSC and those invited to attend at the request of the GSC. Meetings of the GSC shall be held at the call of the Chair.

III.3.iv Except as may otherwise be provided in this Article III.3, the recommendations of the GSC shall be referred to Faculty Council for consideration.

III.3.v The Faculty Council may, by resolution, delegate to the GSC the responsibility for decisions on any specific question or issue relating to graduate studies.

III.4 Faculty Tenure, ~~and~~ Promotion and Permanence Committee (the "FTPPC")

III.4.i The FTPPC shall serve as the faculty tenure and promotion committee as outlined in University Policy #77, Tenure and Promotion of Faculty Members ("Policy 77").

III.4.ii Membership on the FTPPC shall be as provided for faculty tenure and promotion committees in Policy 77.

III.5 Faculty Committee on Student Appeals (the "FCSA")

III.5.i The FCSA shall:

a) Exercise the jurisdiction vested in faculty committees on student appeals by section 3 of University Policy 72, Student Appeals ("Policy 72"); and

b) Advise Faculty Council on matters referred to in paragraph III.5.i.a) as appropriate.

III.5.ii The FCSA shall consist of the following as members:

a) the Chair;

b) the Secretary;

c) one faculty member to be selected by the Dean from a Sub-Unit on a case-by-case basis; and

d) one full-time graduate or undergraduate student in the Faculty, selected by the FCSA Chair from recommendations made by the President of the Faculty of Environment Graduate Student Association or by the President of the Faculty of Environment Student Society, and determined on a case-by-case basis.

III.5.iii The chair of the FCSA shall be appointed by the Dean (for a term of at least two years) from among regular full-time faculty members in the Faculty. Meetings of the FCSA shall be closed to everyone other than members of the FCSA and those invited to attend at the request of the FCSA.

III.5.iv The Faculty Services Manager & Executive Assistant shall serve as secretary of FCSA

III.5.v If any provision of this Clause III.5 is inconsistent with or contradictory to the provisions of Policy 72, then the provisions of Policy 72 shall prevail.

III.6 Environment Research Council

III.6.i Subject always and as required to the approval of Senate, and other bodies and offices with mandated responsibility for development and operation of research at the University, the Research Council shall:

a) advise the Associate Dean, Research, on policy directions and strategic challenges and opportunities;

b) undertake initiatives that help to build the Faculty of Environment's research strengths, and enhance its research successes and impacts; and

c) provide a forum where research-related concerns of key stakeholders in the Faculty can be raised and addressed.

III.6.ii The Research Council shall consist of the following members:

a) the Associate Dean, Research;

b) one faculty member with significant research experience representing each sub-unit, appointed by their chair/director for a period of three years;

c) two at large faculty members with research weightings in their appointments, selected by the Associate Dean, Research, from among those who have expressed interest, for

two-year appointments;

d) one graduate student member from a research-focused graduate program, nominated by the Environment Graduate Students Association and appointed for a period of one year;

e) one full-time research staff member or post-doctoral researcher appointed for a period of one year by the Associate Dean, Research, based on expressions of interest;

f) the Manager, Environment Indigenous Initiatives;

g) the Faculty's Director, Strategic Initiatives & Communications;

h) the Faculty's Director, Advancement; and

i) The Faculty's Executive Officer.

III.6.iii The chair of the Research Council shall be the Associate Dean, Research. The secretary of the Research Council shall be the Research and Administrative Coordinator. Meetings of the Research Council shall be closed to everyone other than members of the Council and those invited to attend at the request of the Research Council. Meetings of the Research Council shall be held monthly, and as needed at the discretion of the Chair.

IV

AD HOC COMMITTEES

IV.1.i Faculty Council shall be entitled to establish such other standing or ad hoc committees as it sees fit, to determine the composition and terms of reference of such committees, and to appoint the initial members of such committees, provided that:

a) no such committee shall remain a committee of Faculty Council for more than two years from the date of the meeting of Faculty Council at which it was established unless its composition and terms of reference are incorporated in this Constitution.

IV.2 Quorum

Unless otherwise established by resolution of Faculty Council, the quorum for the proper conduct of business at a meeting of any ad hoc committee established by Faculty Council pursuant to this Constitution shall be a majority of the members of such committee, present either in person, by telephone or by teleconference.

V

VACANCIES

V.1 Vacancies on Committees of Faculty Council

V.1.i Should the office of chair or secretary (as the case may be) of Faculty Council become vacant for any reason whatsoever, then the remaining members of the AC shall appoint a faculty member of Faculty Council to serve in that office until a replacement is identified in accordance with the provisions of sub-Clause V.1.i. Normally, any replacement chair shall be selected from the Sub-Unit from which the former chair was selected, and shall serve as chair for the balance of the term of the former chair.

V.1.ii Any elected member of a committee of Faculty Council shall be deemed to have vacated the position should the incumbent be absent from the University for longer than six consecutive months.

V.1.iii Should a vacancy occur for any reason whatsoever in any elected position on a committee of Faculty Council, then the remaining members of that committee shall appoint another member to serve in that position until a replacement is identified in accordance with the provisions of this Constitution by which the relevant committee is established.

VI

BYLAWS AND CONSTITUTIONAL AMENDMENTS

VI.1 Bylaws of Faculty Council shall be adopted by a simple majority of the votes cast at a duly constituted meeting of Faculty Council at which a quorum is present. Notice of proposed amendment, repeal or adoption of bylaws must be given in writing not less than 30 days prior to the meeting at which those proposals are intended to be considered.

VI.2 Subject to approval of Senate, this Constitution may be adopted or amended by a vote of 2/3 of the votes cast at a regularly scheduled meeting of Faculty Council at which a quorum is present. Notice of proposed constitutional amendments must be given in writing not less than 30 days prior to the meeting at which those proposals are intended to be considered.

Approved at a meeting of Faculty Council held January 16, 2025~~September 28, 2017~~~~xxxxx~~.
Approved at a meeting of Senate held ~~January 15, 2018~~xxxx.

UNIVERSITY OF WATERLOO

2024-2025 Senate Work Plan

Secretariat

Senate Agenda Items · expected *as needed	May 6, 2024	June 10, 2024	September 23, 2024	October 21, 2024	November 25, 2024	January 27, 2025	March 3, 2025	April 7, 2025
REGULAR AGENDA (including items for information and discussion)								
Minutes	·	·	·	·	·	·	·	·
Business Arising	·	·	·	·	·	·	·	·
LEADERSHIP UPDATES[6]								
Report of the Vice-President, Academic & Provost	*	*	*	*	*	*	*	*
Report of the Vice-President, Research and International	*	*	*	*	*	*	*	*
COMMITTEE/COUNCIL REPORTS								
Executive Committee	*	*	*	*	*	*	*	*
Graduate & Research Council (GRC)	·	·	·	·	·	·	·	·
Undergraduate Council (UC)	·	·	·	·	·	·	·	·
Long Range Planning Committee				·		·		·
Fall Update, University Operating Budget				·				
Joint Report of GRC & UC, Academic Calendar Dates[1]					·			
University Committee on Student Appeals Annual Report[1] (Policy 72)					·			
University Appointment Review Committee Annual Report[1] (Policy 76)								·
Finance Committee - Budget Update[3]							·	
Finance Committee - Budget recommendation[2, 3]								·
OTHER SENATE AGENDA ITEMS								
New Senator Orientations (before meeting)	·							
Teaching Awards Committee, appointment of members							·	
Delegation of Roster of Graduands								·
Report of Roster of Graduands			·		·			
Convocation Report – summary of this years' ceremonies					·			
Undergraduate and Graduate Admissions Update						·		
Conduct Self-Assessment Survey[1]							·	
Appointment of COU Academic Colleague	Current appointment runs to April 30, 2025							
SENATE PRESENTATIONS								
Presentations from the Presidents of the Faculty Association, Waterloo Undergraduate Association and Graduate Student Association[1]							·	
Strategic Plan Accountability Update[1] (June)		·						
PART Annual Update		·						
Faculty/Unit Updates				SCI				

[1] Annual item
[2] Board of Governors approval
[3] Presented by the Vice-President Academic and Provost
[4] Presented by the President and Vice-Chancellor, and Chair of Senate
[5] Presented by the University Secretary
[6] Leadership updates may include such topics as: Talent, We Accelerate Report, Communities (EDI, Sustainability), Waterloo International, etc.

UNIVERSITY OF WATERLOO

Secretariat

Senate Agenda Items · expected *as needed	May 6, 2024	June 10, 2024	September 23, 2024	October 21, 2024	November 25, 2024	January 27, 2025	March 3, 2025	April 7, 2025
CONSENT AGENDA								
Reports from Faculties (e.g., appointments, administrative appointments, sabbaticals)[2]	·	·	·	·	·	·	·	·
Tenure and Promotion Report[4]			·					
University Professor Designation[3]								·
Call for Nominations for University Professor[3]			·					
Call for Nominations for Honorary Degree Recipients[4]								·
Report of the COU Academic Colleague[1]								·
Senate Committee Appointments[5]	*	*	·	*	*	*	*	*
CLOSED AGENDA								
Minutes	·	·	·	·	·	·	·	·
Business Arising	·	·	·	·	·	·	·	·
Reports from Committees and Councils	*	*	*	*	*	*	*	*
Honorary Degree Recommendations	*	*	*	*	·	·	*	*
Reports from Search and Review Committees for Policy-based Senior Leadership Appointments and Reappointments	*	*	*	*	*	*	*	*
Report of VP Advancement on Policy 7[1]		·						

Special Topics for 2024-2025 to be Scheduled:

- President's Anti-racism Task Force Update (PART)

For more information: secretariat@uwaterloo.ca
uwaterloo.ca/secretariat, NH 3060

[1] Annual item
[2] Board of Governors approval
[3] Presented by the Vice-President Academic and Provost
[4] Presented by the President and Vice-Chancellor, and Chair of Senate
[5] Presented by the University Secretary
[6] Leadership updates may include such topics as: Talent, We Accelerate Report, Communities (EDI, Sustainability), Waterloo International, etc.

UNIVERSITY OF WATERLOO | Senate

For Information **Open Session - Consent**

To:	Senate
From:	Senate Graduate and Research Council
Presenter(s):	Charmaine Dean Vice-President, Research & International Clarence Woudsma Interim Co-Associate Vice-President, Graduate Studies and Postdoctoral Affairs
Date of Meeting:	April 7, 2025
Agenda Item:	**9.2 Senate Graduate and Research Council**

Summary

Senate Graduate & Research Council met on March 17, 2025 and agreed to forward the following items to Senate for information as part of the consent agenda. On behalf of Senate, the following items were approved:

1. Human Research Ethics Board

   Council received for information a membership update to the Human Research Ethics Board (HREB).

2. Research Institutes

   Council approved the renewal of the Centre for Accounting Research and Education for a five-year term.

3. Curricular Submissions
   Council approved the following new graduate courses, the deletion of graduate courses, and proposed minor changes to existing graduate courses and programs for:
   a. Faculty of Engineering
   b. Faculty of Mathematics

4. Update to Rules for Major Modifications – Program Name Changes

   Council received for information revised the classification criteria for program name changes to ensure consistency with the Quality Council's guidelines.

Jurisdictional Information

As provided for in Senate Bylaw 2, section 4.03, council is empowered to make approvals on behalf of Senate for a variety of operational matters:

c. On behalf of Senate, consider and approve all new graduate courses, the deletion of graduate courses, and proposed minor changes to existing graduate courses and

programs, and provide Senate with a brief summary of council's deliberations in this regard. Any matter of controversy that might arise may be referred to Senate.

h. On behalf of Senate, consider and approve renewals for centres and institutes, and report such renewals to Senate for information. Any matter of controversy that might arise may be referred to Senate.

Governance Path

Senate Graduate and Research Council: 03/17/2025

UNIVERSITY OF WATERLOO | Senate

For Information **Open Session - Consent**

To:	Senate	
From:	Senate Academic Quality Enhancement Committee	
Presenter(s):	David DeVidi	
	Associate Vice-President, Academic	
Date of Meeting:	April 7, 2025	
Agenda Item:	**9.3**	**Report: Senate Academic Quality Enhancement Committee**

Summary

Senate Academic Quality Enhancement Committee conducted an e-vote concluding on February 24, 2025 and agreed to forward the following items to Senate for information as part of the consent agenda. On behalf of Senate, the following items were approved:

Academic Program Reviews and Reports

Following the review of the reports and responses from the programs, the Committee approved the following reports:

a. Final Assessment Report for Fine Arts Studio Practice (BA/Minor), Visual Culture (BA/Minor), Studio Art (MFA)
b. Final Assessment Report for Management Engineering (BASc), Management Sciences (Option, MASc, MMSc, MMSc – Management of Technology, PhD), Type 3 Graduate Diploma in Data Analytics (GDip)
c. Final Assessment Report for Political Science (BA, MA, Minors) and Public Service (MPS)
d. Final Assessment Report for Social Work (BSW, MSW)

There were no issues noted in the reports.

Jurisdictional Information

As outlined in the committee's Terms and Reference, Senate Academic Quality Enhancement Committee is empowered to make approvals on behalf of Senate for a variety of operational matters:

2. On behalf of Senate, consider and approve all Final Assessment Reports and Progress Reports within the University's IQAP, and provide Senate with a summary of the committee's deliberations in this regard. Any matter of controversy that might arise may be referred to Senate.

Governance Path

Senate Academic Quality Enhancement Committee approval date: 02/24/2025

UNIVERSITY OF WATERLOO | Senate

For Information **Open Session**

To:	Senate
From:	Vice-President, Academic & Provost
Presenter(s):	James Rush Vice-President, Academic & Provost
Date of Meeting:	April 7, 2025
Agenda Item:	**9.4 Report of the Provost, Faculty Appointments, Leaves**

Summary:

The Faculty Reports for Senators' information regarding the variety of appointments, reappointments, special appointments, leaves, and other matters of interest about individuals in the Faculties are available at the Senate agenda page[1].

1 https://uwaterloo.ca/secretariat/sites/default/files/uploads/documents/all-faculty-april-2025.pdf

UNIVERSITY OF WATERLOO | Senate

For Information **Open Session**

To:	Senate
Presenter(s):	Charmaine Dean Vice President, Research and International
Date of Meeting:	April 7, 2025
Agenda Item:	**9.5 Awards, Distinctions, Grants, Waterloo International Engagements**

Recommendation/Motion

This item is for information purposes.

Summary

This report summarizes successful commercialization, research and international outputs and outcomes for the period January 2025.

Proposal/Rationale

This report provides a summary of significant monthly outputs related to, commercialization and entrepreneurship; funded research; awards and distinctions and activities towards strategic internationalization. The designation of these outputs are primarily based from students attending University of Waterloo commercialization and entrepreneurship training and faculty members.

Jurisdictional Information

N/A

Governance Path

N/A

Documentation Provided

Attached - Vice-President, Research & International: Report to Senate, March 2025

Vice-President, Research & International
Report to Senate
March 2025

Introduction

This report to Senate highlights successful commercialization, research and international outputs and outcomes for the period January 2025.

Awards and Distinctions

King Charles Medal Recipients
The Coronation Medal commemorates the Coronation of His Majesty King Charles III as King of Canada. The medal is administered by the Chancellery of Honours at Rideau Hall. This prestigious honour is granted to individuals who have made a lasting impact in their fields, whether through research, innovation, advocacy, or leadership. The work of these recipients embodies Waterloo's spirit of excellence and commitment to addressing global challenges. The following five individuals received this honour during this period:

Blair Feltmate (School of Environment, Enterprise and Development and Intact Centre for Climate Adaptation)
As co-founder and head of the Intact Centre on Climate Adaptation, Feltmate has dedicated his career to developing solutions that mitigate the risks of extreme weather.

Geoffrey Fong (Psychology, School of Public Health Sciences and International Tobacco Control Policy Evaluation Project)
A world-renowned public health researcher, Fong founded the International Tobacco Control Policy Evaluation (ITC) Project, leading efforts in 31 countries to assess and strengthen tobacco control policies.

Vivek Goel (Schools of Pharmacy and Public Health Sciences, President and Vice-Chancellor, University of Waterloo)
A visionary leader in public health and post-secondary education, Goel has shaped the future of public health through three decades of leadership at world-renowned universities and public health agencies.

Rick Haldenby (School of Architecture)
A leader in architectural preservation, Haldenby received the award for his contributions to the advancement of architectural education in Canada, and for his efforts to preserve industrial and mid-century buildings.

Elder Myeengun Henry, LL.d (H.C) (Faculty of Health)
A respected Indigenous Knowledge Keeper, Elder Henry has been instrumental in advancing Indigenization and decolonization at the University of Waterloo.

Philippe Van Cappellen (Earth and Environmental Sciences)
An expert in eco-hydrology and freshwater sustainability, Van Cappellen is a Canada Excellence Research Chair Laureate whose work is shaping the future of water security.

See the full story here.

Order of Ontario
The Order of Ontario is the province's highest civilian honour. It is awarded to an Ontarian who has shown the highest level of excellence and achievement in their field, and whose impact has left a legacy in our province, in our country and around the world.

Vivek Goel (Schools of Pharmacy and Public Health Sciences, President and Vice-Chancellor, University of Waterloo)
Vested Member of the Order of Ontario, 2024
As a world-renowned public health researcher and expert in health-services evaluation, Goel champions the use of research evidence in health policymaking. He was a founding scientist of the Institute for Clinical Evaluative Sciences and founding President of Public Health Ontario. As an academic and administrator, he continues to advance public health services and research innovation. Goel has shaped the public health workforce, influencing education over many decades. He is also a fellow of the Canadian Academy of Health Sciences and the Fields Institute for Research in Mathematical Sciences.

Neil Craik (School of Environment, Enterprise and Development)
2024 Canadian Council on International Law's Scholarly Book Award
The Award recognizes the work of Canadian scholars of international law that make substantial contributions to international law literature.

Matthew Kennedy (Pure Mathematics)
2025 Ciprian Foias Prize in Operator Theory - American Mathematical Society (AMS).
Kennedy has been honoured with this award for his wide-ranging and innovative work on group C*-algebras. His paper "An intrinsic characterization of C*-simplicity," on which the award is based, is the culmination of earlier work in collaboration with Kalantar, Breuillard, and Ozawa. The methods introduced in this work, namely an operator-algebraic theory of boundaries, have found applications in the study of more general classes of C*-algebras and to dynamical systems.

Internal Faculty of Engineering Awards
Hosted by Dean Mary Wells, this event celebrated nineteen individuals with awards for their teaching, research and service excellence.

Tizazu Mekonnen (Chemical Engineering)
2024 Faculty Association of the University of Waterloo (FAUW) Equity & Inclusivity Award
Recognized for extraordinary contributions to advancing equity and inclusion in Canadian academia.

Reinhold Schuster (Civil and Environmental Engineering)
Alfred F. Wong Lifetime Achievement Award, Canadian Institute of Steel Construction (CISC)
This national honour award recognizes individuals whose transformative contributions have advanced the structural steel industry through design, fabrication, construction, or academia.

Alexander Wong (Systems Design Engineering)
Fellow, Royal Geographic Society
Wong is one of 16,000 members of the United Kingdom-based Royal Geographical Society, which is the largest and most active geological society in the world.

Commercialization and Entrepreneurship Highlights

Seun Adetunji (CEO and Founder, MBET '24)- MedInclude
MedInclude has developed a platform that simplifies complex medical language, translates materials into multiple languages and includes voice-to-text features to assist patients with limited English proficiency. For many patients, especially those with limited proficiency in English, receiving and retaining medical instructions can present a significant barrier to effective care.

Christy Lee (Co-foudner and BASc, 2024) – PatientCompanion
PatientCompanion modernizes the traditional call bell system by prioritizing the urgency of patients' requests and, in turn, supports nurses to deliver more responsive and personalized care. Recently, PatientCompanion has partnered with Grand River Hospital and Brightshores Health System to bring a more informed and efficient approach to patient care.

Funded Research Awards

Renewed Canada Research Chairs

Juan Moreno-Cruz (School of Environment, Enterprise and Development)
SSHRC Tier 2
Energy Transitions
Amount: $500,000

Environment and Climate Change Canada
Environment and Climate Change Canada is responsible for the following programs: *Preventing and Managing Pollution* and *Predicting Weather and Environmental Conditions*. The following projects received funding from these programs in January:

Mark Servos (Biology)
Title: Moving toward an integrated assessment of complex chemical mixtures in watersheds
Amount: $451,384

Juliane Mai (Earth and Environmental Sciences)
Title: Interactive multi-model hydrologic simulation and dissemination portal using physically-based and data-driven models across Canada
Amount: $215,000

Mitacs
Through matched funding programs, Mitacs connects researchers, government, and public and private sectors, to promote innovation, complex problem solving, economic growth and productivity across a diverse range of sectors including advanced manufacturing, AI, cleantech, cybersecurity, health and life sciences, IT, quantum, and beyond. The following project was successful in this period:

Hassan Baaj (Civil and Environmental Engineering)
Amir Khajepour (Mechanical & Mechatronics Engineering)
Maria Anna Polak (Civil and Environmental Engineering)
Title: 3-Dimensional Construction Printing: Process Optimization
Partner: Amida 3D
Amount: $217,333

Natural Resources Canada - Investments in Forest Industry Transformation Program
This program promotes the adoption of innovative technologies and products in Canada's forest sector by linking development with commercialization. It aims to build a more competitive, resilient, and sustainable industry, focusing on low-carbon projects that create new or diversified revenue opportunities. The following project was successful:

Daniel Lacroix (Civil and Environmental Engineering)
Title: Research, development, and commercialization of HMT panels for long floor span applications
Amount: $300,000

NSERC Alliance – Flash Call – Quantum Science and Technology Grant
Proposals under this Flash Call address challenges in quantum science, with a thrust to advance one or more of the National Quantum Strategy (NQS) missions by advancing research in areas of quantum technologies. In January, the following project received funding:

Graeme Smith (Applied Mathematics and Institute for Quantum Computing)
Title: Fundamental limits on quantum communications
Amount: $483,562

NSERC Alliance Idea to Innovation- Phase 1
Idea to Innovation (I2I) grants accelerate the pre-competitive development of promising technologies originating from the university and college sectors and promote its transfer to a new or established Canadian company. Phase I reduction-to-practice projects are designed to advance technologies to attract early-stage investment and/or to build valuable intellectual property in anticipation of transferring the technology to a new or established company. There were four successful I2I Phase 1 projects:

Hany Aziz (Electrical and Computer Engineering)
Title: QLED RGB Color Patterning Technology
Amount: $125,000

Hamid Jahed (Mechanical and Mechatronic Engineering)
Title: Grounding Solutions for Heating Panels Using Teflon Metallization
Amount: $125,000

Carolyn Ren (Mechanical and Mechatronic Engineering)
Title: Portable Intermittent Pneumatic Compression Sleeve and Glove for Sports Therapy and Athleisure Applications
Amount: $125,000
Mahla Poudineh (Electrical and Computer Engineering)
Title: Commercialization of the Wearable Aptalyzer for Continuous Lactate Monitoring During Exercise: Overcoming the Limitations of Frequent Invasive Blood Testing
Amount: $125,000

NSERC Alliance Quantum
Alliance Quantum grants reinforce, coordinate and scale up Canada's domestic research capabilities in quantum science and technology through partnerships between university researchers and organizations from the private, public or not-for-profit sectors. Waterloo had one successful NSERC Alliance Quantum grant.

David Cory (Chemistry and Institute for Quantum Computing)
Title: High Tc Josephson junction arrays for quantum standards and measurement devices
Partners: Measurements International Ltd., National Research Council Canada
Amount: $1,042,636

Waterloo International

1) Enhancing International Priorities and Partnership Connections:

- Signed a new MOU with Prince Sultan University (PSU) and the Waterloo Institute for Sustainable Aeronautics (WISA) to support engagements that drive strong sustainability focused activities.

2) Supporting International Talent Pipeline Development and Student Mobility:

- Registered 163 international university-sanctioned trips and monitored over 1300 active travellers.
- Monitored 21 high-risk global incidents and four of which required follow up with travellers.

3) Developing New International Opportunities:

- Created and signed a new pathway agreement with University of Strathclyde in support of the Faculty of Science's internationalization priorities. This agreement will allow UW students who have completed a four-year BSc a pathway into a MSc Forensic in Forensic Science at Strathclyde with the Faculty of Science.

- Created and signed a new pathway agreement with American Canadian School of Medicine (ACSOM) in support of the Faculty of Science's internationalization priorities. This agreement will allow UW students enrolled in a Bachelor of Science program a conditional admission to the Medical School Pathway with the with American Canadian School of Medicine (ACSOM).

UNIVERSITY OF WATERLOO | Senate

For Information **Open Session**

To:	Senate Finance Committee
From:	Secretariat
Agenda Item:	**11.1 Annual Senate Survey**

Background

The annual survey of Senate, and that of Senate's committees/councils, will be distributed in the coming weeks.

In advance of the survey's issue a copy of the survey for Senate is provided here for information. This was reviewed by Senate Executive Committee at its meeting on February 18, 2025.

Documentation Provided

i. Attachment - Senate Self-Assessment Survey, 2024-25

Senate Self-Assessment Survey, 2024-25

This self-assessment survey is designed for Senate members to provide feedback on their experience. Your feedback is essential to understanding the strengths of Senate, as well as to identify specific areas where improvement can be made.

Data from respondents will be compiled and aggregated to provide Senate with a high-level overview of how members as a group view Senate governance at the University of Waterloo. Comments provided as part of the survey will also be reported in aggregate and without attribution.

For all questions, please indicate your response by selecting a value on the corresponding rating scale:

- 5 = I strongly agree
- 4 = I agree
- 3 = Neutral
- 2 = I disagree
- 1 = I strongly disagree
- N/A / not enough information to evaluate

You will also have the opportunity to offer comments to support your rating.

2. How long have you been on the Senate? [required response, multiple choice]

- Less than 1 year
- 1-3 years
- 3 or more years

3. ***Meeting preparation and logistics*** – Senate meetings are intended to operate effectively and efficiently. This section examines how members prepare for and operate within meetings. [required response, matrix]

- The pre-meeting information package and other information provided for Senate decision-making frame the issues at the right level with sufficient detail.
- Senate meetings have an appropriate division of time between presentation and discussion.
- Senate focuses its time together on the right topics, aligned with its role and mandate.
- Senate meetings address issues of substance.
- Senate meeting practices (e.g., meeting times, venues, facilitation, etc.) help foster inclusion.
- Staff support before, during, and after meetings is effective.

4. Please provide any additional comments in relation to the above. [short text entry]

5. Group dynamics and relationships – Relationship dynamics influence Senate's effectiveness. This section explores your perception of how members relate to each other and with members of the University administration. [required response, matrix]

- Meeting dynamics encourage critical dialogue and discussion.
- Member disagreement is viewed as a search for solutions rather than a "win/lose".
- Meetings are conducted in a respectful manner that ensures open communication and meaningful participation.
- Senate brings an EDI-R (Equity, Diversity, Inclusion and Anti-Racism) lens to discussion and decision-making.
- At Senate meetings, I ask questions and provide input based on my knowledge, experience, analytical skills, and common sense.
- Members of Senate ask tough questions when the need arises.
- At Senate meetings, I have the freedom to express a dissenting opinion in a constructive manner.
- At Senate meetings, I feel heard.

- At Senate meetings where I participate by videoconference, I feel appropriately engaged (e.g., my feedback is actively solicited and/or I am encouraged to participate as if I were there in person).

6. Please provide any additional comments in relation to the above. [short text entry]

7. Overall experience – Please provide your observations on your overall experience as a member of Senate, as well as any other observations you would like to share. [required response, matrix]

    - I feel knowledgeable about my role and responsibilities as a Senator
    - I find my responsibilities as a Senate member stimulating and rewarding.
    - Involvement in Senate provides a connection between my efforts and the success of the University.
    - Senate is a place for meaningful conversations about the future of the University.

8. Please provide any additional comments in relation to the above.
   [short text entry]

9. What does Senate do particularly well? [short text entry]

10. What would help Senate function more effectively? [short text entry]

11. Please provide any additional comments you would like to offer. [short text entry]