UNIVERSITY OF WATERLOO

Senate

Senate

October 21, 2024

Needles Hall

3407

200 University Av West

Waterloo, ON, N2L 3G1

UNIVERSITY OF WATERLOO

Senate

Meeting Book - Senate Meeting

3:30 p.m.	1. Territorial Acknowledgment [Nasser Abukhdeir]		
	2. Approval of the Agenda and Minutes		
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	2.2 Approval of the Agenda, and Approval of the Consent Agenda	Decision	
	2.3 Minutes of the September 23, 2024 Meeting To approve the minutes of the September 23, 2024 meeting as distributed/amended.	Decision	
	2.4 Business Arising from the Minutes	Information	
	2.4.1 Approved appointments to Senate committees/councils by Senate Executive Committee	Information	6
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4:00 p.m.	5. Report of the President	Information	
	5.1 President's Update		13
4:20 p.m.	6. Report - Senate Graduate & Research Council		
	6.1 New Program - MASc and PhD in Biomedical Engineering That Senate approve the proposed new academic programs of Doctor of Philosophy (PhD) and research-based Master of Applied Science (MASc) degrees in Biomedical Engineering (BME), as presented; and, That the effective date be either January 1, 2025 or May 1, 2025, to be confirmed and subject to the date of review and approval by the Ontario Universities Council on Quality Assurance and the Ministry of Colleges and Universities.	Decision	14
4:25 p.m.	7. Report - Senate Undergraduate Council		
	7.1 Major Modification – Quantum Information Option To approve the proposed major modification to create a new option, Quantum Information (Bachelor of Computer Science, Bachelor of Computing and Financial Management, Bachelor of Mathematics, Bachelor of Software Engineering), effective September 1, 2025, as presented.	Decision	49
	7.2 Regulation Revisions – Averages and Academic Standings To approve the proposed academic regulation revisions to Mathematics: Averages and Academic Standings, Addition of First Term Withdrawal Policy, effective September 1, 2025, as presented.	Decision	57
4:30 p.m.			

	8. Report - Senate Executive Committee		
	8.1 Guidelines for Visitors to Senate Meetings That Senate adopt the Guidelines for Visitors to Senate Meetings as presented.	Decision	70
	8.2 Senate Undergraduate Council – Report on Curriculum Subcommittee Pilot That Senate approve the establishment of a curriculum subcommittee for Senate Undergraduate Council, as presented.	Decision	79
	8.3 Election to Senate Committee To elect Neela Hassan as the graduate student member of the Academic Quality Enhancement Committee.	Decision	83
4:50 p.m.	9. Report - Senate Finance Committee		
	9.1 Mid-Year Update, 2024/25 University Operating Budget This report will be distributed to Senate following the committee meeting of October 16, 2024.	Information	
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	16. Report - Vice-President, Academic & Provost		
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5:25 p.m.	CONFIDENTIAL Senators, Vice-Presidents, Secretariat and Technical Staff as required		
	18. Minutes		
	18.1 Minutes of the September 23, 2024 Meeting To approve the minutes of the September 23, 2024 meeting as distributed/amended.	Decision	107
	19. Business Arising from the Minutes	Information	
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	21. Adjournment		

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 13-19 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 September 23, 2024 Meeting

Motion: To approve the minutes of the September 23, 2024 meeting as distributed/amended.

Documentation Provided:

- Minutes of the September 23, 2024 Meeting – Open Session

2.4 Business Arising from the Minutes

There are two items of business arising identified with the meeting agenda.

- Elections to Senate Committees on Behalf of Senate

  This is a report on the committee/council vacancies filled as per the delegation of authority given by Senate at the meeting on September 23, 2024.

- Response to query on task forces

Written reports in response to the query on the two task forces recently struck (the first on institutional investing, the other on institutional partnerships)

For Information **Open Session**

To:	**Senate**
From:	Secretariat
Agenda Item Identification:	**2.4.2. Appointments to Senate Committees and Councils on Behalf of Senate**

Summary:

Senate passed a motion at the meeting of September 23, 2024 to delegate its authority to the Senate Executive Committee for the purpose of filling a limited number of vacancies which currently exist on the Senate's various committees and councils. Nominations to fill said vacancies were obtained by either direct outreach to eligible individuals through by way of communication with the deans to recommend names of faculty member nominees.

The following vacancies were filled by the committee by e-vote:

1. Senate Executive Committee1 (one year term, through April 30, 2025)

    Faculty (1 from each Faculty)

    • Faculty of Environment – Mark Seasons

2. Senate Long Range Planning Committee1 (one year term, through April 30, 2025)

    Faculty (1 from each Faculty)

    • Faculty of Health – Martin Cooke

3. Senate Graduate and Research Council1 (two-year term, through April 30, 2026)

    Graduate Students (1 from each Faculty)

    • Faculty of Environment – Carlee Montgomery

4. Senate Undergraduate Council1 (two-year term, through April 30, 2026)

    Faculty (1 from each Faculty)

    • Faculty of Arts – Robert Stark

5. Academic Quality Enhancement Committee2 (two-year terms, through April 30, 2026)

Three (3) faculty representatives from Senate Graduate & Research Council

    Peter Deadman

Anna Esselment

Martin Ross

Three (3) faculty representatives from Senate Undergraduate Council

Carol Ann MacGregor

Cynthia Richard

Helena Shilomboleni

Student senators

Jordan Bauman

Vacancy (approval to be brought forward separately to Senate on October 21, 2024)

For Information **Open Session**

To:	**Senate**
Sponsor/Presenter:	Charmaine B. Dean, Vice-President Research and International
Contact Information:	vpri@uwaterloo.ca
	Jacinda Reitsma, Vice-President Administration and Finance
	jacinda.reitsma@uwaterloo.ca
Date of Meeting:	**October 21, 2024**
Agenda Item Identification:	**2.4.2 Update on Task Forces: Principles for Institutional Partnerships and Social Responsibility in Investing**

Summary:

Both Task Forces, Principles for Institutional Partnerships and Social Responsibility in Investing began their work in September. The Task Forces were established over the summer with members of the community invited to self-nominate or nominate to serve on each of the task forces through a message to the community on June 17th, with a deadline of July 9th. Information on the mandate of the Task Forces, the nomination process, skills and competencies for task force members were provided at university websites identified in the community message inviting nominations.

The mandate of the Task Force on Principles for Institutional Partnership is to develop a set of recommended principles that will ensure a consistent and transparent approach to institutional partnerships that reflect institutional values, while that for the Task Force on Social Responsibility in Investing is to make recommendations on the University's investment policy framework to address matters related to receipt of expressions of concern in relation to the University's investments, in accordance with the Responsible Investment Policy. The Task Forces will also review existing practices and conduct environmental scans as identified at relevant websites discussing their work in more detail.

The process for identifying members of the Task Forces was based on past practices for similar institutional groups. Nominations were received from 31 faculty, 11 staff, 19 students and 1 community member (alumnus) to serve on the Task Force on Principles for Institutional Partnerships, while corresponding numbers for the Task on Social Responsibility in Investing were 7 faculty members, 6 staff members, 23 students and 2 community members (affiliated or previously affiliated with the Board of Governors). We are grateful for the strong interest and the nominations we received to contribute to these Task Forces. We are also grateful to those who provided support and feedback on the selection process. This included outreach to leadership at various associations, as well as institutional leaders, who provided confidential perspectives based on their expertise and experiences. This outreach also included leaders of programs dealing with human rights, and peace and conflict at affiliate colleges who provided confidential comments, as they were able, to

support the selection process. Conversations with some nominees were also conducted to understand supports needed for participation on the Task Forces, based on queries and comments articulated in their nomination packages.

The Chairs of the committees were approved by the President in consultation with Vice-Presidents prior to the selection process for the rest of the members of the Task Forces. Working closely with the chairs of the Task Forces there was a focus in the selection process on ensuring diversity across key areas of the university and Faculties and representation across the skill elements required for the work of the Task Forces. For ease of reference, as the websites inviting nominations are no longer active, these skills are provided below. Alternates were also identified in case the nominees approached were no longer be able to participate. Recommendations on membership were made to the Vice-Presidents, who provided endorsement, and then subsequently to the President, who also confirmed the membership.

The members of the Task Force on Principles for Institutional Partnerships are Suman Armitage (staff), Jennifer Clapp (faculty), Christiane Lemieux (co-Chair), Samantha Meyer (faculty), Ian Milligan (co-Chair), Bessma Momani (faculty), Josh Neufeld (faculty), Maia Norman (student), Catherine Rosenberg (faculty), Michael Saunders (student), and Andrew Thompson (staff).

The members of the Task Force on Social Responsibility in Investing are Peter Barr (Chair, community member), Goldi Gill (staff), Sheryl Kennedy (community member), Bilal Khan (Board member), Majid Mirza (student), Blake Phillips (faculty), Lev Pollock (student), James Thompson (faculty), Michael Wood (faculty).

Given the close relationship between the work of these Task Forces and the work of the Task Force on Freedom of Expression, there will be a workshop provided to Task Force members on the report on the Task Force on Freedom of Expression. Another workshop will be provided on human rights by an external scholar. Both Task Forces have dedicated staff to support their work. As well, offices on campus who manage partnerships and investments (co-op, advancement, research, WatSPEED, safeguarding research, international, university relations, finance, sustainability) will offer availability to the Task Forces to provide material required for the assembly of information on current processes.

Both Task Forces have developed workplans and these plans include community consultations which are currently planned to occur in October and November. The two Task Forces will be working in collaboration with each other with similar approaches to offer the university community consistent messaging and consultation.

The reports and recommendations resulting from the Task Forces will be presented to the President. The reports will be publicly posted to the university community, including Senate and the Board of Governors. The President will provide a response to the Task Force reports to the community, and implementation plans will be developed. Responsible offices will hold accountability for implementation. Any changes to policy, or development of new policies will follow the normal governance processes through Senate and/or Board as appropriate. Regular progress updates will be communicated to the broad community based on the President’s response to the reports.

Required Skills and Competencies for Task Forces: Social Responsibility in Investing & Principles for Institutional Partnerships

Institutional Partnerships	Social Responsibility in Investing
Demonstrated sound judgment and critical thinking skills	Demonstrated sound judgment and critical thinking skills
Experience with international engagements and partnerships	Demonstrated significant education in institutional investments an asset.
Experience in international human rights law, justice, rights and freedoms	Demonstrated experience with one or more of responsible investment, institutional investments and/or incorporation of ESG factors in investment decision making
	Experience with Canadian or international sustainability disclosure standards and/or ESG investment related disclosures by investees is preferred
	Knowledge/experience working with the "S" in ESG is preferred (i.e. knowledge of UN sustainable development goals etc.)
Equity, Diversity, and Inclusion criteria, allowing for members to bring lived experiences and diverse backgrounds to bear on these questions;	Equity, Diversity, and Inclusion criteria, allowing for members to bring lived experiences and diverse backgrounds to bear on these questions;
Diverse representation across the University	Diverse representation across the University
For faculty, academic experience with the subject matter is not required but would be an asset	For faculty, academic experience with the subject matter is not required but would be an asset
Experience with academic consultation and governance is desirable (for example, administrative experience within the University)	Experience with University committees and governance is preferred

For Information **Open Session**

To:	**Senate**
From:	Gen Gauthier-Chalifour, University Secretary
Agenda Item Identification:	**3. Faculty Update Presentation – Science**

Chris Houser, Dean of the Faculty of Science, will provide a presentation on activities and undertaking in the Faculty.

For Information **Open Session**

To:	**Senate**
From:	Gen Gauthier-Chalifour, University Secretary
Agenda Item Identification:	**4. Deans' United Way Presentation**

In support of the University's 2024 United Way Campaign and continuing a Senate tradition, the Deans of the six Faculties have been allocated a short amount of time to raise awareness of the campaign.

For more information, visit the University of Waterloo's United Way Campaign website.

For Information **Open Session**

To:	**Senate**
From:	Gen Gauthier-Chalifour, University Secretary
Agenda Item Identification:	**5. Report of the President**

5.1 President's Update

Dr. Vivek Goel, President and Vice-Chancellor, will provide an update to the Senate on matters of interest to the University community.

UNIVERSITY OF WATERLOO | Senate

Senate Graduate & Research Council

For Approval **Open Session**

To:	**Senate**
Sponsor:	Charmaine Dean Vice-President, Research & International Clarence Woudsma Interim Co-Associate Vice-President, Graduate Studies and Postdoctoral Affairs
Presenter: **Contact Information:**	Clarence Woudsma cwoudsma@uwaterloo.ca
Date of Meeting:	October 21, 2024
Agenda Item Identification:	**6.1 Report – Senate Graduate & Research Council: New Academic Programs – MASc and PhD in Biomedical Engineering**

Recommendation/Motion:

That Senate approve the proposed new academic programs of Doctor of Philosophy (PhD) and research-based Master of Applied Science (MASc) degrees in Biomedical Engineering (BME), as presented; and,

That the effective date be either January 1, 2025 or May 1, 2025, to be confirmed and subject to the date of review and approval by the Ontario Universities Council on Quality Assurance and the Ministry of Colleges and Universities.

Summary:

Senate Graduate & Research Council met on September 16, 2024 and agreed to forward the following items to Senate for approval as part of the regular agenda.

Jurisdictional Information:

This item is being submitted to Senate in accordance with Senate Bylaw 2, section 4.03(e): "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:

Faculty approval date (mm/dd/yy):12/4/2023

Senate Graduate & Research Council approval date (mm/dd/yy): 09/16/24

Highlights/Rationale:

The Departments of Systems Design Engineering (SYDE), Electrical and Computer Engineering (ECE) and Mechanical and Mechatronics Engineering (MME) seek to establish Doctor of Philosophy (PhD) and research-based Master of Applied Science (MASc) degrees in Biomedical Engineering (BME).

The PhD and MASc programs, which will be four and two years in duration, respectively, include new and existing courses that will engage students in the acquisition of high-level technical knowledge and methods. The program is research-focused on biomedical engineering, with complementary emphases on professional engineering and explicit design practice. In addition to an independent thesis, students will develop professional and transferable skills in modules for milestone-based activities in the proposed Professional Attributes and Competence Enhancement (PACE) Module. The program will include a strong model of engaged thesis advisers forming active interdisciplinary advisory and examination committees.

The initiative builds on several existing research training programs such as, NSERC-CREATE (Global Biomedical Technology Research and Innovation, led by Prof. Catherine Burns), N-GENIUS (Next-Generation Innovations in Ultrasonics, led by Prof Alfred Yu) etc. The graduate education programs will be delivered on campus in Waterloo, Ontario, using online technology and field-based locations, as needed, for optimal student experience. The tuition fees for the programs will be consistent with the fees of the existing graduate programs in the Faculty of Engineering as outlined in the UW Finance fee schedule.

Documentation Provided:

Appendix A – Program Revision Template

UNIVERSITY OF
WATERLOO

NEW GRADUATE PROGRAM PROPOSAL*

OF

MASc AND PhD

IN

BIOMEDICAL ENGINEERING

Submitted to the
Ontario Universities Council on Quality Assurance

VOLUME I - PROPOSED BRIEF

NOVEMBER 2023

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Brief Listing of the Program

The Departments of Systems Design Engineering (SYDE), Electrical and Computer Engineering (ECE) and Mechanical and Mechatronics Engineering (MME) seek to establish Doctor of Philosophy (PhD) and research-based Master of Applied Science (MASc) degrees in Biomedical Engineering (BME).

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The initiative builds on several existing research training programs such as, NSERC-CREATE (Global Biomedical Technology Research and Innovation, led by Prof. Catherine Burns), N-GENIUS (Next-Generation Innovations in Ultrasonics, led by Prof Alfred Yu) etc. The graduate education programs will be delivered on campus in Waterloo, Ontario, using online technology and field-based locations, as needed, for optimal student experience. The tuition fees for the programs will be consistent with the fees of the existing graduate programs in the Faculty of Engineering as outlined in the UW Finance fee schedule.

1.2 Method Used for Preparation of the Brief

While the intention to create BME graduate programs stems back to the initiation of the BME undergraduate program more than a decade ago, this version of the proposal was initiated in Winter 2021 after the Dean of the Faculty of Engineering and the Chair of Systems Design Engineering department engaged with the departments of Electrical and Computer Engineering and Mechanical and Mechatronics Engineering.

The intent of those meetings was to present the rationale for a new approach to a graduate program and to seek partnership from the three departments. Following the consultations, the three departments recommended two faculty members each to serve on an interdisciplinary task force. Upon request, department chairs from the Department of Kinesiology and Health Sciences in the Faculty of Health and the School of Optometry and Vision Science in the Faculty of Science also appointed one representative each to the task force. The composition of the task force was based on consultations with students and alumni that showed a preference for a program that is engineering-based and strongly interdisciplinary.

The work of the BME Graduate Program Task Force built on prior analysis of national, graduate-level BME curricula undertaken by SYDE faculty in fall 2020. During the latter half of 2021, a

subset of the Task Force worked on defining curriculum and admissions requirements, with careful consideration of how to engage students with prior degrees that may provide disparate preparation for the graduate program. The Task Force also consulted industry stakeholders, who communicated the importance of transferable skills and motivated the vision for the Professional Attributes and Competence Enhancement (PACE) modules.

To establish the financial model of the program, the SYDE chair worked with staff from the Dean of Engineering office to conceptualize a program involving three departments in an administrative partnership and managed by BME but consist of students training in faculty labs across departments, schools, and faculties. Teaching duties will be shared amongst the partners and costs reimbursed to participating departments.

1.3 Objectives of the Program (QAF 2.1.2.1)

The primary objective of the proposed BME Graduate Program is to produce comprehensively trained and technically outstanding master's and doctoral graduates in biomedical engineering who are prepared to excel and lead in all sectors of society—postsecondary education, industry, not-for-profit, government and more. Our objective is to align the University of Waterloo's research strengths and output with important global challenges in the biomedical sector.

The program aligns with the University of Waterloo Strategic Plan and Strategic Mandate Agreement, as well as these three Signature Commitments described in the Strategic Plan which are: 1. Align our research strengths deliberately with important global challenges, 2. Lead globally and nationally at the interface of society, health and technology, and 3. Be a global powerhouse for commercializing research, developing new enterprises, and supporting business growth.

1) The proposed program strengthens the University's commitment to align research strengths with important global challenges, specifically in the area of health technologies. Developing talent for a complex future and advancing research for global impact are also key to Waterloo's strategic plan themes. Health is an area that is enormously complex, with great need for global education and research; this program's contributions will be at the forefront of biomedical engineering where technology and design contribute to the solution to increasingly complex, real-world challenges. Examples include rehabilitation robotics, tissue engineering, leading edge imaging technologies, and multifaceted systems approach to deal with pandemics (e.g., COVID-19).

2) Leading globally and nationally at the interface of society, health, and technology is something we already do at Waterloo. The program will provide a focal point by contributing directly to this goal. By leveraging Waterloo's research strengths in technology and the social, economic, biological and environmental determinants of health, Waterloo

will lead in securing healthy futures for local and global communities. It is salient to this goal that the proposed BME graduate program will be administratively led by SYDE which is known for its extensive interdisciplinary endeavors. The program will establish a structure within which interdisciplinary learning objectives can be achieved for students seeking the BME credential. Although based in Engineering, the program's proposed partnership structure and interdisciplinary nature exploits existing cross-faculty, interdisciplinary research teams that apply their disciplinary strengths to problems of societal importance. By strengthening existing partnerships, Waterloo can attract more talent at all levels – faculty, researchers, postdoctoral scholars, and graduate students. In this way, the program provides a venue for attracting, developing, and retaining tomorrow's research and industry leaders, including outstanding scholars from around the world.

3) The University of Waterloo has a globally recognized entrepreneurial ecosystem, with many notable alumni founders coming from the Faculty of Engineering. The BME graduate programs have tremendous potential to combine Waterloo's entrepreneurial resources with groundbreaking healthcare technologies that improve quality of life. Several Waterloo faculty members with research interest in biomedical engineering have commercialized their research, are working with an industry partner, and/or started a business venture alongside their research work. There are graduate students currently enrolled in the partner programs developing their own ventures in the biomedical engineering field. For example, a graduate of the first BME undergraduate class and current SYDE PhD student, developed an app to improve the workflow of vaccine clinics. Interest in commercializing research is demonstrated among students in the BME undergraduate program. Capstone design teams often continue to work on their projects beyond the program requirements. In 2022, team Petalos developed a prototype for a novel gastrointestinal modular endoscope that reduces contamination for better clinical outcomes. The team has entered and won several pitch competitions to obtain funding to keep the project going. Advancing to BME graduate program would give interested students the opportunity to continue developing their research training while working towards commercializing their project.

1.4 Admission Requirements (QAF 2.1.2.5)

Admission to the BME graduate program is through direct application, managed by the BME program. While the successful applicant will be registered in the BME program, students will have connection(s) to their advisor's (or advisors') home department(s), where they will conduct their research and be allocated lab and space resources. The admitting advisor must be a BME faculty member. Due to the extensive interdisciplinary nature of BME, students with diverse academic backgrounds are expected to apply, and the admission requirements will take

this into account. The curriculum, guided by the BME Graduate Program Committee, ensures the intended learning outcomes are achieved.
Below is a summary of the admission requirements:

- MASc applicants must have completed a bachelor's degree (or equivalent) in any field of engineering or a related science discipline at a recognized institution with a minimum 80% overall average.
- PhD (regular entry) applicants will have completed a research thesis-based master's degree (or equivalent) in engineering, applied science, or science from a recognized institution with at least an overall 80% average and documented evidence of potential to excel in PhD studies and research.
- For both MASc and PhD applicants, English Language Proficiency (ELP) requirements of the Faculty of Engineering must be met. (Appendix B and C).
- Both MASc and PhD applicants who are deemed by the graduate coordinator, BME graduate program director, Admissions Committee or intended advisor to have an inadequate depth of technical BME background may be directed to take additional foundational courses, to be specified at the time of admission.
- PhD (direct from Honours BME undergraduate entry) applicants require a minimum overall average of 80% in a BME program at the undergraduate level and clear evidence of excellent potential to excel in PhD studies and research. Substantial research experience is expected.

The full description of the admission requirements is in Appendix B for MASc and Appendix C for PhD.

Transfer students from other Waterloo graduate research programs applying to enter the BME graduate program by completing a Change of Program form will be considered on a case-by-case basis by the BME Admissions committee, and must meet the following additional requirements:

- be in good academic standing with their current program;
- have met the BME minimum academic admission requirements above;
- have a research focus on BME, as determined by the BME graduate program director;
- ensure the comprehensive exams and the curriculum requirements will be met; (core, field, two electives, and PACE Modules) by taking additional courses, if required. Exceptions may be granted as described below.

If a student enters the program with substantial BME experience, they may seek recognition for that work in lieu of completing some of the program requirements. Recognition is granted following approval, first by the student's supervisor then by the BME graduate program director who makes the final decision. This exception to waive course requirements will not lower the

total number of courses required.

1.5 Structure

To achieve an MASc or PhD degree in the BME program, students will have successfully completed relevant courses, participated in modules designed to train and enhance professional competencies, attended, and presented at a regular seminar series, and completed a research thesis. These activities ensure the Graduate Level Expectations (GDLE) for both MASc and PhD are met.

For both the MASc and PhD programs, students must successfully complete at least one of the three core courses (BME 601, BME 602, or BME 603) that take a quantitative approach to broad aspects related to human physiology and BME, at least one field-specific course relevant to their research, and at least two electives (Appendix H). Further details on the course requirements, including how they vary between degrees and based on the educational background of the student, can be found in section 4.

Students who have completed the MASc program in BME at Waterloo may apply and continue to the doctoral program. In this situation, students will have already completed the core course requirements (one of BME 601, BME 602, or BME 603), a field-specific course and two electives as part of their master's degree requirements. To satisfy the PhD program requirements, these students must complete a total of four courses including a) one core course requirement (one of BME 601, BME 602 or BME 603 that was not completed as part of the MASc in BME program); b) two additional electives; c) an additional field-specific course if they have switched fields between MASc and PhD. PhD candidates who qualify to enter directly from an Honours undergraduate program must take two core courses, one field-specific course, and four electives to establish an equivalent level of depth.

The program courses are supplemented by the milestone-based[1] PACE Module. In these modules, both MASc and PhD students will receive training in the areas of research design and planning, academic integrity, professional presentation, and scientific writing. PhD students will receive additional training in developing research plans and in writing grant and business proposals.

The program requirements include deadlines for completing milestones (e.g., coursework, research presentation at the regular seminar series, dissertation, and defense) to aid in keeping students on track to complete degrees within the University's expected timeframe. The standard degree lengths are two and four years for MASc and PhD, respectively.

A summary is provided below for different student groups admitted to the program:

[1] Milestones are defined as "non-course degree requirements (e.g., thesis, comprehensives, master's research paper) that a student must complete toward degree progress in order to graduate."

Student admitted from outside of UW		
	MASC admission	PhD admission
Courses:	1 of BME 601, 602, 603	1 of BME 601, 602, 603
	1 Field related course	1 Field related course
	2 Electives	2 Electives
Milestones:	PACE	PACE
		Comprehensive Exam
	Seminar attendance and presentation	Seminar attendance and presentation
	Thesis Defense	Thesis Defense
Student admitted to PhD program having completed UW Masters in BME		
Courses:		1 Additional course from BME 601, 602 or 603 (not taken in Master's program)
		1 Field related course if PhD field differs from Master's
		2 Electives with additional field course; or 3 Electives
Milestones:		As above
Student admitted to PhD program from Honours BME undergraduate program		
Courses:		2 of BME 601, 602, 603
		1 Field related course
		4 electives
Milestones:		As above

The administrative structure and curricular oversight of the BME Graduate programs are described in Section 4.6. The structure includes an administrative department home for program staff, a representative curriculum program committee, an oversight policy committee of core department chairs, and a process for faculty membership in the program from across multiple departments and Faculties.

1.6 Program Content

Biomedical engineering is the application of engineering principles and design concepts to medicine and biology for healthcare purposes. The field seeks to close the gap between engineering and medicine, combining the design and problem-solving skills of engineering with medical and biological sciences to advance healthcare treatment, including diagnosis, monitoring, and therapy.[2]

With the interdisciplinary strengths of faculty from the largest engineering school in Canada, the Waterloo BME graduate program will be at the leading edge of the discipline. Waterloo has deep expertise in five defined research fields (described in section 1.9) that cover the span of BME and represent Waterloo's strengths and societal needs. The proposed curriculum provides

[2] Enderle and Bronzino, Introduction to Biomedical Engineering

for training and instruction in the discipline's state-of-the-art by leaders in said research fields using a combination of the following:

- one core course providing a quantitative engineering approach to human physiology;
- one field-specific course; and
- two electives providing greater depth related to the student's research topic.

A series of experiences described as the Professional Attributes and Competence Enhancement (PACE) Module is a particularly important component to provide professional and transferable skill development that prepares students for careers outside and inside academia. This learning opportunity builds on the University of Waterloo's strong history of partnering with industry to establish relevance and translate research to real-world contexts and potential commercialization.

Consistent with most, if not all, graduate training programs in engineering in Canada, the major research requirement for degree completion is a research thesis examined and approved by an examination committee. The examination will also require an oral defense at both the master's and PhD levels. The thesis research, writing, and overall progress is overseen throughout the program by an advisor and a committee of faculty.

1.7 Mode of Delivery

All graduate courses will be designed and developed by Waterloo faculty, delivered in person on campus, and supported by Waterloo's learning management system (LMS).

Activities related to the PACE Module milestones, such as the regular seminar series and research days, will be conducted in person on campus. The PACE Module milestones will be directed by the BME graduate program director with the support of a new staff member.

Given our recent experiences with the COVID-19 pandemic, we are prepared to deliver training using online teaching tools. In addition to online learning during emergencies and for flipped classroom-style activities, certain components of the program will be enhanced by global advances in online communications that allow us to connect students to research leaders and clinicians globally. For example, virtual site visits to and from distant locations, presentations from higher-profile guest speakers and more extensive interactions with stakeholders and clinicians are all possible with digital technology.

1.8 Assessment of Teaching and Learning (QAF 2.1.2.4)

Assessment of teaching and learning will be conducted at the student and program levels. The BME graduate program will be assessed at the program level by the BME Graduate Program Committee and BME graduate 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. It will identify opportunities to improve performance,

such as enriching course content or teaching. In addition to the information noted above, thesis supervisors, course faculty and the BME Program Committee will note any other student achievements and successes that are relevant to the program.

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

- Applications to and enrollment within the BME graduate program;
- Student evaluations of PACE Module milestones, core and field courses;
- NSERC and CIHR Scholarships and Graduate Student Awards won by students.
- BME student graduation rates;
- Surveys of alumni;
- Surveys of employers/industry partners; and
- Publications and conference presentations of BME students.

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

a) Required core courses, field-specific elective courses, and elective courses: 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) Comprehensive background exam (Comprehensive Exam I (Background); PhD students only) at the end of year one.
c) Thesis proposal defense: Typically completed after year two for PhD students (Comprehensive Exam II (Proposal)) and at approximately year one for master's students.
d) End-of-term reports: For both MASc and PhD students, reports include their self-reflection on their own research and professional development, as well as supervisors' evaluation of progress and individual development. Reports are completed online.
e) Annual committee assessment: Completed by the advisory committee outlined below, the assessment evaluates research progress and quality based on an oral presentation. For full-time master's students, the annual assessment is a one-time proposal defense but for part-time master's students, assessments may be conducted annually.
f) Written thesis or dissertation: Explicitly presents the student's individual contribution(s) to the field. For PhD students, the originality of the contribution is also assessed.
g) Oral thesis defense: Evaluated by the committee outlined below.
h) PACE Module milestones completion: See section 4.4 for details.

Refer to Appendix E and Appendix F for the list of methods for assessing student achievement of the intended program learning outcomes and GDLEs.

For the PACE Module milestones, students will be assigned credit/no credit based on whether they complete each component. The components of the module include presenting research proposals and results, drafting research plans, writing mock grants or business proposals, and more. Participation in these activities can also include providing critical, constructive feedback to other students on their work and performance.

For each student, research will be mentored and assessed by an Advisory Committee that is appointed at the end of year 1 for PhD students and during year 1 for Master's students. The Advisory Committee will consist of the members of the Examining Committee except for the PhD external examiner. The Advisory Committee will conduct the comprehensive examinations (if applicable), consider the thesis proposal, evaluate annual research progress and results, and ultimately conduct the thesis defense. At the defense, the written thesis and the performance of the student during the oral defense will be considered.

Annual advisory committee meetings will be required and documented. The first annual committee meeting may include the Comprehensive Exam I (Background) for PhD students. For master's students, the first annual meeting will be the proposal defense.

At the master's level, the composition of the Advisory Committee will consider the required expertise needed to support and evaluate the thesis research. Co-supervision is an option. The Advisory Committee shall be comprised of at least: one tenured or tenure track faculty member from the BME graduate program who will be the student's supervisor(s); an additional tenured or tenure track BME graduate faculty member; and at least one additional examiner who is not a BME faculty member (but may be from a department with BME faculty members) and whose expertise can support the evaluation of the Master's thesis... Consistent with the Faculty of Engineering requirements, a maximum of one committee member with an adjunct appointment or emeritus status is permitted. The University is currently considering changes to the membership of advisory committees, potentially allowing non-voting committee members to provide advice to students as they research. As such changes come into effect they will be adopted as appropriate.

For PhD students, the Examining Committee consists of a minimum of five voting members including the external examiner, with internal members representing at least two different departments or schools. The PhD Examining Committee must follow the Faculty of Engineering requirements and include the following members:

- External examiner (not included in annual meetings, only for the final defense)
- Supervisor or co-supervisors (at least one must be a BME faculty member)
- Internal members (2 BME program faculty members)
- Internal-external member (not a BME faculty member but may be from a department with BME faculty)

Optionally, additional BME program faculty member(s) can be on the committee.

1.9 Fields in a Graduate Program

Both the Master's and PhD programs are composed of the following research fields:

A. Biomaterials, tissue engineering and drug delivery
    - includes regenerative medicine.
B. Biomechanics and rehabilitation
    - includes both solid and fluid biomechanics.
C. Biomedical signals and devices
    - includes EEG, EMG, brain-computer interfaces and neuroscience applications, micro and nano devices.
D. Biomedical imaging technology
    - includes ultrasound, X-ray, MRI, optics, microwave.
E. Biomedical informatics
    - includes AI, big data, population, and health system studies.

This scope has been established by the BME Task Force in consultation with stakeholders. It reflects traditional or typical fields of BME while incorporating Waterloo's globally recognized strengths in biomechanics, medical imaging, and artificial intelligence, as well as addressing growth areas needed to serve societal needs now and into the future.

2. HUMAN RESOURCES

The following sections provide significant evidence that the BME-associated faculty have the established research programs and technical expertise that will sustain the innovation and intellectual activities of a dedicated BME graduate program. Eighty-two percent (82%) of faculty have Approved Doctoral Dissertation Supervisor Status (ADDS) to sole-supervise PhD students. On average, the BME-related faculty have supervised 27 students at the master's, PhD, and PDF levels over their career. To become a faculty member associated with the BME graduate program, an application process will be implemented as described in section 2.1.

The investment in faculty to focus on BME is long-standing across multiple departments, within and beyond engineering, where multiple faculty members in each traditional discipline have focused on biomedical applications. For example, dating back to 1988, graduate students have completed graduate theses with a biomedical focus. BME topics have long been the focus of faculty and graduate student research interest in Engineering. Rapid advances in health and engineering have created significant research interest in the BME field. The quality of faculty and their research output is described in section 2.6.

The investment in biomedical faculty significantly accelerated in 2011 with the creation of Waterloo's interdisciplinary Centre for Bioengineering and Biotechnology (CBB). In 2014, Waterloo established Canada's second BME undergraduate degree program and hired two tenure-track and one lecturer position in that year. Significant investments in BME-focused faculty have continued in the Faculty of Engineering. In SYDE, two BME faculty positions were

filled in 2022 and two remained to be filled and are budgeted for hire in 2024. As the administrative home for both the BME undergraduate and graduate programs, SYDE is financially responsible for these hires and direct costs to the MASc and PhD programs only occur for service teaching. Additionally, other departments at the University of Waterloo have recently hired or are recruiting faculty with BME-related research interests (Appendix G).

Staff human resources are a critical element of the planned program success. Staffing levels are based on existing Engineering graduate programs and leveraging shared human resources with SYDE. A Graduate Program Manager will be hired to jointly support the BME and SYDE Graduate Offices. Their duties will include content and delivery of the PACE Module milestones in partnership with the Director. The BME Graduate Program Coordinator will be hired to support the coordination of the administrative program work including recruiting, admissions, advising, and approvals related courses, theses, defenses, and milestones. As the number of students increases additional staff for these duties will be added. For management, financial assistance, communication, and reception roles, existing SYDE staff will be used for efficiency.

2.1 List of Faculty by Field

Table 1 demonstrates the strength and the significant degree of involvement of the faculty complement participating in each BME field of the graduate program(s). The list includes the faculty from the three administrative partner departments and those who are expected to be involved in thesis supervision. A subset of CVs is provided in Volume II.

- There are 42 full-time associated faculty members, with one lecturer, 9 at the assistant professor level, 9at the associate professor level and 23 at the professor level.
- Currently, there are two vacant positions that are expected to be filled in 2024.
- Membership as a faculty member for the BME graduate program will be for five years automatically renewed for an additional five years. The BME Program Committee will consider faculty applications based on recent research activity, publications, and graduate advising. Eligibility relies on engagement in BME related research.
- Only faculty with Approved Doctoral Dissertation Supervisors (ADDS) can sole-supervise PhD students. Applications will be considered from any department on campus regardless of whether that department is an administrative member of the program. There are several lecturers with directly applicable expertise that might serve as master's advisers or on PhD committees.
- Faculty members in administrative partner departments are not automatically members of the BME Program Committee. BME research is a requirement for membership in the program's advising faculty but licensure as a practicing engineer is not.
- Faculty members can participate in the BME graduate program and committees even if their home faculty or department is not formally participating.
- While cross-appointed professors from outside of Engineering are expected to play a substantial role as co-supervisors, adjunct professors, clinical professors, or emeritus professors are not expected to play a substantial role in student supervision while they may participate by supporting research.

- No faculty members cross-appointed from other universities have been identified at this time, however, we are open to the inclusion of faculty in the future whose contributions would have an impact on the quality of the program through substantive involvement, including clinical faculty.

TABLE 1: Faculty Members from the Core Supporting Departments (ECE, MME, SYDE)[4]

				Research Fields[3]				
Faculty Name	**Rank[2]**	**Dept [1]**	**Supervisory privilege**	**A**	**B**	**C**	**D**	**E**
Eihab Abdel-Rahman	Professor	SYDE	PhD, MASc		x	X		
Arash Arami	Asst. Professor	MME	PhD, MASc		x	X		x
Catherine Burns	Professor	SYDE	PhD, MASc					X
Naveen Chandrashekar	Assoc. Professor	MME	PhD, MASc		X			
David Clausi	Professor	SYDE	PhD, MASc				X	
Duane Cronin	Professor	MME	PhD, MASc	x	X			
Kerstin Dautenhahn	Professor	ECE	PhD, MASc					X
Chris Eliasmith	Professor	SYDE	PhD, MASc		x	X		x
Paul Fieguth	Professor	SYDE	PhD, MASc				X	
Baris Fidan	Professor	MME	PhD, MASc		x	X		x
Maud Gorbet	Professor	SYDE	PhD, MASc	X	x			
Parsin Haji Reza	Assoc. Professor	SYDE	PhD, MASc			x	X	
Jennifer Howcroft	Lecturer	SYDE	MASc only		X	x		x
Karim Karim	Professor	ECE	PhD, MASc				X	
Behrad Khamesee	Professor	MME	PhD, MASc			X		x
HJ Kwon	Assoc. Professor	MME	PhD, MASc				x	X
Fue-Sang Lien	Professor	MME	PhD, MASc		X			x
Ewen MacDonald	Assoc. Professor	SYDE	MASc only			X		
Nima Maftoon	Asst. Professor	SYDE	MASc only		x	X		
Veronika Magdanz	Asst. Professor	SYDE	MASc only	X		x		
Stewart McLachlin	Asst. Professor	MME	PhD, MASc		X	x		
John McPhee	Professor	SYDE	PhD, MASc		X	x		
Sushanta Mitra	Professor	MME	PhD, MASc	x		X		
Kevin Musselman	Assoc. Professor	MME	PhD, MASc	x		X		
Chrystopher Nehaniv	Professor	SYDE	PhD, MASc			x		X
Richard Nuckols	Asst. Professor	SYDE	MASc only		X	x		
Zhao Pan	Asst. Professor	MME	PhD, MASc		X	x		x
Sean Peterson	Professor	MME	PhD, MASc		X			

				Research Fields[3]				
Faculty Name	**Rank[2]**	**Dept [1]**	**Supervisory privilege**	**A**	**B**	**C**	**D**	**E**
Mahla Poudineh	Asst. Professor	ECE	MASc only			X		
Carolyn Ren	Professor	MME	PhD, MASc	x	X	x		
Bryan Tripp	Assoc. Professor	SYDE	PhD, MASc		x	X		x
James Tung	Assoc. Professor	SYDE	MASc only		X	x		x
Mihaela Vlasea	Asst. Professor	MME	PhD, MASc			X		
Thomas Willett	Assoc. Professor	SYDE	PhD, MASc	X	X			
Alexander Wong	Professor	SYDE	PhD, MASc				x	X
Yimin Wu	Asst. Professor	MME	PhD, MASc	x		X		x
Liang-Liang Xie	Professor	ECE	PhD, MASc			x		X
Serhiy Yarusevych	Professor	MME	PhD, MASc		X			
Mustafa Yavuz	Professor	MME	PhD, MASc		X			
John Yeow	Professor	SYDE	PhD, MASc	x		X		x
Alfred Yu	Professor	ECE	PhD, MASc				X	
John Zelek	Assoc. Professor	SYDE	PhD, MASc		x	X		
Totals				9	12	4	7	18

1. This is the home department of the faculty member associated with the program under review.
2. Only those faculty members who are on the Approved Doctoral Dissertation Supervisor (ADDS) list can supervise PhD students.
3. Quality council approved BME fields of study as listed in Section 1.9. (A: Biomaterials, tissue engineering and drug delivery, B: Biomechanics and rehabilitation, C: Biomedical signals and devices, D: Biomedical imaging technology, E: Biomedical informatics), (X: primary research field, x: secondary research field).
4. The faculty member information was collected in Winter 2022

2.2 External Operating Research Funding

Table 2 presents the external and internal research funding by source received by the core faculty, who are listed in Table 1, for the past seven years. Table 2 illustrates that the level of funding is substantial from both public and private sources. The support for graduate students is already established. The level of funding has increased over time from all sources, demonstrating growth and excellence.

TABLE 2

Operating Research Funding[1] ($) by Source and Fiscal Year						
Fiscal Year[2]	**Tri-Agency[a]**	**Public Sector and Non-Profit Funding[a]**	**Private Sector Funding[a]**	**Internal Awards[a,b]**	**Equipment Awards**	**Total**
2015/16	$2,845,040	$1,193,756	$1,257,251	$8,000	$261,580	**$5,565,627**
2016/17	$2,784,518	$1,187,682	$1,402,864	$16,000	$754,801	**$6,145,865**
2017/18	$2,949,103	$1,818,308	$1,495,681	$40,000	$835,133	**$7,138,226**
2018/19	$4,026,755	$4,897,713	$1,419,377	$50,000	$575,194	**$10,969,039**
2019/20	$6,164,613	$5,435,799	$2,374,895	$35,000	$917,999	**$14,928,306**
2020/21	$7,440,206	$4,339,408	$2,524,125	$0	$1,165,232	**$15,468,971**
2021/22	$7,399,306	$3,792,069	$2,885,241	$0	$488,399	**$14,565,015**
Totals	**$33,609,541**	**$22,664,736**	**$13,359,434**	**$149,000**	**$4,998,338**	**$74,781,049**

Notes on Table 2:

This report is composed of 7 fiscal years of data running from 2015/16 to 2021/22

1. Research funding data is reported on the primary investigators identified in Table 1.
2. The fiscal year used when reporting research awards is the fiscal year used by the government. The government fiscal year runs from April 1 until March 31, thus the 2021/22 fiscal year runs from April 1, 2021 until March 31, 2022.

Inclusions and Exclusions

[a] excludes equipment grants.

[b] includes UW-RIF and UW-SSHRC

2.3 Graduate Supervision

Table 3 presents the master's, doctoral, and postdoctoral supervision numbers (current and career-total) by the faculty members that were listed in Table 1, from the three partner departments. The table documents the significant experience of the large faculty group in graduate supervision. Those listed as having only master's privileges are early career professors who are without exception seeking approval to serve as PhD advisers. The lecturer listed may supervise graduate students in the future but is an active teaching champion. One should note that a significant number of current (and past) graduate students are specializing in BME topics within traditional disciplines. Formalization of the new BME program will increase the depth and interdisciplinary endeavors across the members of the program while leading to a healthy growth of the graduate program.

TABLE 3

Completed and Current Numbers[1] of Thesis Supervisions by Faculty Member[2]						
Faculty Name and Rank	**Total Completed Over Career[3]**			**Current[4]**		
	Master's	**PhD**	**PDF**	**Master's**	**PhD**	**PDF**
Eihab Abdel-Rahman - Professor	5	2	0	3	0	1
Arash Arami - Assistant Professor	2	0	0	3	6	2
Catherine Burns - Professor	27	8	5	3	7	0
Naveen Chandrashekar - Associate Professor	12	1	0	2	2	0
David Clausi - Professor	50	24	12	10	5	1
Duane Cronin - Professor	46	10	7	8	8	2
Kerstin Dautenhahn - Professor	5	23	23	4	7	5
Chris Eliasmith - Professor	23	11	3	0	3	1
Paul Fieguth - Professor	21	30	9	2	4	4
Baris Fidan - Professor	4	0	0	1	0	0
Maud Gorbet - Professor	10	3	4	2	4	0
Parsin Haji Reza - Associate Professor	3	1	1	7	4	1
Jennifer Howcroft - Lecturer	0	0	0	0	0	0
Karim Karim - Professor	18	18	5	2	2	0
Behrad Khamesee - Professor	2	0	0	1	0	0
HJ Kwon - Associate Professor	11	6	2	2	2	2
Fue-Sang Lien - Professor	19	16	9	2	6	0
Ewen MacDonald - Associate Professor	29	10	1	1	1	0
Nima Maftoon - Assistant Professor	1	0	1	0	4	0
Veronika Magdanz[5]	0	0	0	0	1	0
Stewart McLachlin - Assistant Professor	3	0	0	4	3	0
John McPhee - Professor	8	2	7	6	7	0
Sushanta Mitra - Professor	0	3	2	0	2	0
Kevin Musselman - Associate Professor	9	4	4	2	6	1
Chrystopher Nehaniv - Professor	2	1	5	0	2	1
Richard Nuckols[5]	0	0	0	0	0	0
Zhao Pan - Assistant Professor	2	0	0	0	0	0
Sean Peterson - Professor	5	1	2	2	2	1
Mahla Poudineh - Assistant Professor	0	0	0	3	2	1
Carolyn Ren - Professor	18	18	8	6	4	4
Bryan Tripp - Associate Professor	5	2	1	4	6	1

Completed and Current Numbers[1] of Thesis Supervisions by Faculty Member[2]						
Faculty Name and Rank	**Total Completed Over Career[3]**			**Current[4]**		
	Master's	**PhD**	**PDF**	**Master's**	**PhD**	**PDF**
James Tung - Associate Professor	5	2	1	3	0	0
Mihaela Vlasea - Assistant Professor	3	2	3	4	4	1
Thomas Willett - Associate Professor	11	1	1	3	4	1
Alex Wong - Professor	23	14	13	10	10	4
Yimin Wu - Assistant Professor	5	2	1	7	5	3
Liang-Liang Xie - Professor	9	3	1	1	9	3
Serhiy Yarusevych - Professor	20	4	3	1	8	0
Mustafa Yavuz - Professor	32	16	10	2	6	4
John Yeow - Professor	4	20	4	2	4	2
Alfred Yu - Professor	9	8	10	6	10	3
John Zelek - Associate Professor	5	2	0	2	0	0
Total	**376**	**217**	**136**	**105**	**132**	**38**

Notes:

1. Numbers self-reported by each faculty member.
2. Faculty members and ranks as specified in Table 1 (from the core supporting departments ECE, MME, and SYDE).
3. Number of thesis supervisions completed thus far over the faculty member's career.
4. Number of current thesis supervisions underway for each faculty member.
5. New faculty members (less than one year on faculty)

2.4 Commitment of Faculty from Other Graduate Programs/Other Institutions

Faculty members from the three Faculties (Engineering, Health, and Science) have participated in the creation of this proposal. In Fall 2022, the proposal was endorsed by faculty vote in the following departments: ECE, MME, and SYDE. There is strong support as well from individual faculty who perform work in BME but whose department may not be formally involved in the administration of the program. Faculty from other programs may apply to be members of the BME program, even if their department is not administratively part of the BME programs.

Within healthcare-related undergraduate and graduate programs across the university, there is an important strategic goal to pursue clinical experiences for students. The University of Waterloo and individual BME faculty members have cultivated relationships and engaged in research collaborations with external organizations in the Kitchener-Waterloo community and beyond so that students may gain access to research facilities as appropriate. Examples within the local area are the Schlegel Research Institute for Aging and Grand River and Saint Mary's Hospitals. Multiple individual faculty members have long-standing research partnerships with McMaster University, University of Toronto, and Western University, that may allow students to gain access to additional resources and facilities.

2.5 Quality of Faculty

The University of Waterloo is consistently ranked among the top universities in the world, thanks in part to the breadth of high-quality research conducted by faculty members. The BME graduate program benefits from incorporating teaching staff from three faculties, whose CVs are compiled in Volume II. To demonstrate the research excellence of the overall BME faculty (those involved with CREATE and those beyond the CREATE programs), a bibliometric overview of the group was performed by the Faculty of Engineering Research Office. BME faculty were sorted into their field of study and their Scopus IDs were used to collect data on their research output. The same metrics and time parameters were applied for each group in the bibliometric database SciVal. Figure 1 shows scholarly output by each of the 5 BME fields listed in Section 1.9 for all publication types. In general, the publication count corresponds to the number of faculty focused on that field. One can observe a slight slowdown in output around 2020 due to the COVID-19 pandemic, followed by a small spike in 2021 as facilities began to reopen and stabilized in 2022.

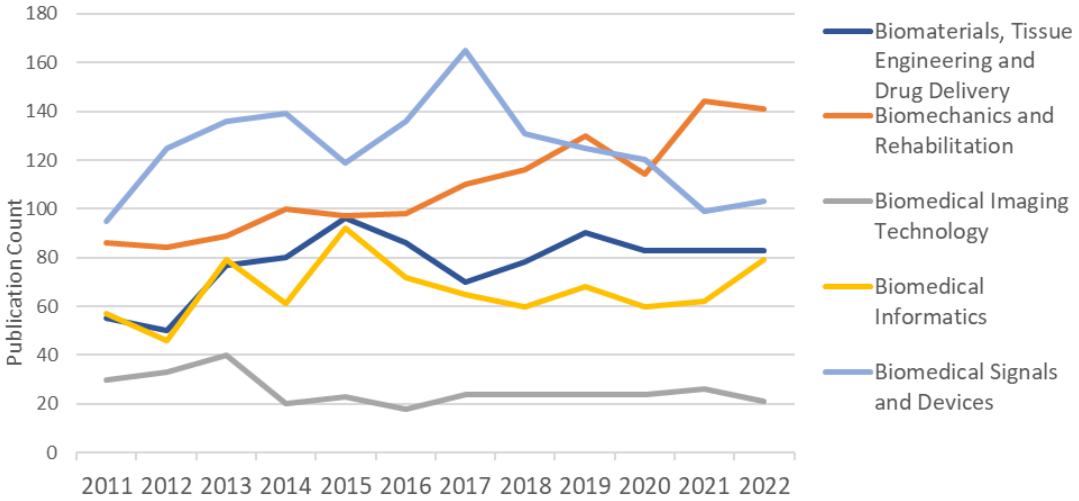


Figure 1. Scholarly Output – All publication types (2011 – 2022) by Research Field

3. PHYSICAL AND FINANCIAL RESOURCES

Due to the long-standing existence of biomedical engineering teaching and research within the traditional engineering departments and their partnerships with cross-campus partners, the new resources needed for this program are not typical. Most of the required faculty resources are already in place, including teaching resources. Additional faculty positions are already approved and will soon be filled.

Support for some of the space and labs used by graduate students will be reallocated within existing groups and compensated using a normalization of new pooled revenue based on the home department of the graduate students' advisers. Operating expenses include student support, staff salaries, faculty salaries/service teaching, program director stipend, student travel and other direct expenses. Financial support to update power and HVAC infrastructure in lab and office facilities is described in section 3.2.

3.1 Library Resources

The University of Waterloo Library purchases and subscribes to numerous resources relevant to BME. Library subscriptions enable access to significant electronic book collections, including Taylor & Francis, Knovel and Springer, and offer access to article indices, such as Scopus and Web of Science. Full text access to many journals is also provided. Given the multidisciplinary nature of BME, resources purchased or licensed to support other faculties and departments at the University expand the breadth of resources available for BME graduate students. These include access to PubMed, Association for Computing Machinery (ACM) Digital Library and publications, Business Source Elite, EconLit, IEEE Xplore Digital Library and publications, and SpringerMaterials. The library's full-text resources are also linked through Google Scholar, which directly connects students to our subscriptions via the search engine.

In response to the COVID-19 pandemic that extended into 2022, the library pivoted to purchasing more electronic content to meet the needs of students while off campus. While electronic procurement was not possible with every title, the library supplemented this by expanding access to print resources through the HathiTrust Digital Library's Emergency Temporary Access Service (ETAS), which permitted special online access for member libraries experiencing unexpected, involuntary or temporary disruptions to normal operations due to the COVID-19 pandemic. Using an ongoing service, students are able to request digitized chapters or articles from a print book in our collection or have print books mailed to their homes or residences provided they are living or staying in Canada.

In addition to the local collection, the University of Waterloo Library partners with other Ontario and Canadian universities to further expand access to information on engineering topics through consortia purchasing at the national and provincial level and through our consortia academic search tool OMNI, which allows users to discover materials from 16 Ontario universities through one search interface.

Should new subject areas emerge within the scope of BME, the library is committed to engaging in discussions to articulate collection needs and assess funding implications. The Liaison Librarian will provide resources during the PACE Module milestones of the proposed program, in particular, to guide students in determining their need for information, locating and evaluating appropriate sources, and properly citing information. The Liaison Librarian is available to answer reference questions via email, telephone, or virtual consultations to support students with their assignments and information needs. Consultations can be booked over email or through the online subject guides for BME at the student's convenience. All are encouraged to make use of the learning, teaching, research support services and expertise the library offers. The Liaison Librarian will interact with the faculty library representatives from the BME graduate program to ensure they are aware of new services.

Representatives from the University of Waterloo Library have prepared a report in Appendix D describing enthusiastic support for the BME graduate programs. Current Library resources and capacity are sufficient to support the programs and there is interest in re-assessing needs should new research areas emerge.

3.2 Laboratory Resources

There are BME-related research spaces and infrastructure spread across ten buildings on the main UW campus, including teaching & individual labs, shared labs, and major research facilities. There are 26 BME research labs in the Faculty of Engineering itself. In addition students will also have access to the 18 Faculty of Health labs that relate to biomechanics, neuroscience and physiology, as well as to resources within the School of Anatomy. The BME researchers and students have access to the analytical facilities in the Faculty of Science such as, the Waterloo Advanced Technology Labs (WATLab); Electron and Confocal Microscopy; Molecular Biology Core Facility; Fusion fluorescence-activated cell sorter (FACS); Mass Spectrometry; Nuclear Magnetic Resonance; X-Ray Diffractometry etc.

In addition, there are several University-administered Research Institutes and Centres that support BME-related research. Examples include:

- Centre of Research Expertise for the Prevention of Musculoskeletal Disorders (CRE-MSD)
- Centre for Theoretical Neuroscience
- Centre for Bioengineering and Biotechnology
- Waterloo Centre for Microbial Research
- Waterloo Institute for Nanotechnology (WIN)
- Giga-to-Nanoelectronics (G2N) Centre
- Central Animal Facility (CAF)
- UW RoboHub

Furthermore, BME faculty at Waterloo have laboratory facilities at external partner locations at the Grand River Hospital, Saint Mary's Hospital, and the Schlegel Research Institute for Aging.

3.3 Computer Facilities

All faculty and graduate students are provided with an account on the university computing system. This account provides access to email, internet, and Microsoft Office 365 applications. Students have access to 3D printing and laser cutting resources through the SYDE.

Research groups can apply for advanced research computing (ARC) resources with the Digital Research Alliance of Canada (formerly Compute Canada).

3.4 Space

Faculty will remain in their current faculty and lab offices in their home departments. Administrative staff will be located in SYDE in the Engineering 5 Building (E5). The Faculty of Engineering at Waterloo is already co-located across departments in approximately 10 buildings. This co-location is intended to promote interdisciplinary interactions such as those intended for the BME graduate program.

Faculty have private offices while post-doctoral fellows and graduate students have shared offices. In many engineering departments, graduate students are co-located based on cluster areas.

Due to the distribution of space across many campus buildings, space allocated to the BME graduate program is estimated by the proportion of BME faculty in Engineering by department in approximate Net Assignable Square Meters (NASM).

Table A: BME Associated Engineering Space Allocations (in NASMs)

	Classrooms (m^2)	**Research Labs (m^2)**	**Offices (m^2)**	**Study Space (m^2)**
ECE	64	228	254	26
MME	300	1654	1391	31
SYDE	420	1296	1503	44

3.5 Financial Support

Financial support will be provided to all admitted BME graduate students. Typical support is two years for master's students and four years for PhD students. A fifth year of support may be provided for PhD students pursuing significant lab or field data collection. Sources of support are the following:

1. Graduate Research Studentships (GRS) from faculty supervisors (minimum $26k for PhD, $18k for MASc, per year);
2. Teaching Assistantships (TA) in support of the core BME graduate courses (typically $5850/course if selected, paid on top of the GRS);
3. scholarships are expected in a new Faculty and Department funding modeling for PhD students with faculty GRS support. The current estimate of the Faculty and Department funding is $5,000 per PhD student per year. This will impact student minimum funding from the advisor and TA allocation and duties;
4. international doctoral student award (IDSA) for all eligible students ($15k/year, paid for by the University);
5. international masters award of excellence (IMAE) for select MASc students ($7.5k/year, paid for by the University).

4. CURRICULUM

4.1 The Intellectual Development and the Educational Experience of the Student

We envision positioning and equipping our graduates to innovate and succeed at the intersecting frontiers of engineering and medicine. To achieve this, we have developed a structure that combines a classical thesis-based research degree with courses and innovative professional development modules that ensure graduates have a solid foundation and

expertise for the pursuit of both academic and non-academic careers in biomedical engineering. Supporting this structure is the very large cohort of faculty establishing the program who have significant experience in interdisciplinary research and pedagogy.

The curriculum program is permeated with interdisciplinarity in both experiential and didactic learning and associated assessment methods. The PACE Module milestones, described in detail in section 4.4 includes sessions to orient the students to the program curriculum and build community. The remaining PACE seminars and workshops build professional skills, leading up to the showcase event and their research thesis. To provide hands-on learning opportunities and technical skill development, most courses will include lab experiences. The internal milestones will be tracked by the BME graduate program office and end-of-term reports will be used for assessment. Self-reflection and tracking of activities will be reported by students to their Advisory Committee on a minimum annual basis. Graduate Studies and Postdoctoral Affairs (GSPA) provides travel awards for students to attend external workshops and conferences. Students will be encouraged to take advantage of existing on-campus resources through the Centre for Career Action, Writing and Communications Centre, and the Centre for Teaching Excellence, among others.

4.2 Program Regulations

The admission requirements have been discussed in detail in section 1.4. The program requirements, including course requirements, are listed below. The comprehensive examination and thesis evaluation procedures and annual student assessments are described in section 1.8.

To maintain good standing during coursework, students must maintain a minimum average of 75%. The regulations meet or require a higher standard than the University of Waterloo and the Faculty of Engineering minimum requirements for graduate programs.

Students in both the master's and PhD programs are required to take one course offered by a faculty outside of Engineering. It must be a graduate level course that directly complements the student's research focus.

An Advisory Committee will be formed to evaluate each student's progress throughout the course of the degree. Each student's Advisory Committee must have a minimum of three Waterloo faculty. At least one supervisor and at least one committee member must be on the list of BME faculty members (see section 2.2). For PhD students, at least one supervisor must have Approved Doctoral Dissertation Supervisor (ADDS) status.

The BME graduate program is supportive of the strategic priority to build work-integrated learning (WIL) experiences into curriculum at the graduate level and is open to exploring opportunities in the future. Note, that the PACE modules (Section 4.4) provide opportunity for this type of training, even though there are no co-operative education work terms or field placements integrated into the BME graduate program, at this time.

4.2.1 MASc (thesis-based master's degree)

- Graduate courses: 4 courses (with 0.5 credits each), including 1 core BME course (BME 601, BME 602, BME 603), 1 field-specific course, and 2 elective courses (Appendix H)
    - The field specific course must be selected from the list in Appendix H.
    - The field specific course and the chosen electives must be approved by the supervisor(s).
    - One course shall be taken from outside the Faculty of Engineering.
    - All courses are ideally completed by the end of term 4.
- PACE Module milestones:
    - Seminar series participation, including the student's research seminar presentation, which must be completed by the end of term 5.
    - PACE days participation
    - Annual BME research day participation
- Thesis research milestones: 2 milestones, plus annual committee progress meetings and term reports
    - Proposal defense: Complete by end of term 3
    - Written dissertation and oral thesis defense: Complete by end of term 6

4.2.2 PhD (regular, with master's degree in BME)

- Graduate courses: 4 courses (with 0.5 credits each), including 1 core BME course (BME 601, BME 602, BME 603), 1 field-specific course, and 2 elective courses.
    - The field specific course must be selected from the list in Appendix H.
    - The field specific course and the chosen electives must be approved by the supervisor(s).
    - One course shall be taken from outside the Faculty of Engineering
    - All courses must be completed by the end of term 4.
    - Students who have completed the MASc program in BME at Waterloo may apply and continue to the doctoral program. In this situation, students will have already completed the core course requirements (one of BME 601, BME 602, or BME 603), a field-specific course and two electives as part of their master's degree requirements. To satisfy the PhD program requirements, these students must complete a total of four courses including a) one core course requirement (one of BME 601, BME 602 or BME 603 that was not completed as part of the MASc in BME program); b) two additional electives; c) an additional field-specific course if they have switched fields between MASc and PhD.
- PACE Module milestones:
    - Seminar series participation, including the student's research seminar presentation, which must be completed by end of term 9.
    - PACE days participation
    - Annual BME research day participation

- Thesis research milestones: 3 milestones, plus annual committee progress meetings and term reports
    - PhD Comprehensive Exam I (Background): Complete by end of term 3
    - PhD Comprehensive Exam II (Proposal): Complete by end of term 6
    - Written dissertation (thesis) and oral thesis defense: Complete by end of term 12

4.2.3 PhD (direct entry, with BME Honors undergraduate degree)

- Graduate courses: 7 courses (with 0.5 credits each), including 2 core BME courses (BME 601, BME 602, BME 603), 1 field-specific course, and 4 elective courses.
    - The field specific course must be selected from the list in Appendix H.
    - The field specific course and the chosen electives must be approved by the supervisor(s).
    - One course shall be taken from outside the Faculty of Engineering
    - All courses must be completed by the end of term 5.
- PACE Module milestones:
    - Seminar series participation, including the student's research seminar presentation, must be completed by the end of term 12.
    - PACE days participation
    - Annual BME research day participation
- Thesis research: 3 milestones, plus annual committee progress meetings and term reports
    - PhD Comprehensive Exam I (Background): Complete by end of term 6
    - PhD Comprehensive Exam II (Proposal): Complete by end of term 9
    - Written dissertation (thesis) and oral thesis defense: Complete by end of term 15

4.2.4 PhD (with non-BME equivalent master's degree)

- Graduate courses: 6 courses (with 0.5 credits each), including 1 core BME course (BME 601, BME 602, BME 603), 1 field-specific course, and 4 elective courses.
    - The field specific course must be selected from the list in Appendix H.
    - The field specific course and the chosen electives must be approved by the supervisor(s).
    - One course shall be taken from outside the Faculty of Engineering.
    - All courses must be completed by end of term 5
- PACE Module milestones:
    - Seminar series participation, including the student's research seminar presentation, which must be completed by end of term 12.
    - PACE days participation
    - Annual BME research day participation
- Thesis research: 3 milestones, plus annual committee progress meetings and term reports
    - PhD Comprehensive Exam I (Background): Complete by end of term 4
    - PhD Comprehensive Exam II (Proposal): Complete by end of term 7
    - Written dissertation (thesis) and oral thesis defense: Complete by end of term 15

4.3 Part-time Studies

Full-time study is required for enrolment into BME Graduate programs. At the discretion of the supervisor and program director, and subject to University's regulations, a switch to part-time may be considered for individual cases.

4.4 Curriculum

All incoming graduate students will complete a set of graduate courses to build their intellectual foundations and to prepare them for the effective undertaking of BME research. To satisfy the program's graduate course preparation requirement, each student must complete the following:

- One core BME course with strong emphasis on engineering analysis or design.
- One field-specific course to be chosen based on the student's research field.
- Elective courses (two for MASc and regular PhD, four for direct-entry and non-BME/equivalent master's degree PhD students) to be chosen by the student in consultation with their supervisor. Core and field-specific courses may be taken as electives.
- One course must be taken outside the Faculty of Engineering.

Core BME Course

All incoming students to the BME program, regardless of previous training, will be required to take one of three approved core courses for the BME graduate program. Each course provides an engineering perspective to human biology at the physiological or cellular level and includes a laboratory experience. Students may choose to take the one that best complements the training they already have in order to build out their BME knowledge and skills. Core courses are as follows:

- BME 601 - Physiological Systems and Biomedical Design: Integrates biomedical design with concepts in human biology and physiology from a quantitative, systems perspective. (Taught by SYDE)

- BME 602 – Foundations in Biomechanical Engineering: Provides foundational knowledge in the biomechanics of human physiology, pathology and treatment. (Taught by MME)

- BME 603 - Engineering Analysis of Living Cells: Teaches cell and molecular biology with a focus on mathematical and engineering modeling. (Taught by ECE)

Students may choose to take the other core courses as electives to broaden their foundational knowledge in quantitative human biology. Core courses will not assume that students have an undergraduate background in BME, biomedical science, life physics or variants thereof. Other common BME background knowledge will be covered as part of the PACE Module milestones (e.g., as part of PACE Day events). It is recommended that students with an undergraduate BME background take BME 603.

The context, vision, and general content for the core courses are described below.

BME 601: Physiological Systems and Biomedical Design
This course surveys the anatomy and physiology of the human body at the cellular, organ and whole-body scale, from a systems biology/physiology perspective. Cell biology and some of the physiological systems (e.g., musculoskeletal, cardiovascular, pulmonary, digestive, renal, nervous and sensory, and immune) and their integration/interactions will be introduced from a quantitative systems perspective. Where applicable, common sources of impairments of each system (e.g., pathologies, aging, etc.) will be presented along with implications for diagnostic, therapeutic and rehabilitative technologies (and universal design). Students will be required to perform engineering design that applies their knowledge in biology and physiology that they have gained throughout the course.

BME 602: Foundations in Biomechanical Engineering
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.

BME 603: Engineering Analysis of Living Cells
Cell biology has reached a stage where it is in dire need of quantitative understanding. The vast amount of data gathered with the advance of experimental technologies, in the search for a general understanding of the complex cell mechanism at the molecular level, have often made the traditional way of direct interpretation impossible. Therefore, recent years have seen significant efforts made to understand these data with more sophisticated mathematical models, using fundamental physical laws and engineering analytic techniques. This course is an introduction to some of the successful achievements of these approaches, and the exciting potential outcomes of this line of research.

Please see Appendix I for the Senate Graduate & Research Council - Graduate Studies Course/Milestone Forms for these three courses.

Professional Attributes and Competence Enhancement (PACE) Module milestones
All BME MASc and PhD students will be required to complete the PACE Module milestones that focus on professional skills development. See Table B for MASc and Table C for PhD students found below. This module will consist of:

1) Active participation in a bi-weekly seminar series, including giving their own research seminar by the end of their final term (as described in 4.2.1 to 4.2.4);
2) a set of professional education day events known as PACE days; and
3) an annual BME research day event.

Students will be required to complete all three components to meet the PACE Module milestones requirement.

Seminar Series

- Biweekly seminar series with students and internal and external BME speakers (1.5-hour duration).
- Each student must attend a minimum of five seminars per term, except for their final term.
- Each student will be required to present a research seminar by the end of their final term.
- Guest speakers will also be invited to speak at this seminar series.
- Seminar topics may be related to BME research or professional development.

PACE Days for both MASc and PhD students

- Two days at the start of every term (~10 hours of instructional time split over both days) will be dedicated to students' professional development.
- MASc students shall participate in PACE Day events at the start of terms 1, 2 and 3.
    - Total contact time around 30 hours (spread over the first year of study).
    - PACE Day activity topics vary for MASc students (Table B).

Table B: PACE Days Activities for MASc Students

Term	Topic	Remarks
1	Research Design and Planning	• Orientation event • Learn how to draft research project plans with need-oriented problem statements, testable hypotheses, feasible designs, technical solutions etc. • Professionalism in following ethics guidelines and regulatory protocols
2	Professional Presentations	• Learn how to give oral presentations to a range of audiences – laypersons, subject experts, professionals in complementary disciplines.
3	Scientific Writing	• Learn how to effectively communicate in technical English to biomedical professionals and engineers

- PhD students shall participate in PACE Days events at the start of every term, from terms #1 to #5.
    - Total contact time around 50 hours (spread over the first two years of the student's study).
    - PACE Days activity topics for PhD students vary from MASc (Table C).

Table C: PACE Days Activities for PhD Students

Term	Topic	Remarks
1	Research Design and Planning	• For non-holders of the MASC-BME degree from Waterloo
2	Professional Presentations	• For non-holders of the MASC-BME degree from Waterloo
3	Scientific Writing	• For non-holders of the MASC-BME degree from Waterloo
4	Vision Development	• Specific to PhD students • Develop a vision for their career (research & professional goals) and the impact it will make, leading to short- and long-term plans. • Learn how to design hypothesis-driven research programs at the frontiers of BME. • Learn about the importance of including sex and gender as variables in BME research (guided by Tri-Council) • Learn about the importance of equity, diversity and inclusivity considerations and the impact they have on research design and outcomes (guided by Tri-Council)
5	Proposal writing and peer review	• Learn how to write grant proposals and business proposals. • Gain experience in conducting peer reviews and mitigating unconscious bias.

BME Research Day

- An annual event that gives students an opportunity to showcase their progress and research findings while building community among BME graduate students.
- The format of the event will model a research conference or symposium, with higher formality than the biweekly seminar series.
- Students will be expected to submit an abstract and give either an oral or poster presentation.
- The BME Research Day may also include keynote speakers from outside the University.

Administrative note:
The PACE Module Milestones will be developed and managed by the BME Graduate Program Coordinator under the direction of the BME Graduate Program Director.

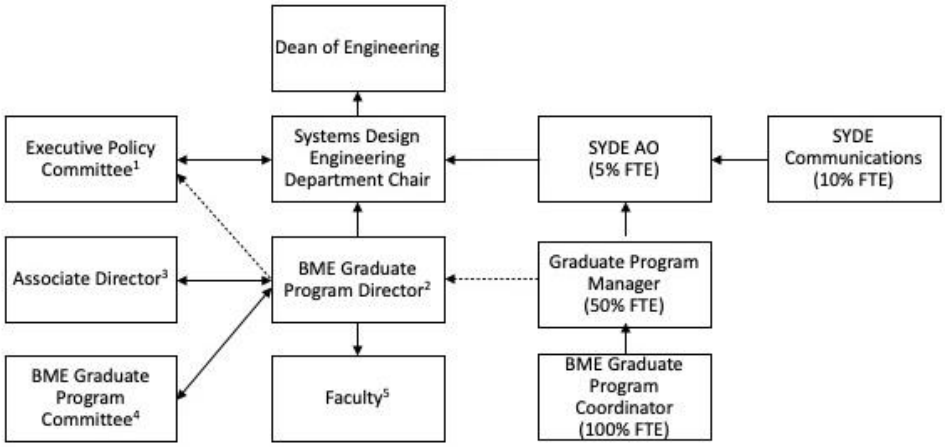
4.5 Collateral and Supporting Departments and Schools

This engineering program is an administrative partnership of three departments in the Faculty of Engineering

- Department of Systems Design Engineering (administrative lead)
- Department of Electrical and Computing Engineering
- Department of Mechanical and Mechatronics Engineering

All individual faculty members, even those in these departments, must apply to the program committees to be associated faculty members that can supervise graduate students in the BME graduate program and supervise graduate students in the program where the coursework and research of graduate students are engineering-based. Other valuable health and science programs exist on campus and complement the work of the BME program faculty and graduate students, while the proposed BME degrees are engineering degrees.

4.6 Organizational Structure



1. Department chairs of partner departments (ECE, MME and SYDE) will serve on the BME Graduate Executive Policy Committee with oversight on policy and resources.
2. Can be a full-time BME faculty member from any partner engineering department.
3. The Director and Associate Director should represent two partner engineering departments.
4. Comprised of 10 faculty members chaired by the Director with oversight of curriculum.
5. Faculty members that wish to supervise graduate students in the BME program will apply to the BME program for membership.

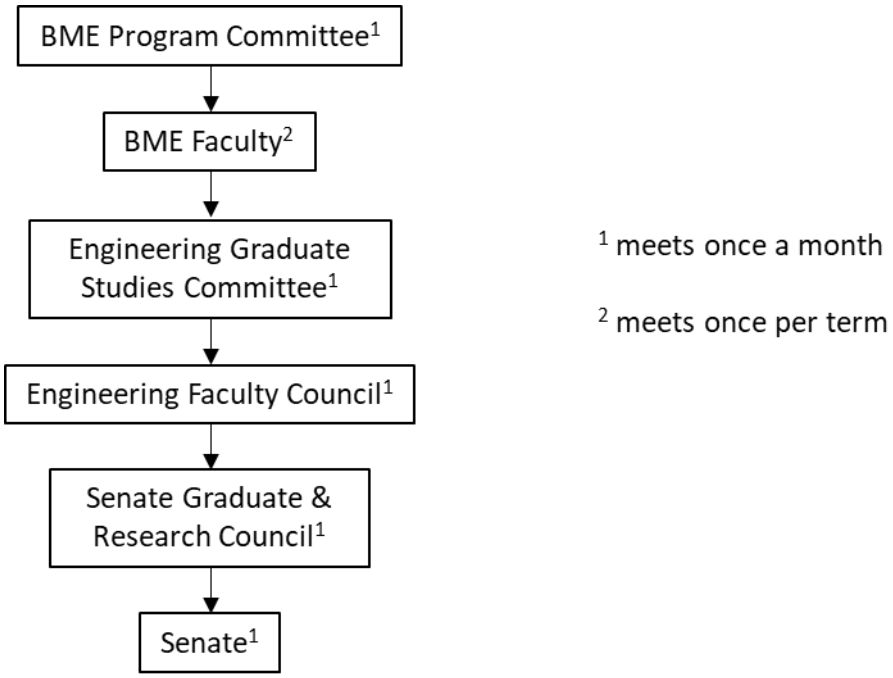
Figure 2: Program Organizational Chart

The organizational arrangements and reporting structures involved in the interdisciplinary, shared program are illustrated in Figure 2. Partner departments in the Faculty of Engineering will be involved in the BME Program Committee, advising, and course instruction. The program will be led by the BME Graduate Program Director who will be a faculty member from any of the partner engineering departments, will report to the chair of SYDE department. The responsibility of the director is to provide strategic direction, including on the curriculum, with the support of the Program Committee. SYDE will function as the administrative home for the program, as it manages the undergraduate program. The arrangement will help minimize costs by sharing some support staff with SYDE. The director or associate director will represent the BME Graduate programs in the Engineering Graduate Studies Committee (EGSC).

The director provides functional supervision to the BME graduate program manager. The director establishes and oversees the components of the PACE Module milestones, while the graduate program manager implements it.

As is the case for all Engineering faculty, partner faculty may apply to the BME Program Membership to serve as graduate advisers. Faculty regardless of home unit are expected to apply for and be approved as faculty advisers in the BME graduate program (see section 4.2). In order to ensure advising faculty members have biomedical engineering expertise, applications to serve as advisers in the programs will be reviewed by the Graduate Program Committee. While this is an engineering program it involves important partnerships with non-engineering units especially in Science and Health. Units with program faculty members may have representations on both the Executive Policy and Program Committees.

The process of BME Graduate Program curricular changes is illustrated in Figure 3.



BME Program Committee: Comprised of 10 faculty members chaired by the Director.

BME Faculty: Approved BME faculty members from any department.

Engineering Graduate Studies Committee: Comprised of graduate associate chairs from the 8 departments/schools in Engineering, 1 faculty member each from the 8 units, BME program director, chaired by the Associate Dean Graduate Studies.

Engineering Faculty Council: Elected legislative body of the Faculty of Engineering

Figure 3: Path of a BME Graduate program curricular change

The first step is that the change will be addressed by the BME Program Committee. This committee will consist of ten members who are appointed for three-year terms by their chairs/directors and will meet monthly. Membership terms will have staggered start and end dates and have an alternate for meeting attendance. Faculty conducting research in all the five research fields must be represented on the committee. There must be at least two members from each of SYDE, MME, and ECE and no partner department may hold a majority on the BME Program Committee. The BME Program Committee will submit approved motions to the collective of BME faculty for vote before motions are submitted to the Engineering Graduate Studies Committee. The BME Graduate Program Director and the BME Undergraduate Program Director will call for a joint BME faculty meeting once per term.

Department Chairs of partner departments (ECE, MME, and SYDE) will serve on the BME Graduate Executive Policy Committee. This committee is called to meet once per term by the SYDE Chair. Meetings are attended by the BME Program Director and Associate Director. The Executive Policy Committee is responsible for budget-related oversight, infrastructure and selection of the program Director and Associate Director.

5. PROJECTED ENROLLMENT

The first intake of new students is planned for 2024 and is expected to be approximately half of the steady-state intake. A modest estimate of the projected enrollment for the master's and PhD programs is given in Table 4a and Table 4b, respectively. The estimates are based on current graduate enrollment in the core supporting departments, the department-based ratios for the current ratio of master's to PhD students, and the ratio of domestic and international students. In steady-state operation the program will attract an increasing number of graduate applicants to BME, contributing to the overall growth of the graduate program.

Table 4a Master's Intake and Enrolment

Projected Student Intake and Enrolment				
Academic Year	**FULL-TIME**			
	Annual Intake[1]		**Total FT Enrolment***	
	Domestic	**International***	**Domestic**	**International****
2024/25	10	5	10	5
2025/26	10	5	20	10
2026/27	10	5	20	10
2027/28	10	5	20	10
2028/29	10	5	20	10

Assuming 100% retention for illustrative purposes

** International fee-paying students

1. Year one intake includes students transferring into a BME graduate program from another Waterloo graduate programs and will be treated on a case-by-case basis.

Table 4b PhD Intake and Enrolment

Projected Student Intake and Enrolment				
Academic Year	**FULL-TIME**			
	Annual Intake[1]		**Total FT Enrolment***	
	Domestic	**International***	**Domestic**	**International****
2024/25	10	8	10	8
2025/26	10	8	20	16
2026/27	10	8	30	24
2027/28	10	8	40	32
2028/29	10	8	40	32

* Assuming 100% retention for illustrative purposes

** International fee-paying students

1. Year one intake includes students transferring into a BME graduate program from another Waterloo graduate programs and will be treated on a case-by-case basis.

It can be anticipated that the first intake may include some current graduate students who are in traditional MASc/PhD discipline programs but would prefer to obtain the BME credential based on their research, course foci, and career goals. Any such student will need to follow the formal Change of Program process and are expected to complete their program on schedule. They will be expected to enroll in the PACE Module milestones and start annual committee meeting requirements upon admission. Course equivalence will be assessed on a case-by-case basis by the BME Graduate Program Director.

6. FINANCIAL PLAN

A financial viability analysis (FVA) investigating the financial parameters and assumptions of the proposed programs was conducted by Institutional Analysis and Planning (IAP) and discussed in detail with the Faculty of Engineering. IAP has not identified significant financial challenges to this proposal moving forward with the proposed enrolment, tuition rate, and costs outlined in the FVA. The financial viability analysis was approved by the Provost on November 23, 2023.

UNIVERSITY OF WATERLOO | Senate

Senate Undergraduate Council

For Approval **Open Session**

To:	**Senate**
Sponsor:	David DeVidi Associate Vice-President, Academic
Presenter: **Contact Information:**	David DeVidi david.devidi@uwaterloo.ca
Date of Meeting:	October 21, 2024
Agenda Item Identification:	**7.1 Report – Senate Undergraduate Council: Major Modification – Quantum Information Option**

Recommendation/Motion:

To approve the proposed major modification to create a new option, Quantum Information (Bachelor of Computer Science, Bachelor of Computing and Financial Management, Bachelor of Mathematics, Bachelor of Software Engineering), effective September 1, 2025, as presented.

Summary:

Senate Undergraduate Council met on September 17, 2024 and agreed to forward the following items to Senate for approval as part of the regular agenda.

Jurisdictional Information:

This item is being submitted to Senate in accordance with Senate Bylaw 2, section 5.03(b): "Make recommendations to Senate with respect to new undergraduate programs/plans, the deletion of undergraduate programs/plans, and major changes to undergraduate programs/plans."

Governance Path:

Mathematics Faculty Council approval date (mm/dd/yy): 05/28/24

Senate Undergraduate Council approval date (mm/dd/yy): 09/17/24

Highlights/Rationale:

The proposed major modification is to create a new option, Quantum Information. The option is available for students in the following degree programs: Bachelor of Computer Science, Bachelor of Computing and Financial Management, Bachelor of Mathematics, and Bachelor of Software Engineering. The option is to be governed by the Faculty with owner units AM, CO, CS, and PM.

The field of Quantum Information studies how the laws of quantum mechanics affect computing, communication, cryptography, and other information processing tasks. Such studies can lead to unexpected applications: algorithms for problems considered intractable for today's computers, and cryptographic schemes with information-theoretic security, among others. These capabilities have generated tremendous interest in the field of Quantum Information in both the academic community and the information technology industry. The interest is reflected in the growing number of students enrolling in the introductory course on quantum information processing. The proposed program builds on the existing expertise and courses on, or related to, this area to provide a solid foundation in its mathematical and theoretical aspects. It thus prepares undergraduate students for future studies and careers in this exciting and important field.

SUC - 2024-09 - Regular Agenda - Faculty of Mathematics

Agenda Page Title

SUC - 2024-09 - Regular Agenda - Faculty of Mathematics

Date	Time	Location
09/17/2024	1:00pm - 3:00pm	Needles Hall 3318

Description

The following motions were approved at UAC (March 25, 2024) and approved at Math Faculty Council (May 28, 2024).

1. Major Program/Plan Modifications

- **Quantum Information Option** - Creation of a new option. To be governed by the faculty with owner units AM, CO, CS, and PM.

2. Regulation Revisions

- **Averages and Academic Standings** - Addition of First-Term Withdrawal Policy.

Attachment(s)

Course Proposals

No proposals have been added.

Program/Plan Proposals

Code	Title	Type	Workflow Step
Quantum Information Option	Quantum Information Option	Program	SUC Subcommittee, SUC Curricular Subcommittee | Under Review

Regulations Proposals

Code	Title	Type	Workflow Step
UG-MATH-Averages and Academic Standings	Mathematics: Averages and Academic Standings	Policy	SUC Subcommittee, SUC Curricular Subcommittee | Under Review

CM Program Code
Quantum Information Option

Under Review | Fall 2025

Proposal Information

Workflow Status

In Progress

SUC Subcommittee, SUC Curricular Subcommittee expand

Waiting for Approval | Approval Delegate(s)

Tim Weber-Kraljevski
Mike Grivicic
Diana Goncalves
Kuali - Arts
Kuali - Env
Melanie Figueiredo
Kuali - Math
Kuali - Eng
Kuali - Hlth

Effective Date and Career

Career

Undergraduate

Important!

Effective Term and Year

Fall 2025

Proposal Details

Proposal Type

New

Academic Unit Approval

03/14/2024

Quality Assurance Designation

Major Modification

Major Modification Categories

Add/re-name a graduate research field, graduate specialization, honours, option, specialization

Recruitment Materials

Yes

Co-operative System of Study and Requirements
No

Creating or Changing Invalid Combinations
No

Rationale and Background for New Program/Plan
The field of Quantum Information studies how the laws of quantum mechanics affect computing, communication, cryptography, and other information processing tasks. Such studies can lead to unexpected applications: algorithms for problems considered intractable for today's computers, and cryptographic schemes with information-theoretic security, among others. These capabilities have generated tremendous interest in the field of Quantum Information in both the academic community and the information technology industry. The interest is reflected in the growing number of students enrolling in the introductory course on quantum information processing. The proposed program builds on the existing expertise and courses on, or related to, this area to provide a solid foundation in its mathematical and theoretical aspects. It thus prepares undergraduate students for future studies and careers in this exciting and important field.

Passed at UAC on 20240325
Passed at MFC on 20240528

Consultations (Departmental)
The following units formally approved the creation of the option and will serve as stakeholder units for its governance.

- Combinatorics and Optimization (2024-03-14)
- School of Computer Science (2024-03-13)
- Pure Mathematics (2024-02-28)
- Applied Mathematics (2024-02-27)

Consultations within IQC included colleagues from ECE, Physics, and Chemistry.

Supporting Documentation

General Program/Plan Information

Faculty
Faculty of Mathematics

Academic Unit
Dean of Mathematics Office

Field of Study
Options: Faculty of Mathematics

Faculty
Faculty of Mathematics

Undergraduate Credential Type
Option

Program/Plan Name
Quantum Information Option

Admissions

Option is available for students in the following degrees

Bachelor of Computer ScienceBachelor of Computing and Financial ManagementBachelor of Mathematics
Bachelor of Software Engineering

Admissions Entry Point

Declare Plan

Declaration Requirements

Requirements Information

Invalid Combinations

No

Average Requirement

Yes

Minimum Average(s) Required

A minimum cumulative overall average of 60.0%

Graduation Requirements

- Complete a total of 4.0 units.

Course Requirements (units)

Required Courses

0
Units to Complete

No Rules

Course Requirements (no units)

Required Courses

- Complete all of the following
  - Complete all the following:
    - PMATH343 - Introduction to the Mathematics of Quantum Information (0.50)
  - Complete 1 of the following:
    - CO481 - Introduction to Quantum Information Processing (0.50)
    - CS467 - Introduction to Quantum Information Processing (0.50)
    - PHYS467 - Introduction to Quantum Information Processing (0.50)
  - Complete 2 of the following
    - Complete 1 of the following:
      - AMATH473 - Quantum Theory 2 (0.50)
      - PHYS454 - Quantum Theory 2 (0.50)
    - Complete 1 of the following:

        - CS231 - Algorithmic Problem Solving (0.50)
        - CS341 - Algorithms (0.50)
    - Choose any of the following:
        - CO432 - Information Theory and Applications (0.50)

- Complete all of the following
    - Complete 3 courses from the following choices:
    - Choose any of the following:
        - AMATH242 - Introduction to Computational Mathematics (0.50)
        - AMATH477 - Stochastic Processes for Applied Mathematics (0.50)
        - CO331 - Coding Theory (0.50)
        - CO471 - Semidefinite Optimization (0.50)
        - CO485 - The Mathematics of Public-Key Cryptography (0.50)
        - CO486 - Topics in Quantum Information (0.50)
        - CO487 - Applied Cryptography (0.50)
        - CS371 - Introduction to Computational Mathematics (0.50)
        - CS466 - Algorithm Design and Analysis (0.50)
        - CS485 - Statistical and Computational Foundations of Machine Learning (0.50)
        - PMATH453 - Functional Analysis (0.50)
        - STAT330 - Mathematical Statistics (0.50)
    - Complete no more than 1 from the following:
        - AMATH373 - Quantum Theory 1 (0.50)
        - PHYS334 - Quantum Physics 2 (0.50)
    - Complete no more than 1 from the following:
        - AMATH474 - Quantum Theory 3: Quantum Information and Foundations (0.50)
        - PHYS484 - Quantum Theory 3: Quantum Information and Foundations (0.50)
    - Complete no more than 1 from the following:
        - CHEM356 - Introductory Quantum Mechanics (0.50)
        - ECE305 - Introduction to Quantum Mechanics (0.50)
        - PHYS233 - Introduction to Quantum Mechanics (0.50)
        - PHYS234 - Quantum Physics 1 (0.50)
    - Complete no more than 1 from the following:
        - CS360 - Introduction to the Theory of Computing (0.50)
        - CS365 - Models of Computation (0.50)
        - PMATH432 - Mathematical Logic (0.50)
    - Complete no more than 1 from the following:
        - PMATH336 - Introduction to Group Theory with Applications (0.50)
        - PMATH347 - Groups and Rings (0.50)
    - Complete no more than 1 from the following:
        - ECE405A - Quantum Information Processing Devices (0.50)
        - PHYS468 - Introduction to the Implementation of Quantum Information Processing (0.50)
- Complete one additional course (0.5 unit) from the above lists

Course Lists

Required Courses

No Rules

Are there cross-listed courses listed in requirements?
Yes

Cross-Listings Options
All cross-listings to be displayed

Additional Constraints

1. Students may only complete one course from any cross-listed set.

Notes

Undergraduate Plan Guidelines

Adherence to Academic Plan Guidelines
Yes

Workflow Information

Workflow Path
Committee approvals

Faculty/AFIW Path(s) for Workflow
Faculty of Mathematics

Senate Workflow
Senate Regular

Dependencies

Dependent Courses and Programs/Plans
There are no dependencies

Senate Undergraduate Council

For Approval **Open Session**

To:	**Senate**
Sponsor:	David DeVidi Associate Vice-President, Academic
Presenter: **Contact Information:**	David DeVidi david.devidi@uwaterloo.ca
Date of Meeting:	October 21, 2024
Agenda Item Identification:	**7.2 Report – Senate Undergraduate Council: Regulation Revision – Mathematics – Averages and Academic Standings – Addition of First Term Withdrawal Policy**

Recommendation/Motion:

To approve the proposed academic regulation revisions to Mathematics: Averages and Academic Standings, Addition of First Term Withdrawal Policy, effective September 1, 2025, as presented.

Summary:

Senate Undergraduate Council met on September 17, 2024 and agreed to forward the following items to Senate for approval as part of the consent agenda.

Jurisdictional Information:

This item is being submitted to Senate in accordance with Senate Bylaw 2, section 5.03(a): "Make recommendations to Senate with respect to rules and regulations for the governance, direction and management of undergraduate studies in the university."

Governance Path:

Math Faculty Council approval date (mm/dd/yy): 05/28/24

Senate Undergraduate Council approval date (mm/dd/yy): 09/17/24

Highlights/Rationale:

The previous iteration of the first-year withdrawal provision/policy was removed from the calendar as of 2019/2020 for two reasons:

- As of fall 2017 a WD grade no longer counted as an unusable course attempt and so there was no academic penalty for withdrawing up until the WD deadline. Students who withdrew from

all courses by the WD deadline would also be free to resume their studies in the following term rather than having to sit out until the following fall.
- After reviewing the data for students who had opted to induce the first-year withdrawal provision it was determined that a negligible amount ever returned to successfully complete a degree in Math illustrating that the provision was not aiding students as it had been intended to.

After the provision was removed from the calendar it was noted that there was no safety net for first-term students who made the decision to withdraw from all courses within the WF drop period. To address this, the Standings & Promotions (S&P) Committee added to their guidelines that students who needed to withdraw from all of their first-term courses during the WF period could petition to have those withdrawals backdated to the WD drop deadline and the petition would be granted. Students would then be eligible to continue their studies in the following term.

Due to this being housed only in the S&P guidelines advisors have been largely unaware of this S&P policy for first-term students needing to drop all courses within the WF period. As such, it is not something that has been presented to students as an option when they find themselves in a catastrophic 1A term and need to fully withdraw after the WD deadline.

Also a factor in this discussion, since fall 2020 the repeat rule has been enforced and as a result, WD grades now carry an academic penalty because they count as one of three maximum attempts students are allowed at any course.

The new proposed provision would do the following:

- Provide a safety net for first-term 1A students who have a catastrophic term and need to withdraw and restart.
- Prevents the first attempts from counting in the repeat rule by backdating the withdrawals to the WD period if necessary and then applying zero-credit weighting.
- Allow students to continue studies in the following term but at a reduced load to account for the fact that something went terribly wrong in their first-term and a lighter work load will allow them more time and space to make the necessary adjustments and seek appropriate supports/resources.

Process:

- Students wishing to take advantage of the new first-term withdrawal provision would contact the Mathematics Undergraduate Office (MUO) to begin the process.
- The MUO would notify an advisor who would connect with the student to discuss what went wrong in their first term and to guide them to appropriate resources moving forward as well as discuss course choices for their next term. As appropriate, an advisor will also help determine if the student's current co-op stream should be changed.
- The MUO would also have the Registrar’s Office (RO) process the withdrawal and apply zero-credit weighting. If the WD deadline had already passed then the RO would be asked to backdate the withdrawals to the WD period before applying zero-credit weighting.
- If first-term students submitted a notice of withdrawal form rather than reach out to the MUO, the RO would need to notify the MUO so that the student could be offered the first-year withdrawal policy and connect with an advisor.
- Students who dropped all of their courses on their own in Quest would also need to be identified by the RO and then highlighted for the MUO.

SUC - 2024-09 - Regular Agenda - Faculty of Mathematics

Agenda Page Title

SUC - 2024-09 - Regular Agenda - Faculty of Mathematics

Date	Time	Location
09/17/2024	1:00pm - 3:00pm	Needles Hall 3318

Description

The following motions were approved at UAC (March 25, 2024) and approved at Math Faculty Council (May 28, 2024).

1. Major Program/Plan Modifications

- **Quantum Information Option** - Creation of a new option. To be governed by the faculty with owner units AM, CO, CS, and PM.

2. Regulation Revisions

- **Averages and Academic Standings** - Addition of First-Term Withdrawal Policy.

Attachment(s)

Course Proposals

No proposals have been added.

Program/Plan Proposals

Code	Title	Type	Workflow Step
Quantum Information Option	Quantum Information Option	Program	SUC Subcommittee, SUC Curricular Subcommittee | Under Review

Regulations Proposals

Code	Title	Type	Workflow Step
UG-MATH-Averages and Academic Standings	Mathematics: Averages and Academic Standings	Policy	SUC Subcommittee, SUC Curricular Subcommittee | Under Review

UG-MATH-Averages and Academic Standings
Mathematics: Averages and Academic Standings

Under Review | Fall 2025

Proposal Information

Status
Active

Workflow Status
In Progress

SUC Subcommittee, SUC Curricular Subcommittee expand ▲
Waiting for Approval | Approval Delegate(s)

Tim Weber-Kraljevski
Mike Grivicic
Diana Goncalves
Kuali - Arts
Kuali - Env
Melanie Figueiredo
Kuali - Math
Kuali - Eng
Kuali - Hlth

Changes

- Admin Notes
- Regulation Details
- Effective Term and Year
- participants

Effective Date & Career

Career
Undergraduate

IMPORTANT!

Proposed
Effective Term and Year
Fall 2025

Existing
Effective Term and Year
Fall 2023

Proposal Details

Proposal Type
Change

Rationale and Background

Rationale:

- The previous iteration of the first-year withdrawal provision/policy was removed from the calendar as of 2019/2020 for two reasons:
    - As of fall 2017 a WD grade no longer counted as an unusable course attempt and so there was no academic penalty for withdrawing up until the WD deadline. Students who withdrew from all courses by the WD deadline would also be free to resume their studies in the following term rather than having to sit out until the following fall.
    - After reviewing the data for students who had opted to induce the first-year withdrawal provision it was determined that a negligible amount ever returned to successfully complete a degree in Math illustrating that the provision was not aiding students as it had been intended to.
- After the provision was removed from the calendar it was noted that there was no safety net for first-term students who made the decision to withdraw from all courses within the WF drop period. To address this, the Standings & Promotions (S&P) Committee added to their guidelines that students who needed to withdraw from all of their first-term courses during the WF period could petition to have those withdrawals backdated to the WD drop deadline and the petition would be granted. Students would then be eligible to continue their studies in the following term.
- Due to this being housed only in the S&P guidelines advisors have been largely unaware of this S&P policy for first-term students needing to drop all courses within the WF period. As such, it is not something that has been presented to students as an option when they find themselves in a catastrophic 1A term and need to fully withdraw after the WD deadline.
- Also a factor in this discussion, since fall 2020 the repeat rule has been enforced and as a result, WD grades now carry an academic penalty because they count as one of three maximum attempts students are allowed at any course.
- The new proposed provision would do the following:
    - Provide a safety net for first-term 1A students who have a catastrophic term and need to withdraw and restart.
    - Prevents the first attempts from counting in the repeat rule by backdating the withdrawals to the WD period if necessary and then applying zero-credit weighting.
    - Allow students to continue studies in the following term but at a reduced load to account for the fact that something went terribly wrong in their first-term and a lighter work load will allow them more time and space to make the necessary adjustments and seek appropriate supports/resources.

Process:

- Students wishing to take advantage of the new first-term withdrawal provision would contact the Mathematics Undergraduate Office (MUO) to begin the process.
- The MUO would notify an advisor who would connect with the student to discuss what went wrong in their first term and to guide them to appropriate resources moving forward as well as discuss course choices for their next term. As appropriate, an advisor will also help determine if the student's current co-op stream should be changed.
- The MUO would also have the Registrar's Office (RO) process the withdrawal and apply zero-credit weighting. If the WD deadline had already passed then the RO would be asked to backdate the withdrawals to the WD period before applying zero-credit weighting.
- If first-term students submitted a notice of withdrawal form rather than reach out to the MUO, the RO would need to notify the MUO so that the student could be offered the first-year withdrawal policy and connect with an advisor.
- Students who dropped all of their courses on their own in Quest would also need to be identified by the RO and then highlighted for the MUO.

Passed at UAC on 20240429

Passed at MFC on 20240528

Supporting Documentation

General Regulation Information

Type of Regulation
Faculty-specific

Faculty
Faculty of Mathematics

Regulation Grouping
Regulations for Faculty of Mathematics Students

Regulation Page Name
Mathematics: Averages and Academic Standings

Description
average definitions, academic standings

Regulation Details

Proposed

Regulation Details

Averages

The Faculty of Mathematics computes several averages that are used to determine a student's academic standing within the Faculty. The average types are:

- **Cumulative Average (CAV):** The average grade of all courses taken by a student that meet the following criteria:
  - were taken while the student was enrolled at the University of Waterloo,
  - are not a specifically excluded course,
  - are eligible for credit toward the student's degree (e.g., ECON211 would not be included in the CAV because all Math students are barred from taking it) and toward their particular academic plan (e.g., CS330 would not be included in a computer science student's major average because it is only for non-majors).
- **Term Average (TAV):** The TAV is just like the CAV except that the courses included are limited to those taken in a specific term. A TAV is computed for each term in which a student is enrolled in the Faculty of Mathematics.
- **Major Average (MAV):** Courses included in the MAV and average requirements are defined in the major academic plan pages.
- **Special Major Average (SMAV):** Some academic plans have a special major average. A SMAV is a kind of MAV. The specific courses in a SMAV are defined in the major academic plan pages.

Notes

1. Courses taken in fall 2013 or later cannot be excluded.
2. Failing grades less than 32 and grades of DNW (did not write exam), FTC (failure to complete), NMR (no mark reported), and WF (withdraw/failure) are counted as 32 for average-calculation purposes.
3. Major Averages and Special Major Averages are calculated after a minimum of three courses are completed. Exception: Computer Science (MAV) and Data Science (MAV) averages are calculated after two courses are completed.

First Term Late Withdrawal Provision

A first-term student who has never previously been registered at a degree-granting post-secondary institution will normally be permitted to withdraw from all of their courses without academic penalty until the last official day to withdraw with a WF for their first term. These courses will continue to appear on the student's academic record with a grade of WD and zero-credit weighting

applied. Such students may resume their studies in the subsequent term at a reduced course load. The maximum allowable course load in the subsequent term will be restricted to 2.0 units. Students wishing to pursue this provision should contact the Mathematics Undergraduate Office.

Academic Standing Within the Faculty

The rules that determine a student's academic standing are specified below. A student's standing determines whether a student is able to proceed in the Faculty or in their chosen academic plan, how many courses they are able to take in the next term, etc.

Academic Standing Table

Conditions	Academic Standing
Any of the following: • The student has more than 4.0 units of failed or excluded courses, or • The student's total unit value of unusable course attempts exceeds 5.0 units, or • In the opinion of Standings & Promotion (S&P) Committee, the student is unlikely to profit from further study in the Faculty or is not making satisfactory progress toward fulfilling degree requirements.	Required to Withdraw – May Not Continue in Faculty
No academic standing above applies, and all of the following: • The student's cumulative average (CAV) is lower than 60%, and • The student has more than 2.0 units and less than or equal to 4.0 units of failed or excluded courses.	Must Change to Mathematical Studies; CAV Low
No academic standing above applies, and all of the following: • The student's major average (MAV) is lower than 60%, and • The student has more than 2.0 units and less than or equal to 4.0 units of failed or excluded courses.	Must Change to Mathematical Studies; MAV Low
No academic standing above applies, and all of the following: • The student's CAV is lower than 60%, and • The MAV is between the required minimum and 5% lower than that, and • The student has more than 2.0 units and less than or equal to 4.0 units of failed or excluded courses.	Must Change to Mathematical Studies; CAV and MAV Low
No academic standing above applies and the student has more than 2.0 units and less than or equal to 4.0 units of failed or excluded courses.	Must Change to Mathematical Studies
No academic standing above applies, and any of the following: • Academic standing from the previous full-time term or equivalent is Conditional or Probation/Conditional and any MAV is below the required minimum, or • Any MAV is below the required minimum and the academic plan's administrators do not give permission for the student to continue, or • Any MAV is more than 5% lower than the required minimum, or • The student is in an Actuarial Science academic plan and special major average (SMAV) is below the required minimum.	Must Change Academic Plan - Plan Average(s) Too Low
No academic standing above applies, and all of the following: • The student's CAV is lower than 60%, and • At least one MAV is between the required minimum and 5% lower than that, and • The academic plan's administrators have given permission for the student to continue.	Probation/Conditional - Must Raise Averages
No academic standing above applies, and the student's CAV is lower than 60%.	Probation - Must Raise Overall Program Average

No academic standing above applies, at least one MAV is between the required minimum and 5% lower than that, and the academic plan's administrators have given permission for the student to continue.	Conditional - Must Raise Plan Average(s)
No academic standing above applies, and the student's CAV is lower than 80%.	Good
No standing above applies, and the student's CAV is at least 80%.	Excellent

Academic Standing Implications Table

The following table describes the implications of the academic standings listed in the Academic Standing Table.

Academic Standing	**Implications**
Required to Withdraw – May Not Continue in Faculty	The student is no longer eligible to study as a Faculty of Mathematics student. This standing normally means that a student is no longer eligible for any subsequent degree studies in the Faculty of Mathematics. Students who are unable to satisfy the major average admission or continuation standard for any honours academic plan will be required to withdraw from the Math Faculty. However, a student may submit a petition to enrol in one final term of non degree studies. Such petitions are likely to be granted only if the student is requesting a non-degree term of courses selected to enhance the chances for admission to a program of study outside the Faculty, either at the University of Waterloo or at some other post-secondary institution. A student who is required to withdraw may graduate with a Three-Year General degree under the Honours Fallback Provision if they meet the requirements when they are required to withdraw.
Must Change to Mathematical Studies; CAV Low	The student is no longer eligible to continue in their current honours academic plan and their major has been changed to Mathematical Studies. Also, the student is not currently meeting the Faculty's CAV standards. If enrolled in a co-op academic plan, the student will normally be suspended from the co-operative education employment process during their next academic term.
Must Change to Mathematical Studies; MAV Low	The student is no longer eligible to continue in their current honours academic plan and their major has been changed to Mathematical Studies. Also, the student is not currently meeting the Faculty's MAV standards. If enrolled in a co-op academic plan, the student will normally be suspended from the co-operative education employment process during their next academic term.
Must Change to Mathematical Studies; CAV/MAV Low	The student is no longer eligible to continue in their current honours academic plan and their major has been changed to Mathematical Studies. Also, the student is not currently meeting the Faculty's CAV and MAV standards. If enrolled in a co-op academic plan, the student will normally be suspended from the co-operative education employment process during their next academic term.
Must Change to Mathematical Studies	The student is no longer eligible to continue in their current honours academic plan and their major has been changed to Mathematical Studies.
Must Change Academic Plan - Plan Average(s) Too Low	The student must change to a different major.
Probation/Conditional - Must Raise Averages	The implications of both probationary standing and conditional standing apply (see below).
Probation - Must Raise Overall Program Average	The student is not currently meeting the Faculty's standards. If enrolled in a co-op academic plan, the student will normally be suspended from the co-operative education employment process during their next academic term.
Conditional - Must Raise Plan Average(s)	The student is not currently meeting their academic plan's standards. If the student's standing does not improve (e.g., by raising their MAV(s) to meet the minimum requirements), they will be required to change their major.
Good	The student may continue with their studies.

Excellent	The student may continue with their studies, and their maximum course load is increased to 3.25 units.

Co-op Standing Rules

Conditions	Co-op Standing
Any of the following: • The student is required to withdraw from the Faculty, or • The student is on academic probation after a full-time academic term for the second time, or • Two unemployed or failed work-term opportunities, or • Three missing or failed PD courses, or • The Standings & Promotions (S&P) Committee deems that the student is unlikely to profit from further participation in co-op or is not making satisfactory progress toward fulfilling co-op degree requirements. Presentation of such requests to S&P result in a notification to the student and an opportunity to reply prior to S&P's decision.	Withdraw from Co-op
No co-op standing above applies, and any of the following: • The student is on academic probation after a full-time term for the first time. • Two missing or failed PD courses.	Co-op Probation
No co-op standing above applies, and in the most recent work term, the employer evaluation was Excellent or Outstanding.	Excellent co-op standing
No co-op standing above applies.	Good co-op standing

Co-op Standing Rules Implications

The following table describes the implications of the co-op standings listed above.

Co-op Standing	Implications
Withdraw from Co-op	The student must withdraw from co-op and will be transferred to the most closely matching regular academic plan for which the student is admissible.
Co-op Probation	The student must meet with a co-op advisor to determine conditions necessary to remediate their co-op standing. A student who is on probation in co-op solely because of their academic standing will be placed in Good co-op standing if they return to Good or Excellent academic standing after one full-time academic term without missing or failing any PD courses. The student's access to the co-op employment process will be blocked pending completion of remedial requirements.
Good co-op standing	Eligible to continue in co-op.
Excellent co-op standing	Eligible to continue in co-op.

Existing

Regulation Details

Averages

The Faculty of Mathematics computes several averages that are used to determine a student's academic standing within the Faculty. The average types are:

- **Cumulative Average (CAV):** The average grade of all courses taken by a student that meet the following criteria:
  - were taken while the student was enrolled at the University of Waterloo,
  - are not a specifically excluded course,
  - are eligible for credit toward the student's degree (e.g., ECON211 would not be included in the CAV because all Math students are barred from taking it) and toward their particular academic plan (e.g., CS330 would not be included in a computer science student's major average because it is only for non-majors).
- **Term Average (TAV):** The TAV is just like the CAV except that the courses included are limited to those taken in a specific term. A TAV is computed for each term in which a student is enrolled in the Faculty of Mathematics.
- **Major Average (MAV):** Courses included in the MAV and average requirements are defined in the major academic plan pages.
- **Special Major Average (SMAV):** Some academic plans have a special major average. A SMAV is a kind of MAV. The specific courses in a SMAV are defined in the major academic plan pages.

Notes

1. Courses taken in fall 2013 or later cannot be excluded.
2. Failing grades less than 32 and grades of DNW (did not write exam), FTC (failure to complete), NMR (no mark reported), and WF (withdraw/failure) are counted as 32 for average-calculation purposes.
3. Major Averages and Special Major Averages are calculated after a minimum of three courses are completed. Exception: Computer Science (MAV) and Data Science (MAV) averages are calculated after two courses are completed.

Academic Standing Within the Faculty

The rules that determine a student's academic standing are specified below. A student's standing determines whether a student is able to proceed in the Faculty or in their chosen academic plan, how many courses they are able to take in the next term, etc.

Academic Standing Table

Conditions	Academic Standing
Any of the following: • The student has more than 4.0 units of failed or excluded courses, or • The student's total unit value of unusable course attempts exceeds 5.0 units, or • In the opinion of Standings & Promotion (S&P) Committee, the student is unlikely to profit from further study in the Faculty or is not making satisfactory progress toward fulfilling degree requirements.	Required to Withdraw – May Not Continue in Faculty
No academic standing above applies, and all of the following: • The student's cumulative average (CAV) is lower than 60%, and • The student has more than 2.0 units and less than or equal to 4.0 units of failed or excluded courses.	Must Change to Mathematical Studies; CAV Low
No academic standing above applies, and all of the following: • The student's major average (MAV) is lower than 60%, and • The student has more than 2.0 units and less than or equal to 4.0 units of failed or excluded courses.	Must Change to Mathematical Studies; MAV Low
No academic standing above applies, and all of the following: • The student's CAV is lower than 60%, and • The MAV is between the required minimum and 5% lower than that, and • The student has more than 2.0 units and less than or equal to 4.0 units of failed or excluded courses.	Must Change to Mathematical Studies; CAV and MAV Low
No academic standing above applies and the student has more than 2.0 units and less than or equal to	Must Change to

4.0 units of failed or excluded courses.	Mathematical Studies
No academic standing above applies, and any of the following: • Academic standing from the previous full-time term or equivalent is Conditional or Probation/Conditional and any MAV is below the required minimum, or • Any MAV is below the required minimum and the academic plan's administrators do not give permission for the student to continue, or • Any MAV is more than 5% lower than the required minimum, or • The student is in an Actuarial Science academic plan and special major average (SMAV) is below the required minimum.	Must Change Academic Plan - Plan Average(s) Too Low
No academic standing above applies, and all of the following: • The student's CAV is lower than 60%, and • At least one MAV is between the required minimum and 5% lower than that, and • The academic plan's administrators have given permission for the student to continue.	Probation/Conditional - Must Raise Averages
No academic standing above applies, and the student's CAV is lower than 60%.	Probation - Must Raise Overall Program Average
No academic standing above applies, at least one MAV is between the required minimum and 5% lower than that, and the academic plan's administrators have given permission for the student to continue.	Conditional - Must Raise Plan Average(s)
No academic standing above applies, and the student's CAV is lower than 80%.	Good
No standing above applies, and the student's CAV is at least 80%.	Excellent

Academic Standing Implications Table

The following table describes the implications of the academic standings listed in the Academic Standing Table.

Academic Standing	**Implications**
Required to Withdraw – May Not Continue in Faculty	The student is no longer eligible to study as a Faculty of Mathematics student. This standing normally means that a student is no longer eligible for any subsequent degree studies in the Faculty of Mathematics. Students who are unable to satisfy the major average admission or continuation standard for any honours academic plan will be required to withdraw from the Math Faculty. However, a student may submit a petition to enrol in one final term of non degree studies. Such petitions are likely to be granted only if the student is requesting a non-degree term of courses selected to enhance the chances for admission to a program of study outside the Faculty, either at the University of Waterloo or at some other post-secondary institution. A student who is required to withdraw may graduate with a Three-Year General degree under the Honours Fallback Provision if they meet the requirements when they are required to withdraw.
Must Change to Mathematical Studies; CAV Low	The student is no longer eligible to continue in their current honours academic plan and their major has been changed to Mathematical Studies. Also, the student is not currently meeting the Faculty's CAV standards. If enrolled in a co-op academic plan, the student will normally be suspended from the co-operative education employment process during their next academic term.
Must Change to Mathematical Studies; MAV Low	The student is no longer eligible to continue in their current honours academic plan and their major has been changed to Mathematical Studies. Also, the student is not currently meeting the Faculty's MAV standards. If enrolled in a co-op academic plan, the student will normally be suspended from the co-operative education employment process during their next academic term.
Must Change to Mathematical Studies; CAV/MAV Low	The student is no longer eligible to continue in their current honours academic plan and their major has been changed to Mathematical Studies. Also, the student is not currently meeting the Faculty's CAV and MAV standards. If enrolled in a co-op academic plan, the student will normally be suspended from the co-operative education employment process during their next academic term.

Must Change to Mathematical Studies	The student is no longer eligible to continue in their current honours academic plan and their major has been changed to Mathematical Studies.
Must Change Academic Plan - Plan Average(s) Too Low	The student must change to a different major.
Probation/Conditional - Must Raise Averages	The implications of both probationary standing and conditional standing apply (see below).
Probation - Must Raise Overall Program Average	The student is not currently meeting the Faculty's standards. If enrolled in a co-op academic plan, the student will normally be suspended from the co-operative education employment process during their next academic term.
Conditional - Must Raise Plan Average(s)	The student is not currently meeting their academic plan's standards. If the student's standing does not improve (e.g., by raising their MAV(s) to meet the minimum requirements), they will be required to change their major.
Good	The student may continue with their studies.
Excellent	The student may continue with their studies, and their maximum course load is increased to 3.25 units.

Co-op Standing Rules

Conditions	Co-op Standing
Any of the following: • The student is required to withdraw from the Faculty, or • The student is on academic probation after a full-time academic term for the second time, or • Two unemployed or failed work-term opportunities, or • Three missing or failed PD courses, or • The Standings & Promotions (S&P) Committee deems that the student is unlikely to profit from further participation in co-op or is not making satisfactory progress toward fulfilling co-op degree requirements. Presentation of such requests to S&P result in a notification to the student and an opportunity to reply prior to S&P's decision.	Withdraw from Co-op
No co-op standing above applies, and any of the following: • The student is on academic probation after a full-time term for the first time. • Two missing or failed PD courses.	Co-op Probation
No co-op standing above applies, and in the most recent work term, the employer evaluation was Excellent or Outstanding.	Excellent co-op standing
No co-op standing above applies.	Good co-op standing

Co-op Standing Rules Implications

The following table describes the implications of the co-op standings listed above.

Co-op Standing	Implications
Withdraw from Co-op	The student must withdraw from co-op and will be transferred to the most closely matching regular academic plan for which the student is admissible.
Co-op Probation	The student must meet with a co-op advisor to determine conditions necessary to remediate their co-op standing. A student who is on probation in co-op solely because of their academic standing will be placed in Good co-op standing if they return to Good or Excellent academic standing after one full-time academic

	term without missing or failing any PD courses. The student's access to the co-op employment process will be blocked pending completion of remedial requirements.
Good co-op standing	Eligible to continue in co-op.
Excellent co-op standing	Eligible to continue in co-op.

Workflow Information

Change to Undergraduate Communication Requirement

No

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

UNIVERSITY OF WATERLOO | Senate

Senate Executive Committee

For Recommendation **Open Session**

To:	**Senate**
Sponsor/Presenters:	Gen Gauthier-Chalifour University Secretary
Date of Meeting:	October 21, 2024
Agenda Item Identification:	**8.1 Guidelines for Visitors to Senate Meetings**

Recommendation/Motion: That Senate adopt the Guidelines for Visitors to Senate Meetings as presented.

Summary:

In March 2024, the Senate Executive Committee (SEC) discussed the need to establish general guidelines for visitors to Senate meetings, which would provide practical guidance to Senate and visitors to Senate with respect to registration of delegations, expectations of decorum at meetings, representations at meetings, etc. Drawing from existing Senate governing documents and relevant University policies and following a review of practices at comparator institutions and an iterative drafting process with feedback from SEC, the enclosed guidelines are brought forward to Senate for consideration and adoption.

The proposed guidelines are consistent with the broad rules pertaining to Senate meetings as outlined the *University of Waterloo Act* section 27(1) as well as Senate Bylaw 1 (sections 3,6,9 and 10), and other University policies and protocols addressing individual conduct, safety and security.

The guidelines have been drafted with the aim of helping Senate to set expectations for visitors to meetings regarding decorum and appropriate conduct at Senate meetings, and to clarify on provisions for the recording/transmittal of Senate meetings.

The guidelines were brought to the Senate meeting of September 23, 2024 and at that meeting it was decided to defer consideration of the guidelines due to time constraints, and to provide senators with an opportunity to share additional comments, with a deadline of Friday September 27, 2024. Comments were received from three senators and are provided (without attribution) in this report.

A parallel document has also been drafted in relation to meetings of the Board of Governors and is anticipated to advance to the Board of Governors, through the Governance Committee, at its October 29, 2024 meeting.

A summary of comments received following the Senate meeting of September 23, 2024, and subsequent revisions recommended by the Senate Executive Committee, are as follows:

1. Strike out "comfortable" in section 1 (incorporated in revised draft)

    - *I will question why this is here, during the meeting. I understand safety and security, but comfort is very subjective, and discomfort is often necessary for change, so including this here seems odd to me.*

2. Removal of points 3.1-3.4 and replaced by indication that the Secretariat will establish and make public a registration process for visitors. This revision was made to provide operational flexibility and in recognition of the need for flexibility depending on meeting mode. Obligations for open meetings and to allow visitors to observe the meeting are codified in the *Act* and Senate Bylaw 1.

3. Section 4.1, minor wording clarification to direct community members to Secretariat for support (incorporated in revised draft)

4. Section 4.2, slight rewording for clarity (incorporated in revised draft)

    - *Does this mean that SEC could recommend an agenda item, which the Chair could refuse to add to the agenda? The bylaws are actually silent on who has final responsibility for the agenda. I guess Bourinot suggests that's the chair?*

      If that's the case, should this clarify to add "...and, if accepted by the Chair, confirmed via..."

5. Rewording section 4.3 for clarity and to specify that exceptions may be made with discretion (incorporated in revised draft)

    - *Section 4.3 — do we really limit *any* speaker to 5 minutes? Surely if senate asks someone (from outside of senate, and thus a visitor) to come and present on a topic, then that person may very well be presenting for longer than 5 minutes?*

6. Suggested rewording of section 4.4 (not incorporated in revised draft, noted for transparency and SEC's consideration)

    - *"shall avoid" seems a bit too mild. It sounds like they should "try". Should we not say that "No personal attacks or offensive references to any individual are permitted by any meeting participant."*

7. Amendment to section 4.9, and suggestion re: section 4.7 (incorporated in revised draft)

    - *in general this is reasonable, but under some circumstances I could imagine a second presentation might be warranted. Shouldn't this constraint be at the judgement of senate executive, rather than being a rule"*

    - *With respect to the guidelines about visitors. I think that guideline 4.7 is a bit strict. I would be in favour of referring to a "subject area" instead of a "subject" and making the max number 2. My rationale is that the current wording may lead to a group making a slight tweak to their subject and then arguing that, technically, it is a new subject. By allowing a subject area to appear twice, we avoid this and we can strictly enforce the two meeting limit. Maybe the wording could be: "An individual or group may request to bring a representative to Senate on a given subject area twice in a Senate meeting cycle (May 1 to April 30).*

Governance Path:

Senate Executive Committee, discussion and amendments (mm/dd/yy): 03/25/24, 04/22/24, 05/28/24

Senate Executive Committee, recommendation to Senate (mm/dd/yy): 09/09/24, 10/07/24

Senate (mm/dd/yy): 09/23/24 (item deferred to October 2024 meeting to invite additional comments from Senators)

Senate (mm/dd/yy): 10/21/24

Attachments:

- Draft – Guidelines for Visitors to Senate Meetings(final version reflecting all changes)
- Draft – Guidelines for Visitors to Senate Meetings (with changes tracked from version distributed to Senate meeting on September 23, 2024)

Guidelines for Visitors to Senate Meetings

Proposed for Approval

1. General

Senate establishes the educational policies of the University and holds powers as outlined in section 22 of *University of Waterloo Act, 1972 ("the Act")*, as amended. These Guidelines are intended to outline attendance expectations for visitors to meetings of the Senate and its standing committees and councils. It is the expectation that the business of these meetings can proceed appropriately and with full attention to a safe and secure environment for all meeting participants.

These Guidelines describe measures that are consistent with the *Act*, Senate Bylaws and other University policies and protocols addressing individual conduct, safety and security.[1]

2. Authority

Section 27(1) of the *Act* requires that meetings of Senate be open to the public

> ...the meetings, including committee meetings of the Board of Governors and of the Senate shall be open to the public, prior notice of the meetings of the Board of Governors and of the Senate shall be given to the members and to the public in such manner as the Board of Governors and the Senate by by-law shall determine, and no person shall be excluded therefrom except for improper conduct...

Senate Bylaw 1, s.6.02, provides that, "Non-members in attendance at meetings shall not disrupt the proceedings of the meeting nor cause any disturbance by unreasonable noise or vocal expression. The chair may remove any such person when, in the chair's sole judgment, such person is engaging in improper or disruptive conduct that is detrimental to Senate carrying out its business."

The *Act*, and Senate Bylaw 1, provide for circumstances in which a meeting of Senate or its committees and councils is held in closed session, "for the purpose of considering confidential financial matters of the university of where intimate financial or personal matters of any person may be disclosed".[2]

3. Registration of Attendance

The Secretariat will establish and make public a registration process for visitors to attend and observe proceedings of the open session of a Senate or Senate standing committee/council meeting.

4. Representations to Senate

4.1 Members of the University community wishing to make representations to a meeting of Senate must file their request with the Secretariat, in writing, by noon on the day of the Senate Executive Committee meeting that precedes the scheduled regular meeting of Senate, as published on the Secretariat website, and include the nature of the proposed representation. Requests should specify how the subject of the proposed representation falls within the jurisdiction of Senate, and also include reference to other internal and/or governance bodies previously engaged in the matter, as appropriate. Any member of the University community may contact the Secretariat for assistance in filing their request.

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[1] https://uwaterloo.ca/secretariat/policies-guidelines-signing-procedures

[2] Senate Bylaw 1, s.7

4.2. Requests are considered by the Chair of Senate on advice of the Senate Executive Committee, and thereafter requests are confirmed via Senate's approval of the meeting agenda.

4.3. Those making representations are normally required to limit their remarks to five minutes, with exceptions at the sole discretion of the chair.

4.4. All meeting participants shall avoid personal attacks or offensive references to any individual.

4.5. A maximum of fifteen minutes may be devoted to representations from individuals and groups who wish to address the members of Senate. These statements will normally be heard following dispensation of the minutes.

4.6. If more than three requests for representations are received for a given Senate meeting, they will be considered in the order received with priority to be given to recognized associations and groups from the University community, as well as to requests pertaining to items of business on the meeting agenda

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

4.8. The Chair of Senate and/or Senate Executive Committee may exercise discretion to appropriately direct the request to a committee or council of Senate or to another governance body.

4.9. The Senate Executive Committee has the authority to adapt the process outlined in these guidelines in cases where its application is uncertain, or to consider exceptions

5. Representations to Senate Standing Committees and Councils

5.1. Senate Bylaw 1, s.9.01, provides that "Any members of the university community, or of the public-at-large, wishing to make representations to any meeting of a committee or council shall file with the secretary of the relevant committee or council, at least two full working days prior to the date of such proposed meeting, written notice to that effect with such notice to designate the nature of the proposed representations."[3]

5.2. Requests for representations to a Senate standing committee or council will be considered by the respective chair and granted with approval from the committee when the agenda is considered.

5.3. The provisions in sections 4.3 to 4.8 of these guidelines shall also apply in the case of representations to a Senate standing committee or council.

6. Order and Decorum

6.1. As the presiding officer of the meeting, the Chair is responsible for maintaining order and decorum at meetings.

6.2. Only duly appointed and elected members of Senate and its standing committees and councils may participate in debate and/or sit at the table. Members of senior administration and/or resource persons who attend meetings of Senate or a standing committee or council to facilitate its work may be called upon to respond to questions. Visitors to meetings do not have speaking privileges unless otherwise provided by the Chair.

6.3. Interference with the progress of a meeting by a visitor will not be permitted and any visitor who attempts to impede the business of the meeting will be instructed by the Chair to leave.

[3] Senate Bylaw 1, s.9.01 is specific to standing committees and councils of Senate, and does not apply to the body of Senate as a whole.

7. Recording of Meetings

Audio and/or video recording or transmittal of meetings is not permitted except where required for participants to support accessibility and meeting participation. The Secretariat may cause the meeting to be recorded for minute-taking purposes. Such recordings will be held confidentially and securely on University-supported servers and destroyed following approval of the respective minutes. Exceptions may be made with permission and at the sole discretion of the Chair of Senate.

8. Contact

Questions related to these guidelines should be directed to the Secretariat at senate@uwaterloo.ca.

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3. Registration of Attendance

The Secretariat will establish and make public a registration process for visitors to attend and observe proceedings of the open session of a Senate or Senate standing committee/council meeting.

~~3.1. Visitors who wish to attend and observe proceedings of the open session of a Senate or Senate standing committee or council meeting are asked to register with the Secretariat in advance of the meeting.~~

~~3.2. Visitors will be granted entrance to the meeting in order of their advance registration with the Secretariat, until such time as the meeting has commenced. In cases where the number of visitors wishing to attend an open session meeting exceeds the physical capacity~~maximum occupancy ~~of the meeting room, space will be granted to individuals in order of their advance registration with the Secretariat until such time as the meeting has commenced.~~

~~• Once the meeting has commenced, space will be granted to individuals in order of their arrival at the meeting.~~

~~3.3. Open session portions of regular meetings are normally also available for visitors to observe by electronic means. Recording or broadcasting of the meeting are not permitted (see section 7).~~

~~3.4.~~ ~~Visitors may be required to sign-in upon arrival at the meeting and the names provided through this process~~

[1] https://uwaterloo.ca/secretariat/policies-guidelines-signing-procedures

[2] Senate Bylaw 1, s.7

~~may~~ ~~will~~ ~~be listed among the attendees included in the official minutes of the meeting~~.

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~~4.1.~~4.2. Requests are considered by the Chair of Senate on advice of the Senate Executive Committee, and thereafter requests are confirmed via Senate's approval of the meeting agenda.~~,~~

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8. Contact

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UNIVERSITY OF WATERLOO

Senate Undergraduate Council

For Recommendation **Open Session**

To:	**Senate Executive Committee**
Sponsor/Presenter: **Contact Information:**	David DeVidi, Associate Vice-President, Academic david.devidi@uwaterloo.ca
Date of Meeting:	**October 7, 2024**
Agenda Item Identification:	**8.2 Senate Undergraduate Council – Report on Curriculum Subcommittee Pilot**

Recommendation/Motion:

That Senate approve the establishment of a curriculum subcommittee for Senate Undergraduate Council, as presented.

Summary:

In response to the request that came out of the Senate Governance Review, the Senate Undergraduate Council (SUC) engaged in a review of its terms of reference and brought forward recommendations to Senate Executive Committee following a series of strategic discussions that occurred from December 2022 to April 2023. As part of this reflective exercise, SUC proposed a one-year term-limited pilot of a curricular subcommittee which was approved by Senate in October 2023.

At the SUC meeting in September 2024, members of SUC discussed their impressions of the pilot and the effectiveness of the subcommittee as well as SUC in light of the pilot, with a short summary of observations included here:

- Support for the curriculum subcommittee, which operates well
- Good utilization of approval at SUC via consent agenda, which frees up bandwidth to be devoted to strategic matters
- The preferred pathway for approval would be for the subcommittee to submit items for the SUC consent agenda, and at this time there is not support for requesting that Senate alter Bylaw 2 to grant the subcommittee power to approve curricular items on behalf of SUC
- General support among current members of the subcommittee for synchronous meetings, though that body may choose to work in other modes e.g. asynchronous, in the future
- Since there is only one student representative on the subcommittee, it does not routinely glean significant feedback from the student perspective or on elements such as co-op, however the inclusion of items for approval at SUC allows for that

feedback to be gleaned later in the process or by members of the subcommittee reaching out to relevant student leaders for input
    - Importantly, student input is also gleaned in departmental/faculty processes, well before SUC consideration, and engagement with co-op is generally (and should routinely) be integrated earlier into the process
- The consent agenda can be voluminous, and so requires diligence to review
- Member orientation will be helpful for transitioning between members and general onboarding, which could be encompassed in a short, written briefing on the roles and processes of the subcommittee

The feedback of SUC is strongly in favour of continuing the work of the subcommittee and also to utilize the structures adopted during the pilot period.

Proposed Terms of Reference, and Membership

SUC proposed the same membership and terms of reference as was approved at the October 2023 meeting of Senate, with the exception of specifying that the undergraduate student member be a delegate of the WUSA President:

Membership:

1. Associate Vice-President, Academic (AVPA) [Chair]
2. The six Faculty Associate Deans for Undergraduate Studies (ADUs)
3. One SUC member from an Affiliated and Federated Institutions of Waterloo (AFIW), one year term
   [this member will rotate between the AFIW represented at SUC, and the member will consult with representatives from other AFIW, as appropriate]
4. One Undergraduate student member of SUC, appointed by the WUSA President, one year term
5. Editor, Undergraduate Calendar (UGC) [non-voting resource to the committee]
6. Coordinator, Quality Assurance (QA) [non-voting resource to the committee]
7. SUC Secretary [non-voting resource to the committee]

SUC Curriculum Subcommittee, Description of Remit and Processes:

1. Currently, when curriculum submissions arrive from Faculties they are reviewed by the Editor, UGC, the Coordinator, QA, and the AVPA. The Editor identifies infelicities and arranges for correction at this early stage; the QA coordinator ensures that major and minor modifications are appropriately categorized; and the AVPA reviews the rationales and flags concerns. With new workflows, the QA review may be completed well before this stage. It remains to be seen whether it will continue to be sensible for the UGC Editor and the AVPA to review

submissions in advance, or if practice may sensibly shift to distribute curricular submissions to subcommittee members as received

2. Members of the subcommittee to review submissions in advance of SUC meetings, with scrutiny akin to that rendered by the ADUs:
    a. Discover clarifications/corrections
    b. Reach out to non-committee members as necessary in this process. This work can take place asynchronously and largely without the need for in-person meetings.
    c. Evolve practices to utilize workflows embedded within the new curriculum and calendar management system
3. Once curricular submissions are revised and refined to address any issues with the submission, a vote will be taken ("Yes/no" on recommending the change to SUC). The aim will be to allow easy and efficient discourse and voting for committee members and will further aim to provide an automatic record of the result. Since a unanimous "yes" vote is currently the typical outcome at SUC, we anticipate that this will remain the normal result in the subcommittee, since required corrections will be made along the way
4. The subcommittee may choose to operate through synchronous meetings, or through asynchronous processes where all members have the opportunity to engage in the business of the subcommittee.
5. Impact on SUC meetings:
    a. The subcommittee would submit a report to recommend to SUC the unanimously approved courses and minor modifications, and this would be brought forward in the consent agenda. It is anticipated that nearly all such curricular business would be handled in three (3) meetings over the course of the year
    b. Where the subcommittee does not obtain unanimous approval, those curricular items would be brought forward to SUC for approval, with an item on the regular agenda for an SUC vote. It is anticipated that this would occur infrequently
    c. The subcommittee would make recommendations to SUC to approve new program proposals, major modifications to programs, and regulation changes to SUC, with this business carried out in the regular agenda

The scrutiny and approval of curricular submissions is allocated rationally to streamline processes, and there continues to be provision for any SUC member to request that any item of business be discussed in greater detail at any time e.g. moving the item from consent agenda to regular agenda.

While this subcommittee only has one student on it, the ADUs confirm that there is significant student involvement on the Faculty-level committees through which

proposals travel before arriving at SUC, and an increasing number of departments have student members on their curriculum/undergraduate affairs committees.

In reviewing current business practices, it appears that for almost all Faculties it will suffice for the Faculties to aim for three "target meetings" for their curricular submissions to be approved by SUC: October/November, January/February, and April/May. As such, it would be worthwhile to ask Faculties to align their business to allow the subcommittee to meet these target dates, and this further aligns with the recent moving of the publication date for the Undergraduate Calendar from February to April, as endorsed by Undergraduate Operations (UOps). This does not prohibit curricular submissions from appearing on the consent agendas of other regularly scheduled meetings.

Jurisdictional Information:

As provided for in Senate Bylaw 2, section 1.04, Senate Executive Council is empowered:

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 Undergraduate Council (mm/dd/yy): 09/17/24

Senate Executive Committee (mm/dd/yy): 10/07/24

Senate approval date: 10/21/24 [prospective]

For Approval **Open Session**

To:	**Senate**
Sponsor:	Secretariat
Contact Information:	senate@uwaterloo.ca
Date of Meeting:	**October 21, 2024**
Agenda Item Identification:	**8.3 Election to Senate Committee**

Recommendation/Motion:

To elect Neela Hassan as the graduate student member of the Academic Quality Enhancement Committee.

Summary:

The membership of the Academic Quality Enhancement Committee is stated in the terms of reference for the committee and includes

> Two members of Senate from the elected student members, one of whom shall be an undergraduate student and one of whom shall be a graduate student.

This election is outside of the time period provided for the delegation of authority from Senate as granted to the Senate Executive Committee at the meeting of September 23, 2024.

At the meeting further nominations will be accepted from the floor. Where there is more than one name for a position, an electronic election will follow the meeting.

Click or tap here to enter text.

Governance Path:

Senate, October 21, 2024

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.

Senate Agenda Items · expected *as needed	**May 6, 2024**	**June 10, 2024**	**September 23, 2024**	**October 21, 2024** *Strategic Plan Annual Update / Waterloo at 100*	**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
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UNIVERSITY OF WATERLOO | Senate

Senate Graduate & Research Council

For Information **Open Session**

To:	**Senate**
Sponsor:	Charmaine Dean Vice-President, Research & International Clarence Woudsma Interim Co-Associate Vice-President, Graduate Studies and Postdoctoral Affairs
Presenter: **Contact Information:**	Clarence Woudsma cwoudsma@uwaterloo.ca
Date of Meeting:	October 21, 2024
Agenda Item Identification:	**11. Report – Senate Graduate & Research Council**

Summary:

Senate Graduate & Research Council met on September 16, 2024 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. Research Ethics

   Council approved membership updates to the Human Research Ethics Board (HREB) and Clinical Research Ethics Board (CREB).

2. Graduate Awards

   Council approved the following graduate awards:

   a. Dean of Engineering Master's Excellence Award (DEMEA) [operating]

   b. Haitham Kamil Graduate Award [trust]

   c. Professor Sofyan Taya Memorial Graduate Scholarship [trust]

   d. Faculty of Engineering Discretionary Graduate Award [operating]

3. Curricular Submissions

   Council approved course changes for:

a. Faculty of Environment: (Geography)

4. Research Institute

   Council approved the renewal of the Waterloo Centre for Astrophysics (WCA) for a five year term.

5. RCR Integrity Administrative Guidelines

   Council received for information updated (July 2024) *Integrity in Research Administrative Guidelines* to reflect changes made to the Tri-Agency Framework on the Responsible Conduct of Research.

6. 2025 Times Higher Education Digital Health Conference

   Council received for information a presentation on the upcoming Times Higher Education Digital Health Summit which will take place April 11 & 12, 2025.

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:

f. 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.

g. 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.

i. On behalf of Senate, consider and approve all new graduate scholarships and awards. Any matter of controversy that might arise may be referred to Senate.

UNIVERSITY OF WATERLOO | Senate

Senate Undergraduate Council

For Information **Open Session**

To:	**Senate**
Sponsor:	David DeVidi Associate Vice-President, Academic
Presenter: **Contact Information:**	David DeVidi david.devidi@uwaterloo.ca
Date of Meeting:	October 21, 2024
Agenda Item Identification:	**12. Report – Senate Undergraduate Council**

Summary:

Senate Undergraduate Council met on September 17, 2024 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. Curricular Submissions

   Council approved course changes, course ownership, and minor plan/program modifications for:

   a. Faculty of Mathematics: (Math Studies Business Specialization)

Jurisdictional Information:

As provided for in Senate Bylaw 2, section 5.03, 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 undergraduate courses; the deletion of undergraduate courses; and proposed changes to existing undergraduate courses and minor changes to programs and/or plans; and provide Senate with a summary of council's deliberations in this regard. Any matter of controversy that might arise may be referred to Senate.

Senate Long Range Planning Committee

For Information		**Open Session**
To:	**Senate**	
Sponsor: **Contact Information:**	James W.E. Rush, Vice-President, Academic and Provost provost@uwaterloo.ca	
Presenter: **Contact Information:**	James W.E. Rush, Vice-President, Academic and Provost provost@uwaterloo.ca	
Date of Meeting:	**October 21, 2024**	
Agenda Item Identification:	**13. Report from Senate Long Range Planning Committee**	

Summary:

Senate Long Range Planning Committee met on September 11, 2024. A summary of the item discussed is provided for the information of Senate.

1. Cross-Institutional and Multidisciplinary Initiatives—Briefing and Discussion

The committee received presentations which showcased collaboration across department, schools and Faculties to bring innovative opportunities in teaching and research, along with driving potential new advancement opportunities, and creating avenues for supporting and informing government policy. The initiatives have taken specific efforts to align their focus with the five Global Futures enunciated in Waterloo at 100.

- Global Futures Capstone Experience / iCapstone
  - Capstone project on the theme of "Future Cities", with 120 students pursuing 21 project ideas, with courses offerings across five Faculties
  - Project work engaged a variety of partners including municipalizes, real estate developers, and engineering/technology professionals
- Future Cities Institute
  - Engagement with city builders in applied, interdisciplinary teaching, research and knowledge mobilization focused on problem solving in cities
  - Focusing on building metrics, fostering relationships within the campus community to engage faculty and students, and forming partnership with industry and government

2. Planning for the Upcoming Cycle of Committee Meetings

The committee reviewed feedback from the annual Senate survey at the June 2024 meeting, and resolved to allocate time at the September meeting to discuss the committee's mandate and how to strategically fulfill the mandate, along with generating strategic topics for the committee to focus on for the 2024-25 year. The committee highlighted its unique role in the Senate governance structure to serve as a coordinating body and making recommendations to Senate in all matters pertaining to the planning of the academic, physical, and operational development of the University; this dovetails with the work underway on integrated planning. The committee emphasized the need to gain fluency in key files e.g. strategic mandate agreements, to facilitate discussions that will inform Senate in those areas. The committee will develop a repository of key topics and will prioritize those topics for discussion.

For Information **Open Session**

To:	**Senate**
Sponsor:	Vivek Goel President and Vice-chancellor James W.E. Rush Vice-President, Academic and Provost
Presenter: **Contact Information:**	Vivek Goel president@uwaterloo.ca
Date of Meeting:	October 21, 2024
Agenda Item Identification:	**14. Report – Honorary Degrees Committee: 2024 Fall Convocation List of Honorands**

Summary:

The Honorary Degrees Committee announces the 2024 Fall Convocation List of Honorands:
Note (S) = speaker

Faculty of Environment and Faculty of Health: Friday, October 25, 2024, 10:00 a.m.
Myeengun Henry - Doctor of Laws (S)
Jagdeep Singh Bachher – installation as Chancellor of the University of Waterloo

Faculty of Mathematics: Friday, October 25, 2024, 2:30 p.m.
[no honorand for Fall 2024 ceremony]

Faculty of Science: Friday, October 25, 2024, 6:30 p.m.
Barb Moffatt – Distinguished Professor Emerita
Sherry Schiff – Distinguished Professor Emerita
Danielle Paes – Invited Guest Speaker (S)

Faculty of Arts: Saturday, October 26, 2024, 10:00 a.m.
Mark Yantzi – Doctor of Laws (S)
Guy Poirier – Distinguished Professor Emeritus

Faculty of Engineering: Saturday, October 26, 2024, 2:30 p.m.
Jim Estill – Doctor of Laws (S)
Howard Armitage – Distinguished Professor Emeritus

Biographies (in order of ceremonies)

Myeegun Henry

Elder Myeengun Henry joined the University of Waterloo in 2022 as Indigenous Knowledge Keeper in the Faculty of Health. He is former Elected Chief and band councilor for the Chippewas of the Thames First Nation. He served as Manager of Indigenous Services and educator of Indigenous Studies at Conestoga College. Elder Henry conducts Indigenous ceremonies and teachings on campus. He is also a traditional medicine practitioner, environmental protectionist, Indigenous counsellor, Pow Wow coordinator and Indigenous advisor to the Ontario Provincial Police and Law Society of Ontario. Elder Henry works with compassion alongside the Office of Indigenous Relations toward reconciliation.

Jagdeep Singh Bachher

Dr. Jagdeep Singh Bachher is chief investment officer and vice president of investments at the ten-campus University of California (UC), where he oversees an investment portfolio of $164 billion. Born in Nigeria, he emigrated to Canada with his family in 1988 and began his studies at Waterloo shortly thereafter at the age of 15. He is a triple alumnus of the University, having earned his bachelor's (BASc 1993, mechanical engineering), master's (MASc 1994, management sciences) and doctoral (PhD 2000, management sciences) degrees all at Waterloo.

Dr. Bachher has demonstrated leadership in the areas of equity, diversity, inclusion and anti-racism at UC including strengthening the diversity of his investment team, committing to diverse-owned investment partners (now managing 40% of UC investments), and divesting from assets categories including private prisons and predatory lending. He has led the divestment of fossil fuel assets from the UC investment portfolio.

An ardent believer in the power of education, he has been instrumental in developing educational opportunities including the UC Investments Academy, the UC Investments/Toigo Fellowship, and a program for UC students and postdoctoral fellows to participate in the annual Lindau Nobel Laurate meetings. He is a visiting scholar in the *Global Projects* Center at *Stanford* University and has served on the University of Waterloo Board of Governors since 2018, including in his current role as vice-chair.

Barb Moffatt

Professor Moffatt is a plant biologist whose research focused on the role of enzymes in plant development and was a pioneer in early aspects of molecular genetics. In her teaching she encouraged students to think critically rather than memorize facts. She was a Biology program advisor for most of her career. Her commitment to students led to her receiving the University of Waterloo Distinguished Teaching Award in 2007 and she served as Associate Dean, Student Relations for ten years. She considers being able to share her passion for science with hundreds of students each year, and then to see them flourish as her greatest honour.

Sherry Schiff

Sherry Schiff received her BSc (1978) from McMaster University, and her MA (1981), MPhil (1984), and PhD (1986) in Geological Science from Columbia University. She joined the University of Waterloo in 1986 as an NSERC Post-Doctoral Fellow in the Department of Earth and Environmental Sciences. In the following year was hired as an Assistant Professor (1987), and then promoted to Associate Professor (1992) and finally full Professor (1998). Professor Schiff is a distinguished and innovative researcher in the field of watershed biogeochemistry, who has made significant contributions to environmental science and has been recognized as a leader in the field of environmental and isotope biogeochemistry. She established an internationally renowned research program, focusing on the cycling of key elements within lakes, rivers, forests, and agricultural watersheds.

Danielle Paes

As award-winning clinician and dedicated patient advocate, Dr. Danielle Paes is well recognized as a dynamic and forward-thinking healthcare leader. She earned her bachelor and Doctor of Pharmacy degrees from the University of Waterloo and holds a Bachelor of Science in applied pharmaceutical chemistry from the University of Guelph.

Dr. Paes currently holds the position of Chief Pharmacist Officer at the Canadian Pharmacists Association, where she is driving strategic efforts in the areas of pharmacy practice, workforce sustainability and diversity, equity and inclusion.

In addition to her genuine passion, her unique career portfolio gives Dr. Paes a national lens, enabling her to provide leadership and guidance on key issues facing health care in Canada. One of her greatest joys is spending time with her partner and their two bright and curious children.

Mark Yantzi

Mark Yantzi is a pioneer in restorative justice and a leader in addressing conflict. He earned a BA in Sociology in 1969 and a MASC in Human Relations and Counselling in 1977, both from the University of Waterloo. As a parole officer in the 1970's, Yantzi implemented Canada's first formal use of restorative justice in criminal sentencing. He founded and led Community Justice Initiatives, developing programs to support victims and offenders. He served Waterloo as City and Regional Councillor and was a mediator for Correctional Service of Canada. He is author of *Sexual Offending and Reconciliation* and recipient of Conrad Grebel University College's Distinguished Alumni Service Award.

Guy Poirer

Dr. Guy Poirier retired in 2023 from Waterloo's Department of French Studies after 20 years of service. During his tenure at Waterloo, he was department chair for 8 years. Poirier is recognized for his scholarship on representations of gender and homosexuality in Early Modern France and on Jesuit travel narratives in New France. His excellence and impact have been recognized in numerous ways including the 2023 Canadian Society for Renaissance Studies Lifetime Achievement award and as co-recipient of the 2020 Gabrielle-Roy Prize. In 2021, he was elected a Fellow of the Royal Society of Canada for his contributions to Renaissance Studies in Canada.

Jim Estill

Jim Estill, is the President and CEO of Danby Appliances, a role he has held since 2015. A successful entrepreneur and investor, he has backed over 150 start-ups throughout his career. In 2015 Estill gained international recognition for sponsoring the resettlement of 50 Syrian refugee families in Canada. In honor of his philanthropic contributions, he was awarded the Order of Ontario in 2017 and the Order of Canada in 2018. Estill holds a Bachelor of Science in Systems Design Engineering from the University of Waterloo and an Honorary Doctorate of Laws from the University of Guelph.

Howard Armitage

Howard Armitage is Professor Emeritus and Founder of the Conrad School of Entrepreneurship and Business at the University of Waterloo. He has served as Director of the School of Accounting and Finance and Special Advisor to the President for Entrepreneurship. He holds a PhD from Michigan State University and an MBA from the University of Alberta. Armitage has received numerous accolades, including the 3M Teaching Fellowship, "Start-up Canada" Entrepreneurship Educator of the Year and the City of Waterloo's highest civic award. Armitage is widely published and a sought-after speaker, focusing on entrepreneurship and innovation's role in driving organizational and community growth. He has worked with global institutions such as the World Bank, assisting countries in developing entrepreneurship programs.

For Discussion	**Open Session**
To:	**Senate**
Sponsor: **Contact Information:**	Charmaine B. Dean, Vice President Research and International vpri@uwaterloo.ca
Presenter: **Contact Information:**	Charmaine B. Dean, Vice President Research and International vpri@uwaterloo.ca
Date of Meeting:	**October 21, 2024**
Agenda Item Identification:	**15.1 Awards, Distinctions, Grants, Waterloo International Engagements**

Summary:

Presenting the Vice-President, Research and International Report to Senate for October 2024. This report to Senate highlights successful research, international and entrepreneurial outputs and outcomes for the period July and August 2024 by the thematic areas as outlined in Waterloo's Strategic Plan 2020-25.

Documentation Provided:

- Vice-President, Research and International October 2024 Report to Senate

Vice-President, Research & International
Report to Senate
October 2024

Introduction
This report to Senate highlights successful research and international outputs and outcomes for the period July and August, 2024.

Velocity Highlights:

Health Tech Spotlight
Canada's population could double in the next 50 years, and the population of people aged 85 and older could triple, according to the Statistics Canada data released in July 2024. The following are University of Waterloo connected companies working in aging research recently featured at Velocity.

Ibukun Elebute (Founder and Master of Business, Entrepreneurship and Technology (MBET) – current) – ForeAltMedical Inc.
ForesAIt Medical Inc. assists hospitals and long-term care homes with software aimed to help chronic disease patients and their health-care teams manage their health more effectively. The platform uses health data from wearable devices and applies AI-driven analytics.

Parthipan Siva (Co-founder and Post-Doctoral student – current, Systems Design Engineering) and Shannon White (Co-founder, BMath '91, MMath '93) - Chirp
Chirp is a startup that makes hardware to detect falls and other movement. Chirp's fire alarm-sized, wall-mounted device uses radar to alert caregivers and health-care providers if a person's movement has changed.

Shirley Tang (Founder and Associate Dean of Science, Research, University of Waterloo) – HeMeTekx
HeMeTekx Inc. is developing a point-of-care device, which uses nanobiosensor technology and AI, to measure many common biomarkers that are currently only available in a clinical lab or emergency department. The platform aims to make essential blood tests more accessible.

Morteza Ahmadi (Founder and PhD, '13 – Systems Design Engineering) - Qidni
Qidni's portable and nearly waterless dialysis makes the procedure accessible for patients with kidney failure. Founder and CEO, Morteza Ahmadi, says that standard dialysis uses large and expensive machines that require patients to receive treatment at a clinic three to four times a week. Qidni's device allows patients to dialyze anywhere and at any time.

Philip Cooper and Michael Phillips - (Co-founders and BASc. '17 - Mechanical and Mechatronic Engineering with Entrepreneurship option) - Vena Medical
Vena Medical recently passed a medical milestone as The Ottawa Hospital adopted their Balloon Distal Access Catheter, the first device the company ever brought to market and developed here in the province. The device combines the attributes of the balloon-guide catheters and distal access catheters that are currently used in thrombectomy to remove clots from the brains of stroke patients.

Jessica Lunshof (Co-founder and BScKin., '23) and Jordan Lunshof (Co-founder, BScKin., '23) - TAMVOES
TAMVOES is a startup that has created a platform that gives patients access to their own health care information so they can track and share care plans and appointments. The team has also branched out into home care services.

Dr. Alison Smith (Co-founder and PhD – Neuroscience, '09) - Roga
Roga is a Healthtech company that aims to advance the fields of Neurotech and AI with a wearable device that helps reduce feelings of stress, anxiety and burnout. In this period, the mental healthcare-focused company secured $1.7 million CAD ($1.2 million USD) in pre-seed funding and support from a slew of healthtech investors to fuel the launch of its next-generation wearable device.

Nima Zamani (Co-founder and CTO, BASc.,'14 and MASc.,`16 – Mechanical and Mechatronics Engineering) and Tim Lasswell – (Co-founder, BASc.,'14 and MASc.,`17 – Mechanical and Mechatronics Engineering) and John Van Leeuwen (Co-founder, BSc.,'81 - Chemistry) and Matthew Sefati (CEO and BSc '16) - Cobionix Corporation
Cobionix Corporation has pioneered a robotics platform called Cobi and outfitted it with a needle-free injection technology for patients to receive intramuscular injections, such as vaccines, with no involvement from a healthcare professional.

Other Velocity Highlights:

Danielle Rose (Co-founder and MA candidate – Biology, current) and Matthew Rose (Co-founder and BASc. '21 - Mechanical and Mechatronic Engineering) - Ceragen
Ceragen is a biotechnology company focused on helping farmers increase their crop yields through plant microbiome engineering. In this period, it gained US$2 million seed funding to help grow its portfolio of products and expand into new markets.

Dr. Sebastian Fischmeister (Founder and Professor, Mechanical and Mechatronic Engineering) – Palitronica Inc.
Palitronica Inc. provides cyber and quality assurance solutions for the Zero Trust Supply Chain and helps guard against manufacturing defects, counterfeits and malicious hardware and software attacks. In this period, Palitronica was featured in Canada's National Observer's article on increasing cyber security risks facing the country.

Dr. Michael Pope (Associate Professor, Chemical Engineering) and Evelyn Allen (CEO and Velocity Co-Founder) - Evercloak
Evercloak is an advanced material company with a breakthrough approach in producing 2D nanofilms to significantly reduce the energy use and associated greenhouse gas related to building cooling by commercializing a manufacturing platform for producing continuous, large area nanofilms. In this period. In this period, Evercloak Inc. secured additional funding to accelerate the development of its membrane-based system for low carbon HVAC technology. The $1.1 million comes from Natural Resources Canada (NRCan)'s Energy Innovation Program (EIP).

Funded Research Awards:

Canada Foundation for Innovation (CFI) - JELF
JELF funding helps institutions recruit and retain outstanding researchers and acquire the tools that enable their innovative research. In this period, 11 JELF grants were awarded that totaled **$1,019,410.**

Annemarie Dedek (School of Pharmacy)
Title: Translational approaches to studying chronic pain
Amount: $100,000
Christian Euler (Chemical Engineering)
Title: Scalable biomanufacturing for a net-zero economy
Amount: $84,721
Moojan Ghafurian (Systems Design Engineering)
Title: Social robots for supporting older adults and children
Amount: $95,000
Sheereen Harris (Kinesiology and Health Studies)
Title Integrating behavioural science and digital health approaches to predict and promote physical activity
Amount: $100,000
Neil Hester (Psychology)
Title: Creation and validation of the Waterloo dress database to support impression formation research
Amount: $22,000
Yilan Liu (Chemical Engineering)
Title: Developing synthetic symbiotic bacterial consortia for mixed plastic upcycling
Amount: $80,000

Alana Lund (Civil and Environmental Engineering)
Title: Uncertainty-aware structural identification testbed for bridge infrastructure
Amount: $110,000
Abiola Olaitan (Biology)
Title: Developing a high-throughput genome-wide screening system to study stress defense mechanisms in clostridioides difficile
Amount: $150,000
Elisabeth Prince (Chemical Engineering)
Title: Injectable filamentous hydrogels for regenerative medicine
Amount: $92,689
Joshua Pulsipher (Chemical Engineering)
Title: CPU-GPU accelerated optimal process design and control to rigorously model space-time
amount: $80,000
Pejoohan Tavassoti (Civil and Environmental Engineering)
Title: Developing next generation of green pavement technologies
Amount: $105,000

ECO Canada

Eco-Canada is a wage subsidy program that helps youth to gain experience within the natural resources field. In this period, two research assistants were funded under the supervision of Amelia Clarke, Faculty of Environment.

Government of Alberta - Forest Resource Improvement Program (FRIP)

This program supports projects that enhance forest resources and improve the integrated management of Alberta's forested lands. In this period, the following project was funded:

Monica Emelko (Civil & Environmental Engineering)
Title: Assessing the effects of wildfire on drinking water supplies to inform forest management practices
Amount: $758,000

National Capital Region – Public Services and Procurement Canada (PSPC)

The Government recently announced Public Services and Procurement Canada (PSPC) would develop new tools, guidelines and targets to support the adoption of green procurement across the federal government. In this period, the following project was funded:

Steven Young (School of Environment, Enterprise & Development)
Title: Conducting a life cycle assessment for large and complex scientific equipment
Amount: $179,309

National Research Council Canada (NRC)

NRC is the primary national research and technology organization in Canada. It conducts scientific research, supports industrial innovation, and helps with the development of technologies across various sectors, including engineering, aerospace, health, and energy. In this period, the following projects were funded:

Carl Haas (Civil & Environmental Engineering)
Title: Development of a Canadian Construction Automation and Robotics R&D Roadmap
Amount: $120,000.00

Andrea Scott (Mechanical & Mechatronics Engineering)
Title: Mapping the St. Lawrence River Ice Cover Using Satellite Data
Amount: $38,100.00

NSERC

NSERC Alliance Advantage

Alliance Advantage grants (formerly Alliance cost-sharing option 1) are for partner-driven projects**.** They fund projects focused on the partners' goals, with at least one partner sharing in the costs of research. In this period, 16 Alliance Advantage grants were awarded that totalled **$9,579,841.**

Dayan Ban (Electrical and Computer Engineering)
Title: Self-powered sensing for structural health monitoring
Partner: Shimco
Amount: NSERC award $225,000 over 3 years (+ $150,000 cash and $120,000 in-kind from partner contributions recognized for cost sharing)

Slim Boumaiza (Electrical and Computer Engineering)
Title: Developing high performance integrated transceivers and antenna arrays for 6G high-hand communication systems
Partners: C-Com Satellite Systems, Skyworks Solutions Inc. (Canada)
Amount: NSERC award $3,706,088 over 4 years (+ $1,853,044 cash and $1,252,600 in-kind from partner contributions recognized for cost sharing)

David Blowes (Earth & Environmental Sciences)
Title: Application of Novel Characterization Approaches to Northern Abandoned Mine Sites
Partner: Government of Canada
Amount: NSERC award $1,893,029 over 5 years (+ $946,855 cash and $70,000 in-kind from partner contributions recognized for cost sharing)

Giovanni Cascante (Civil & Environmental Engineering)
Title: Improved scanning technologies for the application of high-power ultrasonic guided waves for CANDU® piping inspection
Partner: Kinectrics Inc.
Amount: NSERC award $207,693 over 3 years (+ $103,845 cash and $126,750 in-kind from partner contributions recognized for cost sharing)

Charles Clarke (David R. Cheriton School of Computer Science)
Title: Tools to Support Lateral Reading of News Articles
Partner: Microsoft Vancouver
Amount: NSERC award $100,000 over 2 years (+ $50,000 cash and $68,000 in-kind from partner contributions recognized for cost sharing)

Duane Cronin (Mechanical and Mechatronics Engineering)
Title: Side impact safety for vulnerable populations enabled by finite element human body models
Partner: Honda R&D Americas, Inc.
Amount: NSERC award $223,636 over 3 years (+ $130,314 cash and $72,321 in-kind from partner contributions recognized for cost sharing)

Kyle Daun (Mechanical and Mechatronics Engineering)
Title: Radiative Properties of Galvanneal for Process Control
Partners: Teck Metals Ltd, International Zinc Association, Williamson Corp., Stelco Inc.
Amount: NSERC award $307,692 over 4 years (+ $153,846 cash and $107,300 in-kind from partner contributions recognized for cost sharing)

Adrian Gerlich (Mechanical and Mechatronics Engineering)
Title: Welding Technologies for the SMR Supply Chain
Partners: Liburdi Engineering Limited, Natural Resources Canada, Canadian Nuclear Laboratories Limited, Terrestrial Energy Inc., Sorsys Technologies Inc
Amount: NSERC award $370,693 over 2 years (+ $161,307 cash and $221,250 in-kind from partner contributions recognized for cost sharing)

Guang Gong (Electrical and Computer Engineering)
Title: Efficient post-quantum secure mechanisms for video conferencing systems
Partner: TAURIA Inc.
Amount: NSERC award $192,000 over 3 years (+ $96,000 cash and $92,000 in-kind from partner contributions recognized for cost sharing)

Kaan Inal (Mechanical and Mechatronics Engineering)
Title: A machine learning-based constitutive model to predict fracture and crashworthiness of quenched and partitioned steels
Partner: Natural Resources Canada
Amount: NSERC award $60,000 over 1 year (+ $30,000 cash and $30,000 in-kind from partner contributions recognized for cost sharing)

Kunho Eugene Kim (Civil & Environmental Engineering)
Title: Investigating Impacts of Construction Contaminants to Fibre Reinforced Polymer (FRP) Internal Reinforcing Bars
Partners: Ontario Ministry of Transportation, MST Rebar Inc.
Amount: NSERC award $154,800 over 2 years (+ $77,400 cash and $46,800 in-kind from partner contributions recognized for cost sharing)

Giovanni Montesano (Mechanical and Mechatronics Engineering)
Title: Robust AI-supported virtual tools to accelerate the constitutive characterization and modelling of lightweight fiber-reinforced composite materials
Partner: General Motors of Canada Ltd.
Amount: NSERC award $396,874 over 3 years (+ $198,437 cash and $255,700 in-kind from partner contributions recognized for cost sharing)

Sirisha Rambhatla (Management Science and Engineering)
Title: AI for Intelligent Production Monitoring
Partner: Apple Canada Inc
Amount: NSERC award $728,800 over 5 years (+ $364,400 cash and $1,183,400 in-kind from partner contributions recognized for cost sharing)

Karim Sallaudin Karim (Electrical and Computer Engineering)
Title: Non-destructive testing using high energy spectral and phase contrast X-ray
Partner: Hitachi High-Technologies Canada Inc.
Amount: NSERC award $92,306 over 2 years (+ $46,154 cash and $140,000 in-kind from partner contributions recognized for cost sharing)

Weiyi Shang (Electrical and Computer Engineering)
Title: Test/Req Intelligent: Bridging the gap between testing and requirement in WindRiver
Partner: Wind River
Amount: NSERC award $461,230 over 5 years (+ $230,770 cash and $165,500 in-kind from partner contributions recognized for cost sharing)

William Wong (Electrical and Computer Engineering)
Title: Ultra-shallow Junctions by Monolayer Doping and Laser Processing for Advanced Sensor Applications
Partner: Teledyne Dalsa
Amount: NSERC award $460,000 over 5 years (+ $230,000 cash and $1,692,280 in-kind from partner contributions recognized for cost sharing)

NSERC Alliance Missions grants

Alliance Missions grants are a unique opportunity aimed at addressing critical science and technology challenges that can play a pivotal role in Canada's economy. In this period, 4 Alliance Missions grants were awarded that totalled **$1,542,201.**

Michael Benoit (Mechanical and Mechatronics Engineering)
Title: Laser cladding of nickel superalloy Inconel 686 for resilient zinc processing infrastructure
Partner: Teck Resources Limited
Amount: NSERC award $452,250 over 3 years (+ $116,800 in-kind from partner contributions recognized for cost sharing)

Komal Habib (School of Environment, Enterprise & Development)
Title: Beyond Lithium: Establishing resource efficient circularity pathways for urban mines of battery materials in Canada
Partners: ES Recycle; Nickel Institute; Weber Manufacturing Technologies Inc.
Amount: NSERC award $501,500 over 3 years (+ $47,500 in-kind from partner contributions recognized for cost sharing)

Yuning Li (Chemical Engineering)
Title: Developing an affordable, portable/wearable sensor for Nickel Carbonyl monitoring and detection in Nickel manufacturing
Partner: Vale
Amount: NSERC award $498,400 over 3 years (+ $156,000 in-kind from partner contributions recognized for cost sharing)
Steven Young (School of Environment, Enterprise & Development)
Title: Lumet -Sustainability standards and traceability of critical minerals value chains
Partners: Canadian Critical Minerals and Materials Alliance; Teck Resources Limited; Weber Manufacturing Technologies Inc.
Amount: NSERC award $1,040,701 over 3 years (+ $71,600 in-kind from partner contributions recognized for cost sharing)

NSERC Alliance/ Mitacs
NSERC Alliance-Mitacs Accelerate grants support projects of varying scale and complexity, from short-term smaller projects involving one researcher to long-term projects involving researchers across several universities, and from one-on-one collaborations with a single partner organization directly involved in the research to projects involving many partner organizations across multiple sectors. In this period, 1 1 Alliance Mitacs grants were awarded that totalled **$3,401,794**.

Sanjeev Bedi (Mechanical and Mechatronics Engineering)
Title: AI methods for CNC machines
Partners: Elliot Matsuura Canada Inc., HURCO
Amount: NSERC award $300,000 over 3 years (+$150,000 cash from Mitacs, +$150,000 cash and $60,000 in-kind from partner contributions recognized for cost sharing)
Amir Khajepour (**Mechanical and Mechatronics Engineering)**
Title: Towards Green Autonomous Distribution Yards
Partner: Electrans Technologies Ltd.
Amount: NSERC award $1,498,335 over 5 years (+$916,665 cash from Mitacs, +$750,000 cash and $925,000 in-kind from partner contributions recognized for cost sharing)
Tizazu Mekonnen (Chemical Engineering)
Title: Next-generation cellulose modifications, plasticizations, and processing for bioplastics
Partner: CTK Bio Canada
Amount: NSERC award $50,000 over 1 year (+$22,500 cash from Mitacs, +$25,000 cash and $70,000 in-kind from partner contributions recognized for cost sharing)
Giovanni Montesano (Mechanical and Mechatronics Engineering)
Title: Advanced structural analysis toolchain to support the development of lightweight composite airframes for high-speed uncrewed aerial vehicles
Partner: Unmanned Vehicle Applied Dynamics
Amount: NSERC award $80,000 over 4 years (+$40,000 cash from Mitacs, +$40,000 cash and $75,080 in-kind from partner contributions recognized for cost sharing)
Wayne Parker (Civil and Environmental Engineering)
Title: Multifunctional particles from drinking water treatment sludges
Partners: USP Technologies - Canada, Brown and Caldwell Consultants Canada
Amount: NSERC award $192,307 over 5 years (+$75,000 cash from Mitacs, +$96,155 cash and $76,500 in-kind from partner contributions recognized for cost sharing)
Rodney Smith (Chemistry)
Title: Deuterium Chemistry and Catalysts for Isotope Exchange
Partner: Key D.H. Technologies Inc.
Amount: NSERC Alliance/Mitacs NSERC award $400,000 over 5 years (+$200,000 cash from Mitacs, +$200,000 cash and $155,800 in-kind from partner contributions recognized for cost sharing)
Rodney Smith (Chemistry)
Title: Facilitating intermetallic compound formation on aluminized steel during industrial hot-stamping
Partner: Cosma International (Canada)
Amount: NSERC award $150,000 over 3 years (+$75,000 cash from Mitacs, +$75,000 cash and $145,400 in-kind from partner contributions recognized for cost sharing)

Rodney Smith (Chemistry)
Title: Optimization of Novel Anodes for Electrochemical Trace Oxygen Sensors
Partner: IC Controls
Amount: NSERC award $40,000 over 1 year (+$20,000 cash from Mitacs, +$20,000 cash and $24,600 in-kind from partner contributions recognized for cost sharing
Mark Smucker (Management Science and Engineering)
Title: High recall retrieval for enterprise data management
Partner: Shinydocs
Amount: NSERC award $46,152 over 2 years (+20,000 cash from Mitacs, +$23,076 cash and $115,200 in-kind from partner contributions recognized for cost sharing)
John Wen (Mechanical and Mechatronics Engineering)
Title: Manufacturing metal powder fuel derived from lunar resources for thermal energy production
Partner: Columbiad Launch Services Inc
Amount: NSERC award $510,000 over 3 years (+$255,000 cash from Mitacs, +$255,000 cash and $255,000 in-kind from partner contributions recognized for cost sharing)
Chul Min Yeum (Civil and Environmental Engineering)
Title: 5G-enabled Drone based Online Inspection System
Partner: Rogers Communications Inc.
Amount: NSERC award $135,000 over 2 years (+80,833 cash from Mitacs, +$67,500 cash and $18,000 in-kind from partner contributions recognized for cost sharing)

NSERC Alliance Quantum grants
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. In this period, 6 Alliance Quantum grants were awarded that totalled **$9,165,523.**

Bradley Hauer (Electrical and Computer Engineering)
Title: Next-generation technology to access new regimes of quantum sensing
Partners: Defence R&D Canada, Qubic, Zero Point Cryogenics Inc
Amount: NSERC award $1,350,000 over 5 years (+ $1,350,000 cash from DRDC +$760,900 in-kind from partners)
Kazi Rajibul Islam (Physics & Astronomy)
Title: Benchmarking and optimizing a large-scale trapped ion quantum processor
Partner: Keysight Technologies Canada
Amount: NSERC award $2,128,817 over 5 years (+ $586,072 in-kind from partner contributions recognized for cost sharing)
Adrian Lupascu (Physics & Astronomy)
Title: Superconducting levitation in the quantum regime - a platform for quantum science and technology
Partner: Defence R&D Canada
Amount: NSERC award $1,465,706 over 5 years (+ $222,500 in-kind from partner contributions recognized for cost sharing)
Michael Reimer (Electrical and Computer Engineering)
Title: Hybrid quantum repeater node for practical quantum networks
Partner: CMC Microsystems
Amount: NSERC award $2,500,000 over 5 years (+ $145,000 in-kind from partner contributions recognized for cost sharing)
German Sciaini (Chemistry)
Title: Unlocking Quantum Secrets: The CanCL Initiative for Atomic Level Characterization of Quantum Materials and Single-Photon Sources
Partners: Hitachi High-Technologies Canada Inc., National Research Council Canada
Amount: NSERC award $1,480,000 over 5 years (+ $266,000 in-kind from partner contributions recognized for cost sharing)
Christopher Wilson (Electrical and Computer Engineering)
Title: Advanced manufacturing for quantum simulation
Partner: Angstrom Engineering Inc.
Amount: NSERC award $241,000 over 2 years (+ $60,000 in-kind from partner contributions recognized for cost sharing).

NSERC Alliance International Collaboration

Collaboration grants allow Canadian researchers to participate in international projects and leverage the best international expertise in the Natural Science and Engineering disciplines to help address research challenges of impact and benefit for Canada. International academic collaborators are expected to have already secured funding from their own national funding agency for the collaborative project and identified the Canadian academic researcher(s) in their proposal. In this period, 1 Alliance International Collaboration grant was awarded.

David Del Rey Fernandez (Applied Mathematics)
Title: Entropy stable and asymptotic preserving discretizations of kinetic models for fluid flow problems
Amount: $97,998

NSERC Alliance International catalyst grants- Quantum specific call

Alliance International Quantum grants provide support for researchers in Canada to establish and grow international research collaborations that will strengthen research excellence in Canada and abroad, and further develop Canadian research strengths and leadership in quantum science and technology. In this period, 5 grants were awarded with each grant worth $25,000 = **$125,000 total**

Roberto Guglielmi (Applied Mathematics)
Title: Control of quantum systems described by the Dirac equation
Anna Klinkova (Chemistry)
Title: Proof-of-Concept Quantum Shells with Boosted Quantum Confinement Obtained Using Customized Nanoreactors
Sushanta K. Mitra (Mechanical and Mechatronics Engineering)
Title: A Novel Trapped Ion Architecture for Quantum Sensing
Ashwin Nayak (Combinatronics and Optimization)
Title: Algorithms for Quantum Computers
Kazi Rajibul (Physics and Astronomy)
Title: Simulating driven-dissipative systems on a trapped ion quantum processor

NSERC Alliance International Catalyst

Catalyst grants provide funding for one year to support Canadian researchers in initiating international research collaborations in the Natural Science and Engineering disciplines. In this period, 4 grants were awarded with each grant worth $25,000 = **$100,000 total**

Ayman El-Hag (Electrical and Computer Engineering)
Title: A Drone-based Inspection System for Outdoor Insulators
Eduardo Martin-Martinez (Applied Mathematics)
Title: Exploring quantum effects in extreme gravitational regimes
John Quilty (Civil and Environmental Engineering)
Title: EC-SIM - Emerging Contaminants SIMulation in drinking water distribution systems: a global physical-machine learning model
Serhiy Yarusevych (Mechanical and Mechatronic Engineering)
Title: New collaborative program focused on improving performance and reducing noise of propellers for urban mobility

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Ontario Research Fund

The Ontario Research Fund – Research Excellence (ORF–RE) provides research institutions with funding to support the operational costs of major projects of strategic value to the province. During this period, the following project was awarded.

Jahed Hamid (Mechanical and Mechatronics Engineering)
Title: Driving the Future of Sustainability in Automotive Industry: the Cold Spray Enabler
Amount: $2,000,000

Social Science and Humanities Research Council (SSHRC)

SSHRC Insight Grants
Insight Grants support research proposed by scholars and judged worthy of funding by their peers and/or other experts to build knowledge and understanding about people, societies and the world in all subject areas eligible for SSHRC funding. In this period, 9 SSHRC Insight grants were awarded that totalled **$1,196,648.**

Janet Boekhorst (Conrad School of Business and Entrepreneurship)
Title: The inclusion warriors: An event system perspective of high performers in fostering workgroup inclusion
Amount: $162,628
Philip Boyle (Sociology and Legal Studies)
Title: Infrastructures of Vulnerability: Governing Critical Systems
Amount: $135,429
Dillon Browne (Psychology)
Title: "We Belong": Exploring Patterns and Predictors of Belonging and Well-being with the Youth Impact Survey
Amount: $92,323
Stephanie Denson (Psychology)
Title: Children's reasoning about variable social and physical causes
Amount: $272,393
Fraser Easton (English Language and Literature)
Title: Cross-dressing in the news: practice and generic constraint in the Times, 1785-1884
Amount: $187,417
Jean Guillaume Forand (Economics)
Title: The Political Power of Public Sector Voters
Amount: $47,203
Dan Gorman (History)
Title: Freedom of Expression and PEN International, 1921-1970
Amount: $60,466
Shavin Malhotra (Conrad School of Business and Entrepreneurship)
Title: CEO Dyads: Unveiling Personality Dynamics in Joint Corporate Strategies
Amount: $ 173,831
Derek Stacey (Economics)
Title: Frictional and Speculative Vacancies: The Effects of an Empty Homes Tax
Amount: $ 64,958

SSHRC Insight Development Grants
Insight Development Grants support research in its initial stages. Theses grants enable the development of new research questions, as well as experimentation with new methods, theoretical approaches and/or ideas. In this period, 18 SSHRC Insight Development grants were awarded that totalled **$1,131,674.**

Laura Jane Brubacher (School of Public Health Sciences)
Title: Identifying entry points for social prescribing to support temporary and/or precarious-status (TAPS) migrants
Amount: $73,895
Victor Cui (Conrad School of Business and Entrepreneurship)
Title: Geopolitical tension and inventor mobility
Amount: $64,113
Kim de Laat (Stratford School of Design)
Title: Hybrid work arrangements and cognitive labour: Implications for gender inequality at work and home
Amount: $66,190
Felicitas Egunyu (School of Environment, Resource Studies and Sustainability)
Title: Can Non-government Organizations mitigate the social impacts of mining in Uganda?
Amount: $52,561

Amir El Alfy (School of Environment, Enterprise and Development)
Title: Sustainability Disclosure and Net Zero Targets: Investigating the Readiness of Canadian Firms and Implications for Financial Stability
Amount: $62,347
Adam Ellis (Sociology and Legal Studies)
Title: Challenging Mainstream Narratives About the Canadian War on Drugs through the Urban Arts: Stories of Survivors
Amount: $70,500
Moojan Ghafurian (Systems Design Egineering)
Title: Developing a Personalizable Robotic System for Enhancing Children's Emotion Knowledge
Amount: $75,000
Nicolas Hebbinckuys (French Studies)
Title: Examiner la fabrique "d'une" Histoire de la Nouvelle-France : le cas Marc Lescarbot
Amount: $47,079
Daniel Kim (School of Accounting and Finance)
Title: Carbon emission and firms: Estimates from a Dynamic Model
Amount: $69,477
James Kim (St. Jerome's University)
Title: Modern Man-ifestations: An Interdisciplinary Mixed-Methods Investigation of Misogyny and Gender-Based Violence
Amount: $54,926
Juyein Lee (School of Public Health Sciences)
Titel: Working behind the closed doors: Examining policy and research needs for digital platform workers in the private households sector
Amount: $74,444
Laura Mae Lindo (Philosophy)
Title: Philosophy as Resistance: Imagining Black Youth Engagement in Philosophy
Amount: $53,740
Shana MacDonald (Communication Arts)
Title: Exploring The Visual Culture of Misogyny Across Material and Digital Archives
Amount: $74,232
Kaleigh Pennock (Recreation and Leisure Studies)
Title: A Community-Based Approach to Concussion Reporting in Youth Girls' Sport
Amount: $69,122
Helena Shilomboleni (School of Environment, Resource Studies and Sustainability)
Title: Assessing the impact of the Stress Tolerant Rice for Africa and South Asia (STRASA) project in Kenya.
Amount: $72,600
Galen Watts (Sociology and Legal Studies)
Title: Scripts, Boundaries, and Repertoires Across Canada's Diploma Divide: A Cultural-Sociological Study of Rural Working-Class Canadians
Amount: $73,239
Heather Whiteside (Political Science)
Title: Canada Lands Company
Amount: $30,413
Kaishu Wu (School of Accounting and Finance)
Title: Cryptocurrency and tax avoidance
Amount: $47,796

The Northern Scientific Training Program

This program provides supplemental travel funding to encourage Canadian universities to train northern specialists. The program is administered by Polar Knowledge Canada as part of its mandate to foster science and technology in Canada's North. The University of Waterloo received $40,200.00 to support northern training for students during the fiscal year 2024-2025.

Awards and Distinctions:

External Awards

Jennifer Clapp (School of Environment, Resource Studies and Sustainability)
Political Science in Canada Leader Award, Research.com
This ranking is based on a scientist's D-index (Discipline H-index), which takes into account only papers and citation values for an examined discipline.
Stephen Evans (Earth and Environmental Sciences)
E.B. Burwell Jr. Award, Geological Society of America
This award is made to the author(s) of a peer-reviewed publication of distinction that advances knowledge concerning principles or practice of environmental and (or) engineering geology, or of related fields of applied soil or rock mechanics where the role of geology is emphasized.
Rhona Hanning (School of Public Health Sciences)
2024 Fellow, Canadian Nutrition Society
"CNS-SCN Fellow" is an exclusive professional distinction that recognizes exceptional service to both the Canadian Nutrition Society (CNS) as well as the broader nutrition profession, both within Canada and globally.
Keith Hipel (Systems Design Engineering)
Lotfi A. Zadeh Pioneer Award, IEEE Systems, Man and Cybernetics Society
This award honors a persons "outstanding and pioneering contributions to academic and/or industrial research in systems science and engineering, human-machine systems, and/or cybernetics."
Emmanuel Ho (School of Pharmacy)
2024 Fellow, Canadian Society for Pharmaceutical Sciences
This award recognizes professional excellence in the fields relevant to the mission of CSPS as well as a record of commitment and service to CSPS.
Laura Hug (Biology)
2024 Member of the College of New Scholars, Artists and Scientists, Royal Society of Canada
The Members of the College are Canadians and Permanent Residents who, are less than fifteen years from the date of PhD or disciplinary equivalent and who have demonstrated exceptional accomplishment.
Ihab Ilyas (Cheriton School of Computer Science)
2024 C.C. Gotlieb Computer Award, Institute of Electrical and Electronics Engineers (IEEE)
In recognition of his contributions to building large-scale machine learning systems for data integration, data cleaning and knowledge construction.
Ihab Ilyas (Cheriton School of Computer Science)
2024 Fellow, Royal Society of Canada
Fellows of the RSC are distinguished Canadians from all branches of learning who have made remarkable contributions in the arts, the humanities and the sciences, as well as in Canadian public life.
Juliane Mai (Earth and Environmental Sciences)
Jim Dooge Award, European Geosciences Union
Mai's paper 'The Great Lakes Runoff Intercomparison Project Phase 4: the Great Lakes (GRIP-GL)' published in Hydrology and Earth System Sciences conducts an immense multi-model comparison across the Great Lakes Basin.
Robert Mann (Physics and Astronomy)
2024 Fellow, Canadian Association of Physics
In recognition of his outstanding research contributions in theoretical physics and excellence in teaching; and for dedicated service to the Canadian physics community, in particular as President of the CAP.
Linda Nazar (Chemistry)
Hughes Medal, Royal Society
The Hughes Medal is awarded for outstanding contributions in the field of energy.
Rebecca Rooney (Biology)
2024 Leadership Award, Invasive Species Centre
The Invasive Species Centre Awards are given annually to recognize and celebrate the leadership and commitment of individuals who help keep land and water in Canada free from invasive species.

Oliver Schneider (Management Science and Engineering)
2024 CHCCS/SCDHM Graphics Interface Early Career Researcher Award, Canadian Human-Computer Communications Society
This award aims to recognize, support and encourage outstanding early career faculty members in the fields related to the Graphics Interface conference, which covers all aspects of graphics, human-computer interaction, and visualization.
Donna Strickland (Physics and Astronomy)
Honorary Member of the Sociedad Cientifico Antonio Alzate (National Academy of Sciences)
Members are elected to the National Academy of Sciences in recognition of their distinguished and continuing achievements in original research. Membership is a widely accepted mark of excellence in science and is considered one of the highest honors that a scientist can receive.
Donna Strickland (Physics and Astronomy)
Honorary Doctorate, D.Sc., University of Alberta
Michael Worswick (Mechanical and Mechatronics Engineering)
Market Development Industry Leadership Award, American Iron and Steel Institute
The American Iron and Steel Institute (AISI) presents this award to recognize individuals who have made significant contributions to advancing the competitive use of steel in the marketplace — specifically in the construction and automotive markets.

Internal Awards

Kevin Cai (Political Science)
Renison Faculty Research Award, Renison University College
David Clausi (Systems Design Engineering)
University Research Chair
Crystena Parker-Shandal (Social Development Studies)
Renison Faculty Teaching Award
Julia Williams (Department of Culture and Language Studies)
Renison Faculty Service Award

Distinguished Professors Emeriti:

- Rhona Hanning (School of Public Health Sciences)
- Ron McCarville (Recreation and Leisure Studies)
- Colin MacLeod (Psychology)
- J. Ian Munro (Cheriton School of Computer Science)
- Patricia O'Brien (School of Accounting and Finance)
- Neil Thomson (Civil and Environmental Engineering)
- Alan Webb (School of Accounting and Finance)
- Christine Wiedman (School of Accounting and Finance)

UNIVERSITY OF WATERLOO | Senate

For Information	**Open Session**
To:	**Senate**
Sponsor: **Contact Information:**	James W.E. Rush, Vice-President, Academic and Provost provost@uwaterloo.ca
Presenter: **Contact Information:**	James W.E. Rush, Vice-President, Academic and Provost provost@uwaterloo.ca
Date of Meeting:	**October 21, 2024**
Agenda Item Identification:	**16.1 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].