BOARD OF GOVERNORS' 130th REGULAR MEETING

AGENDA
November 30, 2023
12:00 p.m. to 3:50 p.m.
Hybrid – 5th Floor Boardroom, 55 Bond St
+1 587-688-3516 PIN: 433 818 851#

PUBLIC SESSION					
No.		**Topic**	**Lead**	**Allocated Time**	**Suggested Start Time**
Luncheon					12:00 p.m.
1		**Call to Order**	Chair	5	12:30 p.m.
2		**Agenda (M)**			
3		**Conflict of Interest Declaration**			
4		**Chair's Remarks**	Chair	5	12:35 p.m.
5		**President's Report**	Steven Murphy	10	12:40 p.m.
6		**Presentation: Brilliant Catalyst**	C. Loughlean	30	12:50 p.m.
7		**Academic Council Report***	O. Ubor	10	1:20 p.m.
	7.1	New Program Proposal – Master of Applied Science and Master of Engineering in Mechatronics Engineering*	O. Ubor/H. Kishawy	5	1:30 p.m.
Committee Reports:					
8		**Audit and Finance Committee (A&F) Report**	C. Carmichael	5	1:35 p.m.
	8.1	Budget Assumptions	C. Carmichael	10	1:40 p.m.
	8.2	Second Quarter Financial Reports*	C. Carmichael	5	1:50 p.m.
	8.3	Interim Risk Management Update	C. Carmichael	5	1:55 p.m.
9		**Strategy and Planning Committee (S&P) Report**	L. Zucker	5	2:00 p.m.
	9.1	Integrated Academic Research Plan – Action Plan and Accountability, Planning Timelines, and Milestones*	L. Zucker	10	2:05 p.m.
10		**Consent Agenda: (M)**	Chair	5	2:15 p.m.

	10.1	Minutes of Public Session of Board Meeting of October 5, 2023*			
	10.2	Minutes of Public Session of A&F Meeting of June 14, 2023*			
	10.3	Minutes of Public Session of Governance, Nominations & Human Resources Committee (GNHR) of May 25, 2023*			
	10.4	Minutes of Public Session of S&P Meeting of May 11, 2023*			
	10.5	Animal Care Committee Terms of Reference*			
	10.6	Micro-Credentials and Continuous Learning Committee Terms of Reference*			
	10.7	Endowment Management Policy & Procedures*			
11		**Adjournment (M)**	Chair		2:20 p.m.
BREAK – 15 Minutes					
NON-PUBLIC SESSION (material not publicly available)					
12		**Call to Order**	Chair	5	2:35 p.m.
13		**Conflict of Interest Declaration**			
14		**Chair's Remarks**	Chair	5	2:40 p.m.
15		**President's Report**	Steven Murphy	10	2:45 p.m.
	15.1	Professor Emeriti Nominations* (M)	Steven Murphy	5	2:55 p.m.
Committee Reports:					
16		**A&F Report**	C. Carmichael	5	3:00 p.m.
	16.1	Non-Public Risk Questions	C. Carmichael	5	3:05 p.m.
17		**GNHR Report**	M. Saros	5	3:10 p.m.
	17.1	Board Committee Appointments* (M)	M. Saros	5	3:15 p.m.
18		**S&P Report**			
	18.1	Advancement and Alumni Relations Update* (U)	L. Zucker	5	3:20 p.m.
19		**Consent Agenda (M):**	Chair	5	3:25 p.m.
	19.1	Minutes of Non-Public Session of Board Meeting of October 5, 2023*			
	19.2	Minutes of Non-Public Session of A&F Meeting of June 14, 2023*			
	19.3	Minutes of Non-Public Session of GNHR Meeting of May 25, 2023*			

	19.4	Minutes of Non-Public Session of S&P of May 11, 2023*			
	19.5	BOG Action Points*			
20		***In Camera* Session**	Chair	10	3:30 p.m.
21		**Termination (M)**	Chair		3:40 p.m.

Lauren Turner, University Secretary

BOARD REPORT

SESSION:		**ACTION REQUESTED:**	
Public	☒	**Decision**	☐
Non-Public	☐	**Discussion/Direction**	☐
		Information	☒

TO: **Board of Governors**

DATE: **November 30, 2023**

FROM: **Oghenetega (Tega) Ubor, Academic Council Liaison**

SUBJECT: **Academic Council Report – November 2023**

Academic Council (AC) is the academic governing body for Ontario Tech and it plays a significant role in university governance. It is the role of AC to oversee the academic work of the university, and to advise and make recommendations to the Board on important matters. As the AC liaison for the academic year 2023-2024, I'm pleased to deliver the following report of AC activities from September and October 2023.

Academic Council Meeting Materials
September 2023
October 2023

At the September meeting, Ruth Nyaamine, Assistant Vice-President, Diversity, Inclusion and Belonging, delivered a presentation titled "Nurturing an Inclusive Community At Ontario Tech: Psychological Safety & Inclusive Leadership". As one of the University's governance bodies, AC also engaged in a discussion regarding international students related to tuition rates, recruiting agents, and housing concerns.

Significant University-wide matters brought before AC included:

- At the September meeting, Sarah Thrush presented an update on Enrolment
- At the October meeting, Sarah Thrush provided a Planning Update

Recommendations to Board of Governors
At its meeting on November 28th, AC is expected to consider a new program proposal for recommendation to the Board of Governors. This proposal is being presented to the Board separately pending the recommendation of AC.

Governance Initiatives

- On a recommendation by the by the Governance and Nominations Committee (GNC), AC approved new members to AC & Committees for the 2023-2024 academic year who were elected or acclaimed during the third call for nominations and the supplemental call for expressions of interest
- AC additionally approved an AC Vice-Chair, the Faculty Council membership lists, and Faculty Council Vice-Chairs for the 2023-2024 academic year

Curriculum & Program Changes
AC approved the following Major Program Modifications:

- Bachelor of Science in Biological Science
- Bachelor of Engineering in Manufacturing Engineering

AC received the following Minor Program Adjustments for information:

- Doctor of Education
- Master of Engineering and Master of Applied Science in Automotive Engineering
- Master of Engineering Master of Applied Science and Doctor of Philosophy in Mechanical Engineering
- Master of Applied Science in Nuclear Engineering
- Doctor of Philosophy in Nuclear Engineering

Institutional Quality Assurance Reports
The Ontario Tech Institutional Quality Assurance Process requires that the Executive Summary and Implementation Plan resulting from a Cyclical Program Review (CPR) be provided to Academic Council and the Board of Governors for information. As such, these materials are being presented to the Board with the Academic Council report.

Academic Council received the following CPR reports from the Undergraduate Studies Committee:

- 18-Month Follow-Up Report from the Bachelor of Arts in Educational Studies and Digital Technology (ESDT) and Designing Adult Learning for the Digital Age (ALDA)
- 18-Month Follow-Up Report from the Bachelor of Engineering in Automotive Engineering
- 18-Month Follow-Up Report from the Bachelor of Engineering in Electrical Engineering
- 18-Month Follow-Up Report from the Bachelor of Engineering in Nuclear Engineering
- 18-Month Follow-Up Report from the Bachelor of Engineering in Software Engineering

- 18-Month Follow-Up Report from the Bachelor of Science in Applied and Industrial Mathematics

Policy

AC received the following policy instruments for information:

- Procedures for Missed In-Term Course Work and Examinations

AC was consulted on the following policy instrument:

- Endowment Policy and Procedure

Reports Received

- COU Academic Colleague Report
- Approved Exception to the Residency Requirement from the Faculty of Health Sciences

BOARD REPORT

ACTION REQUESTED:

Recommendation	☐
Decision	☒
Discussion/Direction	☐
Information	☐

DATE: **28 November 2023**

FROM: **Academic Council**

SUBJECT: **New Program Proposal – Master of Engineering and Master of Applied Science in Mechatronics Engineering**

MANDATE:
In accordance with Article 1.4 of By-law No.2, Academic Council will make recommendations to the Board on matters including the establishment or termination of degree programs. Academic Council is seeking the Board's approval of the establishment of a Master of Engineering and Master of Applied Science in Mechatronics Engineering program.

MOTION FOR CONSIDERATION:
That, pursuant to the recommendation of Academic Council, the Board of Governors hereby approves the establishment of a Master of Engineering and Master of Applied Science in Mechatronics Engineering, as presented.

BACKGROUND/CONTEXT & RATIONALE:
Mechatronics is the interdisciplinary field that combines aspects of mechanical, electrical, control, and software engineering in a concurrent manner. The bases of many modern systems are in fact mechatronic systems. A classic example of a mechatronic system is a robot. The Faculty of Engineering and Applied Science (FEAS) launched a standalone BEng and BEng and Management program in Mechatronics Engineering in 2016. The program has quickly grown to be the most popular engineering program at Ontario Tech. Based on the success it is proposed to launch MASc and Meng programs in Mechatronics Engineering to capitalize on this rapidly growing discipline. A graduate program in Mechatronics Engineering is needed to train the high-tech workforce of today and tomorrow that Ontario and Canada need to compete on a global stage.

The main objective of the MASc program is to prepare students for a career as a R&D engineer. Graduates of the program will be able to work as R&D engineers in advanced technology companies or government agencies or continue on in their education and pursue a doctorate degree.

The objectives of the MASc program are achieved through a combination of course work, supervised research, a research seminar, and a research thesis.

The main objective of the MEng program is to provide the opportunity for engineers in industry to upgrade and expand their skills, including developing research skills. Graduates of the program will be able to apply what they have learned in a variety of applications in industry.

The objectives of the MEng program are achieved through either a combination of course work and a project, or solely course work depending on which option the student selects. Note that all MEng students will be involved in research through research projects included in most of the courses.

The mode of delivery of the programs will be in person. This mode of delivery facilitates students' learning of complex subjects and allows for a better environment for the exchange of ideas. Also, due to the research component of the MASc, it is important that students be able to access research space on campus to complete their research.

The proposed program aligns well with the other offerings within FEAS, in particular it will provide a logical pathway for graduates from the BEng in Mechatronics Engineering to pursue post-graduate studies in the field. The proposed MASc and MEng in Mechatronics Engineering programs compliment the other graduate program offerings within FEAS.

RESOURCES REQUIRED:

It is anticipated that the majority of teaching in the program will be done by Tenure/Tenure Track (TTT) Faculty and Teaching Faculty within the Department of Automotive and Mechatronics Engineering as well as from the other three Departments within FEAS. There may be a limited need for Sessional Instructors depending on matters such as the number of courses offered, faculty on research leave, sick leave, etc.

A Graduate Program Director for the Department of Automotive and Mechatronics Engineering will be required. This faculty member will be responsible for the existing MASc and MEng programs in Automotive Engineering as well as the new MASc and MEng programs in Mechatronics Engineering program.

At the Academic Resource Committee meeting in November 2022, it was noted that two new faculty hires in FEAS were being considered to help support this new program.

No additional TA resource requirements without proportionate enrollment growth.

CONSULTATION AND APPROVAL:

- ✓ Academic Resource Committee Review: 21 November 2022
- ✓ FEAS Faculty Council: 5 October 2023
- ✓ Graduate Studies Committee: 24 October 2023
- ✓ Academic Council (Approval and Recommendation): 28 November 2023
- Board of Governors (Approval): 30 November 2023

Discussed in FEAS department graduate committee and department council for feedback.

NEXT STEPS:

- The proposal must proceed through the following approval steps subsequent to Board approval:
    - Ontario Universities Council on Quality Assurance

    - Ontario Ministry of Colleges and Universities
- The expected date of implementation is the fall semester of 2024

SUPPORTING REFERENCE MATERIALS:

- New Program Proposal with Appendices
- Reports from External Review

New Graduate Program Proposal

Name of proposed program (as it will appear on the student's transcript):	Master of Applied Science in Mechatronics Engineering Master of Engineering in Mechatronics Engineering
Degree Designation/Credential (e.g. BA, BSc, BEng, etc.):	MASc MEng
Cost Recovery Program?	☐ Yes x No
Professional Program?	☐ Yes x No
For Graduate Diplomas	☐ Type 2 ☐ Type 3
Faculty (where the program will be housed):	Faculty of Engineering and Applied Science
Collaborating Faculty (if applicable):	N/A
Program Delivery Location:	Ontario Tech University North Campus
Collaborating Institution(s) (if applicable):	N/A
Proposed Program Start Date:	January 2024
Proposal Contact:	Scott Nokleby
Submission Date:	
Approved by Dean: (signature and date)	

For CIQE Use Only:

Date of Academic Council Approval:	
QAF Version Used:	2021 QAF
☐External reviewers' report ☐Program's and Dean's response (with date)* ☐Summary of changes	☐Final, revised proposal ☐CVs, course outlines, and other supporting material (as appendices)

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1 Introduction

a) Program Abstract

Please provide a brief overview of the proposed program, to be shared with the public, in 1000 characters or less, including:

- *A clear statement of the purpose of the program*
- *Any program components, such as fields, pathways, or micro-credentials (note that fields, pathways, and microcredentials are not required)*
- *Any distinctive elements, including alternative modes of delivery (including online)*
- *Note that this statement is for external purposes; what do you want potential students/advisors to know about this program?*

The master's programs lead to the degrees of Master of Applied Science (MASc) or Master of Engineering (MEng) in Mechatronics Engineering. The MEng program will have two options: MEng project-based which will consist of a combination of courses and a project and MEng course-based which will consist only of courses. A Co-op Option will also be available for MEng students.

There are four objectives common to the Faculty of Engineering and Applied Science graduate programs:

- Depth. To provide students with a detailed understanding for the practice and advanced study of advanced technologies related to automotive systems. This includes scientific principles, analysis techniques, and design methodologies.
- Breadth. To provide students with the broad and advanced education necessary for productive careers in the public or private sectors, as well as academia.
- Professionalism. To develop skills necessary for clear communication and responsible teamwork, and to inspire professional attitudes and ethics, so that students are prepared for modern work environments and lifelong learning.
- Learning Environment. To provide an environment that will enable students to pursue their goals through innovative graduate programs, which are rigorous, challenging, and supportive.

The main objective of the MASc program is to prepare students for a career as an R&D engineer. Graduates of the program will be able to work as R&D engineers in advanced technology companies or government agencies. They also may choose to continue their education and pursue a PhD degree. The objectives of the MASc program are achieved through a combination of course work, supervised research, a research seminar, and a research thesis.

The main objective of the MEng program is to provide the opportunity for engineers in industry to upgrade and expand their skills. Graduates of the

program will apply their education to various advanced technologies in high-tech industries. The objectives of the MEng program are achieved through a combination of course work and a project (MEng project-based), or solely course work (MEng course-based), depending on which option the student selects.

b) Background and Rationale

- *Identify what is being proposed, what are the program objectives, and provide an academic rationale for the proposed program*
- *Explain the appropriateness of the program name and degree nomenclature as they relate to the program objectives; list any program specializations, pathways, etc.* ***(QAF 2.1.2.1a/b)***
- *Describe the mode of delivery (in-class, hybrid, online) and how it will support students in achieving the Degree Level Expectations and learning objectives of the program* ***(QAF 2.1.2.2c)***
- *Describe the ways in which the program fits into the broader array of program offerings within the Faculty and the University*
- *Describe any unique curriculum or program innovations, creative components, or significant high impact practice*

Mechatronics is the interdisciplinary field that combines aspects of mechanical, electrical, control, and software engineering in a concurrent manner. The bases of many modern systems are in fact mechatronic systems. A classic example of a mechatronic system is a robot.

The Faculty of Engineering and Applied Science (FEAS) launched a standalone BEng and BEng and Management program in Mechatronics Engineering in 2016. The program has quickly grown to be the most popular engineering program at Ontario Tech. Based on the success it is proposed to launch MASc and MEng programs in Mechatronics Engineering to capitalize on this rapidly growing discipline. A graduate program in Mechatronics Engineering is needed to train the high-tech workforce of today and tomorrow that Ontario and Canada need to compete on a global stage.

The main objective of the MASc program is to prepare students for a career as a R&D engineer. Graduates of the program will be able to work as R&D engineers in advanced technology companies or government agencies or continue on in their education and pursue a doctorate degree.

The objectives of the MASc program are achieved through a combination of course work, supervised research, a research seminar, and a research thesis.

The main objective of the MEng program is to provide the opportunity for engineers in industry to upgrade and expand their skills, including developing research skills. Graduates of the program will be able to apply what they have learned in a variety of applications in industry.

The objectives of the MEng program are achieved through either a combination of course work and a project, or solely course work depending on which option the student selects. Note that all MEng students will be involved in research through research projects included in most of the courses.

The mode of delivery of the programs will be in person. This mode of delivery facilitates students' learning of complex subjects and allows for a better environment for the exchange of ideas. Also, due to the research component of the MASc, it is important that students be able to access research space on campus to complete their research.

The proposed program aligns well with the other offerings within FEAS, in particular it will provide a logical pathway for graduates from the BEng in Mechatronics Engineering to pursue post-graduate studies in the field. The proposed MASc and MEng in Mechatronics Engineering programs compliment the other graduate program offerings within FEAS.

c) Consistency of Program Objectives with University Mission, Vision, Integrated Academic and Research Plan, and Strategic Mandate Agreement (QAF 2.1.2.1c)

- *Describe how the program contributes to the University's Mission and Vision*
- *Explain how the program aligns with the goals and priorities outlined in the Faculty's(ies') and University's Integrated Plan. Identify how the program fits within one or more areas of strength or growth in Ontario Tech University's Strategic Mandate Agreement*

University Vision

With its foundation in technology, the sciences and professional practice, Ontario Tech University advances the discovery and application of knowledge that accelerates economic growth, regional development and social innovation and inspires graduates who will continue to make an impact on the world, as it is and as it will be.

University Mission

- Provide superior undergraduate and graduate programs that are technology-enriched and responsive to the needs of students and the evolving workplace.
- Conduct research that creates knowledge, solves problems, results in economic and social innovation and engages students.
- Facilitate life-long learning that is flexible, inclusive and emphasizes college university transfers.
- Develop academic and research collaborations with industry and community that stimulate and enhance the region and university at home and abroad.
- Cultivate a dynamic learning environment for students by promoting social engagement, fostering critical thinking and integrating experiences inside and outside the classroom.

Ontario Tech University is Canada's emerging leader in career-ready education and collaborative research that produces new and useful ideas. It will advance through a sharpened focus on three key goals as per the 2017- 2022 Strategic Plan:

Challenge: we will produce an inspire future leaders who have real-world skillsets.

Innovate: we will create new approaches, partnerships, and solutions to improve society.

Connect: we will build lasting relationships to make Ontario Tech a remarkable place for work and study.

The proposed programs align with the University's vision and mission by graduating students that will meet the needs of the evolving workplace. Graduates of the program will have the skills to not only work in the high-tech jobs of today, but those of the future as well. With the rapid rise of autonomous and intelligent systems in today's world, graduates of the MASc and MEng programs will be suited to work in this growing sector.

Ontario Tech's 2020-2025 Strategic Mandate Agreement (SMA) places a heavy emphasis on engineering education and training, of which the proposed programs match perfectly. Further, the co-op option will help contribute to the SMA in the area of experiential learning. Both programs will contribute to the skills and jobs outcomes portion of the SMA by training Highly-Qualified People (HQP) with the skills required by Canadian industries.

d) Student Demand

- *Provide evidence of student demand, including number of prospective student inquiries; applications and registrations for similar programs; results from surveys/focus groups of existing students, graduates, or professionals in the field*
- *Include information about domestic vs. international student interest*

Since the introduction of a standalone BEng program in Mechatronics Engineering in 2016, the program has grown rapidly to become one of the most popular engineering programs at Ontario Tech. Currently, graduates of this program who want to do a MASc or MEng in Mechatronics Engineering cannot do so directly, but instead must do a graduate program in our Mechanical Engineering program. This is less than ideal. Mechatronics Engineering not only includes aspects of Mechanical Engineering, but also aspects of Electrical and Software Engineering. These additional aspects are sometimes not given their due in a standalone Mechanical Engineering graduate program. Dedicated MASc and MEng programs in Mechatronics Engineering will better serve the needs of these graduates from BEng Mechatronics Engineering programs.

Currently, students who want a dedicated graduate program in Mechatronics Engineering are either forced to go to other institutions or simply choose not to pursue an advanced degree.

As more universities offer Mechatronics Engineering at the undergraduate level, the demand for dedicated graduate programs in Mechatronics Engineering will only grow.

At recent Ontario Tech virtual and in person open houses, there were a number of enquiries from both domestic and international students about graduate programs in Mechatronics Engineering. Some of these individuals expressed surprise that there was no graduate program available to them in Mechatronics Engineering at Ontario Tech.

Due to recent events in the United States, there has been a shift in international graduate student applications from the United States to Canada. In addition, new immigrants to Canada and international students are interested in upgrading their skills in order to obtain employment within Canada. These two trends are adding to the demand for increased graduate student spaces in Ontario, including in Mechatronics Engineering.

Enrolment Information

- *Please complete Table 1 and provide, in paragraph form, information regarding enrolment projections*
- *Please determine the academic year when the program enrollment will reach a steady-state and add an asterisk (*) in the corresponding box beside the number*

Table 1 shows the projected enrolment. It is assumed that on average MASc students will take two years to finish and MEng students will take one year to finish.

Note that the expected enrolment numbers for the MASc program have been set conservatively in the first few years. Actual enrollment may be higher, but is dependent on faculty members securing research funding to support their MASc students.

Table 1: Projected Enrollment by Academic and Program Year

	Academic Year					
	2023-2024	2024-2025	2025-2026	2026-2027*	2027-2028	2028-2029
Level of Study						
Master's year 1	6 MASc 10 MEng	8 MASc 15 MEng	10 MASc 20 MEng	10 MASc 20 MEng	10 MASc 20 MEng	10 MASc 20 MEng
Master's year 2	0	6 MASc	8 MASc	10 MASc	10 MASc	10 MASc

		10 MEng	15 MEng	20 MEng	20 MEng	20 MEng
Total Enrolment	16	39	53	60	60	60

e) Societal Need

- *Evidence of the need for graduates of the program and in which fields (within academic, public, and/or private sectors)*
- *Please indicate up to three occupations in which graduates from this proposed program may be employed using the Ontario Job Futures website; you may also wish to review the Durham Workforce Authority website and provide any relevant sector portfolio or local/community impact information*
- *For professional programs, a description of the program's congruence with current regulatory requirements*
- *Mention if any employers in the area support the need for this program and include a letter(s) of support as an additional appendix*

The growth of autonomous and intelligent systems in all aspects of everyday life, from transportation to health care to manufacturing to resource extraction, requires engineers with the skillset provided by an advanced degree in Mechatronics Engineering. Further, to be competitive in the world economy, Canada needs to leverage advanced technology to stay competitive with low labour cost countries. Mechatronics engineers can play a key role in the design and development of these technologies.

According to CareerExplorer[1], the number of positions for mechatronics engineers in the USA alone will grow 6.4% between 2016 and 2026. The website Interesting Engineering[2] lists automation and robotics engineer, which is essentially a mechatronics engineer, as one of the seven most in demand engineering jobs in 2019.

Graduates of this program may work in the robotics, automotive, aerospace, automation, resource, biomedical, and manufacturing industries to name a few.

f) Duplication

- *Describe how the program is distinct from other programs at Ontario Tech. Is it reasonable to anticipate this program might affect enrolment in other related programs? If so, how might this be addressed?*

The proposed program will have some impact on the existing MASc and MEng programs in Mechanical Engineering at Ontario Tech, but this impact will be offset by the expected demand for the new program. The standalone program

[1] Source: https://www.careerexplorer.com/careers/mechatronics-engineer/job-market/

[2] Source: https://interestingengineering.com/7-of-the-most-in-demand-engineering-jobs-for-2019

will allow Ontario Tech to better market the MASc and MEng programs for recruiting students.

- *Identify similar or complementary programs offered elsewhere in Ontario in Table 2. Please be brief but specific in the table. Avoid value-based statements*

Table 2: List of Similar Programs in Ontario

Institution Name	**Credential Level and Program Name**
University of British Columbia (UBC)	MEng – Mechatronics Design
Link to Program Web Page: https://mech.ubc.ca/graduate/prospective/applications-admissions/meng-mechatronics-design/	
Brief Program Description: From the website: Mechatronics Design combines the fields of mechanical and electrical engineering in the study of integrated modelling, analysis, design and manufacture of electromechanical and mechatronic systems. These principles can be applied in the following industries: transportation; manufacturing and production engineering; biomedical and healthcare technologies; energy; aviation and aerospace; automated office and household technologies; and computer systems.	
What differentiates the new program from this existing program: The new program will offer an MASc degree in addition to the MEng degree allowing students who wish to pursue a research-based degree the option to complete graduate studies in the area of Mechatronics Engineering. Further, the program will be available in Central Canada giving access to a wider pool of students.	
Institution Name	**Credential Level and Program Name**
Simon Fraser University (SFU)	MASc – Mechatronics Engineering
Link to Program Web Page: https://www.sfu.ca/students/calendar/2020/fall/programs/mechatronic-systems-engineering/master-of-applied-science.html	
Brief Program Description: From the website: The Master of Applied Science (MASc) is a full-time program to pursue advanced studies in the area of Mechatronics. The primary component of the program is the thesis, which reports the results of an independent research investigation or creative design carried out by the student. Candidates must have strong aptitude for research, including strong analytical and practical problem solving skills in multidisciplinary areas including mechanical, electrical, and systems engineering.	
What differentiates the new program from this existing program: The new program will off the MEng degree in addition to the MASc degree. Further, the program will be available in Central Canada giving access to a wider pool of students.	
Institution Name	**Credential Level and Program Name**
University of Waterloo	MASc – Mechanical and Mechatronics Engineering

Link to Program Web Page: https://uwaterloo.ca/mechanical-mechatronics-engineering/graduate-students/future-students/masc-and-phd and https://uwaterloo.ca/mechanical-mechatronics-engineering/graduate-students/future-students/meng-degree
Brief Program Description: From the website: The general Masters of Engineering (MEng) degree in Mechanical Engineering offered at the University of Waterloo is a course work program open to students who satisfy the admission requirements. The MEng Program takes three to six terms to complete (one to two years) as a full-time student or the maximum time limit for completion of Master's degree requirements totally on a part-time basis is fifteen terms.
What differentiates the new program from this existing program: The program is not Mechatronics Engineering specific, but more of a Mechanical Engineering program.

- *Provide additional overall comment on the justification for this duplication*

There are currently no standalone MASc and MEng programs in Mechatronics Engineering in Ontario. Some universities offer Mechatronics Engineering as an option within Mechanical Engineering, but an opportunity exists for Ontario Tech to be at the forefront of this rapidly growing engineering discipline. A standalone program, separate from a Mechanical Engineering program or Electrical Engineering program, will be attractive to students, especially those graduating from standalone Mechatronics Engineering programs in Ontario. In Ontario, in addition to Ontario Tech, McMaster, Queen's, Waterloo, and Western all offer standalone Mechatronics Engineering programs. However, none of these universities offer dedicated graduate level programs in Mechatronics Engineering. An opportunity exists to tap into this pool of graduates.

2 Program Requirements

a) Admission Requirements (QAF 2.1.2.5)

- *Outline the formal admission requirements; explain how these are appropriate for the program objectives and program learning outcomes: How will they help to ensure students are successful? How do they align with the learning outcomes of the program? (*
- *Explain any additional requirements for admission to the program such as minimum grade point average, special language, portfolio, etc. (and how the program recognizes prior work or learning experience, if applicable) (*
- *Indicate the programs from which students may be drawn*

In addition to the general admission requirements for graduate studies, applicants must meet the following program-specific requirements:

- Completion of an undergraduate engineering degree in a relevant field from an accredited engineering program at a Canadian university, or its equivalent from a recognized institution.
- Overall academic standing of at least a B (GPA: 3.0 on a 4.3 scale), with a minimum B in the last two full-time years (four semesters) of undergraduate work or equivalent. B+ is preferred for MASc applicants.

Applicants must possess maturity and self-motivation. Close technical contact with a research supervisor is essential in research-based engineering programs. Prior to being accepted into the program, MASc applicants must find a faculty member who specializes in their desired area of research and who is willing to act as their thesis research supervisor.

In terms of acceptable undergraduate degrees for the MASc and MEng programs in Mechatronics Engineering, students who have graduated from an undergraduate program in Mechatronics, Mechanical, Manufacturing, Automotive, or Electrical Engineering will be considered.

b) Program Learning Outcomes and Assessment of Student Knowledge (QAF 2.1.2.2 a/b/d, 2.1.2.3, 2.1.2.4)

- ***Connect with CIQE (ciqe@ontariotechu.ca) early in the program development to participate in learning outcome development sessions or arrange for assistance and review prior to the scheduling of the external site visit***
- *In Table 3 below, please describe what the student will know or be able to do (knowledge, methodologies, and skills) by the end of the program and indicate how that knowledge or skill will be demonstrated*
- *An example has been provided in purple in the first row and should be removed.*

Degree Level Expectations are set by the Quality Council of Ontario and should not be modified. For the list of and more information on these expectations, including a detailed description, visit their website.

Table 3: Program Learning Outcomes

Program Learning Outcomes By the end of the program, students graduating will be able to… (normally 6-8 outcomes per program with 12 being the maximum)	Degree Level Expectations (list all that apply; you must align with each expectation at least once)	Relevant courses (provide course code and course title)	Assessment of Learning Outcomes (e.g. test, rubric, self-assessment, etc.)

Explain advanced concepts, principles, and theories in mechatronics.	Depth and breadth of knowledge	ENGR 5001G, ENGR 5002G, elective courses	MASc thesis, MASc defence, MEng project, course projects, course assignments
Design and implement experiments.	Research and scholarship	ENGR 5001G, ENGR 5002G	MASc thesis, MEng project
Interpret experimental data and computational results.	Research and scholarship	ENGR 5001G, ENGR 5002G	MASc thesis, MEng project
Solve engineering problems and enhance existing practices through research.	Level of application of knowledge	ENGR 5001G, ENGR 5002G, elective courses	MASc thesis, MEng project, course projects
Adhere to social, professional, and ethical expectations involved in advanced education and research.	Professional capacity/autonomy	ENGR 5201G, ENGR 5002G, METE 5003G, core courses, elective courses	MASc thesis, MEng project, MASc seminars, course projects, course assignments
Describe the importance of, and develop the strategies for, further education and lifelong learning in the discipline.	Professional capacity/autonomy	METE 5003G, core courses, elective courses	MASc seminars, course projects, course assignments
Communicate mechatronics concepts, principles, and results effectively using written and verbal formats.	Communications skills	ENGR 5201G, ENGR 5002G, METE 5003G, core courses, elective courses	Course projects, course presentations, MASc seminars, MASc thesis, MASc defence, MEng project
Critically evaluate advanced information and knowledge and apply in engineering practice.	Awareness of limits of knowledge	ENGR 5201G, ENGR 5002G, METE 5003G, core courses, elective courses	Course projects, MASc seminars, MASc thesis, MEng project

- *Selecting a few examples from above, and with assistance from CIQE (ciqe@ontariotechu.ca), please provide further details on:*
  - *Appropriateness of the program's structure and the requirements to meet its objectives and program learning outcomes; Guidance on program objectives and program-level learning outcomes, including examples, is available here*

- *Appropriateness of the proposed methods for the assessment of student achievement of the intended program learning outcomes and Degree Level Expectations (How will students demonstrate they have learned and can do what we expect them to by the end of the program?); and*
- *Completeness and appropriateness of plans for monitoring and assessing:*
  - *The overall quality of the program*
  - *Whether the program is achieving in practice its proposed objectives;*
  - *Whether the students are achieving the program learning outcomes; and*
  - *How the resulting information will be documented and subsequently used to inform continuous program improvement*

Please see Guidance on Assessment of Teaching and Learning for advice on how to satisfy these criteria.

The learning outcomes for the MASc program are achieved through a combination of course work, supervised research, a research seminar, and a research thesis.

For example, the ability to explain advanced concepts, principles, and theories in mechatronics is taught in the various elective courses using many practical examples of problems solved in class to teach how advanced mechatronic systems work. This is followed by projects where students apply their knowledge to solve open-ended design problems. Student deliver written reports and presentations to communicate mechatronics concepts, principles, and results effectively using written and verbal formats. The ability to design and implement experiments is demonstrated in the completion of the MASc Thesis.

The objectives for the MEng program are achieved through either a combination of course work and a project, or solely course work depending on which option the student selects. Note that all MEng students will be involved in research through research projects included in many of the courses. Students will be exposed to both quantitative and qualitative research methodologies through these course-based research projects.

For example, the ability to communicate mechatronics concepts, principles, and results effectively using written and verbal formats is taught ENGR 5201G: Engineering Communications and Ethics. As for the MASc, in the MEng, the ability to explain advanced concepts, principles, and theories in mechatronics is taught in the various elective courses using many practical examples of problems solved in class to teach how advanced mechatronic systems work.

The combination of courses and/or projects and research, will be designed collaboratively between the student and an assigned faculty advisor/mentor. Each learner will have the opportunity to develop the prerequisites for specialized practice of, or for advanced study in, Mechatronics Engineering, including their scientific principles, analysis techniques, and design methodologies. Learning activities and materials in graduate courses will be

carefully designed to ensure that learners are deliberately exposed to study, the majority of which is at, or informed by, the forefront of engineering theory and practice.

The courses have been designed to give students in depth learning in Mechatronics Engineering, opportunity for advanced development of generic skills such as communication and teamwork, as well as participation in the scholarly activities of research, seminars, and presentations.

Throughout the curriculum, learning activities are planned, and student progress will be monitored to ensure that safety, professional guidelines, and ethical responsibilities relevant to engineering and for specific areas of advanced study are modelled developed, and evaluated.

The main avenue for assessing and monitoring the program effectiveness will be through the cyclical program review process. In addition, Ontario Tech's Academic Resource Committee requires a report one-year after start-up of a new program and, if there are areas of concerns raised, a subsequent 18-month report will be required. The one-year report will ask the program to review enrollment data, admission averages, and provide an analysis of successes and challenges encountered in the first year. After the first year of the program being implemented, it will be internally assessed by this committee and, if needed, recommendations will be made to enhance program effectiveness and student success. If required, the 18-month report will address key curricular and student data (e.g. GPA, retention data, etc.) as well as any outstanding recommendations from the one-year report. Pending the committee's review, further documentation may be required of the program for ongoing monitoring. The reports will be developed by the Graduate Program director in consultation with the Faculty Graduate Committee.

- *Describe the requirements and structure of the program. Is it full-time/part-time? Is this an online or partially online/hybrid program? What are the unique curriculum or program innovations or creative components in this program?*
- *Address how the program's structure, requirements, and program-level learning outcomes are appropriate in meeting the Degree Level Expectations.*

MASc Program

The objective of the MASc program in Mechatronics Engineering is to prepare students for careers in research, development, and advanced engineering. Graduates of the program will be able to work as engineers in research and development or other areas in advanced technology companies or government agencies, or continue their education and pursue a PhD degree. The objectives of the MASc program are achieved through a combination of course work, supervised research, a research seminar and a research thesis.

For the MASc in Mechatronics Engineering, students must complete five courses for a total of 15 credits and a thesis worth 15 credits. Students must also successfully complete METE 5003G - MASc Seminar for Mechatronics Engineering and ENGR 5001G - MASc Thesis.

Typically, the MASc program is full-time, but can be completed part-time in some cases.

Undergraduate courses

In addition to the required graduate courses, students may take only one senior year undergraduate engineering course (i.e., with prefix ENGR 4xxxU) in lieu of a graduate-level course, provided they have not already taken a similar course during their undergraduate degree and the course is approved by both the student's supervisor and the graduate program director.

Courses outside of the program

Courses in other graduate programs at the university may be taken provided that students have not taken similar courses during their undergraduate or master's degrees and the courses are approved by the graduate program director. At least half of a student's courses must be within their program in the Faculty of Engineering and Applied Science. Students who wish to take courses outside of their program must gain approval from the graduate program director. Students who are uncertain about the academic background needed for a graduate course should consult the course instructor before registering for the course.

Course listing

ENGR 5001G - MASc Thesis
ENGR 5004G - MASc/MEng Directed Studies
ENGR 5005G - Special Topics
ENGR 5010G - Advanced Optimization
ENGR 5012G - Advanced and Smart Materials
ENGR 5013G - Advanced Engineering Mathematics
ENGR 5200G - Programming Methodology and Abstraction for Engineers
ENGR 5201G - Engineering Communications and Ethics
ENGR 5240G - Advanced Dynamics
ENGR 5245G - Micro and Nano Manufacturing
ENGR 5260G - Advanced Robotics and Automation
ENGR 5261G - Advanced Mechatronics: MEMS and Nanotechnology
ENGR 5262G - Manipulator and Mechanism Design
ENGR 5263G - Advanced Control
ENGR 5271G - Innovative Design Engineering
ENGR 5273G - Design by Failure

ENGR 5410G - Project Management for Engineers
ENGR 5510G - Foundations of Software Engineering
ENGR 5520G - Software Development Methods and Tools
ENGR 5605G - Convex Optimization
ENGR 5910G - Embedded Real-Time Control Systems
ENGR 5915G - Discrete Time Control Systems
ENGR 5930G - Adaptive Control
ENGR 5940G - Intelligent Control Systems
ENGR 5945G - Mobile Robotic Systems
ENGR 5946G - Advanced Fluid Power Control and Simulation
METE 5003G - MASc Seminar for Mechatronics Engineering
METE 5101G - Artificial Intelligence and Machine Learning Methods and Applications
METE 5102G - Control Design in Robotic Systems
METE 5103G - Model Predictive Control
METE 5104G - Multivariable Feedback Control
METE 5105G - Nonlinear Control Systems
METE 5106G - Advanced System Dynamics
METE 5107G - Biomechatronic Systems
METE 5108G - Neuromechanics and Control of Human Movement
METE 5280G - Robotic Manipulators
METE 5300G - Mobile Robotics

MEng Program

The objective of the MEng program in Mechatronics Engineering is to provide the opportunity for engineers in industry to upgrade and expand their skills, including the development of research skills. Graduates of the program will be able to apply what they have learned in a variety of applications in industry, government, and academia.

The MEng program can be taken full-time or part-time.

MEng (course-based option):

For the course-based option, students must complete 10 courses worth a total of 30 credits.

Four core courses are required to be taken by all students in the MEng program. These courses are expected to be taken first before other graduate courses:

- ENGR 5013G - Advanced Engineering Mathematics
- ENGR 5200G - Programming Methodology and Abstraction for Engineers
- ENGR 5201G - Engineering Communications and Ethics
- ENGR 5410G - Project Management for Engineers

A minimum of three courses must be taken from the following list of core courses:

- ENGR 5260G - Advanced Robotics and Automation
- ENGR 5261G - Advanced Mechatronics: MEMS and Nanotechnology
- ENGR 5262G - Manipulator and Mechanism Design
- ENGR 5945G - Mobile Robotic Systems*
- METE 5107G - Biomechatronic Systems
- METE 5101G - Artificial Intelligence and Machine Learning Methods and Application
- METE 5102G - Control Design in Robotic Systems
- METE 5103G - Model Predictive Control
- METE 5106G - Advanced System Modeling Methods
- METE 5108G - Neuromechanics and Control of Human Movement
- METE 5280G - Robotic Manipulators
- METE 5300G - Mobile Robotics*

*Students can take ENGR 5945G or METE 5300G, but not both.

The remaining courses are expected to be taken from graduate courses listed in the student's program. Students are also provided the following allowance:

Undergraduate courses

MEng course-based students may take one senior year undergraduate course from the Faculty of Engineering and Applied Science in lieu of one graduate-level course, provided they have not taken similar courses during their undergraduate degree and the course is approved by the graduate program director.

Courses outside of the program

MEng course-based students may take up to two courses in other graduate programs at the university, provided that students have not taken similar courses during their undergraduate or master's degrees, and the courses are approved by the graduate program director. Students who wish to take courses outside of their program must gain approval from the graduate program director. Students who are uncertain about the academic background needed for a graduate course should consult the course instructor before registering for the course.

MEng (project-based option):

For the project-based option, students must complete 8 courses worth a total of 24 credits and a project worth 6 credits (ENGR 5002G - MEng/MEngM Project).

Four core courses are required to be taken by all students in the MEng program. These are expected to be taken first before other graduate courses:

- ENGR 5013G - Advanced Engineering Mathematics
- ENGR 5200G - Programming Methodology and Abstraction for Engineers
- ENGR 5201G - Engineering Communications and Ethics
- ENGR 5410G - Project Management for Engineers

A minimum of three courses must be taken from the following list of core courses:

- ENGR 5260G - Advanced Robotics and Automation
- ENGR 5261G - Advanced Mechatronics: MEMS and Nanotechnology
- ENGR 5262G - Manipulator and Mechanism Design
- ENGR 5945G - Mobile Robotic Systems*
- METE 5107G - Biomechatronic Systems
- METE 5101G - Artificial Intelligence and Machine Learning Methods and Application
- METE 5102G - Control Design in Robotic Systems
- METE 5103G - Model Predictive Control
- METE 5106G - Advanced System Modeling Methods
- METE 5108G - Neuromechanics and Control of Human Movement
- METE 5280G - Robotic Manipulators
- METE 5300G - Mobile Robotics*

*Students can take ENGR 5945G or METE 5300G, but not both.

The remaining courses are expected to be taken from graduate courses listed in the student's program.

Scope of the Project: The project should represent real-world problems. It can be an industry project or defined within a research laboratory or research space setting. The project must be supervised by one of the graduate faculty members in the student's program who are active in the research area.

Course listing

ENGR 5002G - MEng/MEngM Project
ENGR 5005G - Special Topics
ENGR 5010G - Advanced Optimization
ENGR 5012G - Advanced and Smart Materials
ENGR 5013G - Advanced Engineering Mathematics
ENGR 5200G - Programming Methodology and Abstraction for Engineers
ENGR 5201G - Engineering Communications and Ethics
ENGR 5240G - Advanced Dynamics
ENGR 5245G - Micro and Nano Manufacturing

ENGR 5260G - Advanced Robotics and Automation
ENGR 5261G - Advanced Mechatronics: MEMS and Nanotechnology
ENGR 5262G - Manipulator and Mechanism Design
ENGR 5263G - Advanced Control
ENGR 5271G - Innovative Design Engineering
ENGR 5273G - Design by Failure
ENGR 5410G - Project Management for Engineers
ENGR 5510G - Foundations of Software Engineering
ENGR 5520G - Software Development Methods and Tools
ENGR 5605G - Convex Optimization
ENGR 5910G - Embedded Real-Time Control Systems
ENGR 5915G - Discrete Time Control Systems
ENGR 5930G - Adaptive Control
ENGR 5940G - Intelligent Control Systems
ENGR 5945G - Mobile Robotic Systems
ENGR 5946G - Advanced Fluid Power Control and Simulation
METE 5003G - MASc Seminar for Mechatronics Engineering
METE 5101G - Artificial Intelligence and Machine Learning Methods and Applications
METE 5102G - Control Design in Robotic Systems
METE 5103G - Model Predictive Control
METE 5104G - Multivariable Feedback Control
METE 5105G - Nonlinear Control Systems
METE 5106G - Advanced System Dynamics
METE 5107G - Biomechatronic Systems
METE 5108G - Neuromechanics and Control of Human Movement
METE 5280G - Robotic Manipulators
METE 5300G - Mobile Robotics

- *Please attach, as an Appendix, the Program Learning Outcome Alignment Map to Degree Level Expectations*
- *If the program is to be accredited, include with the above information about the accreditation requirements and add the accreditation tables, if available, as an Appendix.*

- *Provide evidence that each graduate student is required to take a minimum of two-thirds of the course requirements from among graduate-level courses*
- *What is the program length? Provide a rationale for the length that ensures the program learning outcomes and requirements can be reasonably completed*

See Appendix A for the Program Learning Outcome Alignment Map to Degree Level Expectations.

MASc Program

Students are required to take five courses of which only one may be a fourth-year undergraduate course, i.e., a minimum of 80% of the courses are graduate level.

The program length for the MASc will be two years.

MEng Program

MEng course-based students must take 10 courses of which up to two may be fourth-year undergraduate courses, i.e., a minimum of 80% of the courses are graduate level.

MEng project-based students must take eight courses and all of them must be at the graduate level.

The program length for the MEng will be one to two years.

A list of new courses for the programs along with new course proposals can be found in Appendix B. A list of existing courses for the programs along with their course descriptions can be found in Appendix C.

- *Describe the ways in which the curriculum addresses the current state of the discipline (QAF 2.1.4a)*
- *For researched-focused graduate programs, provide a clear indication of the nature and suitability of the major research requirements for degree completion*

The courses available in the program cover the state-of-the-art in their respective topics and are taught by faculty members who are active researchers on those topics. This will help ensure the courses remain relevant and current.

For MASc students, the main focus is a research thesis supervised by a faculty member who is a subject matter expert. For MEng project-based students, the project features a research element that is also supervised by a faculty member who is a subject matter expert. In addition to the thesis and project, many courses feature a term project that is often research focussed.

- *Is there an experiential learning component (e.g. workplace learning, co-op, internship, field placements, service learning, mandatory professional practice) to the program? If yes, please describe this component in 2500 words or less. Include confirmed partners, duration of the experiential learning component(s), and projected number of placements (where applicable)*

While many of the courses in the MASc and MEng programs will provide experiential learning components, formal work-integrated learning is built into the MEng program in the form of a co-op internship for 4-8 months (i.e., one or

two co-op work terms). Co-operative education is a form of experiential learning that offers students a journey of self-discovery and transformative learning experiences, and the proposed co-op stream will allow the Faculty of Engineering and Applied Science to align with the Ontario Tech Mission to provide superior lifelong learning experiences.

The co-op stream would also be especially attractive to international students since off-campus employment through a co-op job will be a program requirement.

Applicants to the MEng program have the option of applying directly to the MEng co-op stream with an additional fee. In addition, students may apply to join the co-op stream during their first or second semester of study through the Engineering Co-op Office.

During their first or second semester of study, prior to their co-op placement, students in the co-op stream will be required to take ENGR 1000W - Professional Competencies for Engineers [0 credit, pass/fail], unless they have previously taken and passed this course at Ontario Tech during their undergraduate education.

Students will be able to take a co-op job after their first, second, or third semester of study, and must complete at least one co-op work term in order to qualify for the co-op designation to appear on their degree. At the end of a co-op work term, the student must submit a work term report using the guidelines provided by the Engineering Co-op Office.

Co-op work terms will be recorded on a student's transcript using a special course number similar to the process followed for undergraduate Engineering students in the Co-op stream.

An industrial co-op work term must be between 12 – 16 weeks of full-time paid work (35 – 40 hours per week) with a minimum of 420 hours. Students will be required to pay a co-op work term fee (this fee is set by the Board of Governors).

The Co-op stream of the MEng program will be supported by the Engineering Co-op Office.

- *Describe how the principles of Equity, Diversity, Inclusion, and Decolonization have been considered:*
    - *Does the program contain concepts, materials, or resources from scholars/professionals who are part of one or more historically marginalized groups?*
    - *Are multiple perspectives represented in the program, such as those offered by those who are Indigenous, Black, Persons of Colour, and/or 2SLGBTQIA+?*

- *How has accessibility been considered? More specifically, have the needs of students with disabilities been integrated into the program design (e.g., the ways that students are asked to demonstrate their learning)?*
- *Will this program provide space to allow for the discussion of other viewpoints outside the "dominant, Western narrative"?*
- *Have the principles of Universal Design been considered?*

- *Describe how the potential need to provide accessibility accommodations has been considered in the development of this program; please provide information beyond the services offered by Student Accessibility Services*

The Faculty of Engineering and Applied Science (FEAS) is fully committed to Equity, Diversity, and Inclusion (EDI), including in all its courses and all its research activities. The majority of the material covered in these programs is mathematical in nature and is generally subject to these principles.

As an example of its focus on EDI, FEAS has the Women in Engineering Society with the following goals[3]:

- We foster a welcoming and engaging space for female engineering students to create a sense of community on and off campus.
- We connect female students to future employers and engineering career opportunities across Canada, and showcase successful female engineering professionals.
- We equip our students with professional skills, connections, and inspiration to prepare them for their professional careers.
- We give back to the community by running outreach events to encourage and inspire young women to pursue an education in Engineering.

FEAS is committed to reconciliation with Indigenous peoples. Students in the MASc and MEng programs can take as one of their courses the fourth-year undergrad course:

ENGR 4570U/INDG 4570U - Indigenous Design and Technology
This course will explore design and technology of Indigenous peoples in Canada and the impacts on technology development. Two-Eyed Seeing (where with one eye we view the subject through Indigenous ways of knowing and with the other eye we view it through Western approaches) will be used to study the evolution of Indigenous design and technology and its influence on modern systems. Indigenous approaches to sustainability and its role in Indigenous design and technology will be investigated with the goal of engineers and designers incorporating this knowledge and methodologies in the development of new sustainable technologies.

[3] Source: https://engineering.ontariotechu.ca/current-students/current-undergraduate/women-in-engineering/about-us.php

For students who have accommodation needs, existing Student Accessibility Services (SAS) supports will be available to students who require specific accommodations.

c) Calendar Copy with Program Map(s)

- *Provide, as an Appendix using the template provided, a clear and full calendar copy. The template ensures consistency across all programs in the Academic Calendar*
- *Provide, as an Appendix, a full list of the all courses included in the program including course numbers, titles, and descriptions. Please indicate clearly whether they are new/existing. Include full course proposals for new courses, and the most recent course syllabi for existing courses. If you are making changes to existing courses, include instead a course change form. In an appendix noted below, you will note which faculty members are expected to teach in the program and who is responsible for developing any new courses.*

Please see Appendix D for the proposed Calendar copy.

Please see Appendices B and C for a full list of courses in the program.

3 Consultation

- *Describe the expected impact of the new program on the nature and quality of other programs delivered by the home and collaborating Faculty(ies) and any expected impact on programs offered by other Faculties*
- *Outline the process of consultation with the Deans of Faculties that will be implicated or affected by the creation of the proposed program*
- *Provide letters of support for the program from Deans at Ontario Tech and/or from other institutions/partners*
- *Describe any consultation undertaken with regard to the principles of Equity, Diversity, Inclusion, and Decolonization*

Consultation followed the University's process by requesting feedback on the Notice of Intent. No specific concerns were raised at this stage.

The development of the program was done in consultation with the faculty members within the Mechatronics Engineering area as well as the Department of Automotive and Mechatronics Engineering as whole. Further consultation was done within the Faculty of Engineering and Applied Science level at the FEAS Graduate Committee and FEAS Faculty Council. Feedback from these various levels of consultation has been incorporated into this proposal prior to proceeding with the program's formal approval.

The new program will slightly impact the enrollment of the existing MASc and MEng programs in Mechanical Engineering at Ontario Tech. However, it is anticipated that overall graduate student enrollment will increase as this

program can be marketed to students graduating from undergraduate Mechatronics Engineering programs in Ontario, across Canada, and around the world. Mechatronics is a rapidly growing engineering discipline with more and more undergraduate programs opening each year.

Does this Program contain any Indigenous content? ☐ Yes ☒ No ☐ Unsure
For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted ☐ Yes ☒ No

If yes, when?

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ Yes ☐ No

If yes, have they completed their review? ☐ Yes ☐ No ☐ N/A

4 Resource Requirements (QAF 2.1.2.6, 2.1.2.7, 2.1.2.8 a)

a) General Resource Considerations

- *Note here if this new program may impact enrolment agreements with other institutions/external partners that exist with the Faculty/Provost's office*
- *Indicate if the new program will require changes to any existing agreements with other institutions, or will require the creation of a new agreement. Please consult with CIQE (ciqe@ontariotechu.ca) regarding any implications to existing or new agreements.*

It is anticipated that the majority of teaching in the program will be done by Tenure/Tenure Track (TTT) Faculty and Teaching Faculty within the Department of Automotive and Mechatronics Engineering as well as from the other three Departments within FEAS. There may be a limited need for Sessional Instructors depending on matters such as number of courses offered, faculty on research leave, sick leave, etc.

A Graduate Program Director for the Department of Automotive and Mechatronics Engineering will be required. This faculty member will be responsible for the existing MASc and MEng programs in Automotive Engineering as well as the new MASc and MEng programs in Mechatronics Engineering program.

b) Faculty Members - Current and New Faculty Requirements

- *Complete as an Appendix, using the Faculty Information templates provided, charts chart detailing the list of faculty committed to the program and provide any additional details, in paragraph form below; the information in the Appendix or additional information must include clear evidence that faculty have the recent research or professional/clinical expertise needed to sustain the program, promote innovation, and foster an appropriate intellectual climate. This should also demonstrate how supervisory loads are distributed in light of qualifications and appointment status; if necessary, include this information below*
- *Include a brief statement to provide evidence of the participation of a sufficient number and quality of faculty who will actively participate in the delivery of the program and achieve the goals of the program and foster the appropriate academic environment, contribute substantively to the program, and commit to student mentoring*
- *Describe the role of any sessional/part-time faculty; provide an approximate percentage used in the delivery of the program and the plans to ensure the sustainability of the program and quality of the student experience*
- *Explain the provision of supervision of any experiential learning opportunities; how will supervisory loads be distributed?*
- ***If new faculty resources are needed, describe the plan and commitment to provide these resources to support the program and the rationale in section 4h)***

Due to the rapid growth of the BEng in Mechatronics Engineering program at Ontario Tech, the Department of Automotive and Mechatronics Engineering is currently hiring one TTT Faculty member in the area of Mechatronics Engineering. In addition to supporting the BEng in Mechatronics Engineering program, these new faculty members will also support the MASc and MEng programs as well. This new hire will bring the number of dedicate Mechatronics Engineering faculty members to eight, with a further six faculty members in Automotive Engineering that can also support the program through teaching courses. In addition, there are numerous faculty members within the Department of Electrical, Computer, and Software Engineering, Department of Energy and Nuclear Engineering, and the Department of Mechanical and Manufacturing Engineering who can also teach courses related to the program.

Details about all Department of Automotive and Mechatronics Engineering faculty members involved in the program can be found in Appendix E and their CVs.

c) Additional academic and non-academic human resources

- *Give details regarding the nature and level of Sessional Instructor and TA support required by the program, the level of administrative and academic advising support, etc.*
- ***If new resources are needed, describe the plan and commitment to provide these resources to support the program and the rationale in section 4h)***

As this is a graduate program, there is currently no need for TA support. However, in future if the number of MEng students grows substantially, there may be a requirement for TA support for the core courses in the program. Note, these TA costs would be supported by the increased in funding from students enrolled in the MEng program. PhD students within the Faculty of Engineering and Applied Science would serve as the TA pool if the need arises. As noted above, the majority of instruction will be done by TTT Faculty and Teaching Faculty within FEAS. There may be a limited need for Sessional Instructors depending on matters such as the number of courses that need to be offered in a semester, or faculty on research leave, sick leaves, etc. The existing Graduate Program Assistants within FEAS will be sufficient for the planned enrolment for at least the first five years of the program.

d) Supporting information for online and hybrid programs

- *Describe the adequacy of the technological platform to be used for online delivery*
- *Describe how the quality of education will be maintained*
- *Describe how the program objectives will be met*
- *Describe how the program learning outcomes will be met*
- *Describe the support services and training for teaching staff that will be made available*
- *Describe the sufficiency and type of supports that will be available to students*
  - *How has accessibility been considered?*
  - *What strategies have been considered to accommodate students with disabilities?*
  - *Have the principles of Universal Design been considered?*
  - *Will course content be offered in both written and audible forms (e.g., closed captioning, transcriptions)?*
  - *Is course content designed logically and is it easy to follow with limited instruction?*
  - *Are assignment expectations clear (i.e., a rubric)?*
  - *Have the needs of students with limited or unreliable access to wi-fi been considered (e.g., breaking down pre-recorded lectures into maximum 10-minute videos)?*

N/A

e) Existing non-financial student supports

School of Graduate and Post-Doctoral Studies

Quality graduate and postdoctoral education combines teaching, research, professional development, disciplinary community involvement and personal growth. It is by nature a shared responsibility between students, faculty members, the programs and a large number of support units, with overarching administration being provided by the School of Graduate and Postdoctoral Studies.

The School of Graduate and Postdoctoral Studies (SGPS) furthers the scholarly mission of the university by providing academic and administrative support to the university's postgraduate educational, research, innovation and international activities. Our responsibilities include graduate program development, graduate enrolment management, oversight of academic and quality standards, and the implementation of policies and practices that enhance graduate/postdoctoral scholarly success, career readiness and personal growth. SGPS supports prospective, new and current graduate students through many administrative services including, but not limited to, recruitment, admission, registration, funding and scholarships, orientation, professional development workshops and events, and processing of final theses, projects and papers. SGPS is a single-point-of-contact, multifunctional administrative unit tailored to the complete "life-cycle" of graduate students, providing coordinated support to students and all other stakeholders.

Faculty-Specific Support

Academic Advising (if relevant)
Please provide details on your Faculty Academic Advising Office and supports for graduate students.

Student Life

Ontario Tech University, as a relatively small campus community, has a centralized delivery model for many student supports. All undergraduate students have access to an extensive support system that ensures a quality student experience. Each Faculty may provide additional, Faculty- or program-specific supports. In addition to the outlined services below, students may also take advantage of the Campus Bookstore, Housing and Living Resources as well as the Ontario Tech Student Union. Further information can be found at: http://studentlife.ontariotechu.ca/.

Student Learning Centre
Ontario Tech University fosters a high level of academic excellence by working with students, undergraduate and graduate, to achieve educational success. Faculty specific academic resources are available online and include tip sheets and videos. Academic specialists offer one-on-one support services in mathematics, writing, study skills, ESL and physics. With the additional support of peer tutors and workshops, the

Student Learning Centre can also accommodate the needs of a specific course or program.

Student Accessibility Services

Ontario Tech University ensures that students with disabilities have equal opportunities for academic success. Student Accessibility Services operates under the Ontario Human Rights Code and the Accessibility for Ontarians with Disabilities Act. Services and accommodation support are provided for students with documented disabilities and include:

- Adaptive technology training
- Alternate format course material
- Learning skills support
- Testing support
- Transition support for incoming students

Student Accessibility Services also provides inclusive peer spaces, support groups, and skills workshops for students.

Career Readiness

Ontario Tech University offers comprehensive career service assistance, co-op and internship support and a variety of valuable resources to help students along their career paths, including:

- Assistance with creating effective job-search documents
- Career counselling
- Co-op and internships
- Interview preparation
- Job market information
- Job search strategies

The Career Centre hosts a variety of events during the academic year including employer information and networking sessions, job fairs and interviews conducted by leading employers.

Student Engagement, Equity and Inclusion, and ***Indigenous Education and Cultural Services***

The university supports students' successful transition and provides opportunities to develop leadership and professional skills throughout their university career. Services provided include:

- Equity and inclusivity programming and support groups
- Indigenous Education and Cultural Services provides space and supports for students to connect with Indigenous culture and resources

- Opportunities to grow and develop leadership skills through the Ambassador and Peer Mentorship program
- Orientation and events through first year
- Peer mentoring
- Services and supports for international and exchange students
- Specialized programming for first-generation, graduate, Indigenous, international, mature, online, transfer and diploma-to-degree pathways students

Student Mental Health Services

Student Mental Health Services helps students learn how to better manage the pressures of student life. Students can:

- Access short term counselling and therapy services
- Access tools and resources online to learn about mental health and how to maintain good health and wellness
- Attend drop-in sessions
- Participate in events, activities or support groups that promote positive health and well-being
- Work with a mental health professional to address concerns

Students in distress will also be provided with support and counselling as needed. There is no cost to students and services are confidential. For those who need long-term counselling support or specialized mental health services, Ontario Tech University will provide referrals to assist the student in accessing resources in the local community or in the student's home community.

Athletics and Recreation Facilities

Ontario Tech University offers a number of recreation facilities and fitness opportunities to meet all lifestyles and needs. On-campus facilities include the state-of-the-art FLEX Fitness Centre which overlooks Oshawa Creek, five gymnasiums, a 200-metre indoor track, two aerobic/dance studios, the Campus Ice Centre, Campus Fieldhouse, a soccer pitch, a fastball diamond, squash courts and an indoor golf training centre. Students are able to participate in varsity and intramural sports as well as group fitness classes and personal training sessions.

Campus Health Centre

The Campus Health Centre provides assistance in numerous confidential health-care options including:

- A medical clinic with daily access to physician and nursing staff
- Treatment of disease, illness, and injury
- Allergy injections, immunizations, and influenza injections

- Complementary Health Services featuring acupuncture, chiropractic, custom orthotics, massage therapy, nutritional counselling, and physical therapy
- An on-site laboratory (blood work, STI testing, throat swabs, etc.)
- Gynaecological health-care and prescriptions

Student Awards and Financial Aid

Student Awards and Financial Aid (SAFA) is dedicated to helping students understand the variety of options available to finance their education. Budgeting and financial planning are essential to their success and SAFA is on hand to help create the right financial plan. Financial assistance can be in the form of bursaries, employment (both on-campus and off), parental resources, scholarships, student lines of credit and the Ontario Student Assistance Program (OSAP).

Information Technology Resources

Ontario Tech University is a leader among North American universities in implementing and using curriculum and industry specific software in a technology-enriched learning environment (TELE). Our unique environment is adapted to each discipline based on faculty requirements and input for optimal student learning. We are committed to providing the greatest value for students' investment in education and technology while studying at Ontario Tech University.

One of the greatest advantages of Ontario Tech University's approach to TELE is that all students have equal access to the same technology, resources and services. Whether you are inside or outside of the classroom, your course-specific software allows you to work on your own or with others and enjoy seamless access to all Ontario Tech online resources. TELE supports Bring-your-own-device (BYOD) which provides you with laptop standards when acquiring the right laptop for your program and software support services onsite and online. An annual fee for TELE covers a wide range of program-specific software, technical software support, exam support and virus protection.

IT Services strives to provide quality services to students at Ontario Tech. To support these objectives, the following components are included:

Wireless network
Wireless internet connection is available in public areas and open-air locations around the Ontario Tech campus where students congregate (North Oshawa and Downtown locations).

Wired network
To ensure the success of the technology-enriched learning environment, a comprehensive data network has been installed on campus. This includes network drops in lecture halls and designated areas as well as network drops for each residence suite.

Ontario Tech students benefit from networked classrooms and learning spaces. Each ergonomically-designed space has data network connection access and electrical connections to ensure battery regeneration. In addition, classrooms include electronic projection equipment and full multimedia support.

Exam support services
IT Services provide hardware, software and technical support during examinations. IT team will be equipped with loaner laptops in the event of major technical issues.

Laptop repairs
IT Services provide on campus repairs on eligible laptop models.

IT Service Desk
The IT Service Desk is equipped with certified technicians and experienced IT professionals offering technical support services on a drop-in, call-in or email basis.

General Use Workstations (GUWs)
Ontario Tech undergraduate students are able to use general workstations available at the library and have access to Bring Your Own Device Technology-Enriched Learning Environment (BYOD TELE) model course-specific software.

Software Support
Software Support specialists are available to students on-site and online to assist in downloading/installing University software and support any other software related issues.

Printing services
Printing services are available to students in the following areas: labs, classrooms, study common areas, the Learning Commons and the Library. All Ontario Tech students receive print credits every year, more Printpacks can be purchased through the Campus Bookstore if students require additional printing services.

Teaching & Learning Centre

The mission of the Teaching and Learning Centre (TLC) at Ontario Tech University is to empower faculty to reach their potential as educators and to create a culture where effective teaching is valued. We champion the scholarship of teaching and implementation of pedagogy. We create valuable teaching and learning professional development experiences. We move Ontario Tech University towards being a leader in teaching excellence, ultimately leading to greater student success.

The TLC provides faculty with a range of tools and facilities to assist them in providing a rich learning experience for students. Experts at the TLC provide support in various areas including curriculum development, multimedia design, learning technology and in the overall improvement of teaching practice.

In addition, the TLC funds teaching-related projects from the Teaching Innovation Fund (TIF) for proposals by faculty members aimed at developing new methods in teaching and learning. The TLC facilitates teaching awards at the University and supports faculty in their application for external awards and funding opportunities that focus on teaching and learning.

f) Graduate student financial support

- *Provide evidence that financial assistance will be sufficient to ensure quality and numbers of students*
- *Provide the teaching assistant hours and capacity within the Faculty*

Every MASc student offered admission to a graduate program in FEAS should be able to complete their program regardless of their financial status.

The minimum funding support for MASc students will be $16,000 per year, for two years, with funding coming from a variety of sources, including the following sources:

- Ontario Tech Scholarships/Bursaries
- External Awards – These include NSERC postgraduate awards and provincial awards
- Teaching Assistantships – MASc students will be eligible to earn up to approximately $10,000 per year through teaching assistantships
- Graduate Research Assistantships – Additional support from individual supervisors will be available to students
- Work-Study and Other Forms of Employment-Based Learning will be available
- Provincial Loan Programs are also available

It is expected that most funding for MASc students will come from Graduate Research Assistantships and Teaching Assistantships. Normally, funding will not be provided to part-time students.

MEng students will have access to financial support through provincial loan programs and work-study placements. Normally, additional funding will not be provided to MEng students.

g) Physical resource requirements

- *Please attach a report, as an Appendix, from the Library regarding existing library holdings and support for student learning; please contact your Subject Librarian as you begin your proposal to request a 'Library statement for new program proposal'*
- *Address any space/infrastructure requirements including information technology, laboratory space, equipment, etc.* ***If new space is required, please complete Table 4 (examples in purple); otherwise, please remove this Table***

- *Ideally, please provide information on the change in the number of faculty, students, administrative staff, etc. as well as information on changes in equipment and activities (additional space; the renovation of existing space; or will the current space allocation accommodate the new program)*
- ***If new resources are needed, add the plan and commitment to provide these resources to support the program and the rationale in section 4h)***

Please see Appendix F for the Library report. Existing classroom, lab, and office space will be utilized.

Table 4: Additional Space Requirements

Space Type	Number Required	Space Requirements (sq. ft)

h) Resource Summary

Provide a brief statement of the funding requirements and the rationale.

The MASc and MEng programs will be build upon the BEng in Mechatronics Engineering program in terms of instructors. One TTT Faculty member is currently being hired as part of the BEng program and they will also teach in the MASc and MEng programs. As this is a graduate program, there is currently no need for TA support. However, in future if the number of MEng students grows substantially, there may be a requirement for TA support for the core courses in the program. Note, these TA costs would be supported by the increased in funding from students enrolled in the MEng program. PhD students with the Faculty of Engineering and Applied Science would serve as the TA pool if the need arises. As noted previously, the majority of instruction will be done by TTT Faculty and Teaching Faculty within FEAS. There may be a limited need for Sessional Instructors depending on matters such as the number of courses that need to be offered in a semester, or faculty on research leave, sick leaves, etc. A Graduate Program Director for the Department of Automotive and Mechatronics Engineering will be required. This faculty member will be responsible for the existing MASc and MEng programs in Automotive Engineering as well as the new MASc and MEng programs in Mechatronics Engineering. The existing Graduate Program Assistants within the Faculty of Engineering and Applied Science will be sufficient for the planned enrolment for at least the first five years of the program.

Human Resource Requirements

Are additional faculty required to be able to offer this program? ☐ Yes ☒ No

If yes, what year will the faculty hire be required, and are there additional criteria associated with the hiring requirement (e.g. enrolment levels)?

Are additional staff required to be able to offer this program? ☐ Yes ☒ No

If yes, please outline what year the staff hire will be required and any additional criteria associated with the hiring requirement:

Space Requirements

Are there additional space requirements specific to being able to successfully launch this program? ☐ Yes ☒ No

If yes, please provide additional details:

Technology Requirements

Are there additional technology requirements specific to being able to successfully launch this program? ☐ Yes ☒ No

If yes, please provide additional details:

Additional Resource Requirements

Are there additional resource requirements not specified above that are required to successfully launch this program? If so, please outline them below:

None

The resource requirements outlined above have been reviewed and approved by the Academic Resource Committee (ARC): _____

(date of review)

5 Closing Statements Regarding Program Quality (QAF 2.1.2.8)

- *Please describe any additional evidence of the quality of the faculty (e.g. qualifications, funding, honours, awards, research, innovation and scholarly record) not already discussed*
- *Please provide any other evidence that the program and faculty will ensure the intellectual quality of the student experience*

The faculty members who are involved in the proposed programs are all subject matter experts in Mechatronics Engineering who currently teach in the Canadian Engineering Accredition Board (CEAB) accredited BEng in Mechatronics Engineering program. All faculty members are registered Professional Engineers in Canada or are in the process becoming registered.

The TTT Faculty members all have active research programs supported by both government granting agencies as well as industrial sponsors. In addition, they are experienced in graduate student supervision and graduate teaching. The faculty are all qualified to ensure the intellectual quality of the student experience.

Details about the faculty members qualifications and research can be found in Appendix E and their CVs.

APPENDICES

Please include at minimum the below. Additional Appendices may be added, as appropriate. Appendices should ultimately be listed, attached, and labelled (A, B, C, etc.) in the order in which they first are mentioned in the document.

Program Learning Outcome Alignment Map to DLEs
Accreditation tables (if applicable)
Calendar Copy with Program Maps (please use template)
List of Program Courses, New Course Proposals, Required Course Changes, Course Syllabi for Existing Courses (can each be attached as separate appendices)
Detailed Listing of Faculty Committed to the Program (please use template)
Library Report

Items to be separate documents sent to CIQE:

New Program Funding and Tuition form (for CIQE use only)
Budget Spreadsheet (for ARC use only)
CVs for all faculty committed to the program (to be provided to the external reviewers)

Appendix A – Program Learning Outcome Alignment Map to DLEs

	Explain advanced concepts, principles, and theories in mechatronics.	Design and implement experiments.	Interpret experimental data and computational results.	Solve engineering problems and enhance existing practices through research.	Adhere to social, professional, and ethical expectations involved in advanced education and research.	Describe the importance of, and develop the strategies for, further education and lifelong learning in the discipline.	Communicate mechatronics concepts, principles, and results effectively using written and verbal formats.	Critically evaluate advanced information and knowledge and apply in engineering practice.
Depth and Breadth of Knowledge	x							
Research and Scholarship		x	x					
Level of Application of Knowledge				x				
Communication Skills							x	
Awareness of Limits of Knowledge								x
Autonomy/Professional Capacity					x	x		

Appendix B – New Course Proposals and Required Course Changes

The following courses are new courses in the programs:

METE 5003G - MASc Seminar for Mechatronics Engineering
METE 5101G - Artificial Intelligence and Machine Learning Methods and Applications
METE 5102G - Control Design in Robotic Systems
METE 5103G - Model Predictive Control
METE 5104G - Multivariable Feedback Control
METE 5105G - Nonlinear Control Systems
METE 5106G - Advanced System Modeling Methods
METE 5107G - Biomechatronic Systems
METE 5108G - Neuromechanics and Control of Human Movement
METE 5280G - Robotic Manipulators
METE 5300G - Mobile Robotics

The following course requires a credit restriction to be added:

ENGR 5945G - Mobile Robotic Systems (credit restriction with the new course METE 5300G)

NEW COURSE TEMPLATE

For changes to existing courses see Course Change Template

New courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: Faculty of Engineering and Applied Science	
This new course is associated with: ☐ Minor Program Adjustment ☐ Major Program Modification ☒ New Program ☐ None	
Will this course appear anywhere other than the course description section of the Calendar?	☒ **Yes** ☐ **No**

If you answered yes to the above, please complete:

***A new core course for an existing program, specialization or minor**: Minor Program Adjustment*

***A new elective course for an existing program, specialization or minor, listed in the program map**: Course Placement*

***A new course (core or elective) related to a Major Program Modification**: Major Program Modification*

***A new course (core or elective) related to a New Program**: New Program proposal*

Programs impacted: [Please list all impacted programs including any applicable fields or specializations.]

MASc in Mechatronics Engineering

Calendar start date: (When the course should first appear in the Academic Calendar 2020-2021)

2024-2025

Registration start date: (The first time the course will be open for registration e.g. Fall 2020)

Winter 2024

Additional supporting information (optional; please indicate if you are attaching any additional documentation)

N/A

Subject Code: METE	**Course Number:** 5003G
Full Course Title: MASc Seminar for Mechatronics Engineering	
Short-Form Course Title (max. 30 characters)**:** MASc Seminar for Mechatronics	

Course Description

Participation in a program of seminars by internal and external speakers on current research topics in the area of Mechatronics Engineering. All MASc students will be required to give a seminar on their thesis research during the second year of their program.

Credit Hours: 3		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3		**Lab:**
Tutorial:		**Other:**
Cross-listings		
Prerequisites for Calendar		
Prerequisites for Banner		
Co-requisites		
Prerequisites with concurrency (pre or co-requisite)		
Credit restrictions		☐ **Equivalency***
Recommended Prerequisites		
Course Restrictions		
Course Type	☒ **Core** ☐ **Elective** ☐ **Core or Elective**	
Is the course: ☐ Undergraduate ☒ Graduate ☐ Professional (e.g. some Education courses)		
Grading scheme	☐ **N (normal alpha grade)** ☒ **P (pass/fail)**	

***Equivalency:** Two courses are similar enough in content that they are considered equivalent so students can register in either course but they will only receive credit for one course in their program.

Course instructional method:

CLS (In Class Delivery)		HYB (In Class and Online Delivery)	x
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

Teaching and assessment methods:

Attendance in a series of seminars by internal and external speakers on various engineering topics. Students must attend a minimum of 10 seminars during their program of study. In addition, students are required to give a seminar on their thesis research during the second year of their program. Students are to keep track of their attendance via a log sheet. A faculty member within FEAS must sign-off on the attendance of a student at a given seminar.

Learning outcomes: (for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

Upon successful completion of this course, the students should be able to: • Recognize and be guided by the social, professional, and ethical issues involved in advanced education and research • Understand contemporary issues as well as professional and ethical responsibilities • Recognize the need and ability to further their education through lifelong learning

- Articulate their research ideas and results via an oral presentation

Does this course contain any experiential learning components? ☐ **Yes** ☒ **No**

If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

We have consulted with all impacted areas: ☐ **Yes** ☒ **NA**

Process of consultation, if applicable:

Have you considered the principles of Equity, Diversity, Inclusion, or Decolonization included when creating this new course? ☒ **Yes** ☐ **No** **Please explain:**

The Faculty of Engineering and Applied Science (FEAS) is fully committed to Equity, Diversity, and Inclusion (EDI), including in all of its courses. In this course, students will be exposed to a wide range of ideas and topics from a diverse group of presenters. For students who have accommodation needs, existing Student Accessibility Services (SAS) supports will be available to students who require specific accommodations.

Does this course contain any Indigenous content? ☐ **Yes** ☒ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted? ☐ **Yes** ☒ **No**

If yes, when?

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ **Yes** ☐ **No**

If yes, have they completed their review? ☐ **Yes** ☐ **No** ☐ **N/A**

Financial Implications

None

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

NEW COURSE TEMPLATE

For changes to existing courses see Course Change Template

New courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: Faculty of Engineering and Applied Science	
This new course is associated with: ☐ Minor Program Adjustment ☐ Major Program Modification ☒ New Program ☐ None	
Will this course appear anywhere other than the course description section of the Calendar?	☒ **Yes** ☐ **No**

If you answered yes to the above, please complete:

A new core course for an existing program, specialization or minor*: Minor Program Adjustment*

A new elective course for an existing program, specialization or minor, listed in the program map*: Course Placement*

A new course (core or elective) related to a Major Program Modification*: Major Program Modification*

A new course (core or elective) related to a New Program*: New Program proposal*

Programs impacted: [Please list all impacted programs including any applicable fields or specializations.]

MASc in Mechatronics Engineering
MEng in Mechatronics Engineering

Calendar start date: (When the course should first appear in the Academic Calendar 2020-2021)

2024-2025

Registration start date: (The first time the course will be open for registration e.g. Fall 2020)

Winter 2024

Additional supporting information (optional; please indicate if you are attaching any additional documentation)

N/A

Subject Code: METE	**Course Number:** 5101G
Full Course Title: Artificial Intelligence and Machine Learning Methods and Applications	
Short-Form Course Title (max. 30 characters)**:** AI & ML Methods & Applications	

Course Description

In this course, students will briefly review fundamental artificial intelligence and machine learning methods such as regression methods and decision trees. Students will develop skills to implement advanced machine learning concepts through coding projects. Data transformation and management methods including kernels, principal component analysis, and manifold learning will be discussed as well as ensemble methods and reinforcement learning strategies. Different artificial neural network structures, deep learning methods, regression, and convolution networks will be presented. Heuristic methods to handle non-linear problems in the context of machine learning will be introduced.

Credit Hours: 3		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3		**Lab:**
Tutorial:		**Other:**
Cross-listings		
Prerequisites for Calendar		
Prerequisites for Banner		
Co-requisites		
Prerequisites with concurrency (pre or co-requisite)		
Credit restrictions		☐ **Equivalency***
Recommended Prerequisites		
Course Restrictions		
Course Type	☐ **Core** ☒ **Elective** ☐ **Core or Elective**	
Is the course: ☐ Undergraduate ☒ Graduate ☐ Professional (e.g. some Education courses)		
Grading scheme	☒ **N (normal alpha grade)** ☐ **P (pass/fail)**	

***Equivalency:** Two courses are similar enough in content that they are considered equivalent so students can register in either course but they will only receive credit for one course in their program.

Course instructional method:

CLS (In Class Delivery)	x	HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

Teaching and assessment methods:

Assignments, midterms, projects, and/or the final exam as determined by the instructor.

Learning outcomes: (for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

Upon successful completion of this course, the students should be able to: • Demonstrate strong comprehension of advanced artificial intelligence and machine learning concepts • Apply and optimize the design of artificial intelligence and machine learning methods for engineering problems

- Developed technical skills to use standard tools for ease of machine learning and artificial intelligence implementations

Does this course contain any experiential learning components? ☐ **Yes** ☒ **No**

If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

We have consulted with all impacted areas: ☐ **Yes** ☒ **NA**

Process of consultation, if applicable:

Have you considered the principles of Equity, Diversity, Inclusion, or Decolonization included when creating this new course? ☒ **Yes** ☐ **No** **Please explain:**

The Faculty of Engineering and Applied Science (FEAS) is fully committed to Equity, Diversity, and Inclusion (EDI), including in all of its courses. The material covered in this course is mathematical in nature and is generally subject to these principles. However, when generating models with human data where low diversity in the sample data can affect decision-making results, special attention will be given to EDI principles and will be openly discussed with students. For students who have accommodation needs, existing Student Accessibility Services (SAS) supports will be available to students who require specific accommodations.

Does this course contain any Indigenous content? ☐ **Yes** ☒ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted? ☐ **Yes** ☒ **No**

If yes, when?

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ **Yes** ☐ **No**

If yes, have they completed their review? ☐ **Yes** ☐ **No** ☐ **N/A**

Financial Implications

None

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

NEW COURSE TEMPLATE

For changes to existing courses see Course Change Template

New courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: Faculty of Engineering and Applied Science
This new course is associated with: ☐ Minor Program Adjustment ☐ Major Program Modification ☒ New Program ☐ None

Will this course appear anywhere other than the course description section of the Calendar?	☒ **Yes** ☐ **No**

If you answered yes to the above, please complete:

***A new core course for an existing program, specialization or minor**: Minor Program Adjustment*

***A new elective course for an existing program, specialization or minor, listed in the program map**: Course Placement*

***A new course (core or elective) related to a Major Program Modification**: Major Program Modification*

***A new course (core or elective) related to a New Program**: New Program proposal*

Programs impacted: [Please list all impacted programs including any applicable fields or specializations.]

MASc in Mechatronics Engineering
MEng in Mechatronics Engineering

Calendar start date: (When the course should first appear in the Academic Calendar 2020-2021)

2024-2025

Registration start date: (The first time the course will be open for registration e.g. Fall 2020)

Winter 2024

Additional supporting information (optional; please indicate if you are attaching any additional documentation)

N/A

Subject Code: METE	**Course Number:** 5102G
Full Course Title: Control Design in Robotic Systems	
Short-Form Course Title (max. 30 characters)**:** Control Design Robotic Systems	

Course Description

This course deals with the topic of control design in robotic systems. Specifically, the course addresses the theories and techniques required to design controllers for robot manipulator systems. The detailed topics include: vectors/coordinate transforms, kinematics, robot dynamics, position control (such as PD control, computed torque control, adaptive control, sliding mode control, time-delayed control, disturbance observer) and force control (such as impedance control, hybrid force control). Students will design the introduced controllers and analyze robot dynamics and control performance through MATLAB/Simulink based simulations.

Credit Hours: 3	
Contact Hours – please indicate total number of hours for each component	
Lecture: 3	**Lab:**
Tutorial:	**Other:**
Cross-listings	
Prerequisites for Calendar	
Prerequisites for Banner	
Co-requisites	
Prerequisites with concurrency (pre or co-requisite)	
Credit restrictions	☐ **Equivalency***
Recommended Prerequisites	
Course Restrictions	
Course Type	☐ **Core** ☒ **Elective** ☐ **Core or Elective**
Is the course: ☐ Undergraduate ☒ Graduate ☐ Professional (e.g. some Education courses)	
Grading scheme	☒ **N (normal alpha grade)** ☐ **P (pass/fail)**

***Equivalency:** Two courses are similar enough in content that they are considered equivalent so students can register in either course but they will only receive credit for one course in their program.

Course instructional method:

CLS (In Class Delivery)	x	HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

Teaching and assessment methods:

Assignments, midterms, projects, and/or final exam as determined by the instructor.

Learning outcomes: (for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

Upon successful completion of this course, the students should be able to:

- Understand coordinate transformations in robotics
- Understand kinematic and dynamic modeling for a robotic manipulator
- Learn control design theories and techniques for robot manipulator systems

- Design position control algorithms for robot manipulator systems by applying the techniques of PD control, computed torque control, adaptive control, sliding mode control, time-delayed control, and disturbance observer
- Design force control algorithms for robot manipulator systems based on impedance control and hybrid force control techniques
- Conduct simulations to analyze the dynamics of robot manipulator systems and evaluate the performance of designed controllers

Does this course contain any experiential learning components? ☐ **Yes** ☒ **No**

If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

We have consulted with all impacted areas: ☐ **Yes** ☒ **NA**

Process of consultation, if applicable:

Have you considered the principles of Equity, Diversity, Inclusion, or Decolonization included when creating this new course? ☒ **Yes** ☐ **No** **Please explain:**

The Faculty of Engineering and Applied Science (FEAS) is fully committed to Equity, Diversity, and Inclusion (EDI), including in all of its courses. The material covered in this course is mathematical in nature and is generally subject to these principles. For students who have accommodation needs, existing Student Accessibility Services (SAS) supports will be available to students who require specific accommodations.

Does this course contain any Indigenous content? ☐ **Yes** ☒ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted? ☐ **Yes** ☒ **No**

If yes, when?

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ **Yes** ☐ **No**

If yes, have they completed their review? ☐ **Yes** ☐ **No** ☐ **N/A**

Financial Implications

None

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

NEW COURSE TEMPLATE

For changes to existing courses see Course Change Template

New courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: Faculty of Engineering and Applied Science	
This new course is associated with: ☐ Minor Program Adjustment ☐ Major Program Modification ☒ New Program ☐ None	
Will this course appear anywhere other than the course description section of the Calendar?	☒ **Yes** ☐ **No**

If you answered yes to the above, please complete:

A new core course for an existing program, specialization or minor*: Minor Program Adjustment*

A new elective course for an existing program, specialization or minor, listed in the program map*: Course Placement*

A new course (core or elective) related to a Major Program Modification*: Major Program Modification*

A new course (core or elective) related to a New Program*: New Program proposal*

Programs impacted: [Please list all impacted programs including any applicable fields or specializations.]

MASc in Mechatronics Engineering
MEng in Mechatronics Engineering

Calendar start date: (When the course should first appear in the Academic Calendar 2020-2021)

2024-2025

Registration start date: (The first time the course will be open for registration e.g. Fall 2020)

Winter 2024

Additional supporting information (optional; please indicate if you are attaching any additional documentation)

N/A

Subject Code: METE	**Course Number:** 5103G
Full Course Title: Model Predictive Control	
Short-Form Course Title (max. 30 characters)**:** Model Predictive Control	

Course Description

Model Predictive Control (MPC) theory will be introduced and developed in this project-based course. System identification modeling and control of linear and non-linear systems will be practiced with the implementation and design of different types of MPC algorithms, including: Simplified MPC, Dynamic Matrix Control, General Predictive Control and other MPC conditioning methodologies.

Credit Hours: 3		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3		**Lab:**
Tutorial:		**Other:**
Cross-listings		
Prerequisites for Calendar		
Prerequisites for Banner		
Co-requisites		
Prerequisites with concurrency (pre or co-requisite)		
Credit restrictions		☐ **Equivalency***
Recommended Prerequisites		
Course Restrictions		
Course Type	☐ **Core** ☒ **Elective** ☐ **Core or Elective**	
Is the course: ☐ Undergraduate ☒ Graduate ☐ Professional (e.g. some Education courses)		
Grading scheme	☒ **N (normal alpha grade)** ☐ **P (pass/fail)**	

***Equivalency:** Two courses are similar enough in content that they are considered equivalent so students can register in either course but they will only receive credit for one course in their program.

Course instructional method:

CLS (In Class Delivery)	x	HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

Teaching and assessment methods:

Assignments, midterms, projects, and/or final exam as determined by the instructor.

Learning outcomes: (for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

Upon successful completion of this course, the students should be able to: • Use system identification tools to develop and validate models of real-world systems • Leverage models to implement MPC control schemes for linear and non-linear systems • Select, design, and tune MPC controllers for control application requirements • Compare and communicate MPC controller response performance effectively

Does this course contain any experiential learning components? ☒ **Yes** ☐ **No**

If yes:

Case Study	x	Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

We have consulted with all impacted areas: ☐ **Yes** ☒ **NA**

Process of consultation, if applicable:

Have you considered the principles of Equity, Diversity, Inclusion, or Decolonization included when creating this new course? ☒ **Yes** ☐ **No** **Please explain:**

The Faculty of Engineering and Applied Science (FEAS) is fully committed to Equity, Diversity, and Inclusion (EDI), including in all of its courses. The material covered in this course is mathematical in nature and is generally subject to these principles. For students who have accommodation needs, existing Student Accessibility Services (SAS) supports will be available to students who require specific accommodations.

Does this course contain any Indigenous content? ☐ **Yes** ☒ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted? ☐ **Yes** ☒ **No**

If yes, when?

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ **Yes** ☐ **No**

If yes, have they completed their review? ☐ **Yes** ☐ **No** ☐ **N/A**

Financial Implications

None

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

NEW COURSE TEMPLATE

For changes to existing courses see Course Change Template

New courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: Faculty of Engineering and Applied Science
This new course is associated with: ☐ Minor Program Adjustment ☐ Major Program Modification ☒ New Program ☐ None

Will this course appear anywhere other than the course description section of the Calendar?	☒ **Yes** ☐ **No**

If you answered yes to the above, please complete:

***A new core course for an existing program, specialization or minor**: Minor Program Adjustment*

***A new elective course for an existing program, specialization or minor, listed in the program map**: Course Placement*

***A new course (core or elective) related to a Major Program Modification**: Major Program Modification*

***A new course (core or elective) related to a New Program**: New Program proposal*

Programs impacted: [Please list all impacted programs including any applicable fields or specializations.]

MASc in Mechatronics Engineering
MEng in Mechatronics Engineering

Calendar start date: (When the course should first appear in the Academic Calendar 2020-2021)

2024-2025

Registration start date: (The first time the course will be open for registration e.g. Fall 2020)

Winter 2024

Additional supporting information (optional; please indicate if you are attaching any additional documentation)

N/A

Subject Code: METE	**Course Number:** 5104G
Full Course Title: Multivariable Feedback Control	
Short-Form Course Title (max. 30 characters)**:** Multivariable Feedback Control	

Course Description

This course will cover multi-input, multi-output (MIMO) control systems. Specific topics include: elements of linear system theory; limitations in single-input, single-output (SISO) systems; limitations in MIMO systems; uncertainty and robustness; stability analysis of MIMO systems; control design (for example H-infinity, LQG); and model reduction.

Credit Hours: 3		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3		**Lab:**
Tutorial:		**Other:**
Cross-listings		
Prerequisites for Calendar		
Prerequisites for Banner		
Co-requisites		
Prerequisites with concurrency (pre or co-requisite)		
Credit restrictions		☐ **Equivalency***
Recommended Prerequisites		
Course Restrictions		
Course Type	☐ **Core** ☒ **Elective** ☐ **Core or Elective**	
Is the course: ☐ Undergraduate ☒ Graduate ☐ Professional (e.g. some Education courses)		
Grading scheme	☒ **N (normal alpha grade)** ☐ **P (pass/fail)**	

***Equivalency:** Two courses are similar enough in content that they are considered equivalent so students can register in either course but they will only receive credit for one course in their program.

Course instructional method:

CLS (In Class Delivery)	x	HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

Teaching and assessment methods:

Assignments, midterms, projects, and/or final exam as determined by the instructor.

Learning outcomes: (for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

Upon successful completion of this course, the students should be able to: • Apply concepts of dynamics, electric circuits, actuators and power electronics, and other engineering concepts to model, analyze, and simulate complex MIMO control systems • Apply concepts of linear algebra to assess and study the stability of complex dynamic systems and control systems • Use appropriately engineering practice techniques, skills, and modern engineering tools

- Apply knowledge of calculus, science, and engineering to develop and analyze control systems
- Design and conduct simulations and analyze and interpret experimental data
- Communicate their work effectively

Does this course contain any experiential learning components? ☐ **Yes** ☒ **No**

If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

We have consulted with all impacted areas: ☐ **Yes** ☒ **NA**

Process of consultation, if applicable:

Have you considered the principles of Equity, Diversity, Inclusion, or Decolonization included when creating this new course? ☒ **Yes** ☐ **No** **Please explain:**

The Faculty of Engineering and Applied Science (FEAS) is fully committed to Equity, Diversity, and Inclusion (EDI), including in all of its courses. The material covered in this course is mathematical in nature and is generally subject to these principles. For students who have accommodation needs, existing Student Accessibility Services (SAS) supports will be available to students who require specific accommodations.

Does this course contain any Indigenous content? ☐ **Yes** ☒ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted? ☐ **Yes** ☒ **No**

If yes, when?

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ **Yes** ☐ **No**

If yes, have they completed their review? ☐ **Yes** ☐ **No** ☐ **N/A**

Financial Implications

None

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

NEW COURSE TEMPLATE

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Faculty: Faculty of Engineering and Applied Science	
This new course is associated with: ☐ Minor Program Adjustment ☐ Major Program Modification ☒ New Program ☐ None	
Will this course appear anywhere other than the course description section of the Calendar?	☒ **Yes** ☐ **No**

If you answered yes to the above, please complete:

A new core course for an existing program, specialization or minor*: Minor Program Adjustment*

A new elective course for an existing program, specialization or minor, listed in the program map*: Course Placement*

A new course (core or elective) related to a Major Program Modification*: Major Program Modification*

A new course (core or elective) related to a New Program*: New Program proposal*

Programs impacted: [Please list all impacted programs including any applicable fields or specializations.]

MASc in Mechatronics Engineering
MEng in Mechatronics Engineering

Calendar start date: (When the course should first appear in the Academic Calendar 2020-2021)

2024-2025

Registration start date: (The first time the course will be open for registration e.g. Fall 2020)

Winter 2024

Additional supporting information (optional; please indicate if you are attaching any additional documentation)

N/A

Subject Code: METE	**Course Number:** 5105G
Full Course Title: Nonlinear Control Systems	
Short-Form Course Title (max. 30 characters)**:** Nonlinear Control Systems	

Course Description

This course will cover nonlinear state space control systems. Specific topics include: dynamic systems; input-output analysis; stability and observability of nonlinear systems; Lyapunov stability and applications; dynamics systems and bifurcations; linearization by state feedback; and introduction to geometric control.

Credit Hours: 3		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3	**Lab:**	
Tutorial:	**Other:**	
Cross-listings		
Prerequisites for Calendar		
Prerequisites for Banner		
Co-requisites		
Prerequisites with concurrency (pre or co-requisite)		
Credit restrictions	☐ **Equivalency***	
Recommended Prerequisites		
Course Restrictions		
Course Type	☐ **Core** ☒ **Elective** ☐ **Core or Elective**	
Is the course: ☐ Undergraduate ☒ Graduate ☐ Professional (e.g. some Education courses)		
Grading scheme	☒ **N (normal alpha grade)** ☐ **P (pass/fail)**	

***Equivalency:** Two courses are similar enough in content that they are considered equivalent so students can register in either course but they will only receive credit for one course in their program.

Course instructional method:

CLS (In Class Delivery)	x	HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

Teaching and assessment methods:

Assignments, midterms, projects, and/or final exam as determined by the instructor.

Learning outcomes: (for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

Upon successful completion of this course, the students should be able to:

- Apply concepts of dynamics, electric circuits, actuators and power electronics, and other engineering concepts to model, analyze, and simulate complex nonlinear dynamic systems
- Apply concepts of linear algebra to assess and study the stability of complex dynamic systems and control systems
- Use appropriately engineering practice techniques, skills, and modern engineering tools
- Apply knowledge of calculus, science, and engineering to develop and analyze control systems

- Design and conduct simulations and analyze and interpret experimental data
- Communicate their work effectively

Does this course contain any experiential learning components? ☐ **Yes** ☒ **No**

If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

We have consulted with all impacted areas: ☐ **Yes** ☒ **NA**

Process of consultation, if applicable:

Have you considered the principles of Equity, Diversity, Inclusion, or Decolonization included when creating this new course? ☒ **Yes** ☐ **No** **Please explain:**

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Does this course contain any Indigenous content? ☐ **Yes** ☒ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted? ☐ **Yes** ☒ **No**

If yes, when?

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ **Yes** ☐ **No**

If yes, have they completed their review? ☐ **Yes** ☐ **No** ☐ **N/A**

Financial Implications

None

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

NEW COURSE TEMPLATE

For changes to existing courses see Course Change Template

New courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: Faculty of Engineering and Applied Science	
This new course is associated with: ☐ Minor Program Adjustment ☐ Major Program Modification ☒ New Program ☐ None	
Will this course appear anywhere other than the course description section of the Calendar?	☒ **Yes** ☐ **No**

If you answered yes to the above, please complete:

A new core course for an existing program, specialization or minor*: Minor Program Adjustment*

A new elective course for an existing program, specialization or minor, listed in the program map*: Course Placement*

A new course (core or elective) related to a Major Program Modification*: Major Program Modification*

A new course (core or elective) related to a New Program*: New Program proposal*

Programs impacted: [Please list all impacted programs including any applicable fields or specializations.]

MASc in Mechatronics Engineering
MEng in Mechatronics Engineering

Calendar start date: (When the course should first appear in the Academic Calendar 2020-2021)

2024-2025

Registration start date: (The first time the course will be open for registration e.g. Fall 2020)

Winter 2024

Additional supporting information (optional; please indicate if you are attaching any additional documentation)

N/A

Subject Code: METE	**Course Number:** 5106G
Full Course Title: Advanced System Dynamics	
Short-Form Course Title (max. 30 characters)**:** Advanced System Dynamics	

Course Description

In this course, students will be introduced to linear graph theory and its application to the modelling of rigid body dynamics and kinematics. Graph theory will be used to derive systems of equations to simulate and analyze the multibody dynamics and kinematics of complex systems. Non-linear system dynamic formulation and simulation will be covered with electro-mechanical application examples.

Credit Hours: 3		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3		**Lab:**
Tutorial:		**Other:**
Cross-listings		
Prerequisites for Calendar		
Prerequisites for Banner		
Co-requisites		
Prerequisites with concurrency (pre or co-requisite)		
Credit restrictions		☐ **Equivalency***
Recommended Prerequisites		
Course Restrictions		
Course Type	☐ **Core** ☒ **Elective** ☐ **Core or Elective**	
Is the course: ☐ Undergraduate ☒ Graduate ☐ Professional (e.g. some Education courses)		
Grading scheme	☒ **N (normal alpha grade)** ☐ **P (pass/fail)**	

***Equivalency:** Two courses are similar enough in content that they are considered equivalent so students can register in either course but they will only receive credit for one course in their program.

Course instructional method:

CLS (In Class Delivery)	x	HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

Teaching and assessment methods:

Assignments, midterms, projects, and/or the final exam as determined by the instructor.

Learning outcomes: (for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

Upon successful completion of this course, the students should be able to: • Model systems using linear graph theory • Generate equations for complex system configurations • Simulate non-linear system dynamics

Does this course contain any experiential learning components? ☐ **Yes** ☒ **No**

If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

We have consulted with all impacted areas: ☐ **Yes** ☒ **NA**

Process of consultation, if applicable:

Have you considered the principles of Equity, Diversity, Inclusion, or Decolonization included when creating this new course? ☒ **Yes** ☐ **No** **Please explain:**

The Faculty of Engineering and Applied Science (FEAS) is fully committed to Equity, Diversity, and Inclusion (EDI), including in all of its courses. The material covered in this course is mathematical in nature and is generally subject to these principles. For students who have accommodation needs, existing Student Accessibility Services (SAS) supports will be available to students who require specific accommodations.

Does this course contain any Indigenous content? ☐ **Yes** ☒ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted? ☐ **Yes** ☒ **No**

If yes, when?

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ **Yes** ☐ **No**

If yes, have they completed their review? ☐ **Yes** ☐ **No** ☐ **N/A**

Financial Implications

None

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

NEW COURSE TEMPLATE

For changes to existing courses see Course Change Template

New courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: Faculty of Engineering and Applied Science	
This new course is associated with: ☐ Minor Program Adjustment ☐ Major Program Modification ☒ New Program ☐ None	
Will this course appear anywhere other than the course description section of the Calendar?	☒ **Yes** ☐ **No**

If you answered yes to the above, please complete:

A new core course for an existing program, specialization or minor*: Minor Program Adjustment*

A new elective course for an existing program, specialization or minor, listed in the program map*: Course Placement*

A new course (core or elective) related to a Major Program Modification*: Major Program Modification*

A new course (core or elective) related to a New Program*: New Program proposal*

Programs impacted: [Please list all impacted programs including any applicable fields or specializations.]

MASc in Mechatronics Engineering
MEng in Mechatronics Engineering

Calendar start date: (When the course should first appear in the Academic Calendar 2020-2021)

2024-2025

Registration start date: (The first time the course will be open for registration e.g. Fall 2020)

Winter 2024

Additional supporting information (optional; please indicate if you are attaching any additional documentation)

N/A

Subject Code: METE	**Course Number:** 5107G
Full Course Title: Biomechatronic Systems	
Short-Form Course Title (max. 30 characters)**:** Biomechatronic Systems	

Course Description

This course addresses design, modeling, and control of mechatronic systems (i.e., mechanics, electronics, computer science, and system integration) with medical and biomechanical devices. Function and coordination of human motion shapes the core of the course. Detailed topics include biomechanics of human movement, biomedical signal acquisition, control and sensor interfaces and actuators, functional electrical stimulation, robotics for medical and rehabilitation applications, exoskeletons, upper and lower extremities smart artificial mechanical systems, and clinical engineering research. Students will complete problem analysis for related case studies. Students will identify the underlying cause of the problem and describe and explain possible conceptual design solutions. They will assess their conceptual designs and will develop the introduced controllers and analyze the mechatronic systems performance through simulation.

Credit Hours: 3		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3	**Lab:**	
Tutorial:	**Other:**	
Cross-listings		
Prerequisites for Calendar		
Prerequisites for Banner		
Co-requisites		
Prerequisites with concurrency (pre or co-requisite)		
Credit restrictions	☐ **Equivalency***	
Recommended Prerequisites		
Course Restrictions		
Course Type	☐ **Core** ☒ **Elective** ☐ **Core or Elective**	
Is the course: ☐ Undergraduate ☒ Graduate ☐ Professional (e.g. some Education courses)		
Grading scheme	☒ **N (normal alpha grade)** ☐ **P (pass/fail)**	

***Equivalency:** Two courses are similar enough in content that they are considered equivalent so students can register in either course but they will only receive credit for one course in their program.

Course instructional method:

CLS (In Class Delivery)	x	HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

Teaching and assessment methods:

Assignments, midterms, projects, and/or the final exam as determined by the instructor.

Learning outcomes: (for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

By the end of this course, students should be able to:

- Understand concepts of statics, kinematics, and kinetics in human movement

- Evaluate movement and estimate force on human structures
- Process (debug, filter, and analyze) biological signals, including Electromyographic (EMG-muscles') signals, Electroencephalogram (ECG) signals (heart vital signal), electroencephalogram (EEG signals), etc.
- Understand the operation of biomedical signal acquisition instrumentation systems
- Gain an understating of the principles of functional electrical stimulation (FES)
- Discuss the various uses of FES in the rehabilitation of persons with neurological limitations
- Identify and describe healthcare robotics and artificial actuators, including Assistive, rehabilitative, and surgical robots
- Understand the concepts of sensing in assistive motor control systems
- Develop the analytical and experimental skills necessary to design and implement biomechatronic systems

Does this course contain any experiential learning components? ☒ **Yes** ☐ **No**

If yes:

Case Study	x	Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

We have consulted with all impacted areas: ☐ **Yes** ☒ **NA**

Process of consultation, if applicable:

Have you considered the principles of Equity, Diversity, Inclusion, or Decolonization included when creating this new course? ☒ **Yes** ☐ **No** **Please explain:**

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Does this course contain any Indigenous content? ☐ **Yes** ☒ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted? ☐ **Yes** ☒ **No**

If yes, when?

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ **Yes** ☐ **No**

If yes, have they completed their review? ☐ **Yes** ☐ **No** ☐ **N/A**

Financial Implications

None

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

NEW COURSE TEMPLATE

For changes to existing courses see Course Change Template

New courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: Faculty of Engineering and Applied Science	
This new course is associated with: ☐ Minor Program Adjustment ☐ Major Program Modification ☒ New Program ☐ None	
Will this course appear anywhere other than the course description section of the Calendar?	☒ **Yes** ☐ **No**

If you answered yes to the above, please complete:

***A new core course for an existing program, specialization or minor**: Minor Program Adjustment*

***A new elective course for an existing program, specialization or minor, listed in the program map**: Course Placement*

***A new course (core or elective) related to a Major Program Modification**: Major Program Modification*

***A new course (core or elective) related to a New Program**: New Program proposal*

Programs impacted: [Please list all impacted programs including any applicable fields or specializations.]

MASc in Mechatronics Engineering
MEng in Mechatronics Engineering

Calendar start date: (When the course should first appear in the Academic Calendar 2020-2021)

2024-2025

Registration start date: (The first time the course will be open for registration e.g. Fall 2020)

Winter 2024

Additional supporting information (optional; please indicate if you are attaching any additional documentation)

N/A

Subject Code: METE	**Course Number:** 5108G
Full Course Title: Neuromechanics and Control of Human Movement	
Short-Form Course Title (max. 30 characters)**:** Neuromechanics of Human Movement	

Course Description

This course combines principles of mechanical system dynamics and control with motor neuroscience and musculoskeletal biomechanics to model and simulate how humans integrate sensory information, estimate, plan, control, and adapt movements. The topics include system dynamics to model human movement, concepts of inverse dynamics and forward dynamics and the general way to describe rigid-body motion in the Newton-Euler or Lagrange formulation, musculoskeletal and nervous systems interaction, neural strategies for the control of postures and motion, numerical and computational methods to simulate human movement, motor control learning and planning, and multisensory integration and filtering for the body state estimation.

Credit Hours: 3	
Contact Hours – please indicate total number of hours for each component	
Lecture: 3	**Lab:**
Tutorial:	**Other:**
Cross-listings	
Prerequisites for Calendar	
Prerequisites for Banner	
Co-requisites	
Prerequisites with concurrency (pre or co-requisite)	
Credit restrictions	☐ **Equivalency***
Recommended Prerequisites	
Course Restrictions	
Course Type	☐ **Core** ☒ **Elective** ☐ **Core or Elective**
Is the course: ☐ Undergraduate ☒ Graduate ☐ Professional (e.g. some Education courses)	
Grading scheme	☒ **N (normal alpha grade)** ☐ **P (pass/fail)**

***Equivalency:** Two courses are similar enough in content that they are considered equivalent so students can register in either course but they will only receive credit for one course in their program.

Course instructional method:

CLS (In Class Delivery)	x	HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

Teaching and assessment methods:

Projects, assignments, midterms and/or final exam as determined by the instructor.

Learning outcomes: (for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

By the end of this course, students should be able to:

- Understand concepts of kinematics and kinetics in human movement
- Derive the equations of motion for the upper and lower extremities of the human body
- Explain optimal feedback control theory and its application to human movement

- Discuss the effect of perturbation and changes in systems that are involved in controlling postures on the stability
- Develop mathematical models of postural control and control of movement in MATLAB
- Implement multisensory integration and Kalman filtering to improve posture state estimation
- Understand multi-rate and V-shaped learning models
- Employ learning models to predict motor adaptation to kinematic and dynamic perturbations

Does this course contain any experiential learning components? ☒ **Yes** ☐ **No**

If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	x
Field Experiences			
Other Types of Experiences:			

We have consulted with all impacted areas: ☐ **Yes** ☒ **NA**

Process of consultation, if applicable:

Have you considered the principles of Equity, Diversity, Inclusion, or Decolonization included when creating this new course? ☒ **Yes** ☐ **No** **Please explain:**

The Faculty of Engineering and Applied Science (FEAS) is fully committed to Equity, Diversity, and Inclusion (EDI), including in all of its courses. The material covered in this course is mathematical in nature and is generally subject to these principles. For students who have accommodation needs, existing Student Accessibility Services (SAS) supports will be available to students who require specific accommodations.

Does this course contain any Indigenous content? ☐ **Yes** ☒ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted? ☐ **Yes** ☒ **No**

If yes, when?

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ **Yes** ☐ **No**

If yes, have they completed their review? ☐ **Yes** ☐ **No** ☐ **N/A**

Financial Implications

None

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

NEW COURSE TEMPLATE

For changes to existing courses see Course Change Template

New courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: Faculty of Engineering and Applied Science
This new course is associated with: ☐ Minor Program Adjustment ☐ Major Program Modification ☒ New Program ☐ None

Will this course appear anywhere other than the course description section of the Calendar?	☐ **Yes** ☒ **No**

If you answered yes to the above, please complete:

A new core course for an existing program, specialization or minor*: Minor Program Adjustment*

A new elective course for an existing program, specialization or minor, listed in the program map*: Course Placement*

A new course (core or elective) related to a Major Program Modification*: Major Program Modification*

A new course (core or elective) related to a New Program*: New Program proposal*

Programs impacted: [Please list all impacted programs including any applicable fields or specializations.]

MASc in Mechatronics Engineering
MEng in Mechatronics Engineering

Calendar start date: (When the course should first appear in the Academic Calendar 2020-2021)

2024-2025

Registration start date: (The first time the course will be open for registration e.g. Fall 2020)

Winter 2024

Additional supporting information (optional; please indicate if you are attaching any additional documentation)

N/A

Subject Code: METE	**Course Number:** 5280G
Full Course Title: Robotic Manipulators	
Short-Form Course Title (max. 30 characters)**:** Robotic Manipulators	

Course Description

Industrial robots; robot kinematics, differential kinematics; statics, dynamics and control of robot arms; noncontact and contact sensors; actuators; real-time joint control; task planning and programming of industrial robots; applications of robots.

Credit Hours: 3		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3		**Lab:** 2 (bi-weekly)
Tutorial: 1		**Other:**
Cross-listings	MANE 4280U - Robotics and Automation	
Prerequisites for Calendar		
Prerequisites for Banner		
Co-requisites		
Prerequisites with concurrency (pre or co-requisite)		
Credit restrictions		☐ **Equivalency***
Recommended Prerequisites		
Course Restrictions		
Course Type	☐ **Core** ☒ **Elective** ☐ **Core or Elective**	
Is the course: ☐ Undergraduate ☒ Graduate ☐ Professional (e.g. some Education courses)		
Grading scheme	☒ **N (normal alpha grade)** ☐ **P (pass/fail)**	

***Equivalency:** Two courses are similar enough in content that they are considered equivalent so students can register in either course but they will only receive credit for one course in their program.

Course instructional method:

CLS (In Class Delivery)	x	HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

Teaching and assessment methods:

Assignments, labs, midterms, projects, and/or final exam as determined by the instructor.

Learning outcomes: (for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

Upon successful completion of this course, the students should be able to: • Classify industrial robots and know the uses of industrial robots. • Analyze the kinematics associated with complex robot motion. • Establish the dynamics of robot arms and how to control the arms. • Understand the basics on non-contact and contact sensors as used in robots. • Analyze actuators and real-time joint control systems. • Establish the methodology for the task planning and programming of industrial robots.

- Work with a wide variety of applications of industrial robots.

Does this course contain any experiential learning components? ☐ **Yes** ☒ **No**

If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

We have consulted with all impacted areas: ☐ **Yes** ☒ **NA**

Process of consultation, if applicable:

Have you considered the principles of Equity, Diversity, Inclusion, or Decolonization included when creating this new course? ☒ **Yes** ☐ **No** **Please explain:**

The Faculty of Engineering and Applied Science (FEAS) is fully committed to Equity, Diversity, and Inclusion (EDI), including in all of its courses. The material covered in this course is mathematical in nature and is generally subject to these principles. For students who have accommodation needs, existing Student Accessibility Services (SAS) supports will be available to students who require specific accommodations.

Does this course contain any Indigenous content? ☐ **Yes** ☒ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted? ☐ **Yes** ☒ **No**

If yes, when?

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ **Yes** ☐ **No**

If yes, have they completed their review? ☐ **Yes** ☐ **No** ☐ **N/A**

Financial Implications

None

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

NEW COURSE TEMPLATE

For changes to existing courses see Course Change Template

New courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact.

Faculty: Faculty of Engineering and Applied Science	
This new course is associated with: ☐ Minor Program Adjustment ☐ Major Program Modification ☒ New Program ☐ None	
Will this course appear anywhere other than the course description section of the Calendar?	☒ **Yes** ☐ **No**

If you answered yes to the above, please complete:

A new core course for an existing program, specialization or minor*: Minor Program Adjustment*

A new elective course for an existing program, specialization or minor, listed in the program map*: Course Placement*

A new course (core or elective) related to a Major Program Modification*: Major Program Modification*

A new course (core or elective) related to a New Program*: New Program proposal*

Programs impacted: [Please list all impacted programs including any applicable fields or specializations.]

MASc in Mechatronics Engineering
MEng in Mechatronics Engineering

Calendar start date: (When the course should first appear in the Academic Calendar 2020-2021)

2024-2025

Registration start date: (The first time the course will be open for registration e.g. Fall 2020)

Winter 2024

Additional supporting information (optional; please indicate if you are attaching any additional documentation)

N/A

Subject Code: METE	**Course Number:** 5300G
Full Course Title: Mobile Robotics	
Short-Form Course Title (max. 30 characters)**:** Mobile Robotics	

Course Description

Students will learn the basics of mobile robotics through a series of open-ended projects in a hands-on learning environment. Topics covered, include: locomotion; mobile robot kinematics; perception; mapping and localization; and path planning, obstacle avoidance, and navigation.

Credit Hours: 3		
Contact Hours – please indicate total number of hours for each component		
Lecture: 3		**Lab:** 3
Tutorial:		**Other:**
Cross-listings	METE 4300U – Introduction to Mobile Robotics	
Prerequisites for Calendar		
Prerequisites for Banner		
Co-requisites		
Prerequisites with concurrency (pre or co-requisite)		
Credit restrictions	ENGR 5945G – Mobile Robotic Systems	☒ **Equivalency***
Recommended Prerequisites		
Course Restrictions		
Course Type	☐ **Core** ☒ **Elective** ☐ **Core or Elective**	
Is the course: ☐ Undergraduate ☒ Graduate ☐ Professional (e.g. some Education courses)		
Grading scheme	☒ **N (normal alpha grade)** ☐ **P (pass/fail)**	

***Equivalency:** Two courses are similar enough in content that they are considered equivalent so students can register in either course but they will only receive credit for one course in their program.

Course instructional method:

CLS (In Class Delivery)	x	HYB (In Class and Online Delivery)	
IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

Teaching and assessment methods:

Assignments, labs, midterms, projects, and/or final exam as determined by the instructor.

Learning outcomes: (for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

Upon successful completion of this course, the students should be able to: • Understand the fundamentals of mobile robot locomotion including wheeled and legged systems • Understand the kinematics and low-level control of mobile robotic systems • Become familiar with methods of robotic perception and sensor data interpretation • Become familiar with various localization schemes • Understand the principles and methods of mapping, obstacle avoidance, path planning, and navigation

Does this course contain any experiential learning components? ☒ **Yes** ☐ **No**

If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	X
Field Experiences			
Other Types of Experiences:			

We have consulted with all impacted areas: ☐ **Yes** ☒ **NA**

Process of consultation, if applicable:

Have you considered the principles of Equity, Diversity, Inclusion, or Decolonization included when creating this new course? ☒ **Yes** ☐ **No** **Please explain:**

The Faculty of Engineering and Applied Science (FEAS) is fully committed to Equity, Diversity, and Inclusion (EDI), including in all of its courses. The material covered in this course is mathematical in nature and is generally subject to these principles. For students who have accommodation needs, existing Student Accessibility Services (SAS) supports will be available to students who require specific accommodations.

Does this course contain any Indigenous content? ☐ **Yes** ☒ **No** ☐ **Unsure**

For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

Has the IEAC been contacted? ☐ **Yes** ☒ **No**

If yes, when?

What was the advice you received from the IEAC, and how has it been included in your proposal?

Did the IEAC ask you to return the proposal to them for review? ☐ **Yes** ☐ **No**

If yes, have they completed their review? ☐ **Yes** ☐ **No** ☐ **N/A**

Financial Implications

None

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

COURSE CHANGE TEMPLATE

For new courses see New Course Template
Changes to courses must be entered into Curriculog prior to Faculty Council. Please use this template to provide the information to your Curriculog contact. If you are uncertain about a change or definitions of terms used on this form, please reach out to your Curriculog contact, or ciqe@ontariotechu.ca.

Faculty: Faculty of Engineering and Applied Science	
Course Level	☐ **Undergraduate** ☒ **Graduate**

COURSE CHANGES (check all that apply)

☐	Contact hours	☐	Cross-listings
☐	Co-requisites	☐	Experiential Learning
☐	Course description	☐	Grade Mode (N – alpha grade, P – Pass/Fail)
☐	Course Instructional Method (CLS, HYB, WB1, WEB)	☐	Learning outcomes
☐	Course number or course Subject code	☐	Prerequisites
☐	Course title (include new short form title)	☐	Delete course from Academic Calendar
☒	Credit restrictions and/or Equivalencies	☐	Teaching and assessment methods
☐	Credit weighting	☐	Course restrictions
☐	Deleting an Elective Shown in the Program Map	☐	Other (please specify):

IS THIS COURSE CHANGE ASSOCIATED WITH A PROGRAM PROPOSAL? ☒ **Yes** ☐ **No**

REASON FOR CHANGE AND WAYS IN WHICH IT MAINTAINS/ENHANCES COURSE/PROGRAM OBJECTIVES

As part of the new MASc/MEng in Mechatronics Engineering, the content of the new course METE 5300G – Mobile Robotics is too similar to the content of the existing course ENGR 5945G – Mobile Robotic Systems. Note METE 5300G is being created to allow the offering of a joint fourth-year/graduate course on mobile robotics.

FINANCIAL IMPLICATIONS

CALENDAR START DATE (When the course should first appear in the Academic Calendar e.g. 2020-2021)

2024-2025

REGISTRATION START DATE (The first time the course will be open for registration e.g. Fall 2020)

Fall 2024

ADDITIONAL SUPPORTING INFORMATION (optional; please indicate if you are attaching any additional documentation)

N/A

COURSE INFORMATION

Subject Code: ENGR	**Course Number:** 5945G
Full Course Title: Mobile Robotic Systems	
Short-Form Course Title (max. 30 characters): Mobile Robotic Systems	

CHANGE TO CALENDAR DESCRIPTION (if required)

Current	**Proposed**

CHANGE TO CREDIT AND CONTACT HOURS [if applicable, indicate changes to total contact hours only; changes to frequency (e.g. 1x3 hours to 2X1.5 hours) not required]:

Credit Hours	
Lecture	Lab
Tutorial	Other

OTHER CHANGES (if applicable)

Cross-listings	
Prerequisites for Calendar and Banner	
Co-requisites	
Prerequisites with concurrency (pre or co-requisite)	
Credit restrictions	METE 5300G – Mobile Robotics ☒ **Equivalency***
Recommended Prerequisites	
Course Restrictions	
Course Type	☐ **Core** ☐ **Elective** ☐ **Core or Elective**
Grading scheme	☐ **N (normal alpha grade)** ☐ **P (pass/fail)**

***Equivalency:** Two courses are similar enough in content that they are considered equivalent so students can register in either course but they will only receive credit for one course in their program.

CHANGES TO COURSE INSTRUCTIONAL METHOD (if applicable):

CLS (In Class Delivery)		HYB (In Class and Online Delivery)	

IND (Individual Studies)		OFF (Off Site)	
WB1 (Virtual Meet Time – Synchronous)		WEB (Fully Online – Asynchronous)	
Not Applicable			

CHANGES TO TEACHING AND ASSESSMENT METHODS (if applicable)

N/A

CHANGES TO LEARNING OUTCOMES (if applicable; for assistance developing course learning outcomes, please refer to the Teaching and Learning website, or contact them at teachingandlearning@ontariotechu.ca.)

N/A

DOES THIS COURSE CONTAIN ANY EXPERIENTIAL LEARNING COMPONENTS?
If yes:

Case Study		Simulated Workplace Project	
Consulting project/workplace project		Applied Research	
Field Experiences			
Other Types of Experiences:			

CONSULTATION (Curriculog contact to complete an Impact Report)

N/A

DOES THIS COURSE CHANGE IMPACT BOTH THE UNDERGRADUATE AND GRADUATE CALENDARS?
☐ **Yes** ☒ **No**

WE HAVE CONSULTED WITH ALL IMPACTED AREAS? ☐ **Yes** ☒ **NA**
Please describe:

ARE THERE ANY CONSIDERATIONS FOR THE PRINCIPLES OF EQUITY, DIVERSITY, INCLUSION, OR DECOLONIZATION INCLUDED WITH THIS COURSE CHANGE? ☐ **Yes** ☒ **No** **Please explain:**

N/A

DOES THIS COURSE CONTAIN ANY INDIGENOUS CONTENT? ☐ **Yes** ☒ **No** ☐ **Unsure**
For more information on how Indigenous content is defined at Ontario Tech University and how to consult with the Indigenous Education Advisory Circle (IEAC), please refer to the Protocol for Consultation with the Indigenous Education Advisory Circle.

HAS THE IEAC BEEN CONTACTED? ☐ **Yes** ☐ **No**

If yes, when?

WHAT WAS THE ADVICE YOU RECEIVED FROM THE IEAC, AND HOW HAS IT BEEN INCLUDED IN YOUR PROPOSAL?

DID THE IEAC ASK YOU TO RETURN THE PROPOSAL TO THEM FOR REVIEW? ☐ **Yes** ☐ **No**

IF YES, HAVE THEY COMPLETED THEIR REVIEW? ☐ **Yes** ☐ **No** ☐ **N/A**

Pre-Faculty Council Approval Dates (e.g. Curriculum Committee, Program Committee):

Appendix C – Existing Course Descriptions

The following courses are existing courses in the programs:

ENGR 5001G - MASc Thesis
ENGR 5002G - MEng/MEngM Project
ENGR 5004G - MASc/MEng Directed Studies
ENGR 5005G - Special Topics
ENGR 5010G - Advanced Optimization
ENGR 5012G - Advanced and Smart Materials
ENGR 5013G - Advanced Engineering Mathematics
ENGR 5200G - Programming Methodology and Abstraction for Engineers
ENGR 5201G - Engineering Communications and Ethics
ENGR 5240G - Advanced Dynamics
ENGR 5245G - Micro and Nano Manufacturing
ENGR 5260G - Advanced Robotics and Automation
ENGR 5261G - Advanced Mechatronics: MEMS and Nanotechnology
ENGR 5262G - Manipulator and Mechanism Design
ENGR 5263G - Advanced Control
ENGR 5271G - Innovative Design Engineering
ENGR 5273G - Design by Failure
ENGR 5410G - Project Management for Engineers
ENGR 5510G - Foundations of Software Engineering
ENGR 5520G - Software Development Methods and Tools
ENGR 5605G - Convex Optimization
ENGR 5910G - Embedded Real-Time Control Systems
ENGR 5915G - Discrete Time Control Systems
ENGR 5930G - Adaptive Control
ENGR 5940G - Intelligent Control Systems
ENGR 5945G - Mobile Robotic Systems
ENGR 5946G - Advanced Fluid Power Control and Simulation

ENGR 5001G - MASc Thesis
The thesis is the major component of the MASc program and is carried out under the direction of the student's supervisor. The thesis may involve an investigation that is fundamental in nature or may be applied incorporating creative design. Through the thesis, candidates are expected to give evidence of competence in research and a sound understanding of the area of specialization involved. The student will receive a grade of either pass or fail.

ENGR 5002G - MEng/MEngM Project
The master's project provides students with the opportunity, under the supervision of a faculty member, to integrate and synthesize knowledge gained throughout their program of study. The chosen topic will be dependent on the area of specialization of the student. The student will receive a grade of either pass or fail.

ENGR 5004G - MASc/MEng Directed Studies
Faculty permission may be given for supervised research projects, individual study, or directed readings. MASc/ MEng students wishing to pursue a course of directed studies must, with a faculty member who is willing to supervise such a course, formulate a proposal accurately describing the course content, the learning goals, the intended method and extent of supervision, and the method by which work will be evaluated. This course may only be taken once.

ENGR 5005G - Special Topics
Presents material in an emerging field or one not covered in regular offerings. This course may be taken more than once, provided the subject matter is substantially different.

ENGR 5010G - Advanced Optimization
The objective of this course is to understand the principles of optimization and its application to engineering problems. Topics covered include the steepest descent and Newton methods for unconstrained optimization; golden section, quadratic, cubic and inexact line searches; conjugate and quasi-Newton methods; the Fletcher-Reeves algorithm; fundamentals of constrained optimization theory; simplex methods for linear programming; modern interior-point methods; active-set methods and primal-dual interior point methods for quadratic and convex programming; semi-definite programming algorithms; sequential quadratic programming; and interior-point methods for non-convex optimization. In addition, implementation issues and current software packages/algorithms for optimization will be covered. Global optimization, including genetic algorithms and simulated annealing, will be introduced.

ENGR 5012G - Advanced and Smart Materials
The core material will consist of basic features of physical transducer behaviour, mathematical constitutive models and material properties, characterization methods and experimental data, sensor and actuator devices, translation of material behaviour to device behaviour, solid state devices, nonsolid state devices (motors and pumps), mesoscale and MEMS devices, and adaptive structures. However, due to the rapid evolutions in the field, the syllabus will be

dynamic to respond to the new developments in materials and their applications. The topics will be continually reviewed and monitored for currency. Selected topics from the following list will also be covered: fundamental principles, mechanisms and applications of piezoelectric materials, 'negative' materials, conductive polymers, advanced composites, shape memory materials, magnetorheological fluids and intelligent textiles.

ENGR 5013G - Advanced Engineering Mathematics
Review of fundamentals of linear algebra; eigenvalue, singular value, Cholesky and QR decompositions; properties and applications; Topelitz matrices; Laplace transforms; Fourier analysis; conformal transformation; selected topics in ordinary and partial differential equations.

ENGR 5200G - Programming Methodology and Abstraction for Engineers
This course is intended for MEng students with little or no programming experience. It provides students with a solid foundation of programming techniques and tools for engineering computer applications. Students will gain an understanding and hands-on knowledge of popular programming language facilities, common data structures, manipulating data, programming style, testing and debugging, version control, and other good software engineering principles such as encapsulation and abstraction. The course will start with simple fundamental programming constructs but moves quickly to advanced topics to enable students to build and enhance their programming skills and develop applications to accomplish useful goals.

ENGR 5201G - Engineering Communications and Ethics
Engineers must be able to analyze, interpret, and create a variety of communications for a wide range of audiences. In this course, students will learn the principles of professional oral, written, visual, and interpersonal communication required to effectively communicate engineering innovations in an engineering career. Students will become familiar with common forms of engineering communications, such as research papers, reports, briefs, memos, proposals, academic posters, emails, and conference presentations. In addition, students will gain practical experience producing informative, persuasive, and professional written and oral communication of their own. Students will also learn the ethical aspects of engineering practice, research ethics and best practices in ethics, academic integrity, and proper engineering citation.

ENGR 5245G - Micro and Nano Manufacturing
This course will cover principles of fabrication and characterization technologies in micro and nano scale to learn major applications and principles of micro/nano systems in photonics, ICs and MEMS, and biomedical devices. The course will address specific techniques, such as photolithography, thin-film deposition, Chemical Vapor Deposition (CVD), Physical Vapor Deposition (PVD), advanced lithography, etc. The optical, electron and probe microscopy techniques for imaging at the micro and nano scale will be discussed. Also, the current status and future of micro and nano manufacturing in the field of microelectronics, photonics and biomedical engineering will be discussed in this course.

ENGR 5260G - Advanced Robotics and Automation
This course builds upon the knowledge students have gained in a first robotics course to cover more advanced kinematics topics and their application to more complex robotic systems such as redundant manipulators and parallel mechanisms. Topics covered include point, direction, line and screw motion descriptions; homogeneous transformations; line and screw coordinates; quaternion representations; inverse displacement solutions by analytic, root finding, hybrid and numerical methods; appropriate frames of reference; screw systems and transforms; local and globally optimum solutions of redundant rates; over determined and near degenerate solutions; singularity analysis; and parallel manipulator kinematics.

ENGR 5261G - Advanced Mechatronics: MEMS and Nanotechnology
This course is designed to be an introduction to micro-electromechanical systems (MEMS) and nanotechnology and their applications. Topics covered include introduction to MEMS and nanotechnology, working principles of MEMS and nanotechnology, design and fabrication of MEMS and nano-systems, microfabrication and micromachining, materials for MEMS and nanotechnology and applications of MEMS and nanotechnology.

ENGR 5262G - Manipulator and Mechanism Design
This course is designed to teach students the necessary skills to design or synthesize mechanisms and manipulators to perform desired tasks. Topics covered include synthesis of mechanisms for function generation, path generation and rigid body guidance; graphical, analytical and optimization based methods of synthesis; mechanism cognates, Chebychev spacing, Burmister curves; manipulator joint layout synthesis for spatial positioning and orientation; conditions of singularity and uncertainty; and solution of nonlinear problems of kinetics involved in mechanism synthesis using compatibility equations, 1/2 angle substitutions and dialytic elimination.

ENGR 5263G - Advanced Control
This course builds upon the knowledge students have gained in a first control course to cover more materials in advanced control systems. Topics covered include a. State variables and state space models: relations between state space models and the transfer function models (controllable and observable canonical forms, and diagonal form), Jordan form, solutions of linear state equations, transition matrix. b. Controllability and observability: definition and criteria, state feedback and output feedback, pole assignment via state feedback, design of servo controlled systems. c. State estimation and observer: observer state-variable feedback control. d. Multi-input multi-output (MIMO) systems: pole assignment via state feedback. e. Introduction to nonlinear systems: describing functions for kinds of nonlinear systems (on/off, dry friction, dead one, saturation and hystersis), phase plane trajectories, concept of limit cycle. f. Stability analysis: Lyapunov function and Lyapunov stability criterion. g. Introduction to optimal control: linear quadratic regulator (LQR), Riccati equation, properties of LQR systems. h. Sampled data systems: pulse transfer function, zero and first order hold systems, stability and root locus in the z-plane, transformations, Routh Hurwitz stability criterion in the z-plane, system compensation in the z-plane using root locus and generalized PID controllers.

ENGR 5271G - Innovative Design Engineering
This course introduces students to the theory, tools and techniques of innovative design engineering and creative problem-solving. The design process in engineering is considered and addressed by stressing its most creative aspects, especially problem definition and concept generation, through emphasis on current industry best practices. A short history of creative engineering solutions, effective methods for communicating new ideas, techniques for creative solutions, and cost effectiveness and tools for innovation are considered and thoroughly addressed. The course involves fundamental coverage of principles of inventive problem solving (TRIZ). TRIZ provides a dialectic way of thinking, i.e., to understand the problem as a system, to make an image of the ideal solution first and to solve contradictions. The course involves hands-on use of computer-aided design (CAD) tools and project management software in engineering applications.

ENGR 5273G - Design by Failure
This course examines the nature of design failure and shows how analysis of failure can be used in improving new designs. Through analysis of historical and contemporary case studies of catastrophes well known worldwide, students acquire learning experiences from past mistakes to avoid repeating them in the future. The course covers Shippaigaku, the Japanese way to research accidents, scandals and other failures to uncover the root cause, reveal the scenario that led to the unwanted event and describe what happened so students can clearly repeat the steps in their mind and propose ways to avoid those mistakes in the future. Various other methods for failure mode identification are also covered.

ENGR 5410G - Project Management for Engineers
This course prepares engineers for the effective application of project management to their work. It covers the following topics: project integration, project scope, cost management, time management, engineering quality, human resources, project communications, risk management and procurement management. The course uses the Project Management Institute's (PMI) Project Management Body of Knowledge (PMBOK) with relevant examples from nuclear, software and other fields of engineering. Special emphasis is placed on Risk Management, particularly in the area of safety-critical engineering projects. The student will be well-positioned both to apply the knowledge in their area of engineering and to write the PMI's Project Management Professional (PMP) examination.

ENGR 5510G - Foundations of Software Engineering
This course introduces students to the state-of-the-art in software engineering covering all areas from the Software Engineering Body of knowledge, along with trends in software engineering. Topics include lifecycle models and methodologies, software requirements and design, architectural styles, software specification and implementation, testing and quality assurance, maintenance, evolution, professional practice and economics, and emerging trends in software engineering.

ENGR 5520G - Software Development Methods and Tools
This course surveys the practical software development methods and tools methods for analysis, design, construction and measurement of large-scale software-intensive systems. Topics include methods and tools for program development to meet specifications, application development frameworks, test-driven development, model-based software development, state machine methods, concurrency control, module specification techniques such as first-order logic, trace specification, weakest preconditions. Trends in development methods and tools such as virtualized environments and containers, version control, continuous integration, DevOps.

ENGR 5605G - Convex Optimization
This course concentrates on recognizing and solving convex optimization problems that arise in engineering. The topics covered in this course include basics of convex analysis, such as convex sets, convex functions and convex optimization problems; log-concave and log-convex functions; quasi-convex and quasi-concave functions; convexity with respect to generalized inequality; least-squares; linear and quadratic programs; semi-definite programming; geometric programming; minimax; extemal volume; optimality conditions; Lagrange dual functions and problems; duality theory; theorems of alternative and applications; algorithms for solving unconstrained and constrained optimization problems; interior-point methods; applications to signal processing, control, digital and analog circuit design; computational geometry; and statistics.

ENGR 5915G - Discrete Time Control Systems
This course covers sample-and-hold systems, discretization of analog systems, discrete-time systems analysis and design and effects of sampling on controllability and observability, pulse transfer function, zero and first order hold systems, stability and root locus in the z-plane, transformations, Routh-Hurwitz stability criterion in the z-plane, pole-placement for discrete time systems and generalized PID controllers.

ENGR 5930G - Adaptive Control
This is a course on the general principles of adaptive control and learning. This course will cover real-time parameter estimation, deterministic self-turning regulators, stochastic and predictive self-tuning regulators, model reference adaptive systems, gain-scheduling, properties of adaptive systems, robust adaptive control schemes, adaptive control of nonlinear systems, and practical issues and implementation.

ENGR 5940G - Intelligent Control Systems
With the advance of increasingly faster computing hardware and cheaper memory chips, computational intelligence, also known as a part of soft computation, is becoming more and more important in control engineering. This course will equip students with the essential knowledge and useful resources to solve some of the systems control problems not easily solved using conventional control methods. This course will cover fundamentals of fuzzy set theory, structures of fuzzy logic controllers, structures of neural networks, learning algorithms and genetic algorithms.

ENGR 5945G - Mobile Robotic Systems
This course covers kinematics models and motion control for mobile robots; navigation, including path planning, obstacle avoidance and techniques for decomposition, localization using odometry, map representation, map building and introduction to probabilistic map-based localization; Kalman filter localization and other localization systems; computer vision, including imaging and image representation, feature extraction, pattern recognition, motion from 2D image sequences, image segmentation, sensing and object pose computation, and virtual reality.

ENGR 5946G - Advanced Fluid Power Control and Simulation
The fluid power systems (FPS) plays an indispensable role in motion and force actuation for various applications in industrial sectors such as automotive, automation, construction, and agriculture. The objective of this course is to introduce advanced technologies on FPS, to understand the principles of FPS modeling and control design, and to learn computational skills using the commercial simulation software, Amesim, that enables modeling/analysis/control of physical multi-domain systems (i.e., mechanical, thermal, fluid, control, electromechanical and mechatronics) and provides a co-simulation interface with Matlab/Simulink. The course covers topics in both theories (introduction to electro-hydraulic actuator (EHA) applications, operational principles of FPS, core components of FPS including independent-metering valve, electro-hydraulic circuit analysis, and design of control algorithms using several control techniques such as fuzzy logic, sliding mode control, etc.) and computer simulations (modeling of mechanical/hydraulic parts/FPS systems, planar mechanical model, co-simulation with Amesim plant model and Matlab/Simulink control model, and data analysis techniques).

Appendix D – Calendar Copy

Mechatronics Engineering, MASc

General information

The Master of Applied Science (MASc) in Mechatronics Engineering allows a student to study all of the main areas associated with mechatronics engineering. Mechatronics engineering is an interdisciplinary discipline featuring aspects of mechanical engineering, electrical engineering, software engineering, and controls. Opportunities exist for graduate students to explore these areas. Topics can vary widely and may include robotics, autonomous systems, biomechatronics, controls, and artificial intelligence and machine learning.

Admission requirements

In addition to the general admission requirements for graduate studies, applicants must meet the following program-specific requirements:

Completion of an undergraduate engineering degree in a relevant field from an accredited engineering program at a Canadian university, or its equivalent from a recognized institution. Overall academic standing of at least a B (GPA: 3.0 on a 4.3 scale), with a minimum B in the last two full-time years (four semesters) of undergraduate work or equivalent. B+ is preferred for MASc applicants.

Applicants must possess maturity and self-motivation. Close technical contact with a research supervisor is essential in research-based engineering programs. Prior to being accepted into the program, MASc applicants must find a faculty member who specializes in their desired area of research and who is willing to act as their thesis research supervisor.

A current list of graduate faculty is available on the Faculty of Engineering and Applied Science's website.

Part-time studies

To facilitate access to all potential students, part-time studies are permitted.

Degree requirements

The objective of the MASc program in Mechatronics Engineering is to prepare students for careers in research, development, and advanced engineering. Graduates of the program will be able to work as engineers in research and development or other areas in advanced technology companies or government agencies, or continue their education and pursue a PhD degree. The

objectives of the MASc program are achieved through a combination of course work, supervised research, a research seminar, and a research thesis.

For the MASc in Mechatronics Engineering, students must complete five courses for a total of 15 credits and a thesis worth 15 credits. Students must also successfully complete METE 5003G - MASc Seminar for Mechatronics Engineering and ENGR 5001G - MASc Thesis.

Undergraduate courses

In addition to the required graduate courses, students may take only one senior year undergraduate engineering course (i.e., with prefix ENGR 4xxxU) in lieu of a graduate-level course, provided they have not already taken a similar course during their undergraduate degree and the course is approved by both the student's supervisor and the graduate program director.

Courses outside of the program

Courses in other graduate programs at the university may be taken provided that students have not taken similar courses during their undergraduate or master's degrees and the courses are approved by the graduate program director. At least half of a student's courses must be within their program in the Faculty of Engineering and Applied Science. Students who wish to take courses outside of their program must gain approval from the graduate program director. Students who are uncertain about the academic background needed for a graduate course should consult the course instructor before registering for the course.

Course listing

The following list shows all courses relevant to the MASc in Mechatronics Engineering graduate program:

ENGR 5001G - MASc Thesis
ENGR 5004G - MASc/MEng Directed Studies
ENGR 5005G - Special Topics
ENGR 5010G - Advanced Optimization
ENGR 5012G - Advanced and Smart Materials
ENGR 5013G - Advanced Engineering Mathematics
ENGR 5200G - Programming Methodology and Abstraction for Engineers
ENGR 5201G - Engineering Communications and Ethics
ENGR 5240G - Advanced Dynamics
ENGR 5245G - Micro and Nano Manufacturing
ENGR 5260G - Advanced Robotics and Automation
ENGR 5261G - Advanced Mechatronics: MEMS and Nanotechnology
ENGR 5262G - Manipulator and Mechanism Design
ENGR 5263G - Advanced Control

ENGR 5271G - Innovative Design Engineering
ENGR 5273G - Design by Failure
ENGR 5410G - Project Management for Engineers
ENGR 5510G - Foundations of Software Engineering
ENGR 5520G - Software Development Methods and Tools
ENGR 5605G - Convex Optimization
ENGR 5910G - Embedded Real-Time Control Systems
ENGR 5915G - Discrete Time Control Systems
ENGR 5930G - Adaptive Control
ENGR 5940G - Intelligent Control Systems
ENGR 5945G - Mobile Robotic Systems
ENGR 5946G - Advanced Fluid Power Control and Simulation
METE 5003G - MASc Seminar for Mechatronics Engineering
METE 5101G - Artificial Intelligence and Machine Learning Methods and Applications
METE 5102G - Control Design in Robotic Systems
METE 5103G - Model Predictive Control
METE 5104G - Multivariable Feedback Control
METE 5105G - Nonlinear Control Systems
METE 5106G - Advanced System Dynamics
METE 5107G - Biomechatronic Systems
METE 5108G - Neuromechanics and Control of Human Movement
METE 5280G - Robotic Manipulators
METE 5300G - Mobile Robotics

Mechatronics Engineering, MEng

General information

The Master of Engineering (MEng) in Mechatronics Engineering allows a student to study all of the main areas associated with mechatronics engineering. Mechatronics engineering is an interdisciplinary discipline featuring aspects of mechanical engineering, electrical engineering, software engineering, and controls. Opportunities exist for graduate students to explore these areas. Topics can vary widely and may include robotics, autonomous systems, bio-mechatronics, controls, and artificial intelligence and machine learning.

Admission requirements

In addition to the general admission requirements for graduate studies, applicants must meet the following program-specific requirements:

Completion of an undergraduate engineering degree in a relevant field from an accredited engineering program at a Canadian university, or its equivalent from a recognized institution. Overall academic standing of at least a B (GPA: 3.0 on a 4.3 scale), with a minimum B in the last two full-time years (four semesters) of undergraduate work or equivalent.

Applicants must possess maturity and self-motivation. Close technical contact with a faculty member is an essential part of graduate education in engineering. MEng applicants who select the MEng-Project option must find a professor who is willing to act as a project supervisor. In the event the MEng-Project applicant cannot find a project supervisor, the applicant may be considered for admission into the MEng-Course option.

A current list of graduate faculty is available on the Faculty of Engineering and Applied Science's website.

Part-time studies

To facilitate access to all potential students, part-time studies are permitted. Engineers in local industries and government agencies, for example, may wish to access the MEng program through part-time studies.

Degree requirements - MEng (course-based option)

For the MEng course-based option, students must complete 10 courses worth a total of 30 credits.

Four core courses are required to be taken by all students in the MEng program. These courses are expected to be taken first before other graduate courses:

- ENGR 5013G - Advanced Engineering Mathematics
- ENGR 5200G - Programming Methodology and Abstraction for Engineers
- ENGR 5201G - Engineering Communications and Ethics
- ENGR 5410G - Project Management for Engineers

A minimum of three courses must be taken from the following list of core courses:

- ENGR 5260G - Advanced Robotics and Automation
- ENGR 5261G - Advanced Mechatronics: MEMS and Nanotechnology
- ENGR 5262G - Manipulator and Mechanism Design
- ENGR 5945G - Mobile Robotic Systems*
- METE 5107G - Biomechatronic Systems
- METE 5101G - Artificial Intelligence and Machine Learning Methods and Application
- METE 5102G - Control Design in Robotic Systems
- METE 5103G - Model Predictive Control
- METE 5106G - Advanced System Modeling Methods
- METE 5108G - Neuromechanics and Control of Human Movement
- METE 5280G - Robotic Manipulators
- METE 5300G - Mobile Robotics*

*Students can take ENGR 5945G or METE 5300G, but not both.

The remaining courses are expected to be taken from graduate courses listed in the student's program. Students are also provided the following allowance:

Undergraduate courses

MEng course-based students may take one senior year undergraduate course from the Faculty of Engineering and Applied Science in lieu of one graduate-level course, provided they have not taken similar courses during their undergraduate degree and the course is approved by the graduate program director.

Courses outside of the program

MEng course-based students may take up to two courses in other graduate programs at the university, provided that students have not taken similar courses during their undergraduate or master's degrees, and the courses are approved by the graduate program director. Students who wish to take courses outside of their program must gain approval from the graduate program director. Students who are uncertain about the academic background needed for a graduate course should consult the course instructor before registering for the course.

Degree requirements - MEng (project-based option)

For the MEng project-based option, students must complete 8 courses worth a total of 24 credits and a project worth 6 credits (ENGR 5002G - MEng/MEngM Project).

Four core courses are required to be taken by all students in the MEng program. These are expected to be taken first before other graduate courses:

- ENGR 5013G - Advanced Engineering Mathematics
- ENGR 5200G - Programming Methodology and Abstraction for Engineers
- ENGR 5201G - Engineering Communications and Ethics
- ENGR 5410G - Project Management for Engineers

A minimum of three courses must be taken from the following list of core courses:

- ENGR 5260G - Advanced Robotics and Automation
- ENGR 5261G - Advanced Mechatronics: MEMS and Nanotechnology
- ENGR 5262G - Manipulator and Mechanism Design
- ENGR 5945G - Mobile Robotic Systems*
- METE 5107G - Biomechatronic Systems
- METE 5101G - Artificial Intelligence and Machine Learning Methods and Application
- METE 5102G - Control Design in Robotic Systems
- METE 5103G - Model Predictive Control
- METE 5106G - Advanced System Modeling Methods
- METE 5108G - Neuromechanics and Control of Human Movement
- METE 5280G - Robotic Manipulators
- METE 5300G - Mobile Robotics*

*Students can take ENGR 5945G or METE 5300G, but not both.

The remaining courses are expected to be taken from graduate courses listed in the student's program.

Scope of the Project: The project should represent real-world problems. It can be an industry project or defined within a research laboratory or research space setting. The project must be supervised by one of the graduate faculty members in the student's program who are active in the research area.

Course listing

The following list shows all courses relevant to the MEng in Mechatronics Engineering graduate program:

ENGR 5002G - MEng/MEngM Project
ENGR 5005G - Special Topics

ENGR 5010G - Advanced Optimization
ENGR 5012G - Advanced and Smart Materials
ENGR 5013G - Advanced Engineering Mathematics
ENGR 5200G - Programming Methodology and Abstraction for Engineers
ENGR 5201G - Engineering Communications and Ethics
ENGR 5240G - Advanced Dynamics
ENGR 5245G - Micro and Nano Manufacturing
ENGR 5260G - Advanced Robotics and Automation
ENGR 5261G - Advanced Mechatronics: MEMS and Nanotechnology
ENGR 5262G - Manipulator and Mechanism Design
ENGR 5263G - Advanced Control
ENGR 5271G - Innovative Design Engineering
ENGR 5273G - Design by Failure
ENGR 5410G - Project Management for Engineers
ENGR 5510G - Foundations of Software Engineering
ENGR 5520G - Software Development Methods and Tools
ENGR 5605G - Convex Optimization
ENGR 5910G - Embedded Real-Time Control Systems
ENGR 5915G - Discrete Time Control Systems
ENGR 5930G - Adaptive Control
ENGR 5940G - Intelligent Control Systems
ENGR 5945G - Mobile Robotic Systems
ENGR 5946G - Advanced Fluid Power Control and Simulation
METE 5003G - MASc Seminar for Mechatronics Engineering
METE 5101G - Artificial Intelligence and Machine Learning Methods and Applications
METE 5102G - Control Design in Robotic Systems
METE 5103G - Model Predictive Control
METE 5104G - Multivariable Feedback Control
METE 5105G - Nonlinear Control Systems
METE 5106G - Advanced System Dynamics
METE 5107G - Biomechatronic Systems
METE 5108G - Neuromechanics and Control of Human Movement
METE 5280G - Robotic Manipulators
METE 5300G - Mobile Robotics

Appendix E – Faculty

Faculty Member	Title	Department
Murat Aydin	Associate Teaching Professor	Automotive and Mechatronics Engineering
Meaghan Charest-Finn	Assistant Professor	Automotive and Mechatronics Engineering
Moustafa El-Gindy	Professor	Automotive and Mechatronics Engineering
Zeinab El-Sayegh	Assistant Professor	Automotive and Mechatronics Engineering
Yuping He	Professor	Automotive and Mechatronics Engineering
Haoxiang Lang	Associate Professor	Automotive and Mechatronics Engineering
Xianke Lin	Associate Professor	Automotive and Mechatronics Engineering
Nasim Moallemi	Associate Teaching Professor	Automotive and Mechatronics Engineering
Scott Nokleby	Professor	Automotive and Mechatronics Engineering
Shabnam Pejhan	Assistant Professor	Automotive and Mechatronics Engineering
Greg Rohrauer	Associate Professor	Automotive and Mechatronics Engineering
Jaho Seo	Associate Professor	Automotive and Mechatronics Engineering
Aaron Yurkewich	Assistant Professor	Automotive and Mechatronics Engineering

New Program Assessment: MASc/MEng in Mechatronics Engineering

Library Statement of Support Provided to Ontario Tech University

Prepared by: Kate Gibbings, Engineering and Applied Science Liaison Librarian, February 9, 2021

OntarioTech Library

Contents

Summary

Ontario Tech University Library's holdings provide a solid foundation of resources to support the MASc/MEng in Mechatronics Engineering program.

Library collections have been developed in support of the Faculty of Engineering and Applied Science's undergraduate and graduate program areas of Automotive, Electrical and Computer, Manufacturing, Mechanical, Mechatronics and Software Engineering; as well as Engineering Management. There is also deep coverage of subjects related to Mechatronics, including Automation, Robotics, Control systems, Engineering design, Materials, Nanotechnology and Artificial Intelligence.

Our research and special collections total more than 102,131 print volumes and 100,754 e-journal subscriptions. The Library provides access to more than 865,736 e-books and primary source materials. Collection strengths support the research and instructional programs at Ontario Tech University.

Resource Requirements

The following resources are required to address specific gaps in our collections, as well as maintain and continue to expand our collections across relevant Engineering disciplines.

Resource	Rationale	Budget Requirement	OTO or Ongoing
Books & Ebooks	Address gaps in specific subject areas relevant to the curriculum, support ongoing collection development across relevant Engineering disciplines	$2,500	Ongoing
Total		**$2500**	**Ongoing**

Introduction

The Library supports the teaching, learning and research missions of Ontario Tech University and Durham College. Ontario Tech students have access to a joint collection of more than 102,131 print books purchased for both Ontario Tech and Durham College. Additionally, the Library provides access to online resources including e-books and online databases that are selected to meet the teaching and research needs of Ontario Tech programs. Students and faculty are served by a team of subject specialist librarians and trained library technicians who provide an array of research and teaching support services including information literacy instruction, workshops, research help and reference service.

Library Collections

The Library's collections expenditures for the fiscal year 2019-20 totaled $1,664,480. Approximately 85% of the collections budget is allocated for the purchase of subscription online resources. The remainder of the budget is allocated for the acquisition of print and online resources to support the curriculum including journals, books and e-books, multimedia and other specialized material.

Our collections are well placed to support the MASc/MEng in Mechatronics Engineering, given the existing Bachelor of Engineering in Mechatronics and the new program's inclusion of existing graduate courses.

Library collections have been developed in support of the Faculty of Engineering and Applied Science's undergraduate and graduate program areas of Automotive, Electrical and Computer, Manufacturing, Mechanical, Mechatronics and Software Engineering; as well as Engineering Management. There is also deep coverage of subject related to Mechatronics, including Automation, Robotics, Control systems, Engineering design, Materials, Nanotechnology and Artificial Intelligence.

Suggestions for purchases from members of the University community are welcome. Faculty and students are encouraged to suggest material for purchase by contacting their Subject Librarian or by submitting our online suggest a purchase form. All recommended purchases are evaluated according to the Collection Development Policy and with consideration to budget constraints.

Consortial Licensing

By virtue of our membership in two key consortia, Ontario Tech University Library is able to take advantage of the increased bargaining power of a collective through which we subscribe to a wide array of scholarly content. Canada Research Knowledge Network (CRKN) is comprised of 81 libraries across Canada that include world-class research institutions, innovative teaching-focused institutions, as well as two national libraries, and Canada's largest public library system. CRKN is dedicated to expanding digital content for the academic research and teaching enterprise in Canada. Through the coordinated leadership of librarians, researchers, administrators and other stakeholders in the research community, CRKN undertakes large-scale content acquisition and licensing initiatives in order to build knowledge infrastructure, research, and teaching capacity in Canada's universities.

The Ontario Council of University Libraries (OCUL) is a consortium of Ontario's 21 university libraries which works together to maximize our collective expertise and resources. OCUL enhances information

services in Ontario and beyond through collective purchasing and shared digital information infrastructure, collaborative planning, advocacy, assessment, research, partnerships, communications, and professional development.

Journals

The Library almost exclusively acquires online journals and provides access to more than 100,754 across all disciplines. The Library's collection of academic journals in disciplines related to Mechatronics Engineering is strong, including coverage related to Automation, Control Systems, and Robotics; as well as Mechanical, Electrical and Manufacturing Engineering.

Students and researchers can access nearly complete journal suites, in many cases including archives, from publishers such as:

- ACM
- ASME
- ASTM
- Elsevier
- IEEE
- IOP
- Oxford
- RSC
- SIAM
- Springer
- Taylor & Francis
- Wiley

The Library provides access, through subscription, to most of the highly ranked journals in Mechanical, Electrical and Mechatronics-related categories, according to Clarivate's Journal Citation Reports database (2019).

By subject category:

Subject Category	Ontario Tech Access	Select Titles
Automation and Control Systems	48 of top 50	• IEEE-ASME Transactions on Mechatronics • IEEE Transactions on Automatic Control • Automatica • Mechatronics
Robotics	24 of top 28	• IEEE Transactions on Robotics • Robotics and Computer-Integrated Manufacturing • International Journal of Robotics Research • Autonomous Robots

Subject Category	Ontario Tech Access	Select Titles
Mechanical Engineering	46 of top 50	• Advances in Applied Mechanics • International Journal of Machine Tools and Manufacture • International Journal of Mechanics and Materials in Design • Journal of Sound and Vibration • Engineering Failure Analysis
Electrical Engineering	49 of top 50	• IEEE Transactions on Pattern Analysis and Machine Intelligence • IEEE Industrial Electronics Magazine • Proceedings of the IEEE • IEEE Transactions on Control Systems Technology

Books & E-Books

The Library at Ontario Tech University provides access to 102,131 print books and 865,736 e-books that support teaching, learning and research across all programs and disciplines. Students and faculty have access to collections of books and e-books from major academic publishers, including:

- Butterworth-Heinemann
- Cengage
- CRC Press
- Elsevier (including Woodhead)
- IEEE
- IET
- Industrial Press
- McGraw-Hill
- Morgan & Claypool
- Pearson
- Routledge/Taylor & Francis
- Springer
- Wiley

The following table highlights Library holdings by subject heading for print books and e-books related to the proposed courses for the MASc/MEng in Mechatronics Engineering. Gaps identified in the Library's holdings in the following subjects will be areas of focus for collection development:

- Smart materials
- Design by failure
- Design for product end of life
- Fluid power control and simulation

While e-books are a preferred format due to their accessibility for students, not all titles or publishers are available for the Library to license in electronic format. For this reason, selecting print books in many of the subject areas below will also be a collection development focus, particularly for key publishers that do not license many e-book titles to libraries.

Subject	# Print Books	# E-Books
Robotics and automation	275	15,716
Automatic control; control theory; control and systems theory; adaptive control systems; intelligent control systems; feedback control systems; discrete time control systems	265	7,420
Engineering design	196	3,104
Microelectronics and nanotechnology	145	5,983
Optimization; convex optimization	95	4,657
Materials; smart materials	1,107	25,065
Computer-aided design	77	1,673
Dynamics	417	13,638
Vibrations	78	2,314
Acoustics and noise control	43	1,355
Failure analysis	1	24
Sustainable mobility systems (Transportation – energy conservation; electric vehicles; hybrid vehicles; fuel cell vehicles; biofuels)	101	713
Product life cycle	24	173
Fluid power technology	15	43
Artificial intelligence	121	19,877
Engineering management	57	440

Search Tools

The Library subscribes to many research databases and indexes that provide access to the literature in Mechatronics Engineering. Systematic searching of these resources enables students and faculty to

access journals and other academic resources such as conference proceedings, theses and dissertations, trade publications and reports.

Highly Relevant Databases: Engineering & Science Focus	Relevant Databases: Multidisciplinary	Relevant Databases: Standards
• ACM • ASME • ASTM Digital Library • Engineering Village (Inspec and Compendex) • Elsevier ScienceDirect • IEEE Xplore • SciTech Premium Collection • SpringerLINK	• Scopus • Web of Science • Journal Citation Reports • Statista	• CSA OnDemand • ASME Standards • ASTM Standards • Techstreet Enterprise

Other Resources

Standards and Codes

In addition to single-publisher collections for CSA, ASME and ASTM standards, the Library subscribes to the Techstreet platform. Through Techstreet, the Library can purchase individual electronic standards by faculty and graduate student request from hundreds of publishers.

Statistics & Data Resources

To support research that requires statistics and datasets, the Library subscribes to four main resources. Statista provides access to Canadian and international statistics and data from over 18,000 sources including industry reports. Datasets are available from Statistics Canada's Data Liberation Initiative (DLI), odesi, and the Interuniversity Consortium for Political and Social Research (ICPSR).

The Library also provides access to Dataverse, a repository that supports research data management and open access data requirements for Tri-Agency research funding compliance.

Multimedia Resources

The Library acquires DVD and streaming video resources that are relevant to Faculty of Engineering and Applied Science programs. Multimedia resources are selected individually or as part of standing subscriptions. Faculty may request streaming videos which the Library can license through its streaming platforms.

The Library's collection includes 1,081 DVDs and 109,200 Streaming Video titles. Of these multimedia resources, the following are particularly relevant to the curriculum in Mechatronics Engineering.

Relevant Streaming Video Collections

Streaming Video Collection	Relevant Titles
Kanopy	Engineering: 254 videos
CBC Curio	Math, Science & Technology: 1,203

Select Multimedia Titles

- Robotics. (2015). The Great Courses.
- Charging the Road: Is the Electric Vehicle Ready to Take on Gas? (2019). CBC.

Library Services

A range of library services support teaching, learning and research at the University. Students and faculty in the Faculty of Engineering and Applied Science have access to services in-person, online and via email or telephone.

Research Support

The Library plays a vital role in supporting student and faculty research at Ontario Tech.

Reference Service & Research Consultations

Students and faculty have access to research support in-person and online, via telephone, email and through online chat help. In the 2019-20 academic year, library staff answered 14,630 research questions from the Ontario Tech community.

Librarians are available for individualized research consultations with students and faculty, in person or online. These consultations are tailored to meet the needs of individual researchers and can cover a range of topics from basic introductions to more advanced search techniques and support for literature reviews.

Open Access & Research Data Management

The Library provides support to faculty and students in complying with the Tri-Agency Open Access Policy (SSHRC, NSERC, CIHR). Faculty and students can make their work open by publishing in an open access or hybrid journal, by depositing their work in a subject repository, or by depositing their work in Ontario Tech's institutional repository, E-Scholar (https://ir.library.dc-uoit.ca).

The Library provides direct support to Faculties through dedicated subject specialist/liaison librarians and online guidance with the Library's Open Access Guide (http://guides.library.uoit.ca/openaccess). The Library has a Research Data Management guide (http://guides.library.uoit.ca/rdm) to support faculty and students in creating data management plans and sharing research data.

During the 2019-20 academic year, these guides were viewed 572 times.

Research Metrics & Impact

The Library supports various departments on campus by fielding requests for reports on author, article, journal and institutional metrics. Subscribed tools include: Web of Science, Scopus and Journal Citation Reports (JCR).

The Library's Research Metrics guide (http://guides.library.uoit.ca/researchmetrics) provides background information and support for these tools.

Theses & Dissertations

The Library ensures that the Ontario Tech community has access to national and international thesis and dissertation databases. Access to PQDT (ProQuest Dissertations and Theses) and the Theses Canada Portal is provided through the Library website. The Library plays a key role in the dissemination and

preservation of Ontario Tech theses, managing copies in the institutional open-access digital repository, E-Scholar, as well as maintaining print copies in the Library archives.

Teaching & Learning Support

As partners in teaching and learning at Ontario Tech, the Library provides a range of instructional and curriculum supports, both in person and online.

Information Literacy Instruction

In collaboration with teaching faculty, Librarians deliver customized information literacy instruction that support the development of students' 21st century skills to successfully search, evaluate and ethically use scholarly resources in their course requirements. These library services are aligned with the Association of College and Research Libraries (ACRL) Framework for Information Literacy for Higher Education. Information literacy sessions are tailored to the specific requirements of the course or assignment and may be delivered synchronously or asynchronously to classes, in person or online. Library information literacy modules are available in the Canvas Learning Management System and can be adapted and added direct into courses, or instructors can opt for asynchronous recordings.

In the 2019-20 academic year, 203 students in the Faculty of Engineering and Applied Science received instructional support from a Librarian. Information literacy instruction is integrated in the Faculty of Engineering and Applied Science in the following courses:

- COMM 1050: Technical Communications
- ENGR 5003: MASc Seminar for Automotive and Mechanical Engineering
- ENGR 5007: MASc Seminar for ECE
- ENGR 5945G: Mobile Robotic Systems

Ideally, Information Literacy instruction is scaffolded across the required curriculum, enabling students to build increasingly sophisticated research skills throughout their program of study. Graduate student would benefit from information literacy instruction in courses that they are likely to take early in their program. This will prepare them to complete literature reviews for theses and other purposes, and to do background research for design projects. They would build skills in finding and using journal articles, technical documents, industry reports and trade publications.

Co-curricular Workshops

In addition to information literacy instruction that is integrated into the curriculum, the Library offers co-curricular workshops that help develop student and faculty skills. Library workshops are available through the Graduate Professional Skills series, which is well attended by Engineering students. Some examples of workshops offered to Ontario Tech students in the past include:

- Starting Off Strong: Library Resources 101
- Organizing Your Literature Search with a Citation Manger
- Trending Topics: How to Find Highly Cited Journals, Articles and Authors
- Making an Impact: Your Research Identity
- Open Access and Sharing Your Research

Workshop offerings are regularly updated in response to the changing needs of the community.

Online Research Guides

Subject specialist librarians create custom Research Guides for each subject area that are available from the Library website. Research Guides include program and course guides that are directly related to the program and course curriculum, as well as topic guides that have cross-disciplinary relevance. Research Guides of particular importance to students in Mechatronics Engineering include:

- Library Research for Engineering Students: https://guides.library.uoit.ca/engineering
- Electrical Engineering: https://guides.library.uoit.ca/elec-eng
- Mechanical Engineering: https://guides.library.uoit.ca/mech-eng
- Manufacturing Engineering: https://guides.library.uoit.ca/man-eng
- Standards and Codes: https://guides.library.uoit.ca/standards
- Patents: https://guides.library.uoit.ca/patents

During the 2019-20 academic year, these guides were viewed a combined 4,559 times. The Library's Citation guide was viewed 6,447 times.

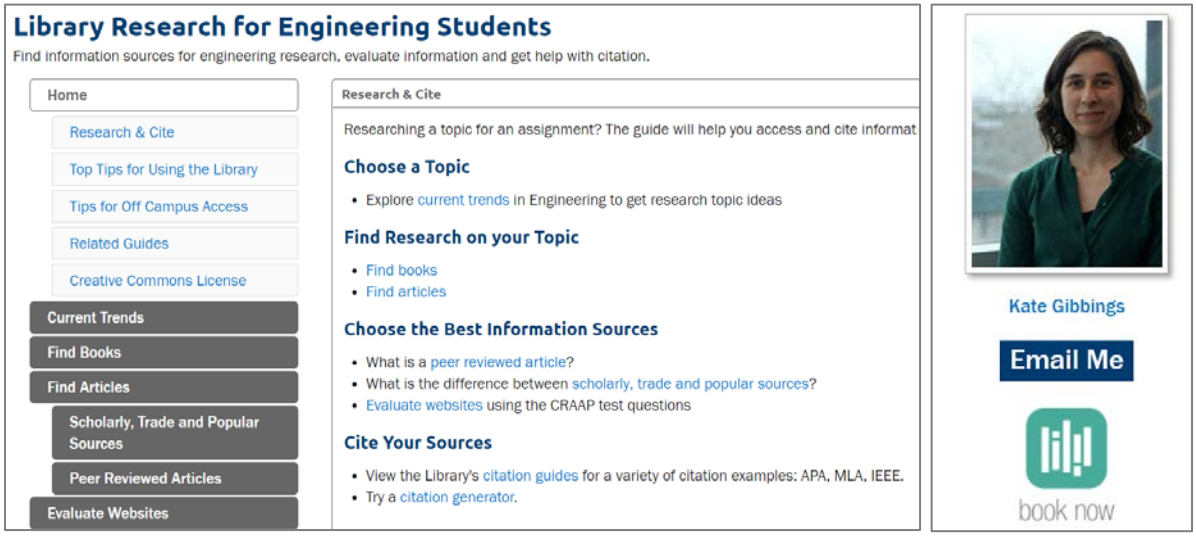

Figure 1 Library Research for Engineering Students Guide

Copyright & Academic Integrity

The Library provides copyright advice for faculty and students. Library staff advise on license terms and the integration of content into the Learning Management System (LMS). The Library also helps faculty find, evaluate and integrate Open Educational Resources into their courses.

The Library's research support services including our citation guides help students avoid plagiarism and comply with the University's Academic Conduct policy.

Course Reserves

Instructors can place material that is in high demand on course reserve in the library. Reserve material is available to students on shorter loan periods, ensuring equitable access to required textbooks and readings.

In addition to print material, instructors may also place material from the library's online holdings on electronic reserve. Electronic reserves are subject to copyright compliance and licensing restrictions.

3D Printing & Equipment Loans

Students have access to 3D printers and 3D printing workshops and can borrow equipment such as laptops and device chargers.

Library Staffing

The anticipated intake for students in the Mechatronics Engineering program for years 1-5 is as follows:

- Year 1: 10-15 students
- Years 2-5: 20-25 students

The Library anticipates that there will be additional staffing requirements associated with growth in graduate and undergraduate degree programs across the University. These requests will be part of the regular budget planning process, following a fulsome and strategic analysis of our staffing needs.

Conclusion

The Library is well-positioned to support the Mechatronics Engineering program. Our suite of services and programs will meet the needs of students and faculty in this program.

We look forward to working in collaboration with students and faculty in this new program.

REVIEWERS' REPORT FOR NEW PROGRAMS

Reviewers' Report on the Proposed MEng and MASc Programs in Mechatronics Engineering at Ontario Tech University

Dr. Brian Surgenor, P.Eng.
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1. OUTLINE OF THE REVIEW

The review was a remote site visit, conducted over two days on April 17 and 18, 2023, that involved interviews with the following:

- Administrators:
  - Dr. Lori Livingston (Provost),
  - Dr. Hossam Kishawy (FEAS Dean),
  - Dr. Scott Nokleby (Chair New Program Committee),
  - Dr. Theodore Christou (Grad Studies Dean),
  - Dr Greg Rohrauer (Chair Dept, Automotive and Mechatronics)
  - Dr. Hidayat Shahid (Faculty Labs) and
  - Mr. Govind Rehal (Manager Tech Services)
- Faculty members:
  - Dr. Haoxiang Lang,
  - Dr. Shabnam Pejhan,
  - Dr. Meaghan Charest-Finn,
    Dr. Aaron Yurkewich,
  - Dr. Jaho Seo
  - Dr. Nasim Moallemi
- Staff members:
  - Ms. Michelle Cholak, FEAS Graduate Program Assistant
  - Ms. Bramsha Panchadcharam, FEAS Graduate Program Assistant
  - Ms. Holly MacPherson, Manager SGPS
  - Ms. Beth Stewart, Senior Admission Officer, SGPS
  - Ms. Kurshid Dain – SGPS Finance Coordinator

Slides of the labs associated with the undergraduate mechatronics program were shown to give an indication of the facilities.

2. EVALUATION CRITERIA

2.1 Program Objectives

The objectives of these programs are clearly stated as:

> *"The main objective of the MASc program is to prepare students for a career as an R&D engineer. Graduates of the program will be able to work as R&D engineers in advanced technology companies or government agencies. They also may choose to continue their education and pursue a PhD degree. The objectives of the MASc*

program are achieved through a combination of course work, supervised research, a research seminar, and a research thesis.

The main objective of the MEng program is to provide the opportunity for engineers in industry to upgrade and expand their skills. Graduates of the program will apply their education to various advanced technologies in high-tech industries. The objectives of the MEng program are achieved through a combination of course work and a project (MEng project-based), or solely course work (MEng course-based), depending on which option the student selects."

The degree requirements are appropriate and are like other similar Canadian programs.

The objectives of these programs seem to be aligned with the institution's mission, at least in the following two directions:

- Provide superior undergraduate and graduate programs that are technology-enriched and responsive to the needs of students and the evolving workplace.
- Conduct research that creates knowledge, solves problems, results in economic and social innovation and engages students.

2.2 Program requirements

Structure and learning outcomes of the programs are appropriate as they are modelled after existing MEng and MASc programs in the Faculty of Engineering and Applied Science (FEAS). Thus, five courses plus a thesis for the MASc program. Ten courses for the course-based MEng program. Eight courses for the project-based MEng program. MEng students are required to take four core courses (ENGR 5013F, 5200G, 5201G and 5410G). Mechatronics is a broad field of research. There will be ten new courses to ensure that the area is well covered.

2.3 Program requirements for graduate programs only

The nature and suitability of the major research requirements are clearly stated:

"For MASc students, the main focus is a research thesis supervised by a faculty member who is a subject matter expert. For MEng project-based students, the project features a research element that is also supervised by a faculty member who is a subject matter expert. In addition to the thesis and project, many courses feature a term project that is often research focused."

Length of the programs are appropriate as they are modelled after existing MEng and MASc programs in FEAS. Both programs are expected to take two years to complete. MEng students are expected to take two to three courses per term. Students are permitted to take one senior level undergraduate course (with approval of supervisor and program director). This is consistent with the university requirement that a minimum of two-thirds of the courses taken are at the graduate level. At least half of a student's courses must be within their program in FEAS (as listed in **Appendices B** and **C** of the Proposal).

There are two concerns related to graduate program requirements: a) no requirement for a student to take at least half of their courses as METE and b) limited oversight on whether the full set of courses selected by a student fit with the objectives of the program. This concern is addressed further in **Section 5** of this report.

2.4 Assessment of teaching and learning

The MSc program requires five courses (3 credits each) plus a thesis (15 credits), and a seminar in which three courses should be from Engineering courses. The MEng program requires eight courses (3 credits each) plus a project (6 credits), in which four courses should be from Engineering courses; or ten courses (3 credits each), and no project. This is similar with other master programs in Canada.

Methods for the assessment of teaching and learning are modelled after existing MEng and MASc programs in FEAS.

Program Learning Outcomes are listed on **Table 3** in the Proposal, as follows:

- Explain advanced principles, and theories mechatronics.
- Design and implement experiments.
- Interpret experimental data and computational results.
- Solve engineering problems and enhance existing practices through research.
- Adhere to social, professional, and ethical expectations involved in advanced education and research.
- Describe the importance of, and develop the strategies for, further education and lifelong learning in the discipline.
- Communicate mechatronics concepts, principles, and results effectively using written and verbal formats.
- Critically evaluate advanced information and knowledge and apply in engineering practice.

The learning outcome are appropriate for Mechatronic advanced degree programs. However, courses listed in **Table 3** need to be more specific to the program, they seem a bit general.

Assessment of program learning are like other programs at Ontario Tech University (OTU), through assignments, exams, term projects, thesis, and defences. The assessments are consistent with other similar programs and institutions.

On the question of "How the resulting information will be documented and subsequently used to inform continuous program improvement", not much is mentioned in the Proposal. This comment will be repeated in Section 5 as a recommendation to provide more detail in the Proposal.

Overall, the proposed programs seem of good quality, and will likely be successful, if there are enough students enroll in these programs as predicated in the Proposal. Although, prediction of enrollments may be a bit exaggerated.

2.5 Admission requirements

Admission requirements are modelled after existing MEng and MASc programs in FEAS. The Proposal states:

> *"The admissions requirements for the program are the same as those for other master's programs at Ontario Tech, namely:*
>
> - *Hold a four-year honours degree or its equivalent from a recognized institution in the same area of graduate study or a closely related subject.*
> - *Overall academic standing of at least a B average (GPA: 3.0 on a 4.3 scale or 73 to 76 per cent), with a minimum B average in the last two full-time years (four semesters) of undergraduate work or equivalent.*

In terms of acceptable undergraduate degrees for the MASc and MEng programs in Mechatronics Engineering, students who have graduated from an undergraduate program in Mechatronics, Mechanical, Manufacturing, Automotive, or Electrical Engineering will be considered."

Also, more is stated in **Appendix D** of the Proposal, where admission requirements for the programs are given as:

"In addition to the general admission requirements for graduate studies, applicants must meet …:
Applicants must possess maturity and self-motivation. Close technical contact with a research supervisor is essential in research-based engineering programs. Prior to being accepted into the program, MASc applicants must find a faculty member who specializes in their desired area of research and who is willing to act as their thesis research supervisor."

For admission requirements, the wording in the body of the Proposal and the wording in **Appendix D** differ somewhat. One recommendation is to confirm which is the correct wording.

Also, English language requirements are stated in the following link:
https://gradstudies.ontariotechu.ca/future_students/application_process_and_requirement/step%203/english-language-proficiency.php
Perhaps, the Proposal can include this link, or its content to be clear.

Overall, the programs' admission requirements are appropriate and consistent with the objectives and program-level learning outcomes.

2.6 Resources

Given the program's planned/anticipated class sizes and the offering of ten new graduate courses, there were concerns that the five faculty members currently assigned to the program will become overloaded. The addition of a sixth member (currently in the search phase) will help to mitigate this concern. However, those faculty interviewed felt that the new courses could be covered under the terms of the current faculty workload agreement. Note that a faculty member who was identified to support the program left after the Proposal was written. Hence the Proposal refers to the addition of a seventh (not sixth) faculty member. Thus, most of the instruction will be done by Tenure Track Faculty and Teaching Faculty within FEAS. As is normal practise, the Proposal acknowledges that there may be a limited need for Sessional Instructors depending on matters such as the number of courses that need to be offered in a given semester, or faculty on research leave or sick leaves. It is agreed that the existing complement of Graduate Program Assistants within FEAS will be sufficient for at least the first five years of the program, given the enrolment projections.

As an explicit form of experiential learning, MEng students have the option to take a co-op internship for four to eight months. This option is not unique to the proposed MEng program and is supported by the Engineering Co-op Office.

With respect to physical resources, it was stated that existing classroom, laboratory and office space were adequate to meet the needs of the new programs. No new space has been requested. The laboratories that we were shown support this statement. With respect to the Library, **Appendix F** in the Proposal confirms that the existing OTU library holdings and facilities can provide the resources needed to support the new programs. There are no extraordinary Information Technology Resources beyond what is available to all students at OTU.

2.7 Resources for graduate programs

Financial assistance for students follows the model of existing MEng and MASc programs in the FEAS. Supervisor workloads will also follow the examples of existing MEng and MASc programs. Evidence that faculty have the research expertise and professional backgrounds to sustain and promote the programs are covered in **Section 2.8** of this report.

1.8 Quality and other indicators

A review of the faculty CV's provides evidence of the quality of the faculty (*e.g.*, qualifications, funding, honours, awards, research, innovation, and scholarly record). All faculty member interviewed, or CV included in the Proposal have PhD degree, many of them are active researchers, and have expertise in control and mechatronics.

We interviewed the following faculty members:

- Dr. Haoxiang Lang, PhD (2012) started in 2015 at OTU; teaches 2 undergraduate courses (UG), and 2 Graduate Course (GC) in alternate years (Advanced Control; Robotics & Automation); 1 each year.
- Dr. Shabnam Pejhan, PhD (2017), started in 2022 at OTU; teaches 2 UG, and 1 GC (Biomechatronic).
- Dr. Aaron Yurkewich, (CV not included?), started in 2023 at OTU; doesn't teach any UG for now, and will teach 1 GC (possibly Biomechatronic system; Neuromechanical and human movement).
- Dr. Meaghan Charest-Finn, PhD (2020), started in 2021 at OTU; teaches 3 UG, and no GC , and will teach 1 GC (possibly METE 5101G- Artificial Intelligence and Machine Learning Methods and Application).
- Dr. Jaho Seo, PhD (2011), started in 2017 at OTU; teaches 2 UG, and 1 GC , and will teach 1 GC (dvanced power control; alternatively Control design and robotic system)
- Dr. Nasim Moallemi, PhD (2015), started in 2018 at OTU; teaches 4 UG, and no GC, as she is in teaching position; she can teach 1 new GC (possibly Advanced Nonlinear control; or AI and signal processing). The department should consider possible contract implication for this and similar cases (i.e. Dr. Aydin given below).

Other Faculty members (whom their CVs were included)

- Dr. Murat Aydin, PhD (1999), Associate Teaching Professor, started 2021 at OTU
- Dr. Moustafa El-Gindy, PhD (1980), started 2015 at OTU
- Dr. Zeinab El-Sayegh, PhD (2020), started 2021 at OTU
- Dr. Yuping He, PhD (2003), started 2017 at OTU
- Dr. Xianke Lin, PhD (2014), started 2017 at OTU
- Dr. Scott Nokleby, PhD (2003), started 2004 at OTU
- Dr. Greg Leo Rohrauer, PhD (1999), started 2005 at OTU

Clerical support staff members who were interviewed indicated this extra load will not affect their ability to handle admission process efficiently. They indicated there is no admin backlog currently, and they will not anticipate such a backlog happens because of this initiative.

3. EQUITY, DIVERSITY, INCLUSION, AND DECOLONIZATION

Reasonably good statements are provided in the Proposal, which address Equity, Diversity, Inclusion, and Decolonization. Some of them are highlights below:

> *"The Faculty of Engineering and Applied Science (FEAS) is fully committed to Equity, Diversity, and Inclusion (EDI), including in all its courses and all its research activities.*
>
> *An example of its focus on EDI, FEAS has the Women in Engineering Society with several stated goals (see page 21 for details).*
>
> *FEAS is committed to reconciliation with Indigenous peoples. Students in the MASc and MEng programs can take as one of their courses a fourth-year undergrad course (ENGR 4570U/INDG 4570U - Indigenous Design and Technology).*
>
> *For students who have accommodation needs, existing Student Accessibility Services (SAS) supports will be available to students who require specific accommodations."*

4. OTHER ISSUES

The only other issue to be addressed is the uniqueness of the programs.

The Proposal identifies three programs that are considered similar to what has been proposed: MASc at Simon Fraser, MEng at UBC and MEng/MASc at Waterloo.

The closest match for the proposed MASc program is the MASc in Mechatronic Systems Engineering offered by the School of Mechatronics Systems Engineering at Simon Fraser University *https://www.sfu.ca/students/calendar/2020/fall/programs/mechatronic-systems-engineering/master-of-applied-science.html* SFU does not offer an MEng program in this area. As with the proposed OTU program, the SFU program is five courses (includes a seminar course) plus a thesis.

The closest match for the proposed MEng project-based program is the MEng in Mechatronics Design offered by the Department of Mechanical Engineering at UBC: *https://mech2.sites.olt.ubc.ca/files/2022/06/MECD-Program-and-Registration-Guidelines-2022W-V.2.pdf* UBC does not offer a MASc program in this area. Students in the UBC MEng program are required to take eight courses plus a mechatronics-based project course. Three of the eight courses are mechatronics in nature and are considered core. This is an important observation as it relates to our recommendation that OTU requires their MEng course-based students to take three courses that are mechatronics in nature. UBC students who are unable to find projects in the summer/fall of the 2nd year, are permitted to take two graduate courses (equivalent to 6 credits) to satisfy the project requirement on a case by case basis. This is like the OTU's MEng course-based proposal.

The Department of Mechanical and Mechatronics Engineering at the University of Waterloo offers both MEng and MAS*c* programs*: https://uwaterloo.ca/mechanical-mechatronics-engineering/graduate-students/future-students/masc-and-phd*. Their undergraduate program is definitely mechatronics in nature. But the graduate courses listed at the Masters level are very much mechanical in nature.

At OTU, MASc students will receive a minimum of $10,000 funding from the department for TA work; the department leaders indicated that they have sufficient budget for TA expenses for the added

MASc new students joining in the future because of these new programs. M.Eng. students do not have such financial commitment for the department.

The conclusion is that there are no similar programs in Ontario.

5. SUMMARY AND RECOMMENDATIONS

Ontario Tech University should be lauded for proposing a novel and much needed graduate program in the area of mechatronics. The demand for graduates in this area is high.

We only have one major recommendation and that has to do with the MEng students.

R1) Course registration can be done by the student, without any requirement for faculty or supervisor approval, as long as the course appears in **Appendix B** (new courses) or **Appendix C** (existing courses). This is cause for concern with the MEng program, particularly with Course-Based students who take ten courses, four of which are required (engineering mathematics, programming methodology, communications, project management). The six remaining courses don't have to be mechatronics in nature and consequently the MEng looks more like a mechanical degree than a mechatronics degree. We recommend that MEng students, both course-based and project-based, be required to take at least three courses that are mechatronics in nature. **Table 1** in this report shows one possible list.

This is not a concern with the MASc students. For the MASc students, one assumes that the student will follow the practice of consulting with their supervisor as to which courses they should take. For the MEng project-based students, if the project is a mechatronics subject, the project can replace one of these three required courses.

There are three other recommendations to consider.

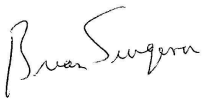
R2) Clarify whether or not Dr. Moallemi and Dr. Aydin are contractually eligible and/or required to teach graduate courses.

R3) For the admission requirements, confirm which wording is preferred, the wording given in **Appendix D** or the wording given in the Proposal.

R4) In **Section 2.4 (**assessment of teaching and learning), more detail should be provided on how the resulting information will be documented and used for continuous program improvement.

Table 1. Courses that are mechatronics in nature

Course Number	Course Name
ENGR 5260G, ***or*** METE 5280G	Advanced Robotics and Automation, ***or*** Robotics and Automation
ENGR 5261G	Advanced Mechatronics: MEMS and Nanotechnology
ENGR 5262G	Manipulator and Mechanism Design
ENGR 5945G, ***or*** METE 5300G	Mobile Robotic Systems, ***or*** Mobile Robotics
METE 5102G	Control Design in Robotic Systems
METE 5107G	Biomechatronic Systems
METE 5101G	Artificial Intelligence and Machine Learning Methods and Application
METE 5108G	Neuromechanics and Control of Human Movement

Signature: 

Date: May 20, 2023

Signature: 

Date: May 20, 2023

Faculty Response to the External Review for the

_____

Master of Applied Science in Mechatronics Engineering

and

Master of Engineering in Mechatronics Engineering

Submitted By:

Scott Nokleby

July 2023

Hossam Kishawy

July 2023

Introduction

Brief comments on the external reviewers report and the program review process in general.

We would like to thank the reviewers for taking the time to review the program and meet with the Faculty to discuss our proposal. The reviewers have provided useful feedback/recommendations that we have implemented completely in the final version of the proposal.

Summary of Recommendations and Faculty Responses

- *Restate the recommendations summarized in the external reviewers' report and provide the Program's comments and responses*
- *The Dean should then provide summative comments/responses from an overarching Faculty perspective for each recommendation and program response*

Recommendation 1
Course registration can be done by the student, without any requirement for faculty or supervisor approval, as long as the course appears in Appendix B (new courses) or Appendix C (existing courses). This is cause for concern with the MEng program, particularly with Course-Based students who take ten courses, four of which are required (engineering mathematics, programming methodology, communications, project management). The six remaining courses don't have to be mechatronics in nature and consequently the MEng looks more like a mechanical degree than a mechatronics degree. We recommend that MEng students, both course-based and project-based, be required to take at least three courses that are mechatronics in nature. Table 1 in this report shows one possible list. This is not a concern with the MASc students. For the MASc students, one assumes that the student will follow the practice of consulting with their supervisor as to which courses they should take. For the MEng project-based students, if the project is a mechatronics subject, the project can replace one of these three required courses.

Program's Response
We agree with this recommendation. MEng students, both course-based and project-based, will be required to take a minimum of three courses from the following approved list of core courses:

ENGR 5260G - Advanced Robotics and Automation
ENGR 5261G - Advanced Mechatronics: MEMS and Nanotechnology
ENGR 5262G - Manipulator and Mechanism Design
ENGR 5945G - Mobile Robotic Systems*
METE 5107G - Biomechatronic Systems
METE 5101G: Artificial Intelligence and Machine Learning Methods and Application
METE 5102G: Control Design in Robotic Systems
METE 5103G : Model Predictive Control
METE 5106G: Advanced System Modeling Methods
METE 5108G: Neuromechanics and Control of Human Movement
METE 5280G: Robotics and Automation
METE 5300G: Mobile Robotics*

*Students can take ENGR 5945G or METE 5300G, but not both.

Dean's response
I agree with the recommendation and the response.

Recommendation 2
Clarify whether or not Dr. Moallemi and Dr. Aydin are contractually eligible and/or required to teach graduate courses.

Program's Response
Both Dr. Moallemi and Dr. Aydin are eligible to teach graduate courses. Teaching assignments are determined by the Dean based on the needs of the undergraduate and graduate programs.

Dean's response
I agree with the recommendation and the response.

Recommendation 3
For the admission requirements, confirm which wording is preferred, the wording given in Appendix D or the wording given in the Proposal.

Program's Response
The preferred wording is in Appendix D, which is consistent for all our engineering master's programs. What was written in the proposal was a summary of the wording in Appendix D. The proposal section has been updated to contain the same wording as Appendix D.

Dean's response
I agree with the recommendation and the response.

Recommendation 4
In Section 2.4 (assessment of teaching and learning), more detail should be provided on how the resulting information will be documented and used for continuous program improvement.

Program's Response
The main avenue for assessing and monitoring the program effectiveness will be through the cyclical program review process. In addition, Ontario Tech's Academic Resource Committee requires a report one-year after start-up of a new program and, if there are areas of concerns raised, a subsequent 18-month report will be required. The one-year report will ask the program to review enrollment data, admission averages, and provide an analysis of successes and challenges encountered in the first year. After the first year of the program being implemented, it will be internally assessed by this committee and, if needed, recommendations will be made to enhance program effectiveness and student success. If required, the 18-month report will address key curricular and student data (e.g. GPA, retention data, etc.) as well as any outstanding recommendations from the one-year report. Pending the committee's review, further documentation may be required of the program for ongoing monitoring. The reports will be developed by the Graduate Program director in consultation with the Faculty Graduate Committee.

The above has been added to the proposal.

Dean's response

I agree with the recommendation and the response.

Suggested Revisions for the Proposal following External Review

- *Program to list all suggested revisions to the proposal*
- *For each suggested revision, the Dean should include a comment indicating whether the revision will proceed. If the revision will not proceed, please indicate a rationale*

- The proposal was updated to address Recommendation 1 by incorporating a list of approved core courses and requiring MEng Course-Based and MEng Project-Based students to take a minimum of three course from the list. These changes are reflected in Section 2 and Appendix D of the proposal.

  Dean's comment: The revision will proceed.

- The proposal was updated to address Recommendation 3 by incorporating the admission requirements wording of Appendix D into Section 2 of the proposal.

  Dean's comment: The revision will proceed.

- The proposal was updated to address Recommendation 4 by elaborating on the continuous improvement proposed for the program in Section 2 of the proposal.

  Dean's comment: The revision will proceed.

Summary of Changes Made to the Proposal Following External Review

List all revisions to the proposal and appendices, noting the Section number from the document. Include this form with the final proposal.

- The proposal was updated to address Recommendation 1 by incorporating a list of approved core courses and requiring MEng Course-Based and MEng Project-Based students to take a minimum of three course from the list. These changes are reflected in Section 2 and Appendix D of the proposal.

- The proposal was updated to address Recommendation 3 by incorporating the admission requirements wording of Appendix D into Section 2 of the proposal.

- The proposal was updated to address Recommendation 4 by elaborating on the continuous improvement proposed for the program in Section 2 of the proposal.

BOARD REPORT

SESSION:		ACTION REQUESTED:	
Public	☒	**Decision**	☐
Non-Public	☐	**Discussion/Direction**	☐
		Information	☒

TO: **Board of Governors**

DATE: **November 30, 2023**

PRESENTED BY: **Brad MacIsaac, Vice-President, Administration**

SUBJECT: **Budget Assumptions and Priorities 2024-2027**

COMMITTEE MANDATE:
The Audit and Finance Committee is responsible for ensuring fiscal responsibility with respect to the financial resources of the university, including reviewing and recommending approval of the annual operating budgets.

BACKGROUND/CONTEXT & RATIONALE:
These materials were presented to the Audit and Finance Committee on November 23, 2023.

As we start to plan for the next three years, noting a focus on 2024-2025, we have updated our assumptions based on this year's results. The intent of The Fiscal Blueprint is to outline the provincial landscape, highlight the main assumptions management is reviewing and link funding priorities with the Integrated Academic Research Plan. The university has created many scenarios and have outlined four in the paper. Looking at the conservative scenario the main facts to be considered are:

a) Enrolment Revenue; The preparation of the operating budget involves the use of projections and estimates. This major revenue driver includes enrolment going up about 600 Full-time Equivalents (include a year-over-year undergraduate domestic student enrolment increase of about 100 and international enrolment increase of about 45).

b) Tuition Revenue: The assumptions include the government continued freeze on domestic rates as we have not heard anything to the contrary. Each 1 per cent increase in the domestic tuition rate is estimated to result in a $470,000 increase in our revenues.

c) Expenses: We must first deal with mandated salary increases and prioritized hiring plans which will be explained further in the final budget proposal. The first draw on the ~$237M budget is a reallocation to invest $12M more in personnel costs compared to 2023-2024. This essentially consumes the entire revenue increase. Other investments will be covered by reallocations.

As we get closer to setting the budget in March, we will have more clarity on student application numbers and expect a response from the government on a proposed tuition policy. Like previous years we will work to set a balanced budget along with a list of unfunded priorities that we can act upon should we see more positive numbers. In every year there is a level of overall risk of not achieving the desired enrolment results (e,g, a 1% deviation in enrolment will lead to ~$1M variance, positive or negative, from tuition fee revenues). Note that the university is normally within ±2% when predicting enrolment totals.

The bigger risk may be what is not included in the budget framework. We recognize that inflation and supply issues continue to wreak havoc on some operating expenses. Currently, we have not placed an inflationary increase into the budget. Instead, we are asking for units to put in an ask for us to prioritize or reallocate from within their existing budgets.

ALIGNMENT WITH MISSION, VISION, VALUES:
The recommendations are made with an eye on the mission of the university and an investment in the priorities laid out in the IARP. They will allow Ontario Tech to continue to provide high quality undergraduate and graduate services and experiences to its students.

COMPLIANCE WITH POLICY/LEGISLATION:
The assumptions are to be compliant with provincial tuition fee policy and Ontario Tech's ancillary fee protocol.

NEXT STEPS:
The paper will be released to all employees. Academic Council consultation and will host a separate hyflex community consultation on November 28th.

Budget holders are to complete and submit their budget by December 16th. The leadership team will review the formal winter count data and finalize the budget submission. This will be presented to the Audit & Finance Committee in April 2024.

SUPPORTING REFERENCE MATERIALS:

Fiscal Blueprint 2024-2027, November 2023

ONTARIO TECH'S FISCAL BLUEPRINT 2024-2027

Budget Working Group, November 2023

For an alternative format of this information, visit ontariotechu.ca/fiscalblueprint.

Executive Summary

Ontario Tech's Fiscal Blueprint provides the campus community with an overview of the university's upcoming 2024-2027 budget cycle. It outlines the key assumptions and factors that underpin the multi-year budget plan. In alignment with our commitment to the Integrated Academic-Research Plan (IARP) 2023-2028, we continue to pursue ambitious goals, while ensuring ongoing excellence and maintaining fiscal sustainability. The IARP encourages us to concentrate on our priorities and to invest effort into actions within our control to position ourselves for success, while avoiding distractions from external factors beyond our control.

Ontario Tech has accomplished many notable achievements in its first 20 years. Our growth, from an inaugural student class of 947, to now more than 11,000 students, underscores our exceptional efforts in recruitment, retention, and the provision of quality educational experiences. Notably, our student applications have outperformed the Ontario university system, with an impressive rise of almost 50 per cent in the past two consecutive years. We're also gaining global recognition as we continue to receive strong reputational and research rankings from national and international organizations. Our successes are the result of deliberate and strategic actions that we've taken while operating in an increasingly complex local and global higher education sector.

We continue to strongly advocate to the provincial government for improved grant funding and flexible tuition frameworks, yet we remain bound by government policies that limit our grant, tuition and ancillary fee revenues. These revenues currently represent about 80 per cent of our total funding. In a landscape where costs are rising with inflation, our financial sustainability and our ability to plan for the future and invest in our priorities are called into question. To address these challenges, we recognize the necessity of integrated planning, as well as the need to pursue new partnerships and alternative revenue sources to build, support and invest in our core activities. The need for this approach has never been greater.

In this paper, we begin with a brief overview of the current provincial landscape and the public policy context within which post-secondary institutions are currently constrained. This is followed by an overview of the university's assumptions as they relate to revenue streams and expenses for the 2024-2027 budget cycle. These serve as the foundation for discussing different budget scenarios, as well as the opportunities and challenges related to our revenue sources and expenses, potential investments, and budgetary reallocations as we deliver on our IARP goals.

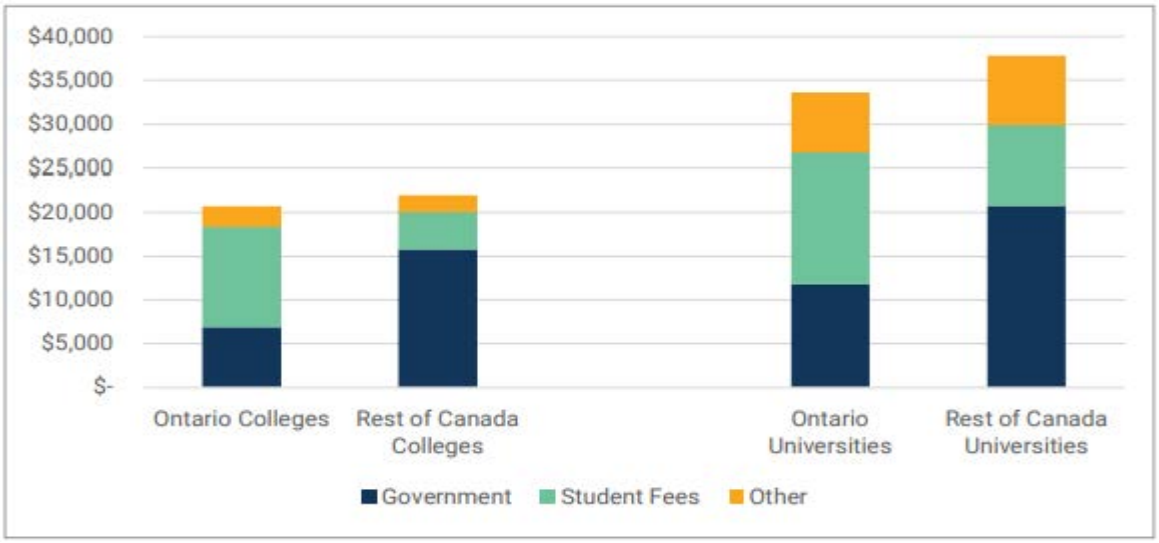
The Higher Education Policy Context in Ontario

As highlighted in The State of Postsecondary Education in Canada 2023[1], despite having one of the world's highest-quality post-secondary systems, the Canadian sector and particularly that in Ontario, finds itself at a critical juncture. Even with near-record revenues, many institutions find their finances more precarious than ever, raising the pressing question of how long this situation can be endured.

Examining the past 70 years, we observe lasting long-term trends. Between 1955 and 1970, post-secondary institutions quintupled in size as a percentage of the entire economy, from about 0.5 per cent of gross domestic product to 2.5 per cent. That is often referred to as the 'golden period' of Canadian higher education, marked by a substantial allocation of provincial resources. Since then, the history of post-secondary education funding can be divided into two phases. From about 1970 until the late 1990s, public funding and total funding decreased in tandem. Then, as the 1990s went on, institutions began exploring private sources of funding, not only to offset declining funding but to increase funding overall. In the long run, this narrative reveals a story of public neglect but also underscores institutional resilience and entrepreneurial endeavours.

Ontario currently ranks last amongst Canada's provinces in public per-student funding. Over the past five years, since this government assumed provincial office, Ontario universities have experienced a reduction of more than 30 per cent in 'government-controlled' income, which includes provincial grants and domestic fees. The decline in fee income, exacerbated by high inflation, has had a significant effect. The government continues to freeze institutional grants in nominal terms, allowing inflation to erode the proportionate value of the contribution due to additional student enrolment. Additionally, in 2019, the government introduced a 10 per cent across-the-board reduction in domestic tuition for institutions and has maintained frozen fees at that reduced level. On a per-student basis, Ontario's funding for universities stands at 57 per cent of the average in the other nine provinces (Figure 1). The sustained compounding effect of public-funding policies has pushed many Ontario universities into financial peril.

Figure 1: Total Income per Full-Time Equivalent Student (FTE), Canada vs. Ontario, 2021-2022



In November 2022, the Ministry of Colleges and Universities (MCU) announced that they had begun developing financial indicators to provide transparent data and insight into the financial health of

[1] Usher, A. (2023, September 6). The state of postsecondary education in Canada 2023. Accessed online at https://higheredstrategy.com/spec-2023/#:~:text=No%20province%20has%20underfunded%20postsecondary,it%20is%20a%20mere%2044%25.

the province's universities. In a recently released draft report, eight measures have been defined to illustrate an institution's liquidity, sustainability and performance. Universities will submit their first analysis to the province in the spring based on their most recent fiscal year end. If an institution is in the medium-risk category, it will have to develop an internal recovery plan with its Board that would address financial risks. If they are in the high-risk category the institution will retain a third-party or expert external advisor to review the institution's finances, recovery plan and overall management strategies. A financially prudent approach to budgeting will potentially protect our fiscal autonomy (i.e., keep us off the government's radar), but at the same time it undermines a fiscally sustainable future as well as our commitments to excellence and innovation in all that we do.

In March 2023, MCU launched a Blue-Ribbon Panel to make recommendations on how to best support the quality, accessibility and sustainability of the post-secondary sector. The panel was tasked to conduct research and to engage in consultations with key participants in the education system to identify actions that can improve the financial sustainability of the post-secondary sector, support the development of a skilled workforce, and promote economic growth and innovation. The panel's work is guided by the following five principles:

1. Enhancing student experience and access.
2. Improving labour market alignment.
3. Keeping education affordable for lower- and middle-income families.
4. Promoting economic growth and prosperity.
5. Rewarding excellence and financial sustainability.

We have been informed that the panel has completed its report and submitted it to the MCU for review. Its release is imminent.

What does this mean for Ontario Tech?

The university recognizes the impending financial challenges that all post-secondary institutions across Ontario face, yet our unique position (i.e., small size, cost structures, the absence of substantial endowment fund) makes us particularly vulnerable. The impact of the province's tuition cut in 2019, followed by a three-year freeze, has resulted in an inflation-adjusted decrease of 25 per cent in provincial funding over the past four years. This, combined with recurring and compounding year-over-year contractual increases in existing labour costs alone, creates an enormous budgeting challenge.

Our university community must stay focused on our own priorities as there is a prevailing belief that the Blue-Ribbon Panel report may not provide any groundbreaking solutions for the university sector. For example, a 3 per cent tuition increase aimed at returning to previous policy levels would cover less than half of today's inflationary expense increases. To avoid severe consequences a reversal of 45 years of government disinvestment is necessary, yet this is not an easy endeavour. The pattern of gradual disinvestment is not specific to a particular government or ideological trend; in fact, it reflects a persistently short-sighted, profound and troubling consensus among Canadian governments. Demonstrating relevance over the past four decades has not swayed our government funders from their commitment to disinvest in universities. As a result, we must explore radically new strategies.

Ontario Tech's Interdependent Planning and Budgetary Contexts

This Fiscal Blueprint provides an overview of anticipated revenue streams and expenses for the 2024-2027 budget cycle. These projections serve as the foundation for discussing three different budget scenarios, each of which explores the opportunities and challenges created by variations in revenue

and budget assumptions, and potential investments and budgetary reallocations as needed to realize our vision and mission, while also focusing on the realization of our strategic priorities as outlined in the IARP and the Strategic Research Plan.

In a landscape filled with competing demands and a challenging fiscal context, this paper focuses on short-term priorities that will stimulate differentiated growth within the university and identifies the longer-term resources required for lasting success and sustainability. This approach helps us to identify areas for future investments while achieving tangible progress during the upcoming budget year. Our strategy will firmly establish our university as a remarkable and highly regarded institution for both work and study. In doing so, we have kept in mind the following excerpt from the Looking Forward' section of the 2023-2028 IARP:

> *"This goal is very ambitious given some of the long-standing and newly emerging fiscal challenges we are currently experiencing. The ongoing financial pressures, created by the imposed 2019 cut to tuition, followed by the ongoing freeze in domestic tuition rates and static grant funding, are growing in magnitude. The grant funding model is scheduled to shift to a new, previously untested performance-based funding model with potentially less predictable outcomes. Moreover, skyrocketing inflation and rising interest rates are reducing our spending power and are having a negative impact on our students' cost of living expenses. Rising rental accommodation rates due to low rental unit availability in Oshawa, as well as bottlenecks in the processing of international student-study permits and visas are a few examples of the real and unanticipated barriers for students wishing to pursue their studies at Ontario Tech. These challenges will require all of us—every member of the Ontario Tech community—to accept a role in supporting our students and the sustainable future of our institution. We must pursue a bold transformation agenda that builds on our unique program offerings and the current momentum of our student demand. This transformation would see us growing to 18,000 students by 2030 to meet the needs of the increasing Greater Toronto Area university-aged population and international demand for science, technology, engineering, math and professional programs. This growth will provide revenues needed to cover the costs of expansion (including enhanced academic and non-academic student, staff, and faculty support services) as well as invest in our priorities and differentiation.*
>
> *Moving forward, staying focused on a combined growth-differentiation agenda aligned with our core strategic priorities (Tech with a conscience, Learning re-imagined, Sticky campus and Partnerships) while adapting to a new post-pandemic reality is crucial. In doing so, we will be data-driven, constantly evaluating the value of our efforts and holding ourselves capable in a constrained fiscal environment. We will grow our revenues, be efficient in our costs and purposefully invest in our priorities. At the same time, we will continue to be accountable for ensuring that our graduates are employable and that the generation, analysis, retention, and meaningful translation of our research efforts support the greater good of society. Importantly, as we move into our next decade of existence, we will continue to envision ourselves as a growing community hub, a place where people will come together to meet and engage in social and cultural activities that reflect community needs.*
>
> *This plan has an important role in keeping us collectively focused to realize a sustainable future for Ontario Tech. It also aligns our activities with our vision, mission, values, strategic priorities and resources. This is exceptionally important during periods of prolonged fiscal restraint such as the one we have now experienced for some time. Our fiscal uncertainty is further complicated by the broader degree-granting privileges now found within the province's colleges as well as a growing number of industry-based education and training programs. We are being pressed to do more with less while also being held to greater levels of accountability by government and society in general."*

Building Ontario Tech's Budgetary Assumptions

In addition to emphasizing the need for differentiated growth within our institution, the 2023-2028 IARP reaffirms our commitment to our four strategic priority areas: Tech with a conscience, Learning re-imagined, Creating a sticky campus and Partnerships, and challenges us to lead as a forward-thinking university. To achieve this, we must identify opportunities within a fiscal context fraught with real constraints and pressures, one that will necessitate ongoing fiscal discipline to address budgetary challenges and allocate resources for our initiatives. We remain committed to growing our enrolment numbers while also finding efficiencies and new ways of doing things.

As we look to the next three years, our assumptions are grouped into two main categories: revenues and expenses. These assumptions are framed and expanded upon based upon currently available information. As new information becomes available throughout the budget cycle, revisions will be made. This is important as any shift in the assumptions, positive or negative, will impact the budget.

Revenues

Our revenue is predominantly tied to student registration numbers, including associated funds such as grants, tuition and ancillary fees, all of which are controlled by the provincial government—with the exception of international student tuition. **The result is that without further enrolment growth, total revenue is projected to increase by a mere 1 per cent on an annual basis due to international tuition increases**.

Given the current freezes on our grant and domestic tuition levels, we must continue to increase, broaden and stabilize our revenue base to accommodate escalating expenses. This involves realizing additional revenues from growth in student enrolment in existing and new programs of study, meeting our Strategic Mandate Agreement (SMA3) performance targets with the provincial government, and raising funds from alternative sources (e.g., philanthropy).

Domestic Enrolment

The IARP explicitly articulates that Ontario Tech's overall student enrolment will grow to 18,000 students by 2030, including near-term enrolment commitments, as set out in our current SMA3. Our strategic enrolment management (SEM) tactics, supported by an increasingly popular new brand, have resulted in record applications in 2021 and 2022. However, the road ahead will require an integrated SEM plan, one that equally encompasses increased student recruitment and retention to realize our differentiated growth goals.

Ontario Tech must specifically focus on capturing a larger share of the traditional direct from high school domestic undergraduate market, particularly the Greater Toronto Area (GTA), as it is unlikely that overall university participation by this cohort in the province will see significant growth in the coming years. Traditional student recruitment will hinge on the development and launch of sound new program offerings and existing program repackaging efforts to attract students from new markets and to enhance our competitiveness in the post-secondary landscape. Making co-operative education, experiential, and work-integrated learning opportunities available for all students is necessary, as is an investment in data-driven tools (e.g., early alert systems) designed to support the success and retention of our students.

International Enrolment

We will continue to make significant investments in recruitment and inter-institutional partnerships to ensure the continuation of international student inflows. This is necessary as post-pandemic

participation by international students in the province's post-secondary sector has yet to fully recover to pre-pandemic levels. Furthermore, the current global political climate may have negative, long-term implications for Canada's appeal as a study destination.

The university intends to grow international enrolment closer to the provincial system average of 20 per cent. This includes increased growth in undergraduate and graduate student admissions in the coming years. To achieve this, it will be imperative that we communicate our value proposition as a highly ranked access university to the international community. In the long term, we will reinforce this proposition with increased budgetary commitments to fund international scholarships, advocacy for and identification of affordable housing options, and the creation of concurrent work opportunities.

We have opportunities to expand course-based master's programs, positioning us to attract new cohorts by responding to local and global labour market demands. These programs hold strong appeal for students, particularly international students, as they offer pathways to both post-graduate work opportunities and expedited routes to permanent residency. These enrolments will allow us to work within our existing domestic graduate student allocation while allowing for strategic growth.

Part of this differentiated growth in international students will result from effective recruitment strategies. However, these strategies must be closely aligned with our mandate and reflect a firm commitment to student success and retention. With the development of a new university retention plan underway, Ontario Tech can work towards achieving increased student persistence of our new and current students, positioning our university for robust enrolment performance in the future.

Grants

Government-funded enrolment-related grants are expected to remain stagnant as the provincial funding levels have remained frozen since 2012. This represents a 32 per cent decrease when adjusted for inflation. Furthermore, we continue to be limited to receiving our 2016 enrolment corridor funding, even though our number of domestic students has increased over those targets. Our strategic decision to grow domestic enrolment is motivated by the tuition revenue and the expectation that the government will eventually resume grant funding for all students.

Government funding is increasingly becoming more focused, with additional dollars being issued as targeted grants allocated to specific activities rather than for the purposes of broad institutional support. For example, in 2023, the university received an extra $800,000 specifically for facilities renewal. These funds were designated for covering capital costs related to existing buildings. In essence Ontario Tech, like all other universities, has no flexibility in reallocating these funds to areas of greater need. This funding is also subject to strict accountability and reporting measures.

In 2016, the provincial government introduced an enrolment-based funding formula where institutions receive a fixed operating grant if their five-year moving enrolment average remains within 3 per cent of an established target (or corridor mid-point). The new funding model aimed to provide equitable, predictable and stable funding for all institutions, enhancing planning certainty.

In 2019, as part of the SMA3, this fixed operating grant became heavily tied to provincially defined performance measures. Due to the pandemic, the government suspended this plan during the 2022-2023 fiscal year. However, this performance funding approach was activated in 2023-2024 (i.e., Year 4 of SMA3) at 10 per cent. More recently, the government has further deferred its implementation for 2024-2025 pending the outcomes of the Blue-Ribbon Panel review.

Tuition

Tuition fee levels for our undergraduate domestic students are currently approaching, yet are still below, the median for Ontario universities. In February 2019, the government announced a 10 per cent cut to domestic student tuition fees for the 2019-2020 academic year and a subsequent tuition freeze for domestic students. When accounting for inflation, this represents a 25 per cent decrease in tuition revenues over the past four years. For Ontario Tech, this resulted in a cumulative annual revenue reduction of $62 million for the same time period, relative to what we might have otherwise expected. In 2023-2024, the MCU approved our application for tuition anomaly adjustments for three of our degree programs for incoming students, resulting in an annual increase of about $640,000 in domestic tuition fee income. However, the broader tuition freeze remains in effect, and at present, we do not have any information on the domestic tuition framework for future years. Universities are currently urging the government to discontinue its tuition freeze policy; however, we assume the domestic tuition freeze will continue for the 2024-2025 budget year.

For 2024-2025, we have assumed a 5 per cent increase in international undergraduate tuition fees. Our international tuition fees remain below the Ontario system median. However, due to competition for international students, we are closely assessing the potential impact of this assumption. We must balance increases and investments in student support, as noted below.

Ancillary Fees

The remaining revenues received via student fees fall under the category of ancillary fees. Ancillary fees are designated for pre-specified approved activities (e.g., recreation services, health services, student learning). These student-centred supports represent about 12 per cent of total student fees. These fees are subject to a provincial fee protocol that allows for an annual inflationary increase based on the Bank of Canada Consumer Price Index (CPI) (September over September). The current CPI is 4 per cent. However, with student affordability in mind, the 2024-2025 budget considers a more conservative 3 per cent increase in total ancillary fees for the coming year.

Commercial Revenues

Our objective in this area (e.g., parking, food sales, and facility rentals) is to maintain an overall financial balance. The university will allocate any surplus realized from these commercial revenues to capital reserves for future investments, with the prior year’s reserve covering any anticipated deficit. This approach ensures the core operating budget is not impacted by supplementary services.

We have received feedback from campus community members who want enhanced services such as extended food service hours and more parking spaces. These pose challenges as we would require further investments from our operating to address these asks. The extended food hours in the past did not achieve enough sales to offset the additional expenses. It could require an additional investment of more than $500,000. For parking, the lots are frequently not at full capacity during the week, even though they can reach capacity at other times. Our 2015 Campus Master Plan promoted sustainability through initiatives such as encouraging more bus and ride-share programs, but we are contemplating options to address the current demand. One option may be an additional investment of $750,000 to build 200 spots, with a break-even point expected after five years; however, this requires upfront funds.

Research and Innovation

Research and innovation funding at Ontario Tech continues to increase, more than doubling in four years to surpass $26 million in 2022-2023. This upward trajectory is expected to continue, a

noteworthy achievement given the limited federal funding for research and graduate students that is causing a great deal of budgetary pressure.

While research granting councils face annual budget reductions, our university secures funding from diverse sources, including an increasing percentage from industry and innovation funding, primarily linked to entrepreneurship and commercialization. The rise in research funding reflects the university's commitment to research intensification, contributing to its enhanced reputation.

It's important to note that research and innovation funding primarily flows into restricted accounts, supporting new and unique learning opportunities for undergraduate and graduate students. The funds do not constitute operating funds; however, they are a key measure of success for the IARP.

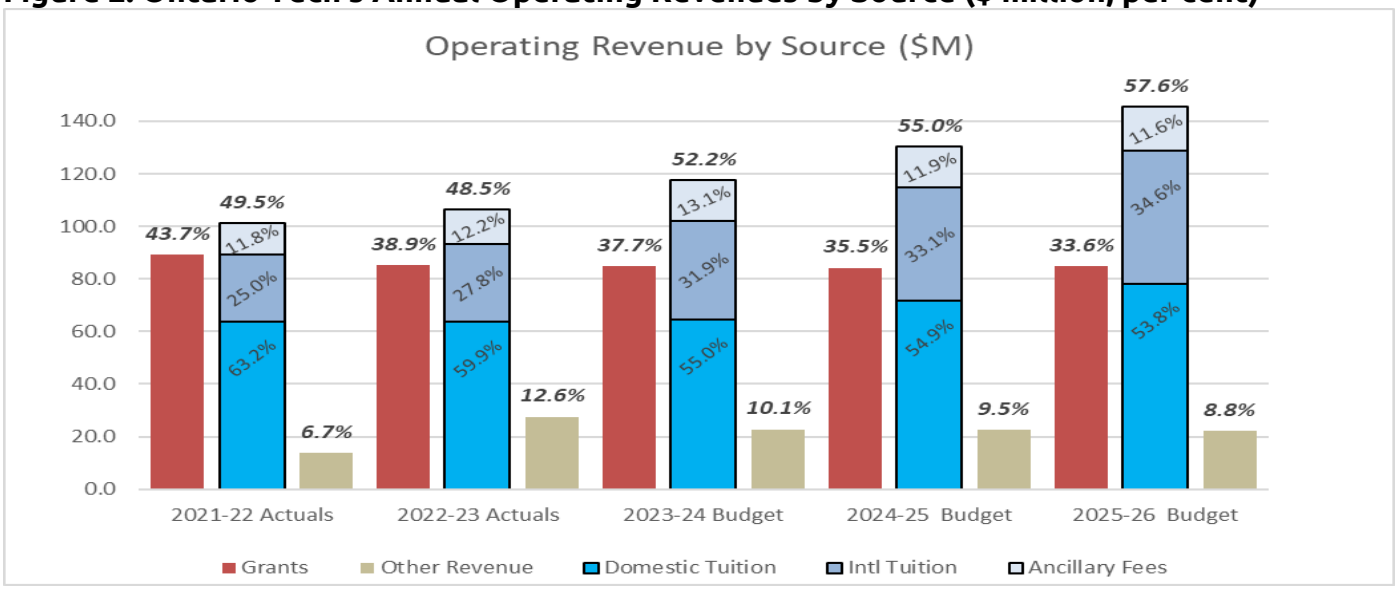
Advancement

In support of the university's strategic priorities and the IARP, the Advancement department is leading the university's comprehensive 'Tech with a Conscience' campaign', anticipated to debut in Spring 2024. In 2022-2023, $4.5 million was raised and this has more recently grown to $9.5 million in new gifts and pledges. This upcoming campaign stands as our most ambitious to date and as the largest in Durham Region's history. The university will see significant growth in fundraising revenue over the next several years, which will continue to be progressive. We will generate campaign revenue through a combination of one-time gifts and multi-year pledges, with a commitment to maintain and nurture relationships beyond the campaign's conclusion.

Overall Revenue Assumption Outlook

In Ontario, the proportion of total revenue from government grant funding has decreased while income from tuition fees, especially international tuition, has grown. In 2020-2021, our tuition and student fees represented 50 per cent of our total revenues. With grants remaining frozen, the percentage of revenue from student fees is estimated to grow to 58 per cent by 2025-2026 (Figure 2). Further, we see international tuition growing from 25 per cent to almost 35 per cent in the same period. This highlights not only our budget's increasing reliance on student fees, but also the potential risk associated with this approach when enrolment targets are not realized. This trend is not unique to Ontario Tech, as other universities share a similar pattern. The provincial system average for the proportion of operating revenue from fees ranges from 40 to 70 per cent, and Ontario Tech is within that range estimating a 55 per cent proportion for 2024-2025.

Figure 2: Ontario Tech's Annual Operating Revenues by Source ($ million, per cent)



Expenses

Ontario Tech has historically implemented a hybrid or two-step approach to budget modelling. In the first step, an incremental budgeting approach is used to address mandated year-over-year increases in known expenses (e.g., contractual salary increases, licensing agreements). Simply put, these increases are automatically factored into the preceding year's base budget on an annual basis and updated. In the second step, a strategic incentive allocation mechanism is used to distribute discretionary resources (when available) to support new initiatives that align with the priorities of our IARP.

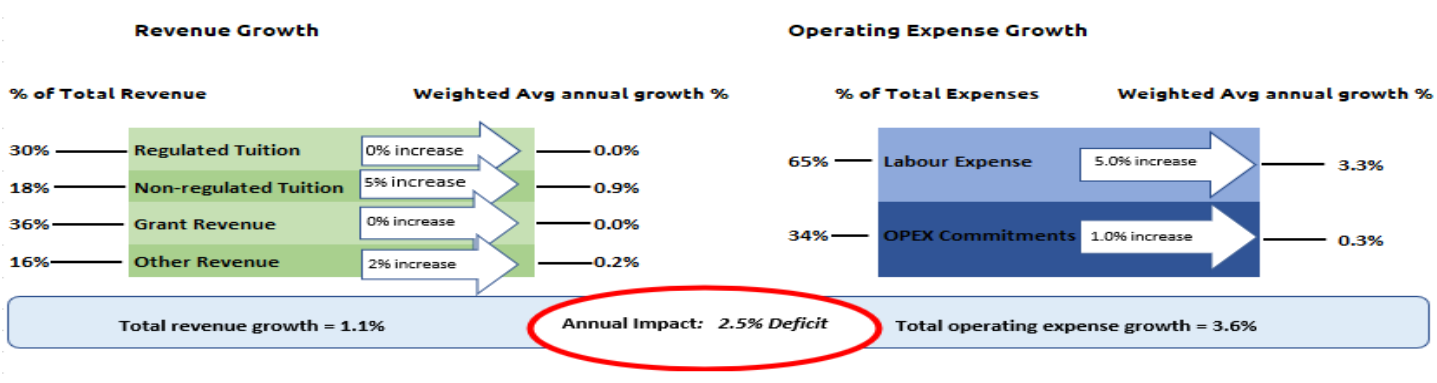
Over the past decade, Ontario Tech has used an activity-based budgeting (ABB) model in the background to simply inform strategic budget allocations. This is a method of budgeting where revenues and expenses are attributed to the areas that generate them. When fully implemented to inform budget allocations, this approach deliberately sets aside funds through revenue-based levies, thus creating a dedicated resource pool to fund strategic priorities and to construct clear incentives for faculties and departments to generate revenue and manage their expenses more consciously.

To create greater transparency, budget understanding and incentives to support differentiated growth during the 2023-2024 fiscal year, the Budget Working Group in collaboration with senior leadership and the deans began to move intentionally toward implementing an ABB model. This model will be shared in the forthcoming budget-setting paper.

The implementation of an ABB model has been necessitated by the fiscal challenges created by the current provincial government's policies (e.g., frozen domestic tuition fees, no additional funding for domestic growth). Simply put, this means that 68 per cent of our total revenues (i.e., 29 per cent regulated tuition and 39 per cent grant revenue) are frozen and subject to no annual increases.

As stated earlier, without further enrolment growth, our revenues are growing at the rate of about 1 per cent on an annual basis. In contrast, using very conservative expense assumptions, our expenses are growing at an average annual rate of 3.6 per cent. This includes a 5 per cent increase attributable to annual mandated salary increases, which encompass across-the-board adjustments and annual progression factors (e.g., promotion increments). To limit the growth in expenses, academic and administrative units are being asked to cover inflationary and contract increases through the reallocation of existing budget dollars. Stated another way, the university is faced with a budget that is contingent upon continuous enrolment growth to fund base operating expenses (Figure 3). To provide some context, salary increases are expected to grow above $6.5 million in each of the next few years. Given that grant and tuition revenues remain stagnant for the foreseeable future, we must enrol about 500 additional students annually to merely cover the mandated salary costs.

Figure 3: An Illustration of the Structural Deficit



Operating expenses are influenced by several factors including, but not limited to, inflation, the rising costs of key goods and services (e.g., software licenses, library subscriptions), and the cost of maintaining and servicing aging facilities. Prior to the pandemic, the Ontario university system typically saw an annual increase in expenses of about 4 per cent. However, between 2021 and 2023, many of these essential expenditures skyrocketed, reaching double-digit percentages. Utility costs and software licensing fees, moreover, continue to increase at these rates. Given that these and other expenses continue to rise, restraining operational expense growth will be required and units may need to reallocate funds from their existing budgets to cover these costs. This will require each and every unit on campus, in alignment with the IARP, to determine if there are activities that must be continued versus others that must be discontinued.

In 2023-2024, our expenses were higher than our revenues as a result of spending commitments and project expenses from prior years. This required reserves to be used to cover the difference. Understanding this context is important as we look forward to the 2024-2025 budget where, compared to the previous year, there is a projected $8.9 million increase in overall expenses (i.e., $236 million compared to $227 million).

Personnel Costs

Additional resources must be allocated to expand our faculty and staff capacity to support new and existing programs, to enhance our ability to move toward the highest quality of hybrid learning capabilities, enhance co-operative education opportunities, and to strengthen supports for teaching and learning, technology and our student recruitment efforts.

Just under 70 per cent of our annual budget supports personnel costs, including salaries and benefits. This is higher than the median for the Ontario university system, which is at 62 per cent. The 2024-2025 base budget already includes almost $10.3 million more in expenses to cover employee labour costs compared to last year's budget. It is important to note that this year's cost is considerably higher in comparison to past years due to the One-Time Retirement Incentive Program for Tenured, Tenure-Track and Teaching Faculty Members as outlined in the recent UOITFA Collective Agreement.

In 2011, our Senior Academic Team set a goal to improve the student-to-faculty ratio from 36:1 to 31:1, aiming to enhance the educational experience of our students and move closer to the provincial average. Our current faculty complement would keep us in this range (Figure 4).

Figure 4: Faculty and Staff Complements (FTEs) and Ratios

FTE COUNT - TOTAL	2022-23 Actual	2023-24 Budget	2024-25 Budget	2025-26 Forecast	2026-27 Forecast
FFTE's	*9,485*	*9,491*	*10,466*	*11,071*	*11,379*
	1-Oct				
Faculty	339.0	336.3	338.9	357.1	367.1
Staff	554.5	584.2	588.2	603.2	616.2
Total FTE	893.5	920.5	927.1	960.4	983.3
Student:Faculty	*28.0*	*28.2*	*30.9*	*31.0*	*31.0*
Student:Staff	*17.1*	*16.2*	*17.8*	*18.4*	*18.5*

Financial Aid Costs

Five per cent of our annual budget expense is allocated for scholarships, bursaries and fellowships to help students attend our university and to support our institutional access agenda. In line with our international student growth targets, we have introduced programs to allocate funds to assist our

international students. In 2023-2024 alone, with increasing investments in entrance scholarships, graduate student assistance, and a new international support program, we will distribute more than $11 million to our students.

Facilities Costs

Ten per cent of our budgetary expenses include the costs associated with the annual physical infrastructure maintenance. This includes more than $5 million annually in building leases and $3 million for the unfunded portion of the debenture.

The following three main items require further consideration when setting our 2024-2027 budget cycle:

- Nondiscretionary costs, such as utilities, are experiencing annual increases of more than 10 per cent, translating to an additional $250,000 cost for the 2024-2025 budget year.

- Our commitment to achieve net zero by 2050 entails some major projects in the coming years.

- We require surpluses to fund future capital requirements. In November 2021, the Audit and Finance Committee was presented a Strategic Reserves Discussion Paper, which aimed to assess and prepare for future capital maintenance and replacement needs. While more than 60 per cent of our buildings are in excellent condition, funds need to be set aside for future renovations. There is a need for above $4 million annually for the next decade to deliver on planned activities such as routine repairs (e.g., roof replacements) and future buildings.

Information Technology (IT) Costs: Major Enterprise Initiatives

To ensure the continued effectiveness of our IT enterprise system, we have planned major initiatives over the next four years:

- Currently, Ontario Tech and Durham College share the same enterprise (i.e., Banner) system. Each institution's data are maintained separately using Shared Technology Platforms (STPs). The STPs have proven effective in facilitating synchronized progress of enterprise systems while preserving a measure of operational autonomy. Although STPs are effectively used by some universities in the United States, we have found that our university's distinct computing needs are testing its limits. As a result, Ontario Tech and Durham College must consider moving to separate enterprise systems. This is a significant endeavor as it would involve more than just separating into two systems such as:
    - Purchasing and implementing other peripheral systems that are currently shared.
    - Re-architecting how we deal with people on the same campus using many shared IT services, but in separate Banner systems.
    - The redesign of how jointly offered academic programs are captured in Banner.

- Currently, Banner operates on-premises, but we are exploring the benefits and implications of moving to the cloud. Several cloud models are being considered, including Platform as a Service (PaaS) and Software as a Service (SaaS). Both PaaS and SaaS offer their own advantages, disadvantages and costs. A move to the cloud could provide more agility in the enterprise space for Ontario Tech, but it is nonetheless important to select the right model and timing for the transition. SaaS, for example, is an effective cloud model, but not all of our required enterprise system functionalities are available at this time. A move to the cloud involves not only the system's migration but also potential changes in the interaction with peripheral systems, data migration, security adjustments, and user and technical staff retraining, etc.

The initiatives highlighted above are significant undertakings in our IT enterprise environment. If Ontario Tech and Durham College move ahead with these initiatives, we estimate the total additional cost for the university to be $10 million over four years.

Opportunities

As explained earlier in this paper, there are several factors that can exert positive and/or negative influences on our annual budget. These factors—some (but not all) of which we can control—are the driving force behind our unwavering commitment to tying fiscal planning to our strategic priorities. This Fiscal Blueprint acknowledges the dynamic nature of revenue shifts and the ever-present pressures of rising expenses. To manage these sensitivities, we have included four possible scenarios in this Fiscal Blueprint in an effort to offer a clear path to navigate a range of potential financial landscapes.

The scenarios presented (Appendix A) reflect a rigorous analysis of potential shifts in enrolment, government support and various other external factors. They represent the range of impacts we may encounter during this budget-planning cycle, combining anticipated events with the university's expected response. These events may represent complex combinations of external factors, such as fluctuations in enrolment, alterations in government student funding, or global economic shifts.

Our analysis focuses on determining the optimal blend of newly introduced versus continuing programs and program delivery modes, for degree and non-degree students as well as traditional and non-traditional learners. This approach needs to fulfill our mission as well as maximize our revenue opportunities. We will concentrate our efforts on factors that support student success and offer programs that ensure we are competitive in an ever-changing environment.

We will primarily focus on what is in our control (e.g., generating revenue through increased student enrolment, expanding our offerings, philanthropy, cost efficiencies) to truly alter our future path. We know that continuing to do business as we have done in the past is not an option. We also know, despite the extensive lobbying efforts of the Council of Ontario Universities, that the provincial government is not likely to introduce measures to sustain or secure our financial future.

We will need to couple aggressive growth, primarily in the area of professional graduate programs, with domestic tuition and grant increases to stabilize our budget and invest in our future.

Summary

Ontario Tech is committed to advancing its strategic priorities in combination with financially responsible budgeting practices. In these challenging financial times, our focus is clear: we must prioritize enrolment growth, explore alternative revenue streams and find cost efficiencies. However, reliance on enrolment growth alone adds a layer of volatility to the planning process as even a minor 3 per cent deviation below the enrolment target could result in more than $1 million in lost revenues. As such, we must be resolute in our efforts to grow our enrolments.

Over the next several months we will know more about the Blue-Ribbon Panel recommendations and MCU's response, as well as have a better understanding of the impact of ongoing international policy decisions on the higher education sector and our university. However, we cannot wait for decisions (or indecision) on behalf of the government to dictate our future. We are not going to sit back and wait for the unknown to happen.

We will continue to provide information so that our campus community has a deeper understanding of the issues and factors that inform our necessary, but difficult decisions within our current fiscally constrained environment. We welcome your feedback through participation in the budget information session or by emailing the Budget Working Group at budget@ontariotechu.ca.

Appendix A: 2023-2027 Budget Cycle Scenarios

As we enter the budget-setting cycle, we have many unknowns that we expect more clarity on by the time we propose the final budget in April 2024. As noted in this paper, enrolments are the largest driver of our revenue, while government policies constrain the same. To begin our discussions, we present four budget scenarios which focus on manipulating these variables (see Figures 8 and 9).

Scenario A: Conservative Enrolment Growth Approach

In this scenario (Figure 5), the assumptions for intake (Figure 6) and total enrolment (Figure 7) estimate revenues exceeding $237 million for 2024-2025, representing an $11.8 million increase from the previous budget year. At the same time, overall, full- and part-time salaries and benefits are expected to increase by almost $10.3 million compared to last year. The result is that our entire estimated revenue increase is entirely consumed, or offset, by estimated expense increases. This forecast would yield a balanced budget for 2024-2025, thanks to minimal to moderate enrolment growth and delayed expenses, counterbalanced by already approved investments in support of the IARP's differentiated growth agenda.

Figure 5: Ontario Tech's Forecasted Operating Budget (2024-2027)

	Budget 2023-24	Budget 2024-25	Budget 2025-26	Budget 2026-27
FTEs	*9,491*	*10,466*	*11,071*	*11,379*
Domestic Tuition	64,669,634	71,679,352	78,265,788	82,604,172
Intl Tuition	37,538,894	43,193,256	50,446,458	55,471,864
Grants	84,875,745	84,210,471	84,848,033	85,246,711
Ancillary Fees	15,424,288	15,574,543	16,878,046	17,757,173
Other Revenue	14,539,477	14,430,352	13,967,566	14,526,269
Donations	2,335,624	2,093,643	2,114,579	2,135,725
Commercial Revenue	5,931,784	5,931,784	6,168,995	6,415,695
Total Revenue	**$ 225,315,446**	**$ 237,113,401**	**$ 252,689,466**	**$ 264,157,608**
FT Labour	122,937,975	134,865,613	146,754,178	159,462,350
PT Labour	21,994,821	20,393,662	20,555,028	21,483,150
OPEX	74,901,655	75,190,463	76,701,451	77,835,759
CAPITAL	7,512,020	5,747,701	8,447,830	7,470,069
Total Expenses	**$ 227,346,471**	**$ 236,197,439**	**$ 252,458,488**	**$ 266,251,328**
PY Reserve Utilization	*2,031,025*	*0*	-	-
Net Surplus/(Deficit)	**$ -**	**$ 915,962**	**$ 230,978**	**$ (2,093,719)**

Historically, using this same conservative approach, Ontario Tech has been able to accurately realize (i.e., within ±2 percent) its enrolment projections year over year. This approach relies on minimal to moderate, yet highly predictable, enrolment growth. For the coming year, it would yield a razor thin $916,000 surplus (i.e., less than 0.4 percent of the total revenues) for allocation. However, this surplus would not include discretionary allocation. This amount would instead be designated as restricted revenues for use in areas such as facility renewal.

In the out years, this model creates even more budgetary uncertainty. For 2024-2025, this model includes a set aside for a modest $1.0 million academic priority fund and a $1.0 million capital fund to promote academic innovation and to address aging equipment needs, respectively. However, this budget does not show an annual surplus exceeding $3.0 million, which is necessary to build reserves for anticipated future deferred maintenance expenses. Consequently, in the out years, there would be no discretionary funds available for new expenditures followed by deficits.

Figure 6: Forecasted Undergraduate Intake by Headcount and Fiscal Year

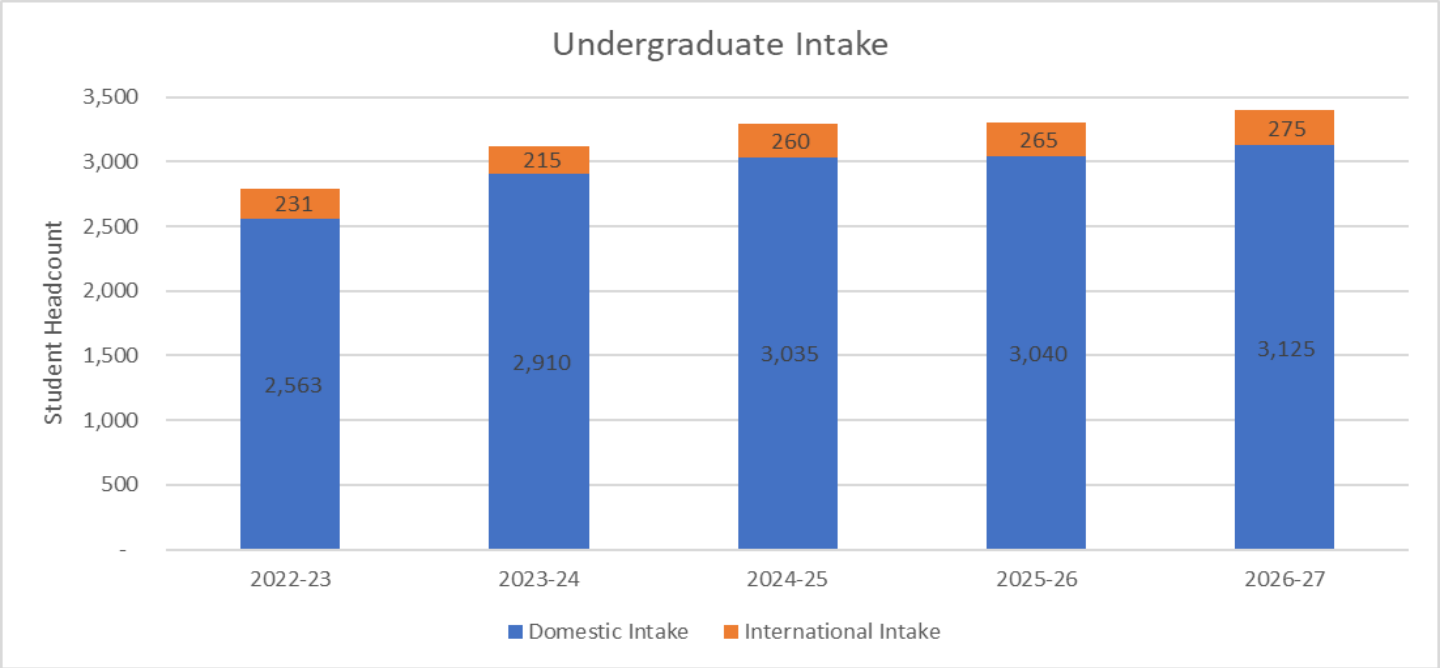
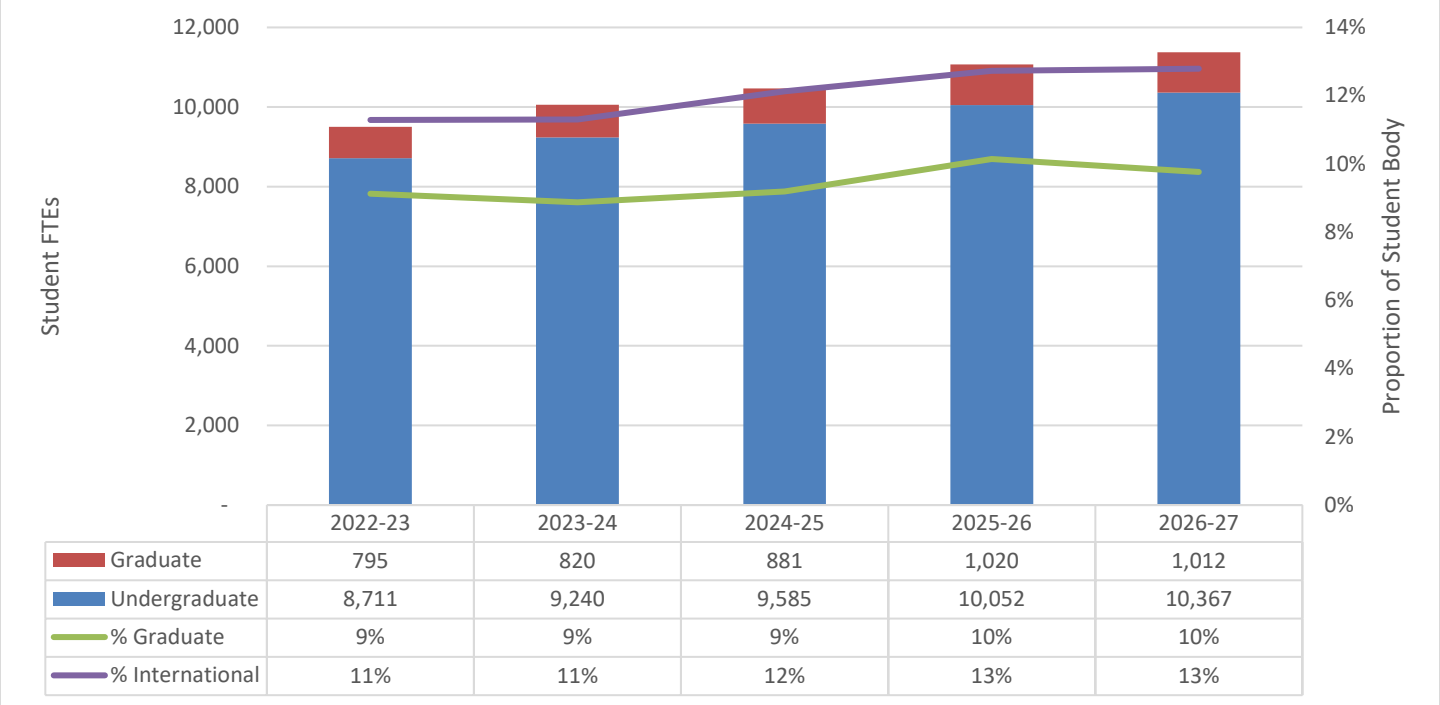


Figure 7: Forecasted Student Enrolment (FTEs) by Fiscal Year



	2022-23	2023-24	2024-25	2025-26	2026-27
Graduate	795	820	881	1,020	1,012
Undergraduate	8,711	9,240	9,585	10,052	10,367
% Graduate	9%	9%	9%	10%	10%
% International	11%	11%	12%	13%	13%

Scenario B: Increasing Domestic Tuition

In this scenario we assume the same enrolment data as seen in Scenario A plus a 2 per cent domestic tuition increase for the out years. While this tuition increase would not keep up with current inflation and is below the previous ministry policy allowance of a 3 per cent increase per annum, it is a number we are hearing as a potential increase. Each 1 per cent increase in the domestic tuition rate is estimated to result in a modest $470,000 increase in total revenues.

Scenario C: Moderate Growth Approach with Tuition Increases

In the short term, we can mitigate the impact of the revenue restrictions by emphasizing growth. We have prepared an aggressive growth plan aligned with our IARP goals. In 2020, we increased our international enrolment targets, aiming to reach levels comparable to the Ontario university system average. This, coupled with reallocations (where possible) and delayed infrastructure investments, would provide at least a temporary solution to our budget challenges.

If we increase international undergraduate intake by 10 per cent in 2025 versus 5 per cent, coupled with the expansion of professional master's programs, while at the same time experiencing a slight increase in undergraduate persistence, it would result in 115 more FTE enrolments in 2025-2026 (Figure 8), and our forecasted surplus for allocation would be $5.6 million more (Figure 9).

It is anticipated that this approach would also require enhanced support to those areas demonstrating growth while some areas not experiencing the same would need to find more efficient ways to operate. Failing to draw this distinction could potentially impact the quality of support and education we provide to our students. More importantly, however, beyond providing a slightly more prolonged period of financial sustainability, this scenario only delays the inevitable structural impact on the budget.

Scenario D: Moderate Growth with Tuition and Grant Increases

In this scenario, we assume the same enrolment in Scenario C with the addition that all domestic students, not just those in our corridor, would receive full grant funding at today's levels. It should be noted that the Blue-Ribbon Panel may make recommendations to the MCU regarding grant funding for universities, but the details of these recommendations and the MCU's response remain unknown at this time.

Figure 8: Budgeted Enrolment vs. Growth Enrolment (FTEs)

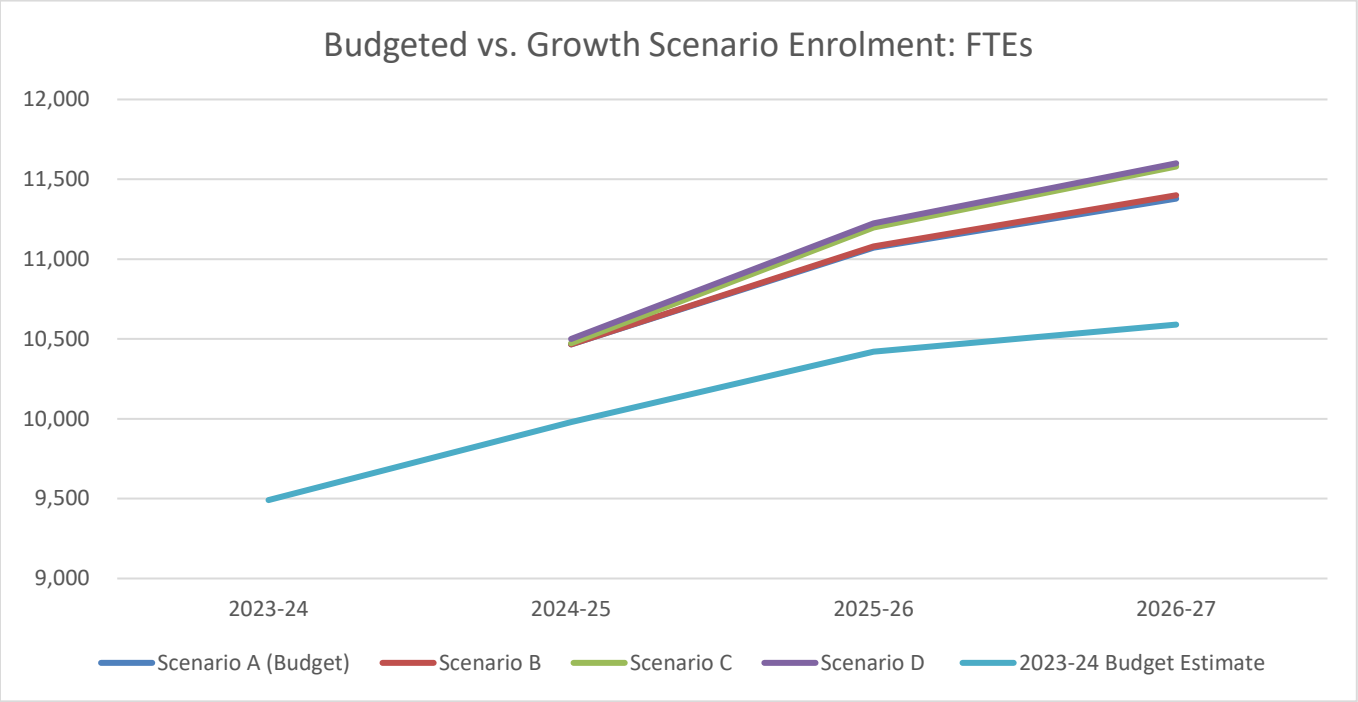
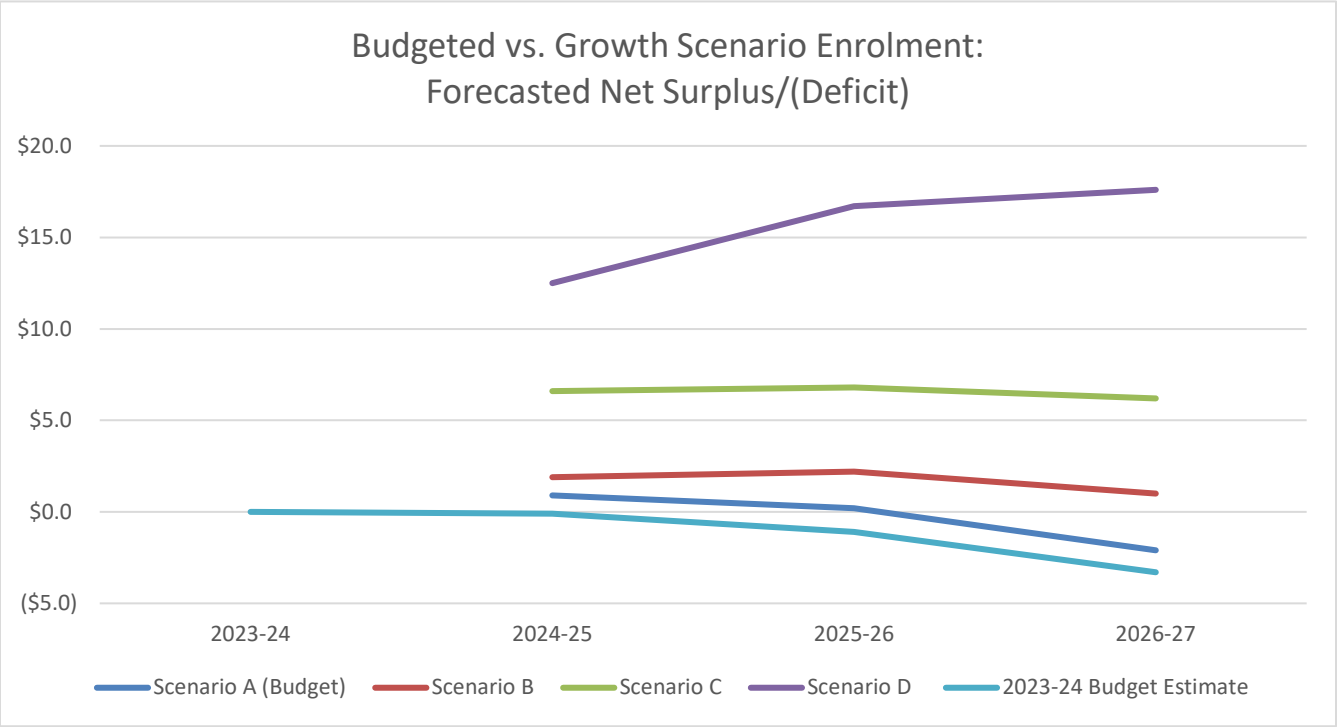


Figure 9: Corresponding Net Surplus (deficit) Based on Enrolment Change



BOARD REPORT

SESSION:

Public ☒
Non-Public ☐

ACTION REQUESTED:

Decision ☐
Discussion/Direction ☐
Information ☒

TO: **Board of Governors**

DATE: **November 30, 2023**

PRESENTED BY: **Brad MacIsaac**

SUBJECT: **2nd Quarter Financial Reports: Operating Forecast for year ending March 31, 2024**

COMMITTEE MANDATE:
The Audit and Finance Committee is responsible for overseeing the financial affairs of the University, including approval of the annual budget and financial reporting to ensure that appropriate financial controls, reporting processes and accountabilities are in place at the University.

BACKGROUND/CONTEXT & RATIONALE:
This report was presented to the Audit and Finance Committee on November 23, 2023.
In April 2023, the Committee approved a balanced 2023/24 budget which included $1.0M of expenses to be funded from internally restricted prior year reserves (see **N1** on Operating Forecast Summary). This report provides the Committee with an overview of the projected year-end results against the approved budget (Appendix 1).

The operating budget is based on a projection of cash receipts and expenditures for the year. This contrasts with the audited financial statements which are prepared in accordance with generally accepted accounting principles ("GAAP") for non-for-profit organizations in Canada. In arriving at the year-end results on a GAAP basis, adjustments are required to be made to the management report, e.g.

- The management report includes cash outlays for capital investment in the budget year while the GAAP financial statements include an expense that reflects the amortization of all capital assets over their useful lives.
- Conversely, the GAAP financial statements include the unrealized gain/loss on endowed investments while these are not budgeted and therefore not included in the management report.

HIGHLIGHTS

Based on Fall 2023, Day 10 enrolment data and expense forecasts from budget holders the **net operating surplus** for the year is projected to be **$3.8M against an original balanced budget.** The net surplus of $3.8M is mainly attributable to a $2.0M temporary increase in investment income and a $0.9M one-time increase in restricted student fees.

Excluding the $1.0M of prior year internally restricted reserves currently not utilized, the forecast surplus is favourable $4.8M and comprises of a $4.5M favourable variance in revenue, net $2.8M labour and operating savings, offset by $2.5M more capital investment than budgeted (see details in analysis below).

The University continues with prudent financial planning in light of the continuing decline in provincial grant funding, the cut and subsequent freeze to domestic tuition coupled with year-over-year escalating costs. In November 2021, a Strategic Reserves Discussion Paper was presented to the Audit and Finance Committee. This paper highlighted a need in excess of $4.0M reserves annually for the next decade to meet future capital (e.g. Charles Hall and Library expansion) and deferred maintenance (e.g. roof replacement) needs. Should the forecast trend continue, management will be recommending that some of the **actual surplus at the end of the year** be reserved for this purpose.

Revenue

Total **revenue** is favourable $5.1M (or 2%) against original budget. Approximately **50% of the increase in revenues have offsetting expenses,** and these are included in this forecast under the Expense and Capital sections. Revenue increase includes:

Tuition revenues increase of $1.1M (or 1%) against budget. This is comprised of an increase in student tuition fees as a result of an increase in enrolment (see Table 2). Total **enrolment** is favourable 488 FTE (or 5.1%) against an approved budget of 9,571 FTE.

Domestic enrolment remains strong with a net increase of 542 FTE or an additional $2.7M domestic tuition revenues. This net favourable variance was offset by the missed international target attributable to the ongoing issues with the processing of international student-study permits and visas. Total international enrolment decreased 54 FTE or a decrease of $2.3M in international tuition revenues.

The remaining increase in tuition revenues pertains to fees attributable to the increase in enrolment and are restricted for student-specific purposes. The university is currently developing a long-term plan as to how these restricted fees will be utilized.

Revenue (continued)

As a result of the increase in enrolment, Management has allocated funds to some of the secondary priorities from the 2023/24 budget setting process. This includes the approval of 7 new hires in the current year, of which 3 pertain to academic positions and the remaining in support of learning innovation and the technology enhanced learning program. These new hires, amounting to $0.6M, are included in the forecast expenses.

Other revenues increase of $3.3M (or 15.0%) against budget includes $2.0M increase in interest revenues on operating cash and short-term investment balances as the Central Bank of Canada has continued to raise interest rates over the last year in an effort to curb high inflation rates. Other revenue increase also includes $1.1M attributable to the accounting recognition of expendable donations and for which there are offsetting operating and capital expenses.

Expense – Operating and Capital

Operating expenses are showing a favourable variance of net $2.8M mostly attributable to vacant full-time positions offset by an increase in limited term contracts to back-fill for the full-time vacant positions and new in-year hires, decrease in scholarships due to students not meeting the eligibility criteria, savings in lease costs due to the termination of the an operating lease in downtown Oshawa, and savings in other general operating expenses.

Capital Expenses are unfavourable $2.5M (or 34%) against budget, of which 90% are funded by higher than expected provincial facilities & equipment renewal grants and expendable donations. The remaining 10% increase is funded from Operations to invest in the University's emergency management systems to improve campus safety.

FINANCIAL IMPLICATIONS:

The primary purpose of this financial update is to report on the projected year-end results of the operating budget. Maintaining a balanced (or surplus) budget is critical to Ontario Tech University's short-term financial health and long-term financial sustainability.

SUPPORTING REFERENCE MATERIALS:

- Appendix 1: Management Reporting: Operating Forecast Summary for the year ending March 31, 2024
- Appendix 2: Enrolment Table

APPENDIX 1

Ontario Tech University

Operating Forecast Summary
For the year ending March 31, 2024 (in $ 000's)

The table below shows the variance of the year-end forecast vs the approved 2023/24 budget

	April 1, 2023 - March 31, 2024			
	Total Annual Budget	Y/E Forecast	Fav. (Unfav.) Forecast vs Budget $ / %	
Revenue				
Grants	84,876	84,799	(77)	0%
Tuition	102,209	103,340	1,131	1%
Student Ancillary	16,389	16,555	165	1%
Other	22,807	26,124	3,317	15%
Total Revenue	**226,280**	**230,817**	**4,537**	**2%**
Expenditures				
Academic/ACRU	94,615	93,738	877	1%
Academic Support	48,894	46,736	2,158	4%
Administrative	31,211	30,853	358	1%
Sub-total	**174,720**	**171,327**	**3,392**	**2%**
Purchased Services	15,308	15,432	(124)	**-1%**
Total Ancillary/Commercial	10,702	11,140	(438)	**-4%**
Debt Interest Expense	9,609	9,623	(14)	**0%**
Total Operating Expenses	**210,339**	**207,522**	**2,817**	**1%**
Net Contribution from Operations	**$ 15,941**	**$ 23,295**	**$ 7,354**	**46%**
Capital Expenses	**7,512**	**10,038**	**(2,526)**	**-34%**
Principal Repayments - debt & capital leases	**9,468**	**9,483**	**(16)**	**0%**
	$ (1,038)	**$ 3,774**	**$ 4,812**	**-463%**
Other disclosures:				
Funded by prior year restricted reserves (N1)	**$ 1,038**	**$ -**	**(1,038)**	**-100%**
Total Net Surplus	**$ (0)**	**$ 3,774**	**$ 3,774**	**N/A**

N1. Original budget had PY reserves of $2,003k being utilised to balance the budget. $965k of these related to PY deferred ancillary revenues (forecast $542k) to fund athletic renovations and therefore have now been reclassified to Student Ancillary under Revenue above, where the deferred revenues will be recognized in actual

APPENDIX 2

ONTARIO TECH UNIVERSITY
Operating Forecast Summary
For the year ending March 31, 2024

Enrolment

FTE's	2022/23 actual	2023/24 approved budget	Q2 forecast *	Q2 forecast vs approved budget
Undergraduate				
Domestic	**7,956**	**7,972**	**8,480**	**508**
International	**765**	**830**	**759**	**(71)**
Graduate				
Domestic	**436**	**408**	**442**	**34**
International	**399**	**361**	**378**	**17**
Total FTE's	**9,556**	**9,571**	**10,059**	**488**

* Q2 enrolment forecast reflects Fall 2023 Day 10 enrolment count.

Under the new funding formula implemented by the Ministry in 2017/18, the funding for domestic students for the current year remains flat at the 2016/17 level. Current eligible undergraduate and graduate enrolment projection is within the + / - 3% of the University's corridor midpoint.

COMMITTEE REPORT

SESSION:	**ACTION REQUESTED:**
Public ☒	**Decision** ☐
Non-Public ☐	**Discussion/Direction** ☐
	Information ☒

TO: **Audit and Finance Committee**

DATE: **November 24, 2023**

PRESENTED BY: **Pamela Onsiong**

SLT LEAD: **Brad MacIsaac**

SUBJECT: **Second Quarter - Financial Statements (unaudited) for the 6 months ending September 30, 2023**

COMMITTEE MANDATE:

The Committee is responsible for overseeing the financial affairs of the University, including approval of the annual financial statements and financial reporting to ensure that appropriate financial controls, reporting processes and accountabilities are in place at the University.

BACKGROUND/CONTEXT & RATIONALE:

This report provides the Committee with an overview of the statements of financial position, operations and cash flow as at September 30, 2023, together with a year-over-year comparison (Appendix 1).

HIGHLIGHTS:

In addition to normal operating activities, these Consolidated financial statements reflect the ongoing tension between revenues and expenses. On the one hand, the Provincial tuition framework has kept tuition fees for domestic funding-eligible programs flat at the 2019-20 levels, after a 10% decrease in the prior year. Grant funding, except for the Collaborative Nursing program, has also remained flat with current year funding for domestic students at the 2016-17 funding level. Expenses, on the other hand, continue to outpace revenue growth with increasing labour costs and inflationary pressures on operating spending as activities at the University return to the higher pre-pandemic levels.

Statement of Operations

The statement of operations includes a net increase in revenue of $10.0M (or 9.4%) and an increase in expenses of $7.8M (or 7.8%) over last year, for a net deficit of $11.6M at the end of the reporting quarter (compared to net deficit of $13.8M last year). Excluding the impact of non-cash transactions (e.g. amortization of capital assets & deferred contributions, or unrealized gain/loss on investment), the increase in revenue still at 10% is offset by an equal increase in expenses.

The University follows Canadian Accounting Standards for Non-for-Profit Organizations in Part lll of the Chartered Professional Accountants of Canada ("CPA") Handbook. In compliance with these standards, student tuition fees are recognized as revenue in the statement of operations when courses are provided, resulting in the deferral of $60.2M in tuition fees at the end of the reporting quarter. This deferred revenue will be taken into income by the end of the fiscal year, thus bridging the gap in the current quarter operating deficit.

Revenue increase is largely driven by:

- $4.9M increase in **tuition fees** due to increase in the enrolment (net 505 domestic FTE and 106 international FTE) coupled with the year-over-year average increase of 5% in international tuition fees.
- $1.7M increase in **student ancillary fees** of which $1.1M relates to the accounting recognition of prior year ancillary fees to fund athletic capital renovations, and remaining increase due to the year-over-year increase in enrolment and an average 2% increase in ancillary fees.
- $2.2M increase in **other income** due to the recovery of the ancillary services from the pandemic, including $1.1M increase in ACE revenues mostly due to increase in "electric vehicle" testing, and $0.5M recognition of prior year deferred revenues for research programs.
- $1.2M increase in **interest revenue** on treasury balances and short-term investments, attributable to the rising interest rates in the last year.

Expenses increase is driven by:

- $5.9M increase in **salaries and benefits** for faculty and staff, including new hires and annual salary increases. Salaries and benefits which comprise over half of the total expenses of the University and are mostly tied to collective agreements, have consumed 60% of the year-over-year increase in total revenue.
- $2.0M increase in **supplies and expenses** as activities return to pre-pandemic levels with increases seen in travel, cost of goods sold for food services, janitorial services and increased supplies for more in class sessions in the current year.

Statement of Operations (continued)

- These increases are offset by $1.9M of **unrealized loss on endowed investments** with the market showing strong performance year-to-date as inflation continues to fall from the highest level in decades and economic activity has continued to expand.

Statement of financial position

The statement of financial position remains stable at the end of the reporting quarter with **net assets** increase of $5.5M (or 5.1%) over the prior year. Net Assets increased in line with the net increase in assets and liabilities, and are supported by cash and restricted investments.

Total Assets increase of $4.4M (or 0.8%) over the prior year is largely driven by:

- Increase of $8.9M in **other accounts receivable** which includes $7.6M of student account receivable attributable to year-over-year enrolment growth.

  Other accounts receivable balance of $50.5M consists of net $46.6M of student receivable ($35.9M for the future winter semester, $10.7M for the current fall and prior receivable), $3.3M of trade, research and ACE receivable and other immaterial variances.
- decrease of $3.1M in **cash and short-term investments** includes a decease attributable to $7.3M investment in Regent Corporation and its related assets in Feb 2023. Cash and operating short-term investment balances remain stable at $91.0M, of which 26% pertain to externally restricted expendable donations and research funds.
- decrease of $6.7M in **capital assets** which is due to the net impact of accumulated amortization ($8.0M) vs asset additions ($1.3M) in the last 12 months.

Liabilities decrease of $1.1M (or 0.2%) over the prior year is mainly driven by:

- $11.0M in total **debt repayment**.
- $4.0M decrease in **deferred capital contributions** and relates to the net impact between contribution amortization ($8.1M) and new grants and donations received for capital projects ($4.1M)
- These decreases are offset by $10.9M increase in **revenues earned and deferred** as these are not spent at the end of the reporting quarter, including $7.0M of deferred tuition.

FINANCIAL IMPLICATIONS:

The primary purpose of this financial update is to report on the statement of financial position of the University for the period ending September 30, 2023. Maintaining a stable financial position is critical to Ontario Tech University's long-term financial sustainability.

COMPLIANCE WITH POLICY/LEGISLATION:
These audited financial statements are prepared in compliance with generally accepted accounting principles for not-for-profit organization.

SUPPORTING REFERENCE MATERIALS:

- Appendix 1: Consolidated GAAP Financial Statements for the 6 months ending September 30, 2023.

Appendix 1

Consolidated Financial Statements of

ONTARIO TECH UNIVERSITY

For 6 months ending September 30, 2023

ONTARIO TECH UNIVERSITY
Consolidated Statement of Financial Position
As at September 30, 2023

	Sep 30, 2023	Sep 30, 2022	YOY Variance	Mar 31, 2023
ASSETS				
Current assets				
Cash and cash equivalents	**$ 73,380,810**	$ 76,815,599	$ (3,434,789)	$ 62,176,383
Short-term investments	**17,474,300**	17,211,507	262,793	17,000,000
Grant receivable	**11,298,954**	9,550,471	1,748,483	9,287,216
Other accounts receivable	**50,498,007**	41,592,869	8,905,139	8,619,781
Prepaid expenses and deposits	**3,143,199**	2,865,577	277,623	2,684,901
Inventories	**43,540**	22,205	21,335	33,729
	155,838,810	148,058,228	7,780,582	99,802,010
Endowed investments	**33,121,874**	31,508,599	1,613,275	33,435,346
Other investments	**(1,779,573)**	(763,102)	(1,016,471)	(1,007,713)
Other assets	**4,533,219**	2,756,925	1,776,294	2,975,239
Capital assets	**392,062,667**	398,789,249	(6,726,581)	398,222,231
Intangible asset - goodwill	**973,421**	-	973,421	973,421
TOTAL ASSETS	**$ 584,750,419**	$ 580,349,900	$ 4,400,519	$ 534,400,534
LIABILITIES				
Current Liabilities				
Accounts payable and accrued liabilities	**35,210,427**	32,149,433	3,060,994	30,576,509
Deferred revenue	**101,638,210**	90,718,375	10,919,835	35,326,367
	136,848,637	122,867,808	13,980,829	65,902,876
Other debt	**6,565,298**	175,116	6,390,182	6,935,027
Obligations under capital leases	**27,064,540**	34,765,271	(7,700,731)	27,275,782
Debenture debt	**133,225,254**	140,897,759	(7,672,505)	137,121,464
Fair value of interest rate swap	**19,214,045**	21,232,730	(2,018,685)	21,670,242
Deferred capital contributions	**153,952,857**	157,996,045	(4,043,188)	156,391,888
	476,870,631	477,934,729	(1,064,098)	415,297,281
NET ASSETS				
NET ASSETS, excluding current year surplus	**93,170,821**	90,723,933	2,446,888	90,562,828
Endowments	**26,283,003**	25,534,143	748,861	25,932,433
Current year deficit	**(11,574,036)**	(13,842,905)	2,268,869	2,607,993
	107,879,788	102,415,170	5,464,617	119,103,254
TOTAL LIABILITIES AND NET ASSETS	**$ 584,750,419**	$ 580,349,900	$ 4,400,519	$ 534,400,534

ONTARIO TECH UNIVERSITY
Consolidated Statement of Operations
For the 6 months ending September 30, 2023

		Sep 30, 2023		Sep 30, 2022		YOY Variance
REVENUE						
Grants - operating & research	**$**	**41,425,377**	$	41,768,397		(343,020)
Grant - debenture		**6,750,000**		6,750,000		-
Donations - operating & research		**154,588**		59,848		94,740
Student tuition fees		**34,923,198**		29,994,465		4,928,734
Student ancillary fees		**8,031,567**		6,344,403		1,687,164
Revenue from purchased services		**592,534**		490,143		102,391
Other income		**6,861,861**		4,637,436		2,224,426
Amortization of deferred capital contributions		**4,068,543**		4,179,467		(110,925)
Interest revenue		**1,903,218**		695,961		1,207,257
Gain/(loss) on disposal of assets		**93,769**		(16,743)		110,511
Unrealized gain on interest rate swap		**2,103,197**		1,968,589		134,608
		106,907,853		96,871,967		10,035,886
EXPENSES						
Salaries and benefits		**67,334,161**		61,444,722		5,889,439
Student aid, financial assistance and awards		**8,691,827**		7,704,608		987,219
Supplies and expenses		**16,987,210**		14,979,154		2,008,056
Purchased Services		**6,143,596**		5,394,682		748,914
Professional fees		**649,508**		560,285		89,223
Interest expense - debt obligations		**6,081,332**		6,523,693		(442,361)
Interest expense - other		**128,829**		106,263		22,566
Amortization of capital assets		**11,018,665**		11,374,803		(356,137)
Unrealized loss on investments		**674,901**		2,617,783		(1,942,882)
Loss on other investments		**771,860**		8,879		762,981
		118,481,889		110,714,872		7,767,017
Excess of expenses over revenues	**$**	**(11,574,036)**	$	(13,842,905)	$	2,268,869

-

ONTARIO TECH UNIVERSITY
Consolidated Statement of Cash Flows
As at September 30, 2023

		Sep 30, 2023		Sep 30, 2022
NET INFLOW (OUTFLOW) OF CASH RELATED TO THE FOLLOWING ACTIVITIES				
OPERATING				
Excess of revenue over expenses	**$**	**(11,574,036)**	$	(13,842,905)
Items not affecting cash:				
Amortization of capital assets		**11,018,665**		11,374,803
Amortization of deferred capital contributions		**(4,068,543)**		(4,179,467)
Unrealized gain on interest rate swap		**(2,103,197)**		(1,968,589)
Unrealized loss on investments		**674,901**		2,617,783
(Gain)/loss on disposal of assets		**(93,769)**		16,743
Loss on other investments		**771,860**		8,879
		(5,374,119)		(5,972,754)
Working Capital				
Grant and other accounts receivable		**(43,889,964)**		(36,424,105)
Prepaid expenses and deposits		**(458,298)**		(706,760)
Inventories		**(9,812)**		(16,475)
Accounts payable and accrued liabilities		**4,633,918**		1,661,342
Deferred revenue		**66,311,843**		58,544,431
		21,213,568		17,085,679
INVESTING				
Purchase of capital assets		**(4,765,332)**		(6,316,886)
Investments		**(835,728)**		(597,562)
Other Assets		**(1,557,980)**		(283,348)
Endowment contributions		**350,571**		617,888
		(6,808,471)		(6,579,909)
FINANCING				
Repayment of interest rate swap		**(353,000)**		(343,000)
Repayment of debenture and other debt		**(4,265,940)**		(3,661,795)
Repayment of obligations under capital leases		**(211,242)**		(495,497)
Deferred capital contributions		**1,629,511**		1,584,659
		(3,200,671)		(2,915,633)
NET CASH INFLOW		**11,204,427**		7,590,137
CASH BALANCE, BEGINNING OF YEAR		**62,176,383**		69,225,462
CASH BALANCE, END OF PERIOD	**$**	**73,380,810**	$	76,815,599

BOARD REPORT

SESSION:		ACTION REQUESTED:	
Public	☒	**Decision**	☐
Non-Public	☐	**Discussion/Direction**	☒
		Information	☐

TO: **Board of Governors**

DATE: **November 30, 2023**

FROM: **Brad MacIsaac, Vice President Administration**

SUBJECT: **Interim Risk Management Update**

COMMITTEE MANDATE:
The Audit and Finance Committee is responsible for overseeing risk management and other control functions at the University. This oversight includes receiving regular reports from management on areas of significant risk to the University.

BACKGROUND/CONTEXT & RATIONALE:
The office of Risk Management is charged with presenting an annual report in April of each year. At all other meetings, we present interim reports focusing on new additions, changes, or emerging risks impacting the University.

These materials were presented to the Audit and Finance Committee on November 23, 2023.

This report showcases the university's current landscape, profiling the most common themes identified by risk owners. The report further provides key mitigation efforts to support the university's resilience and sustainability to emerging and inherent risk.

Four items that were highlighted for A&F this quarter:

EMERGING GLOBAL CLIMATE: In response to the evolving global landscape, our university is proactively and continuously monitoring and reviewing emerging risks on campus to ensure timely identification and management. Key Stakeholders across the institution are collaborating, ensuring an active and engaged response to these dynamic global challenges.

GROWTH STRATEGY: The university's journey towards growth has become top of mind for several risk owners across the institution. As we undertake growth initiatives during a period of steadily increasing institutional reputation, it is imperative to implement coordinated integration efforts, establish robust project oversight, and advance a change management strategy through a well-structured communications plan. Notably, risks related to recruiting and retaining are becoming increasingly prevalent across the entire university. The university has acknowledged the evolving trend and is proactively collaborating with people managers and leaders throughout the institution.

COMPLIANCE TRACKING UPDATE: Efforts to advance the compliance culture include the construction of a comprehensive Master Legislative Compliance Tracker and exhaustive research into legislative mandates. A Compliance Register Questionnaire was implemented in October to validate data accuracy and assess compliance against legislative requirements. Anticipated outcomes include gap identification and the development of strategic workplans to meet legislative expectations. While the university is subject to various compliance and regulatory reporting requirements, the Office of Risk Management has not identified any breaches or incidents that necessitate notification to the Board.

CYBER UPDATE: While the university has not experienced significant cyber incidents recently, the risk landscape continually evolves. The institution must be bold in its cybersecurity initiatives. This is a daily threat as our firewall fended off over 19.9 million threats during the period April to September 2023. This is in line with other small post-secondary institutions. Our current cybersecurity measures encompass a range of controls and recent enhancements. However, it's essential to acknowledge identified risks and vulnerabilities in our cybersecurity approach. These include the possibility of unidentified threat vectors, even in the absence of significant incidents. The collaboration with Durham College introduces interinstitutional dependencies, potentially exposing us to new vulnerabilities due to the involvement of different units in our systems. The emerging initiatives from bodies like the Council of Chief Information Officers (OCCCIO) indicate that information security is becoming a sector-wide concern. We will continue to engage external partners in our risk management processes and reporting, demonstrating our eagerness and ability to adapt and remain open to change.

NEXT STEPS:

As we move the university's strategies ahead, we will consider, as part of our risk workplan, connecting the risks more intentionally to our integrated academic research plan, as well as the common themes of educational excellence, workforce readiness, research and innovation, financial sustainability, access and equity, and infrastructure sustainability. These interconnections will allow for an integrated approach to risk management that supports the university in achieving its long-term goals while effectively addressing potential challenges along the way.

Attachments:

Interim Risk Management Report November 2023

November 2023

INTERIM RISK MANAGEMENT REPORT

Prepared by:
Brad MacIsaac - Chief Risk Officer
Jackie Dupuis - Director of Risk Management
November 23, 2023

BACKGROUND

The University Risk Management (URM) framework was established in June 2014, underpinned by the institutional risk register developed and validated in partnership with all faculty and administrative units in 2017. The University's risk register is continuously (normally annually at minimum and as any in year changes occur) reviewed with risk owners. The 2023 review of the risk register is progressing well. This meticulous process allows us to continually assess and prioritize risks, ensuring that our risk management strategies remain relevant and effective. This exercise will conclude by the early winter term, with a comprehensive report scheduled for April. Key recurring themes have surfaced and are summarized below.

Operational Risk remains well within appetite, consistently maintaining a moderate risk profile throughout the institution. While the operational risk area may not be classified as 'high' risk in our assessment, it undeniably holds the distinction of having the greatest number of risks assigned to it. Furthermore, it garners the most attention and resources across the university, primarily due to its significant implications in terms of both liabilities and resource allocation. Notable efforts to continue the mitigation of operational risks at the institution have been ongoing.

Training Presentations: We have successfully developed unique, comprehensive training presentations designed for university members, university managers, and researchers. These presentations aim to provide valuable insights into risk management practices, thereby equipping our community with the knowledge and tools to mitigate risks effectively. In addition, the Board recently underwent their annual new member orientation training which included a segment on risk management at Ontario Tech.

Series of Inspections: During the summer term, we conducted a series of thorough inspections to assess and identify potential risks across various areas of our university. These inspections are essential in ensuring the safety and security of our campus and its members. Additionally, we welcomed several visits from insurers to review our university's spaces and research initiatives. Of particular note is our focus on cybersecurity during the fourth quarter, highlighting our commitment to safeguarding sensitive data.

Tools and Resources: The establishment of an Event Guide and Field Trip Guide is a significant milestone in ensuring the safety and success of university events and trips away from campus. These guides will serve as a valuable reference for planning and executing events with risk management in mind. Additionally, enhancing the safety and security of our students and staff during such activities. Lastly, to empower front-line staff, we have created easily accessible risk bulletins, which serve as valuable resources for understanding and addressing risks. These resources are now available online for quick reference.

Financial Risk continues to remain top of mind with uncertainty surrounding enrollment challenges and funding diversification. The university continues to invest in diversifying educational offerings, including continuous learning, industry and international partnerships. It's essential to exercise caution by conducting thorough due diligence before entering into transactions and adhering to the university's defined contract framework. As we face competition from non-traditional competitors and continually adapt to industry's evolving landscape, the institution's strategic emphasis is on specialized programs and skills that are not easily replicated elsewhere, ensuring a unique and valuable educational offering. Furthermore, faculties are tasked with prioritizing real-world experience opportunities for students that will enhance their career readiness. The university continues to monitor and review its financial sustainability on an ongoing basis.

The Office of Risk Management has successfully implemented a central database for cross-institutional assessments, in line with the 2022 Auditor General's Report. This effort, led by a specialized task force, has established a centralized framework for effectively identifying and addressing institutional gaps. The introduction of a standardized Report Form, now actively used by stakeholders since September 2023, has significantly improved the efficiency of assessment activities. These advancements are expected to enrich the annual risk report due in April 2024

Strategic Risk discussions have been ongoing with Senior Leadership Team (SLT) to deliberate on current strategic risks key theme classification. We are in the process of preparing a presentation to clarify how these key themes were initially identified and why changes in our risk management approach may be necessary. The review is against the evolution of the university's integrated academic plan, vision, priorities, considering external factors, alongside the changing landscape of risk. Furthermore, this exercise will assist in re-establishing accountabilities and expectations of risk at the institution and tease out common themes to facilitate interdepartmental conversations, which will diversify risk perspective, creativity and innovation, create greater continuity, and establish stronger interconnections.

Reputational Risk remains well within acceptable parameters and has maintained stability since the last reporting period. Several positive developments underscore the institution's commitment to enhancing its brand and reputation. The university has significantly expanded its partnerships with esteemed organizations, showcasing its dedication to collaborative initiatives that positively impact its image. In addition, the institution's approach to program innovation, marked by adaptability and forward-thinking strategies, demonstrates a commitment to staying at the forefront of education trends. Furthermore, the university has successfully expanded its offerings in high-demand programs, aligning its portfolio with market needs and student preferences. The repackaging of existing programs, along with the introduction of varying cost structures, highlights its flexibility and accessibility. The university's encouragement of a culture of adaptability and agility further strengthens its ability to respond effectively to changing circumstances.

Lastly, the President's commitment to transparent and proactive communication, both regarding changes and opportunities for advancement, has significantly contributed to strong brand management. This open approach fosters trust and goodwill among stakeholders and reinforces the institution's positive image.

AT A GLANCE - RISKS

The risks highlighted in the dashboards that follow may evolve every quarter. The highlights are a snapshot of a few of the items that the Office of Risk Management notes as a new addition, a change from last quarter, and/or those possessing the highest residual impact and likelihood scores after existing management controls have been fully considered.

Operational Risk

Risk Definition: Exposures that arise from people or a failure in internal processes, systems or controls and may impact the University's ability to sustain immediate or future business operations.

Alignment to Risk Appetite: Within risk appetite 

Key updates since last report: The university continues to adequately manage operational risk activities on campus diligently. Amidst the backdrop of global uncertainties, the university has consistently upheld its commitment to fostering a secure and inclusive campus environment for its members.

There continues to be opportunity and exposure around travel and mobility risk off campus. Since COVID, and in the wake of recent global distress, addressing requirements and realities for travel will be necessary, including changes to processes and programs, such as the existing crisis management response.

Top Operational Risks	Risk Trend	Risk Mitigation Plan
International Travel Risks associated with students travelling internationally on university-sanctioned activities	↑	**Policy:** Review existing policy against the current landscape and complete fulsome overhaul to include all university membership and assign intentional accountability and responsibility; **Tools and Resources:** Re-evaluate existing registration tools to determine adequacy and efficacy; **Risk:** Reinforce risk assessment process; **Partnerships:** Research and identify complementary resources to support the university's travel safety initiatives;
Risk Owner:		Associate Vice President – International

Financial Risk

Risk Definition: Exposures that arise from the University's financial operations and/or external market forces, with the potential to impact funding level, investment performance, liquidity, budget, premium revenue/rates, and other key financial indicators.

Alignment to Risk Appetite: Within risk appetite

Key updates since last report: After years of budget uncertainty relating to COVID, we are forecasting a relatively stable yet lean three-year balanced budget position. The university has continued to grow over the last two recruitment cycles, however must remain laser focused on continuing to lead in student applications.

Top Financial Risk	Risk Trend	Risk Mitigation Plan
Financial Sustainability: Risk associated with inadequate fiscal controls	→	Maintain focus on short term priorities and tangible gains; Continue to identify efficiencies to reallocate funds to priority areas; Continue to budget conservatively under the assumption of frozen tuition policies and limited government funding, as well as the potential for volatile revenue swings;

		Encourage efforts on establishing alternative revenue streams;
Risk Owner:		Vice President – Administration
Contracts: Failure to adhere to the contract management framework.	→	**Policy:** Contract management and signing authority policy currently in final stages of review. **Training:** Training developed and has been made available to university members, and managers;
Risk Owner:		*Collaborative*: General Counsel and VP - Administration

Strategic Risk

Risk Definition: Risk that arises from internal and external trends and events that might impact the University's ability to achieve its mandate, or that arise from its ability to identify and execute on objectives and to establish and implement strategies to achieve them.

Alignment to Risk Appetite: Within risk appetite 

Key updates since last Report: Despite the university's commitment to growth and expansion, a culture of uncertainty has reared which may impact long term viability and reputation if not managed effectively. Common themes noted include turnover affecting project delays and burnout, knowledge gaps, challenges in the hybrid work model, economic factors, and incivility. The university is taking proactive measures to address these issues and maintain a positive culture.

Top Strategic Risk	Risk Trend	Risk Mitigation Plan
Culture Employee Engagement; Talent Recruitment and Retention; External Economic and Legislative Factors;	↑	**Labor Market Analysis**: a comprehensive review is underway, which will help inform our compensation strategy against market data and assess comparative positioning with counterpart universities; **Training**: Commitments are in place for manager training to address cultural issues, and promote a more respectful and supportive campus environment; **Manager Empowerment:** Develop and implement a comprehensive talent management strategy that includes succession planning to address institutional knowledge gaps; **Cross-Institution Dialogue**: Regular conversations with other educational institutions help us keep a finger on the pulse of broader trends;

	Pan-Institutional Communication: Enhance internal communication to ensure alignment of expectations and standards across departments;
Risk Owner:	Vice President – People and Transformation

Reputational Risk

Risk Definition: Exposures that arise from stakeholders' perception of the University with the potential to impact public trust in the University, as a result of direct or indirect action of the University, its employees, partners or suppliers.

Alignment to Risk Appetite: Within risk appetite 

Key updates since last report: The university has actively managed risk through a comprehensive approach to cybersecurity, including the implementation of robust controls and recent enhancements. The institution must continue to remain vigilant and agile against uncertainty. While cyber security can fall into a realm of risk domains; data breaches, service impacts, negative media cover, legal implications, and trust factors all contribute to the institutions reputation.

Top Reputational Risk	Risk Trend	Risk Mitigation Plan
Cyber Security and Privacy: The failure to safeguard our information systems and data	→	**Enhanced Monitoring:** Extension of CrowdStrike subscription to include 24/7 SOC monitoring offers immediate incident response capabilities; **Collaborative Exercises:** Risk Management offices, ITS from both institutions, and the Office of Campus Safety will continue to have joint tabletop exercises focusing on information security. We are in the planning stages for another exercise in winter 2024, which will include more stakeholders based on the proposed scenario; **Legal Preparedness:** Ontario Tech and Durham College have aligned their breach counsel, allowing for a coordinated legal response to incidents; **Inter-Institutional Information Sharing**: Participation in OCCCIO initiatives for sharing essential information about breaches enhances collective security intelligence; **Investment:** Continued investment in cutting-edge cybersecurity tools and practices; **Risk:** Develop a formalized risk assessment process to identify and evaluate new cyber threats regularly; **Insurance:** Explore cyber risk insurance options as an additional layer of financial protection;
Risk Owner:		Vice President – Administration

APPENDIX A: EMERGING RISKS AND NEW INITIATIVES

Emerging Risks:	Climate Change
Risk Assessment:	Increase in catastrophic losses, caused by diverse climate changes. Extreme weather events are on the rise, such as flash floods, storm surges, wildfire, and excessive heat. Uncertainty can lead to infrastructure vulnerabilities, supply chain disruption, financial exposure, disruptions to research and academic activities, and people health implications.
Risk Category:	Operational, Financial
Next Steps:	Engage the university's reciprocal in completing its first Campus Vulnerability Assessment to benchmark the institution's existing strengths, weaknesses, opportunities, and threats.

New Initiatives:	Intellectual Property – insurance policy
Risk Assessment:	The university may lack adequate protection against patents, trademarks, and copyrights.
Risk Category:	Operational, financial, Reputational
Next Steps:	Work with stakeholders to consider the following: • Identify and inventory intellectual property; • Valuation of IP assets; • Contemplate existing IP protections; • Conduct fulsome risk assessment to identify insurable risks; • Legal review; • Assess IP policy promotion in risk management culture.

BOARD REPORT

SESSION:		**ACTION REQUESTED:**	
Public	☒	**Decision**	☐
Non-Public	☐	**Discussion/Direction**	☐
		Information	☒

TO: **Board of Governors**

DATE: **November 30, 2023**

PRESENTED BY: **Lynne Zucker, Chair Strategy and Planning Committee**

SUBJECT: **Integrated Academic Research Plan – Action Plan and Accountability, Planning Timelines, and Milestones**

COMMITTEE/BOARD MANDATE:
The Committee is responsible for overseeing all aspects of the university's strategic planning efforts, including the implementation and assessment of these plans in the context of the university's vision, mission and values. I am pleased to present the Board with an update on the integrated planning process and year-end reporting enhancements that are being developed.

BACKGROUND/CONTEXT & RATIONALE:
The 2023-2028 Integrated Academic-Research Plan (IARP) was approved by the Board in June 2023. As the University transitions from the 2021-2023 IARP to the new 2023-2028 IARP the Provost and the University Planning Office are working to align the planning and reporting cycles and enhance accountability to demonstrate progress towards plan.

The Strategy and Planning committee reviewed the Integrated Planning process and timelines that highlighted modifications to planning tools, how Faculties and units were moving forward the 2023-2028 IARP, as well as a draft summary report on key accomplishments from Faculties and units from the 2022-2023 year to close off the previous plan. Faculties and units have been engaged in discussions on university priorities and have been articulating key strategies and annual milestones in their integrated planning templates. These plans will be evaluated annually and provide

Integrated Planning Process and 2022-2023 Faculty and Unit Report Back Report

The 2021-2023 Integrated Academic Research Plan (IARP) was concluded and closed off through a simplified final-year report back process. Units and Faculties were asked to recap 2022-2023's key accomplishments, challenges, and highlight future areas of focus. Milestones and initiatives that had been previously outlined for 2022-2023 through the Unit- and Faculty-specific Integrated Planning Templates could be included, as well as any going-forward priority projects or goals, if still applicable.

Faculty and Unit reports highlight the University's continued forward momentum in advancing our institutional priorities. Key accomplishments from the summaries categorized by priority include:

Tech with a Conscience:

- Project Arrow, industry's first all-Canadian, zero-emission concept electric vehicle was unveiled at the Consumer Electric Show 2023 (the world's largest technology showcase) and was highlighted as being a shining example of what Canadian talent, innovation, and know-how can accomplish by the Minister of Innovation, Science, and Industry Canada. Ontario Tech served as the lead academic institution for Phase 2 of Project Arrow, and for the past two years the top-secret and visionary national engineering project has had its home at Ontario Tech's Automotive Centre of Excellence.
- In July, a formal agreement was signed with the Association of Registrars of the Universities and Colleges of Canada (ARUCC) to roll out MyCreds, a digital solution which with allow institutions to securely issue transcripts and other academic documents.
- Collaborative project implementation between I.T. Services and the Office of the Registrar saw improved efficiency and client service through the re-engineering of business processes, including streamlining registration by providing students with a fair and transparent waitlisting process for high demand courses, drastically reduced processing times by automating admission decisions and offer generation for high school applicants, and enabling faster adjudication of scholarships and awards by automating financial aid processes.
- A.I. Ridgebot, an Artificial Intelligence Chatbot, was launched and is assisting Finance, Student Awards and Financial Aid, and Enrolment Services in responding to frequently asked student questions and inquiries.
- The Faculty of Health Sciences completed the development of an on-line course, specific for undergraduate students focused on self-care and resiliency, which will ultimately be included as a core requirement of all Health Science undergraduate programs.

Learning Reimagined:

- The Library improved support of online access to licensed resources through the addition of a Digital Resources Librarian, and continued to advance support for research data management requirements through the creation of customized Ontario Tech data management template developed in consultation with the Office of Research Services, REB, and researchers.
- An extensive study of our Experiential and Work-Integrated Learning landscape was conducted in support of the development of a short- to long-term vision for co-op education, experiential learning, and career development University-wide.
- Continuous Learning has been revitalized under a new vision, with new initiatives in open enrolment and corporate training programs, new partnerships with almost all Faculties, other on-campus units and external organizations, and extensions into micro-credentialing and international certificates (in partnership with the Office of the Registrar).
- The use of the Learning Management System, Canvas, was extended to a broader audience including employees and external users. To date, over 7800 courses have been delivered to students, and 385 courses have been provided for continuous learning opportunities.

qualitative content that will accompany the institutional metrics dashboard as part of the year end reporting exercise.

The attached document is being provided to the Board as an item for information. It is a high-level qualitative summary of accomplishments distilled from the 2022-2023 submissions from Faculties and Units. This summary was presented as a prototype of the additional qualitative reporting that will accompany the year end institutional metrics dashboard report that is provided to Academic Council and the Board.

The enhancements to the integrated planning templates as well as the cycle alignments strengthen and evolve the integrated planning process to provide a more wholistic picture of progress towards plans to the University's governing bodies. Strategy and Planning members provided suggestions to the Provost and AVP Planning and Strategic Analysis to ensure year-over-year progress as well as an explanation of challenges that resulted in not achieving what was set out is captured effectively in year-end reporting.

CONSULTATION:
Feedback on the summary report will be requested from Academic Council, SLT and ALT.

NEXT STEPS:
Use feedback to inform format for 2023-2024 annual reporting on IARP.

SUPPORTING REFERENCE MATERIALS:

2022-23 Integrated Planning Report BOG S and P Summary

- A new Master of Business Analytics and AI was launched, and has been recognized by the Vector Institute as an AI-Related Master's program in Ontario. Students in the MBAI program will become part of the Vector Institute community and receive access to networking and career events, the Digital Talent Hub, professional development, and other opportunities to grow their AI career.
- In response to the growth of the undergraduate Computer Science program, the Faculty of Science, has made significant investments and improvements to the program, both in faculty and staff hires, and program resources.
- Other new programs included the development of a 4-Year Bachelor of Arts in Educational Studies (FEd), Bachelor of Engineering in Energy Engineering (FEAS), Bachelor of Engineering in Industrial Engineering (FEAS), undergraduate Minors in Social Entrepreneurship and Innovation, Global Politics and, Science, Technology & Society (FSSH), and Master of Applied Science and Master of Engineering in Software Engineering (FEAS).

Creating a Sticky Campus:

- 2022-2023 was another record-breaking year for domestic confirmations, with a system leading increase of 11.7% in 101 confirmations.
- Ontario Tech's reputation in high performance sports continued to grow, notably through adaptive sports at the Campus Recreational Centre, as a hosting partner for the 2023 Parasport Games, and most recently in our selection as the host campus for the 2024 USPORT Men's Soccer National Championships. Ontario Tech also received distinctions at the recent OUA Congress for various aspects of its Athletics administration.
- Ontario Tech's Committee for an Age-Friendly University (CAFU) hosted several events on campus for seniors in the community, including an on-campus event highlighting the facilities and programs available for community members, regular athletics programming (e.g., pickleball during the lunch hour), and online webinars.
- We continued to evolve and grow our digital footprint, including upgrading digital screens across campus, developing new program-specific videos for use on key platforms as such YouTube, social media and personalized web pages, and launching over 25 new websites including the Energy microsite which was developed in collaboration with the BEI, the Partnership Office, the Research Office, and Advancement, and showcases the university's overall energy activities from programs, partners, research and more.
- Downtown space was consolidated and redeveloped to support flexible learning & research, modernizing our existing space infrastructure and repurposing unallocated space. The assessment of future space requirements continued to be advanced through the completion of a housing study.
- Following nearly 16 months of planning and design, a multi-phased Flexible Workspace project was formally implemented for administrative and technical staff.
- Campus and student experience were improved via enhancements to digital access of information and services, including through the implemented of Qless, a digital queue management system which allows students to join a virtual line from anywhere rather than a physical line, and LIVEHELPNOW, a live chat which enables Academic Advisors to monitor, track, and advise students in real time.
- Ongoing engagement and efforts to build relationships with Indigenous communities resulted in a significant increase in self-identified student applications and confirmations, and a record intake of new Indigenous students this fall.
- Ontario Tech's Peer Tutoring Program was awarded official CRLA certification at all three levels for its tutor training.
- In support of the recommendations of the Auditor General and best corporate governance practice, internal processes such as the skill matrix and orientation curriculum of the Board of Governors, and the Institutional Quality Assurance Process (IQAP), were reviewed and updated. Similarly, to

enhance internal evaluation and accountability, Institutional Metrics were developed, and a reporting process on the internal and SMA metrics was established.

Partnerships:

- Over $4,700,000 was fundraising towards institutional priorities, and new models of partnership were established in support of amplifying relationships that can assist with campaign goals and university priorities.
- A successful collaboration between, Advancement, the Partnership Office, and the Careers Centre resulted in an investment of $750,000 from RBC in Ontario Tech's Student Enrichment Program (to be initiated Fall 2023).
- Through its Government Relation Office, the University hosted dignitary visits from all levels of government, and participated in multiple Ministerial roundtables, including with the Minister of Red Tape Reduction, advocating for opportunities to reduce the reporting burden on the University to MCU, and with the Minister of Municipal Affairs and Housing, to discuss the provincial housing plan as it related to universities broadly and Ontario Tech specifically.
- The Faculty of Education developed a series of partnerships during 2022-2023 including through Priority Schools Project (DDSB), CDSBEO Partnership, CFREF Grant Proposal, and EdTech Tools Mini-Conference. These partnership help serve marginalized populations in schools and build Education's reputation as an EDI focused program with a conscience.
- As the university's primary connection point with municipal, regional, and provincial economic development units, the Partnership Office advanced the University's profile in a number of areas, including through earned articles in the Financial Post and Globe and Mail, leveraging significant Regional funding to promote Ontario Tech's innovation ecosystem (Brilliant Catalyst, Career Centre and Ontario Tech Talent), and in collaboration with Invest Durham on their Electrification Strategy.
- The Office of Research Services (ORS), in partnership with the Office of Diversity, Equity and Belonging launched the Ontario Tech University Women in Research Council (WIRC), funding for which is provided through an NSERC EDI capacity building grant secured by the Office of Research Services.
- The Joint Research Centre in AI for Health and Wellness, housed in the Faculty of Business and IT, established several strategic partnerships with healthcare facilities such as Ontario Shores, McMaster Children's Hospital, in Ontario and Westmead Children's Hospital in NSW, Australia.
- The Faculty of Engineering and Applied Science secured over 1 million dollars in funding from government and industry partners towards the Engineering Outreach program, which support community engagement with engineering for K-12 students, with a focus on underrepresented student groups (Black Youth, Indigenous Youth).
- The Faculty of Health Science official launched the Center for the Advancement of Dementia Care with Ontario Shores, and signed an MOU with Grandview to support continued research partnerships and begin exploring student experiential learning/placement opportunities.

Challenges highlighted in the Faculty and Unit Reports align with the current employment and funding landscape seen across the sector and province.

Next Steps in the Integrated Planning Process

The Integrated Planning process represents the collective efforts of our campus community in identifying strategic areas of growth and improvement. With the adoption of the 2023-2028 IARP, the Integrated Planning cycle has been adjusted to better align with annual planning and reporting periods. Unit- and Faculty-specific Integrated Plans will now be evaluated and renewed annually as rolling, multi-year plans of action. Similarly, additional emphasis has been placed on aligning strategies and initiatives to

measurable outcomes. The University will be reporting on two sets of metrics for the current planning period; the Institutional Metrics (reported internally) and the Strategic Mandate Agreement 3 (SMA) metrics (reported to the Ministry of Colleges and Universities (MCU), tied to performance funding and posted publicly). Units and Faculties have been tasked to link, where possible, their internal strategies to the Institutional Metrics and/or the SMA metrics, and to think about how their efforts will impact Unit/Faculty or the University's performance. The Institutional Metrics and SMA3 metrics reports are primarily quantitative in nature. Annual qualitative summaries of key accomplishments by priority (similar to the above) will be added to this reporting at the end of the 2023-2024 performance year. Strategic Enrolment Management (SEM), program innovation and student engagement have been highlighted as key areas within IARP priorities to consider. Information on SMA and Institutional level metrics has been included to assist in connecting Unit/Faculty strategies with currently reported-on measures. The multi-year nature of the Integrated Planning process is intended to assist Units and Faculties with establishing measurable milestones and outcomes that allow for year-over-year reporting and drive their internal plans, and the IARP, forward.

Board S and P

Planning Update

Sarah Thrush AVP Planning and Strategic Analysis

November, 2023

Integrated Planning Timelines: Actioning our IARP Aligning Our Cycles

Timeframe

2023-2024 Cycle:

Fall:

- Integrated Planning templates and material distributed to Units and Faculties
- Planning retreats and discussions in Faculties and Units
- Faculties and Units to work with their Faculty members and staff
- Integrated Planning Templates Submitted and reviewed

Winter:

- Integrated Planning Report Back/Evaluation begins

Spring:

- Integrated Planning Report Back/Evaluation due
- June AC and Board Reporting 2024:
  - Summary of Integrated Planning Evaluations (Qualitative)
  - Institutional Metrics
  - SMA3 Report
  - Research Metrics

Integrated Planning Timelines: Actioning our IARP

2024-2025 Cycle:

Spring 2024:

- Next cycle of Integrated Planning templates will be open to Faculties and Units to begin updating/modifying

Summer 2024:

- Integrated Planning Material/Data provided to Faculties and Units
- Faculties and Units to work with their Faculty Members and staff (Faculty/Unit retreats/meetings)
- End of August 2024 Integrated Planning Templates due

Fall/Winter:

- Faculties/Unit action strategies, monitor performance

Winter/Spring:

- Faculties/Unit evaluate performance

Spring/Summer:

- Performance reported to AC and Board as part of year end process

BOARD OF GOVERNORS' 129th REGULAR MEETING

Minutes of the Public Session of the Meeting of October 5, 2023
12:15 p.m. to 1:05 p.m., Hybrid

GOVERNORS IN ATTENDANCE:
Laura Elliott, Board Chair
Maria Saros, Vice-Chair and Chair of Governance, Nominations & Human Resources
Mitch Frazer, Chancellor
Steven Murphy, President
Carla Carmichael, Chair of Audit & Finance Committee
Eric Agius
Ahmad Barari
Frank Carnevale
Kathy Hao
Dale MacMillan
Matthew Mackenzie
Lisa McBride
Hannah Scott
Gaurav Singh
Kim Slade
Dwight Thompson
Roger Thompson, Vice-Chair of Audit & Finance Committee
Michael Watterworth
Emily Whetung

REGRETS:
Michael Rencheck
Lynne Zucker, Vice-Chair and Chair of Strategy & Planning Committee

BOARD SECRETARY:
Lauren Turner, *University Secretary*

STAFF:
James Barnett, *Vice-President, Advancement*
Jamie Bruno, *Vice-President, People and Transformation*
Sara Gottlieb, *General Counsel*
Barb Hamilton, *Legal Executive Assistant*
Krista Hester, *Chief of Staff*
Les Jacobs, *Vice-President, Research & Innovation*
Lori Livingston, *Provost & Vice-President, Academic*

Brad MacIsaac, *Vice-President, Administration*
Kimberley McCartney, *Assistant University Secretary*
Sarah Thrush, *Associate Vice-President, Planning and Strategic Analysis*

1. **Call to Order**
   The Chair called the public session to order at 12:15 p.m. and read aloud the land acknowledgement.

2. **Agenda**
   Upon a motion duly made by C. Carmichael and seconded by M. Mackenzie, the Agenda was approved as presented.

3. **Conflict of Interest Declaration**
   None.

4. **Chair's Remarks**
   The Chair welcomed governors, staff, and guests to the first Board meeting of the 2023/2024 academic year. She welcomed the new governors to the Board and invited a round table of introductions.

5. **President's Report**
   The President provided updates on a number of events at the University including 20th anniversary celebrations, the upcoming first fall Convocation, a successful Chancellor's Challenge, the naming of the Mitch and Leslie Frazer Faculty of Education, and the National Day for Truth and Reconciliation speakers. He shared that Ontario Tech has led the province in application growth for a third straight year, crediting a number of factors including the growth of the University's brand recognition. He then provided an overview of the provincial financial context for higher education, noting the ongoing freeze of provincial grants and the 10% tuition cut in 2019 and continued freeze thereafter. He remarked on increasing international student enrolment, reiterating that international students must be added to the University community ethically and not as a pragmatic means of balancing a budget. He provided an update on the Blue-Ribbon Panel, but did not express optimism that its work or report would result in a material change to the funding of post-secondary institutions. The President then described the drive for differentiated growth at Ontario Tech, citing expansion in professional masters degrees and increasing cooperative education offerings as examples. The Board of Governors expressed support for the direction the President described and credited the President and the senior leadership team on being proactive in their approach to the ongoing crisis of higher education funding.

6. Academic Council

C. Carmichael presented the Academic Council report, noting that this will be her final time doing so. She highlighted two key items from the June Academic Council meeting: (i) the approval of new members for 2023/2024; and (ii) the approval of a new research centre.

6.1 New Research Centre

L. Jacobs presented the motion for a new research centre, the Aerodynamic and Climatic Adaptation Research (AeroClimar) Centre. He advised the Board of Governors that AeroClimar is a part of a multi-year effort to shift the focus of the Automotive Centre of Excellence (ACE) from a commercial testing centre to a core research facility. He cited Project Arrow as a successful example of research being conducted at ACE. In response to a question, L. Jacobs confirmed that if successful, AeroClimar could transform from a research centre into a research institute with a broader reach and mandate. He noted that the University created its first institute in 2021 and added that institutes and research centres are pan-University and do not sit within any one Faculty.

Upon a motion duly made by D. MacMillan and seconded by E. Agius, pursuant to the recommendation of Academic Council, the Board of Governors hereby approves the establishment of the Aerodynamic and Climatic Adaptation Research (AeroClimar) Centre.

7. Consent Agenda:

Upon a motion duly made by C. Carmichael and M. Mackenzie, the Consent Agenda was approved as presented.

7.1 Minutes of the Public Session of Board of Governors – June 28, 2023

8. Adjournment

Upon a motion duly made by D. MacMillan, the public session adjourned at 1:05 p.m.

Lauren Turner, University Secretary

BOARD OF GOVERNORS
Audit & Finance Committee (A&F)

Minutes of the Public Session of the Meeting of June 14, 2023
2:00 p.m. to 2:47 p.m. Videoconference

Attendees: Carla Carmichael (Chair), Laura Elliott, Kathy Hao, Thorsten Koseck, Dale MacMillan, Steven Murphy

Regrets: Mitch Frazer, Kim Slade, Roger Thompson

Governors: Matthew Mackenzie, Dwight Thompson

Staff: Jamie Bruno, Krista Hester, Lori Livingston, Brad MacIsaac, Kimberley McCartney, Pamela Onsiong, Lauren Turner

Guests: Reagen Travers (KPMG), Bobbi White (KPMG)

1. Call to Order
The Chair called the meeting to order at 2:00 p.m. and read aloud the land acknowledgement.

2. Agenda
Upon a motion duly made by T. Koseck and seconded by S. Murphy, the Agenda, including the contents of the consent agenda, was approved as presented.

3. Conflict of Interest Declaration
There was none.

Dale MacMillan joined the meeting.

4. Chair's Remarks
The Chair thanked everyone for joining the last Committee meeting of the academic year. She reflected on an interesting first year as Chair of the Committee, highlighting the evolution of risk reporting, moving to a 3-year budgeting cycle, overseeing remediation of the recommendations from the Auditor General and oversight of complex financial transactions.

5. President's Remarks
The President thanked the Chair for her leadership over the past year and remarked upon the ongoing challenges presented by the tuition and grant freeze.

He then thanked students, staff, faculty and governors for making Convocation a great success last week. He closed by noting that June is Pride and Indigenous History month and welcomed Ruth Nyaamine, the new Associate Vice-President of Inclusion, Diversity and Belonging to the University.

6. Finance

6.1 Draft Audited Financial Statements 2022-2023

P. Onsiong presented the Draft Audited Financial Statements 2022-2023 (Statements). She noted that the Statements reflect the acquisition of control of Regent Corp. and its property located at 55 Bond St which took place in February 2023 for a cash consideration of $7.5 million. Turning to the statement of operations, P. Onsiong drew the Committee's attention to a surplus of $2.6 million for the year with revenues increasing 4% over last year but expenses increasing by 9%. She noted that 6% of the 9% was driven by salaries and benefits which consume over 80% of increased revenues. She advised the Committee that the statement of financial position remains stable with a net asset increase of $3.5 million over last year. Expendable net assets decreased slightly over last year, largely driven by the investment in Regent Corp. She reported that overall cash and short-term investments are healthy at $80 million, 25% of which is restricted for research and donations. She advised the Committee that over $11 million in debt obligations were repaid leaving $193 million on the books at the end of the fiscal year.

P. Onsiong then discussed the appendices to the Statements. She advised that restricted reserves are reviewed in conjunction with the year-end management report, which is prepared on a modified cash basis. She noted that the University used over $11 million from reserves in the current year to fund capital infrastructure and financial assistance to students. She recommended to the Committee that $0.5 million be set to reserves to comply with contractual obligations for faculty startup, professional development, and unspent student funds. Turning to the University's financial ratios, she commented that the ratios remain those recommended by the Council of Ontario Universities (COU) in 2016. Out of five ratios, the University falls short on three: income loss, debt, and interest burden. She advised that if the $13.5 million of grant funding received annually by the University from the Ministry for debenture debt is normalized, debt ratios fall well within minimal recommendations.

A discussion then ensued on the Statements. In response to a question, P. Onsiong confirmed that the threshold for capitalization is $10,000 at the University; staff are exploring increasing this to $25,000 to align with the sector and reduce manual work for the Finance team. In response to a different question, P. Onsiong advised that metrics are reported to the Ministry, including an explanation of the University's debt ratios. In response to a question, P. Onsiong clarified that deferred value represents a combination of operating and research values. The Chair expressed support for normalizing the debt metrics, commenting that they should be contextualized in the University's unique situation with respect to the

debenture. In response to a question, P. Onsiong confirmed that the normalized value reflects the 80% guaranteed by the Ministry. In response to a question about the net income/loss ratio, P. Onsiong confirmed that there will be deficits in 2024/2025 and 2025/2026. The Committee requested that this ratio be monitored and met if possible. In response, P. Onsiong advised that the ratio demonstrates the ongoing challenges presented by restricted grant and tuition funding.

Upon a motion duly made by T. Koseck and seconded by S. Murphy, the Audit and Finance Committee hereby recommends the 2022/23 audited financial statements and the 2022/23 internally reserved funds, as presented, for approval by the Board of Governors.

6.2 Fourth Quarter Financial Reports

P. Onsiong presented the Fourth Quarter Financial Reports (Reports). She provided an overview of performance against forecast, drawing the Committee's attention to a projected $4.7 million forecast in Q3 that was $2 million less by year end actuals. She summarized significant upsides and downsides including unspent grants deferred to next year, lower than projected tuition revenue due to a formula error, and donations. She commented on forecasting challenges stemming from underspending in some units, increased benefit costs not included the budget or Q3 forecast, and unexpected repairs and equipment purchases. She advised that conversations with relevant stakeholders are underway to tighten forecasting processes. She closed by noting that the shortfall in actual year-end surplus meant that $6 million of the funds required to acquire Regent Corp. were funded through prior year reserves.

Carla Carmichael left the meeting.

7. Investment Oversight

7.1 Investment Portfolio Update

B. MacIsaac presented the Investment Portfolio Update, reporting a 5.5% rate of return which represents an increase since the December 2022 report. He advised that management and PH&N are seeing positive signs of recovery. He reported that as of January 2023 new disbursement quotas were required; working with the Advancement Office, Finance, and PH&N, he advised that the University is above the quota for compliance purposes.

Carla Carmichael rejoined the meeting.

8. Interim Risk Update

B. MacIsaac presented the Interim Risk Update, noting that twice a year there will be more in-depth presentations and in between reports will be interim with a focus on major changes since the last in-depth report. For this report, he advised that there were no major changes, but brought two updates to the Committee's attention: (i) consolidation of compliance requirements; and (ii) a site-visit by the University's insurer, Canadian Universities Reciprocal Insurance Exchange

(CURIE). With respect to compliance, he advised that staff are working to consolidate and centralize compliance data and exploring software to support these efforts. Regarding CURIE, he advised that the insurer is moving to a rewards program that incentivizes meeting or exceeding standards with premium reductions. In response to a question, he confirmed that there were significant issues arose in the last three months.

9. Consent Agenda
9.1 Minutes of Public Session of A&F Meeting of April 12, 2023
9.2 A&F Annual Board Report
9.3 Annual Policy Review
9.4 Privacy Report 2023

10. Adjournment
Upon a motion duly made by T. Koseck, the public session adjourned at 2:47 p.m.

Lauren Turner, University Secretary

BOARD OF GOVERNORS
Governance, Nominations and Human Resources Committee (GNHR)

Minutes of the Public Session of the Meeting of May 25, 2023
2:00 p.m. to 2:51 p.m. Videoconference

Attendees: Maria Saros (Chair), Laura Elliott, Mitch Frazer, Kori Kingsbury, Steven Murphy, Dwight Thompson

Regrets: Trevin Stratton

Staff: Jamie Bruno, Sarah Cantrell, Barbara Hamilton, Krista Hester, Lori Livingston, Kimberley McCartney, Andrew Sunstrum, Lauren Turner

1. Call to Order
The Chair called the meeting to order at 2:00 p.m. and read aloud the land acknowledgement.

2. Agenda
Upon a motion duly made by L. Elliott and seconded by K. Kingsbury, the Agenda, including the contents of the consent agenda, was approved as presented.

3. Conflict of Interest Declaration
There was none.

4. Chair's Remarks
The Chair welcomed everyone to the meeting, noting that it is the last of an eventful academic year. She thanked the Committee, the University leadership and the Secretariat for their hard work this year.

5. President's Remarks
The President provided updates on the renewals of the Vice-President, Research & Innovation (VPRI) and the Provost and Vice-President, Academic. The renewal committee for the Provost is being assembled; the VPRI has submitted a vision document on which anonymized feedback is being collected for renewal advisory committee review. He shared that Ontario Tech's Sara Rijkenberg placed second in the Ontario 3 Minute Thesis challenge and will go on to the national competition in November. He closed by noting that the tent is up on Polonsky Commons for Convocation on June 7-9, 2023.

6. Governance

6.1 Board Schedule 2023-2024

The Chair presented the Board Schedule 2023-2024, noting that the dates spaced more evenly across the calendar year were prepared in response to Governor feedback on scheduling. The Committee briefly discussed the two possible calendars for 2023-2024, finding both acceptable. A Committee member requested that a schedule of campus activities be shared with Governors if possible.

6.2 Annual Board & Committee Practices Assessment Results

The Chair made opening remarks on the Annual Board & Committee Practices Assessment Results (the "Results"), noting that this is the first set compiled since 2021. The Chair commented on the response rates, which K. McCartney confirmed were lower than in the past. K. McCartney then shared common themes across the Results, noting positivity around engagement at meetings, and a desire to increase opportunities for generative, strategic discussions. She commented on opportunities for improvement, such as ensuring that Board materials are focused and pithy. She shared some other areas of strength for the Board, including productive conversations, focused meetings, and a sense of pride about serving on the Board of Governors. She noted that Board comments reflected a desire to be more engaged or to advocate on issues of importance to the University. This echoes sentiments from governors expressed at the the recent Strategic Retreat. In feedback about Committee service, she noted some room for improvement in the understanding of terms of reference; she advised that this could be addressed via orientation. Highlighted Committee achievements included the move to a 3-year budgeting cycle, the evolution of risk reporting, and positive relationships with University staff. She closed by advising the Committee that the Secretariat would like to revise the assessment tool for 2023/2024 by (i) shortening and focusing it; (ii) combining Board and Committee assessments; and (iii) adding questions about Board/Committee Chair efficacy.

A discussion then ensued on the Results. The Committee discussed the distribution of responses, with the Secretariat confirming that there were no big surprises in the data. With respect to materials, the University Secretary expressed the view that they represent a constant drive for improvement rather than an achievable state of perfection. A member commented on the various ways that Governors can contribute to meetings; some prefer to speak only when there is a strong point to make. General support was expressed for opportunities like the Strategic Retreat for Governors to interact in a more relaxed environment. The Committee expressed support for the revisions to the assessment tool proposed by the Secretariat.

6.3 Review of EDI Statement

The University Secretary presented the Review of the EDI Statement. She provided an overview of the development of the EDI Statement, highlighting that it

was intended to be a living document. Following a brief discussion, the Committee chose not to make changes to the EDI Statement but directed that a scan of the sector be conducted and that the EDI Statement be shared with the new Assistant Vice-President, Diversity, Inclusion and Belonging.

6.4 Annual Consolidated Human Rights Report

A. Sunstrum presented the Annual Consolidated Human Rights Report (the "Report"). He drew the Committee's attention to the increase in activity when the mask mandate was introduced at the University, noting that numbers are consistent with three years ago outside of that consideration. He noted an increase in the number of consultations requested with the Human Rights Office. He regarded this as a positive development as early engagement and escalation avoidance are objectives of his Office. He reminded the Committee of the Human Rights Office's integration with the Student Sexual Violence program and the move towards centralized disclosure and ensuring that students are provided with all required supports in one place. He closed by advising the Committee that an updated gender-based violence training module has been deployed to employees and will be rolled out to students in September. He noted that the training may drive an increase in cases through improved awareness of the Human Rights Office.

The Chair thanked A. Sunstrum for his report, commenting on the improvements in the Report. In response to a question about concerns and issues, A. Sunstrum advised that the increase in creed-based claims did not concern him as the cause – the mask mandate – was readily identifiable. In response to a question about disability and accommodation, A. Sunstrum advised that the Human Rights Office is consulted by Student Accessibility Services when complex accommodations are required for students as well as by Human Resources in the course of administering the accommodation procedures for employees. He noted that none of the consultation engagements have resulted in investigations; preventive measures have been effective. In response to a question, A. Sunstrum advised that Student Life would be responsible for administering participation surveys, if any, to students.

7. Consent Agenda

7.1 Minutes of the Public Session of the Meeting of March 30, 2023

7.2 Annual Pension Plan Report

7.3 GNHR Annual Board Report

8. Adjournment

Upon a motion duly made by K. Kingsbury, the public session adjourned at 2:51 p.m.

Lauren Turner, University Secretary

BOARD OF GOVERNORS
Strategy & Planning Committee (S&P)

Minutes of the Public Session of the Meeting of May 11, 2023
2:00 p.m. to 3:52 p.m. Hybrid

Attendees: Lynne Zucker (Chair), Eric Agius (Vice-Chair), Ahmad Barari, Kevin Chan, Laura Elliott, Mitch Frazer, Matthew Mackenzie, Steven Murphy, Michael Rencheck, Joshua Sankarlal, Jim Wilson

Staff: James Barnett, Sarah Cantrell, Krista Hester, Les Jacobs, Lori Livingston, Brad MacIsaac, Kimberley McCartney, Ade Oyemande, Lauren Turner

1. Call to Order

At the request of the Chair, the Vice-Chair chaired the meeting.

The Vice-Chair called the meeting to order at 2:00 p.m. and read aloud the land acknowledgement.

2. Agenda

Upon a motion duly made by M. Mackenzie and seconded by S. Murphy, the Agenda, including the contents of the consent agenda, was approved as presented.

3. Conflict of Interest Declaration

There was none.

4. Chair's Remarks

The Chair thanked everyone for attending and welcomed members of the public and guests. The Chair provided highlights from the successful Strategic Retreat for the Board of Governors held in the morning, including solidifying brand identity and key messages, and engaged discussions about ways to increase the Board's impact on the University. He then commented briefly on the agenda before the Committee and encouraged all governors to engage in discussions.

5. President's Remarks

The President provided an update on the work of the Blue-Ribbon Panel, noting that submissions to the Panel close tomorrow. He advised that the University has made its voice heard through the Council of Ontario Universities' (COU) submission as well as the submissions of non-higher education organizations invited by the Panel. He provided a summary of the value that Ontario Tech brings

to the province and the need for a more sustainable financial model in a province that ranks last in the country in investment in post-secondary education.

6. Strategy

6.1 Integrated Academic Research Plan

The Provost presented the 2023-2028 Integrated Academic Research Plan (IARP) noting that it is the third iteration of the plan in this format. She described the evolution of the IARP, highlighting improvements in metrics, quantification, and the introduction of a 5-year timeframe. She described the consultation involved in the creation of the IARP. In response to a question seeking more detail, she advised the Committee that there were two town halls with attendance in excess of 110 people and solicitation of written feedback via a website. She noted that feedback was voluminous and provided some examples of recommendations (e.g., the inclusion of the concept of a “safe workplace”) that were accepted and others that were not.

A Committee member expressed concern about the 5-year timeframe of the IARP, citing upheaval such as artificial intelligence and a general period of change in higher education as reasons against it. In response, the Provost advised that while the IARP has a 5-year horizon, it may change during that timeframe; she noted that the robust metrics that accompany the IARP will inform year over year responses. S. Cantrell commented on the importance of stability and clarity about the University’s direction, noting that a plan with a shorter time horizon can be unduly impacted by exigent circumstances. She went on to highlight the benefits of a longer-term plan for advocacy with the provincial government. In response to continued concern from the Committee member, the Provost explained why the first two iterations of the IARP were 2-year documents. She acknowledged that the University will operate in a context of disruption, but expressed the view that the strong set of metrics will hold the University accountable while allowing for adjustments. She also noted the financial challenges that the University will be facing in two years, expressing the view that a plan that takes the University beyond that point is preferable to attempting to create a new plan in the context of a financial deficit. In response to a comment, the Provost reaffirmed that the University could pivot during the 5-year lifespan of the IARP and that metrics will be monitored diligently. The Chair expressed support for a 5-year timeframe, noting the importance of a long-term anchor for the University’s year-to-year strategies and plans.

Upon a motion duly made by M. Mackenzie and seconded by M. Rencheck, the Strategy and Planning Committee endorsed the 2023-2028 IARP to the Board of Governors for approval.

One Committee member opposed the motion.

6.2 Strategic Discussion: Digital Strategy

B. MacIsaac presented the Digital Strategy, advising the Committee that it is one of the enabling plans of the IARP. The IARP sets the direction of the University; the Digital Strategy will support the trajectory of teaching, learning and research. He reminded the Committee that the network, infrastructure and security are all used and maintained in partnership with Durham College (DC); he went on to share efforts made over the past 16 months to clarify roles and responsibilities with DC. Speaking to improvements in the Digital Strategy, B. MacIsaac highlighted the move to a 4-year plan, planned improvements for student success, cloud migration, and improvements in experiential learning. He discussed input gathered from staff, students and faculty including requests for more self-service.

Mitch Frazer joined the meeting.

The Provost spoke to the impacts of the Digital Strategy in the classroom. She advised the Committee that the classroom experience depends first and foremost on sound pedagogical practices, with technology supporting that experience. She noted trends towards technology uptake at the University, citing the 90% of faculty tying courses to the Learning Management System (LMS). The LMS as a source of important data about student successes and struggles was noted, as was the importance of digital tools integrating with it. She closed by commenting on the synergies between the Digital Strategy and Continuous Learning initiatives.

B. MacIsaac then discussed cybersecurity and research. He advised the Committee that the University has been working with a working group on data strategy to ensure the safety and security of research. He noted that the majority of the University's Canadian research chairs are working on advanced digital infrastructure or incorporating digital tools.

A. Oyemande discussed user experience, advising the Committee that an interim solution for a student portal has been deployed; the University is looking for a robust system to provide students with a positive user experience. In the future, the University would like to be able to reach all students and faculty via a mobile app which will allow personalization of the student journey. She noted that moving more applications to the cloud enhances the user experience by enhancing capacity and stability of University systems. B. MacIsaac noted that while the transition from on-premise to cloud can sometimes be a lengthy experience, IT has prioritized migration of certain items each year.

Laura Elliott joined the meeting.

B. MacIsaac commented on the age of the University's infrastructure and costs association with renovations and repairs. Taking a "cloud first" approach helps to mitigate costs, but in order to drive overall improvements, a $3 million/year investment is recommended. He advised that future reporting will show projects

with a value in excess of $100,000 as well as metrics which either tie to the IARP or are specific to IT.

A discussion then ensued on the Digital Strategy. In response to a question, B. MacIsaac confirmed that the Strategy can scale to align with the growth that the University is projecting. In response to a further question about budgetary pressures, B. MacIsaac advised that there are a number of governance bodies involved in budgetary decisions and that senior leaders are frequently asked which initiatives can be delayed. He agreed with the Vice-Chair's view that there will inevitably be difficult decisions and trade-offs. A Committee member inquired about the potential for the University to position itself as a centre for computing or to work with government or agencies to advance the University and the province instead of taking a reactive approach in the Digital Strategy. In response, B. MacIsaac advised that funding outside of the University's normal operating grant would be required. The President advised the Committee that the Vice-President, Research and Innovation has been conferring with the University of Sherbrooke, a Canadian leader in quantum computing, to understand their strategy.

A Committee member inquired about the stability of LMS and the risk of system outages. In response, B. MacIsaac advised that different types of outages will trigger different business continuity plans. A. Oyemande advised that the LMS is in the cloud and the LMS provider has committed to a disaster recovery plan with less than 2-4 hours of down time. In response to a question about budget allocations for the Digital Strategy, B. MacIsaac confirmed that of the $3 million recommended, $1.7 million is still in flux. In response to a different question, A. Oyemande confirmed that the digital experience platform will be new for the University; input on requirements is being gathered. In response to a concern about the potential for hidden costs or transition to purely online learning as cloud is embraced. B. MacIsaac clarified that the University does not intend to be purely online, noting the "sticky campus" strategic objective. He advised that costs are incorporated into contracts, thus avoiding surprise fees.

6.3 Institutional and SMA3 Metrics

S. Cantrell presented the Institutional and SMA3 Metrics. She discussed the dashboard, advising the Committee that a yellow rating does not necessarily indicate a problem, but rather progress towards a target. She discussed the data behind the metrics and planned education for the community. She commented on the beneficial feedback received on target setting. She noted that the IARP will, if approved, necessitate some modifications to the metrics. Speaking to the SMA3 reporting, S. Cantrell walked the Committee through the dashboard, noting metric weightings and the notional allocations of weightings in terms of dollar values.

A discussion then ensued on the metrics dashboard, colour assignments, and adequate flagging of risk. S. Cantrell advised the Committee that an effort was made to find a balance in representation with regard to financial and reputational implications. The Vice-Chair encouraged leadership to see red as a means of

getting attention, potentially the allocation of resources or support, not as a purely negative indicator. In response to a question about research, S. Cantrell advised that there are a number of research metrics that are captured in the institutional and SMA3 dashboards. The Strategic Research Plan contains a more comprehensive list of research metrics that will track performance over time. The Provost noted that the Strategic Research Plan is linked to but independent from the IARP. The IARP does not capture or duplicate what is within the SRP. In response to a final question about monitoring metrics to ensure planned changes or growth, S. Cantrell advised that the enabling plans of the IARP (e.g., strategic enrolment plan, budget plan) delineate accountabilities for leading pieces of the plan. Next steps will be to have the metrics cascaded into unit- or faculty-level plans to enable tracking of achievement of those targets and will be built into the annual review process.

6.4 Annual Programs Update

(a) 2022-23 Quality Assurance Process & Program Annual Report

The Provost presented the 2022-2023 Quality Assurance Process & Program Annual Report. The Committee expressed concern about the refusal of provincial funding for some programs aligned with the University's vision. S. Cantrell confirmed that the rationale for refusal was misalignment with the University's mission. She advised that there is concern in the sector that this signals an intent on the part of the Ministry to be more intrusive in academic programming.

Mitch Frazer left the meeting.

(b) 2022-2023 Continuous Learning Annual Report

The Provost presented the 2022-2023 Continuous Learning Annual Report. She summarized the history of the Continuous Learning unit and noted the arrival of a new Director in August. A discussion ensued about costs and revenues of Continuous Learning. The Provost committed to finding out about scholarship offerings for these programs and confirmed that the intent is for Continuous Learning to be not just self-sustaining, but profitable. In response to a further question, she advised that the unit is projected to be cost-neutral and profit-generating by 2023/2024.

6.5 International Strategy Update

The Provost presented the International Strategy Update, highlighting four strategic pillars: (i) diversifying the number of countries; (ii) support for students once they are in Canada; (iii) new recruitment strategies including market developments, partnerships, and quality assurance; and, (iv) international goals and tactical priorities including seeking new ways to open Ontario Tech to the international market. She highlighted the efforts and expertise of J. Stokes, the University's Registrar. In response to a question, the Provost confirmed that agents are compensated on a commission basis. She noted that the Auditor General's report made recommendations in this regard, and advised the Committee that the University is being careful about only releasing payment where a student is likely

to be successful at Ontario Tech. She confirmed that the University works only with reputable organizations and offshore agents.

7. Planning

7.1 Endowment Disbursement Recommendation

B. MacIsaac presented the Endowment Disbursement Recommendation, noting that it will also be presented to the Audit and Finance Committee per policy. He advised the Committee that a portion of endowed funds are used each year for student bursaries and support. The University would like to disburse the maximum amount in 2023/2024 while ensuring capital preservation.

Upon a motion duly made by S. Murphy and seconded by M. Rencheck, the Strategy and Planning Committee endorsed to the Board of Governors the disbursement of up to $750,000 from the University's endowed fund and unrestricted expendable sources for distribution by Financial Aid in 2023-24.

8. Consent Agenda

8.1 Minutes of Public Session of Meeting of March 22, 2023

8.2 S&P Annual Board Report

9. Adjournment

Upon a motion duly made by K. Chan, the public session adjourned at 3:52 p.m.

Lauren Turner, University Secretary

BOARD REPORT

SESSION:		**ACTION REQUESTED:**	
Public	☒	**Decision**	☒
Non-Public	☐	**Discussion/Direction**	☐
		Information	☐

TO: **Board of Governors**

DATE: **November 30, 2023**

PRESENTED BY: **Janice Moseley, Manager Research Ethics**

SUBJECT: **Animal Care Committee (ACC) Terms of Reference**

BACKGROUND/CONTEXT & RATIONALE:

The Ontario Tech Animal Care Committee (ACC) is seeking Board approval for the ACC's Terms of Reference (TOR).

The ACC has completed a review of their TOR in response to a planned interim audit from the Canadian Council on Animal Care (CCAC) in 2021. The CCAC requested for more clarity on voting and non-voting ACC members in the TOR. The TOR has been revised to identify the Animal Facility Manager and animal technical staff as ex-officio voting members. Other minor editorial changes were made as well.

The CCAC audit involved an evaluation of the Ontario Tech's animal care and use program, the effectiveness of our ACC to oversee the program, the welfare of the animals in their charge, and the appropriateness of their animal facilities, practices, and procedures. Audits are based on CCAC guidelines, policies, and associated documents, and are conducted by CCAC assessment panels. Audit visits are normally scheduled every three years. The Ontario Tech ACC anticipates another audit in 2024.

A summary of revisions to date are attached in the Summary of Changes document.

CONSULTATION:

The ACC TOR was sent to Academic Council for consultation on October 24, 2023. No substantive changes were recommended.

NEXT STEPS:

Pending the approval of the Board of Governors, the new Animal Care Committee terms of

reference will come into effect immediately upon approval.

COMPLIANCE WITH POLICY/LEGISLATION:

The Canadian Council on Animal Care (CCAC) requires that institutions conducting animal-based research, teaching or testing establish an ACC governed by formal TOR. The amendments to the ACC's TOR comply with the following policies and procedures:

- CCAC policy statement on: scientific merit and ethical review of animal-based research, 2013
- CCAC training modules on: Institutional Animal User Training Program
- CCAC guidelines on: choosing an appropriate endpoint in experiments using animals for research, teaching and testing, 1998
- CCAC guidelines on: animal use protocol review, 1997
- CCAC policy statement on: ethics of animal investigation, 1989
- University Animal Care and Use of Animals in Research and Teaching, 2013
- University 004 Administrative Procedure: University Post Approval Monitoring Program
- University 002 Administrative Procedure: Process for Reconsideration or Appeal of Decisions of the ACC

MOTION:
That the Board of Governors hereby approves the revisions to the Animal Care Committee Terms of Reference.

SUPPORTING REFERENCE MATERIALS:

- Animal Care Committee TOR – Summary of changes
- Animal care committee Terms of Reference – revised

Summary of Changes for University Animal Care Committee: Terms of Reference

Background:

The Terms of Reference for the Ontario Tech Animal Care Committee (ACC) has been revised in response to the ACC's audit from the Canadian Council on Animal Care (CCAC) in 2021. The CCAC requested for more clarity on voting and non-voting ACC members in the Terms of Reference. The Terms of Reference has been revised to identify the Animal Facility Manager and animal technical staff as ex-officio voting members. Other minor editorial changes were made as well.

Section	Previous wording/content	Revised wording/content	Rationale
Substantive Changes			
Section 3.2b Authority	proceed independently with any necessary emergency measures, whether or not the animal user and ACC Chair are available.	proceed independently with any necessary emergency measures, whether or not the animal user and ACC Chair/*Vice-Chair* are available.	Added Vice-Chair
Section 3.3 Authority	~~T~~he consultant veterinarian(s), ~~before exercising authority,~~ must attempt to contact the ACC Chair and the animal user whose animal is in question before beginning any treatment that has not previously been agreed upon. The consultant veterinarian(s) will send a written report to the animal user and to the ACC following any such event.	*Before exercising authority*, the consultant veterinarian(s), must attempt to contact the ACC Chair/*Vice-Chair* and the animal user whose animal is in question before beginning any treatment that has not previously been agreed upon. The consultant veterinarian(s) will send a written report to the animal user and to the ACC following any such event.	Editorial change and added Vice-Chair
Section 4.1 Safeguards	For serious non-compliance or threats to the health and safety of personnel or welfare of animals, the ACC Chair and ACC must promptly address these issues.	For serious non-compliance or threats to the health and safety of personnel or welfare of animals, the ACC Chair/*Vice-Chair* and ACC must promptly address these issues.	Editorial changes and added Vice-Chair

Section	Previous wording/content	Revised wording/content	Rationale
	Individuals ~~raising such concerns~~ must express their concerns in writing to the ACC Chair/Vice-Chair. The ACC Chair will address the issues, through communications with the animal user(s), meetings and site visits in accordance with the University Policy on the Care and Use of Animals in Research and Teaching and associated procedures.	Individuals must express their concerns in writing to the ACC Chair/*Vice-Chair.* The ACC Chair/*Vice-Chair* will address the issues, through communications with the animal user(s), meetings and site visits in accordance with the University Policy on the Care and Use of Animals in Research and Teaching and associated procedures.	
Section 5.3 Membership and Term	The complement of the committee will include appointed and ex-officio ~~members who must be part of the ACC because of their role within the institution.~~ Appointed members include:	The complement of the committee will include *appointed and ex-officio members*.	Removed redundant *ex-officio* definition. Indicated that appointed members have voting rights.
Section 5.3a Membership and Term	a minimum of two (2) scientists ~~and/or teachers experienced~~ in animal ~~care and use~~, who may or may not be actively using animals during their term on the ACC;	*Appointed voting members include*: a minimum of two (2) scientists, *instructors and/or study directors involved* in animal-*based activities*, who may or may not be actively using animals during their term on the ACC;	Editorial change. Replaced: (1) teachers with instructors. (2) animal care and use with animal-based activities.
Section 5.3 d to h Membership and Term		*Ex-officio committee voting members include*: *d) consultant veterinarian(s), who is experienced in care and use of animals at the University;* *e) a representative for occupational health & safety and biosafety.*	Clarified *ex-officio members* with voting rights and non-voting rights.

Section	Previous wording/content	Revised wording/content	Rationale
		f) an Animal Facility Manager who may also fulfill the role of an appointed technical staff representative in 5.3d. *a. technical staff representation either an animal care, animal facility or animal research technician if there are technical staff member(s) actively involved in animal care and/or use within the institution,* *Ex-officio committee non-voting members include:* g) the ACC coordinator (University Research Ethics Officer) who is responsible for the coordination of all animal care related activities and providing support to the ACC*, and* a representative of the senior administration reporting to the VPRI (*Executive* Director, Office of Research Services*).*	
Editorial Changes			
Version date	February 27, 2020	August 22, 2022	
Section 1 Definitions	"Canadian Council on Animal Care (CCAC)" is a national peer review agency	"Canadian Council on Animal Care (CCAC)" is a national peer review	Editorial change.

Section	Previous wording/content	Revised wording/content	Rationale
	responsible for setting and maintaining standards for ethical use and care of experimental animals used in research, teaching and testing in Canada.	agency responsible for setting and maintaining standards for ethical use and care of experiment*al* animals used in research, teaching and testing in Canada.	
Section 2.2 Purpose	2.2. The ACC is established by the University and responsible for the coordination, ethical review and approval for all proposed uses of animals in research (including field studies), testing and teaching at the University. The ACC shall establish internal policies and procedures to ensure compliance with legislation and the Canadian Council on Animal Care (CCAC) policies and guidelines. The operation of the ACC is governed by the following Terms of Reference.	2.2. The ACC is established by the University and *is* responsible for the coordination, ethical review and approval for all proposed uses of animals in research (including field studies), testing and teaching at the University. The ACC shall establish internal policies and procedures to ensure compliance with legislation and the Canadian Council on Animal Care (CCAC) policies and guidelines. The operation of the ACC is governed by the following Terms of Reference.	Editorial change.
Section 3.1b Authority	b) stop immediately any animal use that deviates from the approved protocol or non-approved procedure(s);	b) stop immediately any animal use that deviates from the approved protocol or *use of* non-approved procedure(s);	Editorial change.
Section 3.2 Authority	The ACC ~~delegates to the consultant veterinarian(s) the authority~~ to:	The *consultant veterinarian(s) have delegated authority on behalf of the* ACC to:	Editorial change
Section 4.2 Safeguard	~~N~~on-compliance concerns that cannot be corrected or resolved ~~with the ACC will be referred to t~~he VPRI, ~~who~~ will inform all members of the ~~animal care and use program~~ ACC about sanctions that will be taken by the administration. If the VPRI,	*The ACC will inform the VPRI of n*on-compliance concerns that cannot be corrected or resolved. *T*he VPRI will inform all members of the *ACC* about sanctions that will be taken by the administration. If the VPRI, has a real or	Editorial change

Section	Previous wording/content	Revised wording/content	Rationale
	has a real or perceived conflict of interest, the University President will determine sanctions.	perceived conflict of interest, the University President will determine sanctions.	
Section 5.1 Membership and Term	~~This~~ maximum ~~can be waived by the ACC~~, if necessary, in order to have appropriate animal user representation.	*The ACC can waive* maximum *years of service*, if necessary, in order to have appropriate animal user representation.	Editorial change
Section 5.3b Membership and Term	b) at least one (1) person representing community interests and concerns who has had no affiliation with the institution, and who has not been involved in animal use for research, teaching or testing; community representation must be ensured for all ACC activities throughout the year and included on all protocol review subcommittees;	b) at least one (1) person representing community interests and concerns who has had no affiliation with the institution, and who has not been involved in animal use for research, teaching or testing. *Community* representation must be ensured for all ACC activities throughout the year and included on all protocol review subcommittees;	Editorial change.
Section 6.1c	c) ensure that ACC approval of a written animal use protocol is obtained prior to breeding, research, teaching, production or testing (including field studies) involving animals. For other animal based activities within the institution, the ACC will work with the individuals responsible for the activities to ensure appropriate procedures for animal care and use;	c) ensure that ACC approval of a written animal use protocol is obtained prior to breeding, research, teaching, production or testing (including field studies) involving animals. For other animal- based activities within the institution, the ACC will work with the individuals responsible for the activities to ensure appropriate procedures for animal care and use;	Editorial change

Section	Previous wording/content	Revised wording/content	Rationale
Section 6.1f Responsibility	f) Confirm that each research project has undergone an independent peer review and has been found to have scientific merit, prior to issuing ACC approval. For non-peer reviewed projects, the ACC Administrative Procedure 003 Peer Review Process must be followed;	f) *confirm* that each research project has undergone an independent peer review and has been found to have scientific merit, prior to issuing ACC approval. For non-peer reviewed projects, the ACC Administrative Procedure 003 Peer Review Process must be followed;	Editorial change
Section 12	CCAC Assessment Report: University of Ontario Institute of Technology, April 4, 2012	CCAC Assessment Report: University of Ontario Institute of Technology *(Ontario Tech),* April 4, 2012	Editorial change

Item	Appendix A – Terms of Reference
Parent Policy	Policy on the Care and Use of Animals in Research
Approval Authority	Board of Governors
Policy Owner	VP Research
Approval Date	
Review Date	
Supersedes	

UNIVERSITY ANIMAL CARE COMMITTEE: TERMS OF REFERENCE

The University of Ontario Institute of Technology (Ontario Tech) has a responsibility to ensure that effective control is exercised in the care and use of experimental animals. All animals (live, non-human vertebrates) are protected by the Animals for Research Act of Ontario and its associated regulations. In addition to this, provincial legislation, the Tri-Agency Agreement on the Administration of Agency Grants and Awards by Research Institutions requires the University to maintain a valid Certificate of Good Animal Practice from the Canadian Council on Animal Care (CCAC).

1. Definitions

"Canadian Council on Animal Care (CCAC)" is a national peer review agency responsible for setting and maintaining standards for ethical use and care of experimental animals used in research, teaching and testing in Canada.

"University" means the University of Ontario Institute of Technology (Ontario Tech).

2. Purpose

2.1. The Animal Care Committee (ACC) oversees all research, teaching and testing with animals. The ACC ensures that the 3R's (replacement, reduction, and refinement) are considered for any activity involving the care and use of experimental animals and that these principles are upheld to minimize the number of animals used at the University.

2.2. The ACC is established by the University and is responsible for the coordination, ethical review and approval for all proposed uses of animals in research (including field studies), testing and teaching at the University. The ACC shall establish internal policies and procedures to ensure compliance with legislation and the Canadian Council on Animal Care (CCAC) policies and guidelines. The operation of the ACC is governed by the following Terms of Reference.

3. Authority

3.1. The ACC reports directly to the Vice-President Research & Innovation (VPRI). The ACC, on behalf of the VPRI has the authority to:

a) stop any objectionable procedure that causes unnecessary distress or pain to the animal;

b) stop immediately any animal use that deviates from the approved protocol or use of non-approved procedure(s);

c) determine corrective action on breaches of compliance with approved animal use protocols and Standard Operating Procedures (SOPs). The VPRI will be informed when breaches cannot be corrected by the ACC and will determine sanctions that will be taken;

d) humanely euthanize an animal if pain or distress caused to the animal cannot be alleviated;

e) conduct post approval monitoring of all research and teaching activities involving animals; and,

f) have ongoing access to all areas where animals are held or used.

3.2. The consultant veterinarian(s) have delegated authority on behalf of the ACC to:

a) treat, remove from a study or humanely euthanize an animal according to the veterinarian's professional judgment; and,

b) proceed independently with any necessary emergency measures, whether or not the animal user and ACC Chair/Vice-Chair are available.

3.3. Before exercising authority, the consultant veterinarian(s), must attempt to contact the ACC Chair/Vice-Chair and the animal user whose animal is in question before beginning any treatment that has not previously been agreed upon. The consultant veterinarian(s) will send a written report to the animal user and to the ACC following any such event.

4. Safeguards and Non-compliance

4.1. Collegial working relationships must always be protected and promoted, but it is necessary to have in place safeguards to ensure any difficulties experienced with any aspect of animal care or use can be effectively identified and addressed. For serious non-compliance or threats to the health and safety of personnel or welfare of animals, the ACC Chair/Vice-Chair and ACC must promptly address these issues. Reports of non-compliance may come from the general community at large. Individuals must express their concerns in writing to the ACC Chair/Vice-Chair. Verbal concerns can be accepted when non-compliance situations require prompt attention; however, written documentation must follow post event. The ACC Chair/Vice-Chair will address the issues, through communications with the animal user(s), meetings and site visits in accordance with the University Policy on the Care and Use of Animals in Research and Teaching and associated procedures. The ACC, consultant veterinarian(s) and ACC Coordinator will work with the animal user(s) to ensure a resolution. All communications surrounding the event(s) will be documented in the ACC's Post Approval Monitoring reports.

4.2. The ACC will inform the VPRI of non-compliance concerns that cannot be corrected or resolved. The VPRI will inform all members of the animal care and use program about sanctions that will be taken by the administration. If the VPRI, has a real or perceived conflict of interest, the University President will determine sanctions.

5. Membership and Term

5.1. The ACC is appointed by, and is responsible to the VPRI. ACC members will be appointed for terms of four (4) years and normally renewable only up to a maximum of eight (8) consecutive years of service. The ACC can waive maximum years of service, if necessary, in order to have appropriate animal user representation. This does not apply to ACC members who must be part of the ACC because of their role within the institution (e.g. *ex officio* members).

5.2. The VPRI shall appoint an ACC Chair and ACC Vice-Chair from the complement of the ACC committee. The ACC Chair shall not be directly involved in the management of the animal care facilities, nor be the consultant veterinarian for the University, nor be involved in the preparation of a significant number of the protocols to be reviewed by the ACC in order to avoid potential conflicts of interest.

5.3. The complement of the committee will include appointed and ex-officio members.

Appointed voting members include:

a) a minimum of two (2) scientists, instructors and/or study directors involved in animal-based activities, who may or may not be actively using animals during their term on the ACC;

b) at least one (1) person representing community interests and concerns who has had no affiliation with the institution, and who has not been involved in animal use for research, teaching or testing. Community representation must be ensured for all ACC activities throughout the year and included on all protocol review subcommittees;

c) at least one student representative (graduate and/or undergraduate).

Ex-officio committee voting members include:

d) consultant veterinarian(s), who is experienced in care and use of animals at the University;

e) a representative for occupational health & safety and biosafety.

f) an Animal Facility Manager who may also fulfill the role of an appointed technical staff representative in 5.3d.

a. technical staff representation either an animal care, animal facility or animal research technician if there are technical staff member(s) actively involved in animal care and/or use within the institution,

Ex-officio committee non-voting members include:

g) the ACC coordinator (University Research Ethics Officer) who is responsible for the coordination of all animal care related activities and providing support to the ACC, and

h) a representative of the senior administration reporting to the VPRI (Executive Director, Office of Research Services).

6. Responsibility

6.1. The ACC's responsibilities include but is not limited to:

a) ensure policies and guidelines are established in accordance to CCAC, provincial legislation and institutional standards to ensure appropriate care and use of animals at the University;

b) ensure that written ACC approval is obtained prior to animal use or acquiring animals for research, teaching or testing projects. ACC approval must also be obtained prior to breeding or holding of animals for research, teaching or testing projects;

c) ensure that ACC approval of a written animal use protocol is obtained prior to breeding, research, teaching, production or testing (including field studies) involving animals. For other animal-based activities within the institution, the ACC will work with the individuals responsible for the activities to ensure appropriate procedures for animal care and use;

d) require the completion of an animal use protocol by the animal user and ensure that the protocol includes the nature of all procedures to be used on the animal, the number and type of animals to be used and the anticipated level of discomfort or distress that the animal will likely experience. In addition, other key sections identified in the CCAC guidelines on Terms of Reference for Animal Care Committees must be included in the animal use protocol;

e) review all animal use projects to ensure compliance with the University policies, CCAC guidelines, and applicable regulatory requirements at a full committee meeting;

f) confirm that each research project has undergone an independent peer review and has been found to have scientific merit, prior to issuing ACC approval. For non-peer reviewed projects, the ACC Administrative Procedure 003 Peer Review Process must be followed;

g) review, propose modifications, reject or approve any amendments to an approved animal use protocol. ACC approval is required prior to implementation of any changes. Any major changes to an approved protocol will require submission of a new protocol to the ACC. A major change includes the following: considerable increase in the number of animals, change of species, addition of more invasive procedures and use of entirely new procedures compared to the original approved procedures. The ACC can deem changes as major at their discretion;

h) review and approve annual renewals prior to study expiry. All renewals must be reviewed and approved by a scientist, consultant veterinarian(s) and community member and decisions will be reported back to the full ACC. A new submission will be required after a maximum of 3 consecutive renewals;

i) document all ACC discussions and decisions in the committee minutes;

j) participate in continuing education and training for the matters relating to animal use in research;

k) ensure appropriate veterinary care is available commensurate with current veterinary standards, and consistent with the Standards of Veterinary Care as defined by the Canadian Association for Laboratory Animals Medicine (CALAM/ACMAL).

l) promptly notify the CCAC Secretariat and the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) of any program changes;

m) submit and complete the CCAC and OMAFRA Animal Use Data Form before the yearly deadline;

n) establish a crisis management plan for animal care and use facilities; and

o) implement the Post-Approval Monitoring (PAM) program and ensure established procedures are in place.

7. Research Involving Multiple Institutions

For off-site research, researchers are also responsible for obtaining the necessary ethics approval from any ACC or authorities that oversee research at the other institutions. An ethics review and approval or equivalent is required at each institution responsible for carrying out the research under its auspices regardless of where the research is conducted or led prior to study commencement

8. Meetings, Monitoring Visits and Inspections

8.1. The ACC will meet at least twice per year or more frequently as is necessary to fulfil their Terms of Reference and be satisfied that all animal use within their jurisdiction complies with institutional, municipal, federal and provincial regulations, and CCAC policies and guidelines. Meeting minutes will detail all ACC discussions, decisions, modifications to protocols, site and inspection visits, that will be forwarded to the VPRI.

8.2. All ACC members will complete a general site visit to all facilities where animals are used, in order to better understand the work being conducted within the institution. The general site visit, by all members of the ACC, will occur once a year and can be completed individually or as a group.

8.3. The Post Approval Monitoring Committee will have scheduled visits, which will be held on average every 6 months on a date mutually agreeable to by all parties concerned including the consultant veterinarian and animal users.

8.4. At the discretion of the ACC, monitoring visits and inspections to the animal facilities can increase in frequency.

9. Quorum and Decisions

9.1. A quorum at ACC meetings shall be a simple majority of the committee members and shall include at least one community representative as well as the consultant veterinarian(s). Decisions are made by consensus.

9.2. All delegated reviews must be approved by the ACC Chair/Vice-Chair, the consultant veterinarian(s) and community member. The final approval will be issued by the ACC.

10. Training and Education

10.1. Training opportunities are required for new ACC committee members to provide an understanding of the institutional animal care and use program, animal user facilities, institutional policies and procedures, CCAC guidelines and OMAFRA regulatory requirements.

10.2. All ACC members should complete the CCAC's Modules on the Core Topics of the Laboratory Animal/Teaching Stream of the CCAC Recommended Syllabus. The University will also provide ongoing training and education for ACC members.

10.3. All persons who care for and use animals for research, teaching or testing purposes, and the consultant veterinarian(s) must receive training under the auspices of the University Animal Care Committee in the protocols appropriate to the animal species being used. They must demonstrate competence ensuring maximum benefit to the animals. This would include, continuing education in their field; (scientists/study directors, post-doctoral fellows, graduate students and research technicians)

11. Terms of Reference Review

11.1. The ACC Terms of Reference, standard operating procedures and policies will be reviewed as necessary, and at least every three years (unless another timeframe is required for compliance purposes). The ACC and Office of Research Services are responsible to monitor and review these terms.

12. Policies with Specific Reference to ACC Terms of Reference

CCAC Policy Statement for: Senior Administrators Responsible for Animal Care & Use Programs, 2008

CCAC policy statement on: terms of reference for animal care committees, 2006

CCAC Assessment Report: University of Ontario Institute of Technology (Ontario Tech), April 4, 2012

13. Other Policies Procedures & Guidelines

CCAC policy statement on: scientific merit and ethical review of animal-based research, 2013

CCAC training modules on: Institutional Animal User Training Program

CCAC guidelines on: choosing an appropriate endpoint in experiments using animals for research, teaching and testing, 1998

CCAC guidelines on: animal use protocol review, 1997

CCAC policy statement on: ethics of animal investigation, 1989

University Animal Care and Use of Animals in Research and Teaching, 2013

University 004 Administrative Procedure: University Post Approval Monitoring Program

BOARD REPORT

SESSION:		**ACTION REQUESTED:**	
Public	☒	**Decision**	☒
		Discussion/Direction	☐
		Information	☐

TO: **Board of Governors**

DATE: **30 November, 2023**

FROM: **Academic Council**

SUBJECT: **Micro-credentials and Continuous Learning Committee Terms of Reference**

MANDATE

Under the Policy Framework and the University's Act and By-laws, Academic Council is responsible for approving Academic Policy and to make recommendations to the Board on "the establishment and terms of reference of committees to exercise the Academic Council's delegated authority" under By-law no. 2.

We present the attached Micro-credentials and Continuous Learning Committee Terms of Reference for approval by the Board of Governors.

MOTION FOR CONSIDERATION

That pursuant to the recommendation of Academic Council, the Board of Governors hereby approves the Micro-credentials and Continuous Learning Committee Terms of Reference, as presented.

BACKGROUND/CONTEXT & RATIONALE:

The current Policy on Continuing Education Programs was initially implemented in 2016 and subsequently revised in March 2019. During the period spanning from March 2019 to 2023, the Continuous Learning Department was established to oversee all Not-for-Academic-Credit offerings at the university. This consolidation brought various Not-for-Academic-Credit offerings, such as Nuclear industry training, Management Development Center initiatives, and Summer Camps, under the purview of Continuous Learning.

Within the same timeframe, micro-credentials and digital badging gained wider acceptance within the sector, and the government launched funding for new micro-credential offerings (through the Micro-Credential Challenge Fund) as well as OSAP for Micro-credentials. Ontario Tech integrated micro-credentials into its policies, incorporated updated language, and aligned a newly revised Micro-Credential and Continuous Offerings Policy with the Institutional Quality Assurance Process Policy (IQAP). The IQAP's purpose is to inform and guide undergraduate and graduate program development and changes.

To facilitate these updates, the proposed Micro-credentials and Continuous Learning Committee Terms of Reference will combine the current Continuous Learning Committee and Not-For-Academic Credit Micro-credential committee into a single Committee of Academic Council responsible for approving For-Academic-Credit Micro-credentials (focusing on ensuring that approved micro-credentials meet the definition of a micro-credential). It will also satisfy the required governance approval processes as defined in the IQAP. Finally, the Committee will approve all not-for-academic credit offerings as defined in the policy, reporting those yearly to Academic Council.

CONSULATION AND APPROVAL PATH

- ✓ Academic Leadership Team (Written Consultation): November 2023
- ✓ Online Consultation: November 2023
- ✓ Undergraduate Studies Committee: 21 November 2023
- ✓ Graduate Studies Committee: 28 November 2023
- ✓ Academic Council (Recommendation for Approval): 28 November 2023
- Board of Governors (Approval): 30 November 2023

NEXT STEPS:

- After approval of the Policy and Terms of Reference, the revised Policy will be added to the Policy Library.

SUPPORTING REFERENCE MATERIALS:

- Micro-credentials and Continuous Learning Committee Terms of Reference

Micro-credentials and Continuous Learning Committee Terms of Reference

Ontario Tech University encourages and facilitates the development and implementation of Continuous Learning Offerings. The University is also committed to creating, recognizing, integrating and using high-quality Digital Badges, Micro-credentials and Stackable Credentials to support learning by all members of the Ontario Tech University community.

The Micro-credentials and Continuous Learning Committee is a forum for collaborative discussions regarding the development and use of these programs and credentials bearing the Ontario Tech University name.

The Committee's responsibilities include the following:

- Providing a forum for strategic discussion and guidance for the Continuous Learning Department.
- Recommending new Continuous Learning offerings to meet the needs of the market and local community.
- Recommending new categories of Continuous Learning offerings to develop.
- Approving, assessing, and monitoring all Continuous Learning Offerings hosted by the University and taking responsibility for academic quality and the adequacy of the resources required to support them.
- Reporting all new Continuing Learning offerings, Not-for-Credit Digital Badges, Micro-credentials and Stackable Credentials for information to Academic Council.
- Providing input, feedback, advice and written recommendations on the quality assurance as it pertains to the development, planning, implementation, and evaluation of Digital Badges, Micro-credentials, and Stackable Credentials.
- Assessing and approving all Digital Badges, Micro-credentials, and Stackable Credentials offered by Ontario Tech University and ensuring the adequacy of the resources required to support them.
- Defining a consultation process to include multiple academic and administrative units when discussing cross-institutional initiatives.
- Ensuring currency with existing or forthcoming legislation regarding Micro-credentials.
- Ensuring engagement with industry and/or community partners where appropriate.
- Promoting offerings to members of the University and broader communities, including students, staff, faculty, alumni, and external partners.
- Establishing, overseeing, and periodically reviewing the academic, admissions, and scholarship procedures, guidelines, and directives that apply to Continuous Learning, with revisions and updates to Academic Council as required; and
- Reviewing and recommending to Academic Council changes to academic, admissions, and scholarship policy that apply to Continuous Learning.

Accountability

The Committee is accountable to the Provost.

Membership

The membership of the Committee will be comprised of:

- Deputy Provost (Chair)
- Associate Vice-President, Planning and Strategic Analysis or equivalent
- Director, Continuous Learning or equivalent
- Dean, School of Graduate and Post-Doctoral Studies, or Designate
- Two Deans of Faculties, or Designates (rotating every 2 years)
- Registrar, or Designate
- President Appointee
- Director, Teaching and Learning Centre, or Designate
- Manager, CIQE, or Designate (non-voting)
- Continuous Learning staff member (non-voting, secretary)

Meetings

The Committee will meet quarterly or as needed, determined by the Chair and according to the volume of business.

Quorum

Quorum is achieved when the majority of members (or their Designates) are present. The Committee shall seek to operate by consensus.

Reporting

Discussions, recommendations, and decisions will be recorded at every meeting in the meeting notes. A copy of the meeting notes will be provided to the Chair, the Senior Leadership Team, and committee members following each meeting.

BOARD REPORT

SESSION:	**ACTION REQUESTED:**
Public ☒	**Decision** ☒
Non-Public ☐	**Discussion/Direction** ☐
	Information ☐

TO: **Board of Governors**

DATE: **November 30, 2023**

PRESENTED BY: **Pamela Onsiong**

SLT LEAD: **Brad MacIsaac**

SUBJECT: **Revised – Endowment Management Policy and Procedures**

BOARD MANDATE:

Under the University's Act, section 9(1), the Board of Governors has the power to establish academic, research, service and institutional policies and plans to control the manner in which they are implemented. The University's Policy Framework is a key institutional policy that delegates the Board's power, establishing categories of policy instruments with distinct approval pathways.

Under the Policy Framework, the Board of Governors is the approval authority for the Endowment Management Policy, on the recommendation of the Audit and Finance Committee. On November 23, 2023, Audit and Finance Committee endorsed the Policy to the Board of Governors. At the same meeting, the Committee approved the related Procedures which are attached to this package for information.

BACKGROUND/CONTEXT & RATIONALE:

The University is charged with investing endowment funds in order to maximize the benefit to both current and future beneficiaries. The University receives endowment funding from Donors for purposes including student awards, scholarships, bursaries, and program enrichment. The Board may also make allocations at its discretion to existing endowment funds or to establish new Board restricted endowment funds.

…/continued

The purpose of the amended Policy and Procedures is to outline the objectives and principles by which the University's endowment funds are established, administered and disbursed and to ensure the prudent administration of Donor and Board Endowed Funds. These amendments, if accepted, will supersede the current Endowment Management Policy (approved by the Board, March 2016) and Procedures (approved by A&F, February 2016).

OVERVIEW:

The objective is to re-affirm and put into practice these revised Policy and Procedures to ensure consistent and transparent, endowment fund management in line with best practice. It is also intended to hold the endowment fund in good stead in times of volatile economic conditions such as those we are currently experiencing (i.e. uncomfortably high inflation rates and decreasing total net returns), while at the same time allowing the University to meet its annual endowed disbursement quota.

A summary of the changes from the existing Policy and Procedures, and reasons for the change, are disclosed in the table below:

Category	Current Policy & Procedures	Revised Policy and Procedures
Spending - Capital preservation	In order to avoid a reduction over time in spending in real terms, due to the effects of inflation, a portion of the total net investment return, known as capital preservation, will be added to the Endowment.	No change from current policy. In addition, it is recommended that the Board of Governors **retain the right to limit or suspend the annual allocation of capital preservation**, e.g. when inflation rates are unusually high
Spending - Spending level	Spending levels are calculated using a percentage of a **four-year rolling average of the inflation adjusted capital value of the Endowment**	No change from current policy. The spending as a **basis of a four-year rolling average** will now be applied on a **prospective basis**. Using a 4-year rolling average tampers the impact of wild inflation rates on the spending level

…/continued

Category	Current Policy & Procedures	Revised Policy and Procedures
Funding & Disbursement – Allocation of investment returns	The annual investment return for disbursement is comprised of **realized gains and losses**, including interest, dividends, **and realized capital gains and losses,** net of investment fees.	The annual investment return for disbursement is based on a **total net return**. This comprises of realized capital gains/losses, interest, dividends, and **unrealized capital gains**, net of fees. The crystallization of unrealized capital gains will support the disbursement of awards when realized investment income is not sufficient to support the spending level after capital preservation. This follows endowment management best practices and is in line with donors' expectations
Funding & Disbursement - Stabilization fund	The stabilization fund **will not exceed 5%** of the inflation adjusted cost of the Endowment and any excess earnings will be returned to the principle endowment account	The stabilization fund **will not exceed 15%** of the Endowment and any excess balances will be considered for capitalization into the endowment fund or for one-time disbursement. Stabilization fund **increases from 5% to 15%** as the portfolio has reached a higher level of maturity compared to 7 years ago and has built a significant amount of unrealized gains. A higher stabilization fund also allows the University to continue disbursement of awards to students during economic downturn
Funding & Disbursement - Stabilization fund	When funds in the stabilization are insufficient to support committed spending, there will be, after approval by the BOG: a. A delay in spending b. Execution of unrealized gains; or c. Expense (s) paid from operating funds	When funds in the stabilization are insufficient to support committed spending, there will be, after approval by the BOG: a. A delay in spending; **b. Suspension of capital protection; or** **c. Encroachment on capital where permitted by the Endowment Fund Agreement** **Revised b) and c) will require Board approval** Current b) and c) require management approval only

…/continued

Compliance with this revised policy and procedures aligns with donors' expectations and sector best practice.

COMPLIANCE WITH POLICY/LEGISLATION:

The proposed policy and procedures comply with generally accepted accounting principles (GAAP) for not-for-profit organizations and the federal government's prescribed minimum annual payment percentage in order that the University retain its charitable tax status.

CONSULTATION AND NEXT STEPS:

Presented to:

- ✓ Policy Advisory Committee – Policy Assessment (September 25, 2023)
- ✓ Academic Council – Consultation (October 24, 2023)
- ✓ Administrative Leadership Team – Consultation (November 14, 2023)
- ✓ University on-line Consultation (October 16 – 27, 2023)
- ✓ Audit and Finance Committee – Policy Recommendation to Board of Governors; Procedures Approval (November 23, 2023)
- Board of Governors – Policy Approval (November 30, 2023)

MOTION FOR CONSIDERATION:

That pursuant to the recommendation of the Audit & Finance Committee the Board of Governors hereby approves the Endowment Management Policy.

SUPPORTING REFERENCE MATERIALS:

- Appendix 1: Revised Policy & Procedures